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EDITORIAL COMMUNICATION

The special issue of Bioscience Biotechnology Research Communications Vol 13 No (7) 2020 on "Advances in Dental Research" aims to provide an academic compilation to discuss various original research articles from clinicians, research scholars, academicians and scientific experts on different recent perspectives in the exciting field of dental research. This special issue contains 100 original articles which forms the platform for providing latest scientific knowledge on Advanced Researches in Dentistry and their applications.

Some noteworthy research contributions of the special issue are Centrally acting skeletal muscle relaxants during tooth preparation procedure; Piezoelectric surgery, ER:YAG laser and Rotary surgical burs in harvesting mandibular block grafts; Cytotoxicity of a nanoparticle incorporated root canal sealer; and Comparative evaluation of antimicrobial efficacy of calcium hydroxide mixed with different vehicles on Enterococcus faecalis, which will be very interesting to the readers.

The published research articles have been aimed to motivate the next generation researchers working in this emerging research era. The articles available in this issue will be helpful for the researchers working in these new emerging areas. Best wishes and thanks for the excellent original contributions from the undergraduates and postgraduates, research scholars and senior faculty members, from Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Chennai, India.

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CONTENTS

Factors Affecting Quality of Sleep in Hospitalized Patients : A– Questionnaire Cross Sectional Study

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ABSTRACT

Promoting a peaceful environmental place to sleep in the hospital is very complicated and challenging. Even though a patient may try to sleep in the hospital, it may not be refreshing or restorative because of the following factors like environmental, physiological and psychological. These factors can work concomitantly, making sleep virtually impossible for some patients. Nurses can help their patients by understanding what influences their disturbing sleep patterns. The aim of the study is to know the factors that affect the quality of sleep in hospitalised patients. A cross- sectional questionnaire study was conducted among 100 hospitalised patients of Saveetha Dental College. Their answers were compared with the Farsi Pittsburgh sleep index and graphs have been plotted. Inclusion criteria: Selection criteria includes age greater than or equal to 18 years and completely conscious patients, patients hospitalized for more than two weeks. Exclusion criteria: Recently hospitalized patients , patients who received hypnotics or sedative drug over the last 24 h, history of any major organ failure that may be associated with impaired conscious level and patients with sleep apnea were excluded.Statistical analysis was done using the SPSS software version 22. Descriptive statistics were expressed by means of frequency and percentage. Chi-square tests were used to find the association between the variables.We found that environmental factors affect the quality of sleep by 40% of the study population , Physiological factors affect 30% of the study population and Psychological factors affect the remaining 30% of the study group.The environmental and physiological factors have more influence on the disturbed sleep pattern on hospitalized patients. The proper preventive measures must be taken to improve the sleep quality.

KEY WORDS: PHYSIOLOGICAL, ENVIRONMENTAL, SLEEP, DISTURBANCE, PSYCHOLOGICAL.

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INTRODUCTION

Sleep is an unconscious state in which the person can be woken by any stimuli(Júnior et al., 2014). Electroencephalogram (EEG) monitoring shows that there are five distinct stages of sleep, which can be subdivided into two groups – non-rapid eye movement (NREM) sleep and rapid eye movement (REM) sleep. The first group, NREM sleep, has four stages, and the second, REM sleep, has only one stage. In the former, eye movement is virtually non- existent whereas in the latter the eyes move rapidly under closed eyelids NREM sleep as 'an idle brain in a very relaxed body' and REM sleep is 'a brain that appears wide awake in a virtually paralysed body'. During NREM sleep, breathing and heart rate decrease, muscles relax, and the brain's metabolic rate is reduced by 25–30%. Whereas in REM sleep heart rate increases, the brain's metabolic rate is similar to being awake, and muscles, with the exception of smooth muscles, diaphragm, heart and eye muscles, are in a state of near paralysis (Whitehead, 1976).

Sleep is a cyclical process that is composed of five alternating and mutually different stages or phases. Due to the presence or lack of rapid eyes movement and changes in other variables such as muscle tension and cardiorespiratory pattern there will be change in the pattern of brain waves (Knutson et al., 2007). Sleep is important for humans and it's alteration in quality and quantity can affect the physical well being and health of the individual (Tranmer et al., 2003). Sleeplessness leads to copious negative cognitive, metabolic, autonomic and hormonal changes(Shenoy and Brundha, 2016)that leads to profound physical effects including fatigability, pain intolerance, misception, disorientation, decreases immune function and reduced secretion of growth hormone lead to regulate the body body growth and stimulate tissue restoration by anabolic activity(Rosenberg, 1990).

Mostly the hospitalised patient suffers from the sleeping disorder after surgery or during surgery. Hospitalized patients often have difficulty in initiating and maintaining sleep or complain of early awakening and non restorative sleep (Gangwisch et al., 2006). The cause of sleep disruption is multifactorial and includes the patient's underlying illness, medical treatments and hospital environment. Often unrecognized and untreated during hospitalization sleep disruption may lead to sleep deprivation or chronic lack of restorative sleep ('NIH State-of-the-Science Conference Statement on Manifestations and Management of Chronic Insomnia in Adults', 2009). Health individual, sleep deprivation can result in numerous physical and psychological consequences. Sleep deprivation is associated with hypertension impaired postural control, decreased ventilatory drive, increased sympathetic cardiovascular

activation and blunted hypothalamic pituitary adrenal axis and impaired host defenses and possibly diabetes mellitus and obesity(Besedovsky, Lange and Born, (2012).

Lack of restorative sleep increases the risk of developing anxiety and mood disorder and delirium, especially in acutely ill older patients(Ogawa et al., 2003). The presence of acute sleep may cause compound illness and impair recovery (Fabbri et al., 2006). Hospitalized patients usually have difficulties in meeting the need for sleep and this may be due to the changes in their sleeping and resting phase behaviors and habits. However, these patients have less sleep due to many factors that cause sleep disorders such as environment and the surrounding conditions. Such lack of sleep and rest can increase the cardiovascular risk consequences. It increases the sympathetic system activity resulting in a rise in blood pressure and heart rate (Adam and Oswald, 1977). There were numerous studies on analyzing the quality of sleep in college students as they were under stress and were home sick. This study was conducted to assess, analyse and evaluate the quality of sleep of the patients who were hospitalized for more than two weeks irrespective of the disease conditions and treatment therapy.

MATERIAL AND METHODS

A cross- sectional survey was conducted among 100 patients of Saveetha Dental College and Hospital.Nearly 20 questions had been prepared and it was asked to the patient and answers were recorded. Accordingly, the graph has been plotted with the help of the Farsi Pittsburgh sleep index.

Sampling: In the present study,the sampling method used is a random sampling method.

Data Collection and Tabulation: The number of questions distributed was 10.The close ended yes or no type of question were asked.Their responses were entered into the excel sheets and then tabulation of the data finally and the question comparison was done. The representation of the data is through the bar graph.

Statistical Analysis: The statistical software used IBM SPSS V22.The statistical test used is Chi square test (p value).Type of analysis used were descriptive analysis,demographic data.

Inclusion Criteria: Selection criteria include age greater than or equal to 18 years and conscious patients. Patients hospitalized for more than two weeks.

Exclusion Criteria: Patients who received any hypnotics or sedative drug over the last 24 hours, history of any major organ failure that may be associated with impaired

conscious level and patients with sleep apnea were excluded. All patients were subjected to full history taking including symptoms related to sleep-disordered breathing, routine laboratory workup, and arterial blood gas analysis. Also, presence of comorbidity (hypertension or diabetes) was reported.

RESULTS AND DISCUSSION

Sleep is universally recognized as essential for physical and psychological healing and the restoration of overall well being throughout the ages. This study helps to describe that sleeping pattern of a patient in the hospital. The following questions were prepared accordingly into four factors. They are physical, physiological, environmental and psychological factors. Majority participants were female between the age of 40-50 years ,married, with normal education qualification.

Nearly 50 hospitalized patients from ICU and General In Patient ward were selected for the study. The obtained result shows that most of the patients suffer from sleep disorder in hospitalized condition. Various questions were asked and were compared the quality of sleep at home to the hospitalized condition. When asked to describe factors affecting night time sleep quality, nearly 60%female and 40% of Male patients responded (Figure 1).As for gender, for example, a study undertaken with 150 patients in a hospital concluded that men had better sleep quality than women because women are always more concerned about not performing their home duties and caring for their families during their stay in the hospital(Dogan, Ertekin and Dogan, 2005).

Figure 1: Pie chart shows the result of people participated in the study,60% female respondents(red) and 40% male respondents (blue)
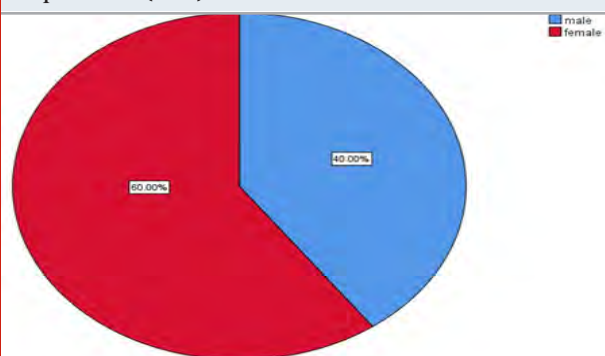
Figure 2 shows, Environmental factor affects (40%) physiological factors affects (30%)and psychological factor affects (30%)of the patients. Figure 3 represents the association between gender and factor affecting the quality of sleep in hospitalised patients and it was shown females have been affected more commonly than

males by environmental, physiological and psychological factors. Chi square test was used to find the association between the variables, Pearson chi square value is 1.389, p value is 0.499(>0.05) and was found to be statistically not significant.

Figure 2: Pie chart shows the results on factors affecting the quality of sleep in hospitalized patient ,40%by environmental factor(blue) ,30% physiological factor (red) and 30% psychological factor(Green)
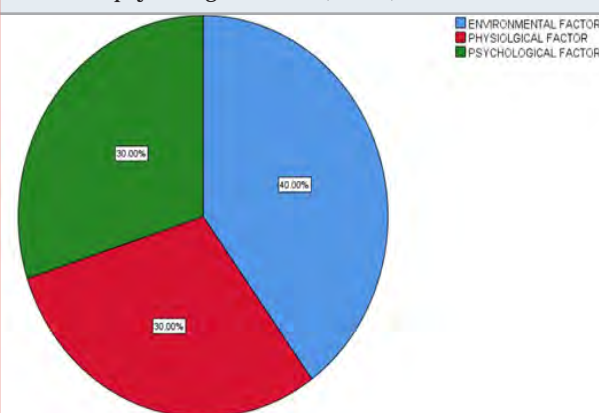
Physical activity positively affects sleep quality. Particularly for the elderly, physical exercise has been shown to be beneficial for sleep problems related to disorders of the circadian rhythm, such that regular physical activity seems to increase the depth and duration of sleep(Sin, Ho and Chung, 2009). While analyzing the reports the sleep characteristic during hospitalization shows that waking them early in the morning and awakening them by the doctors and nurses in mid of their sleep affects their sleep. Excessive light on the room also affects their sleep.

Figure 3: Bar graphs represent the association between gender and factor affecting the quality of sleep in hospitalised patients . X axis represents gender and Y axis represents the number of responses. Females have been affected more commonly than males by environmental, physiological and psychological factors. Chi square test was used to find the association between the variables, Pearson chi square value is 1.389, p value is 0.499(>0.05) and was found to be statistically not significant.

Figure 4 shows, Physiological factors like pain are experienced by 50% of pain, fatigue by 24% and discomfort by 26%. It is similar to the study conducted in ICU ward, where pain, breathing difficulty and choking contributes to the sleep disturbances(Rahimi et al., 2018)).Figure 5 Bar graphs represent the association between gender and physiological factors affecting sleep. Females(36%) have been affected more commonly than males (14%)by pain.However the difference is not significant statistically. Pearson chi square value is 3.386, p value is 0.184(>0.05). Figure 6 shows environmental factors like uncomfortable bed position affects the sleep in 36 % of the patient, restriction of tubes leads to cardiac monitor affects 26% of patients, i.v.(Intravenous injection) sets affect 38% of the patient's sleep.

This is different from the study conducted in tertiary hospital, where noise of the monitor and telephone ringing are the major contributing factors of disturbed sleep (Institute of Medicine, Board on Health Sciences Policy and Committee on Sleep Medicine and Research, 2006).Figure 7 represents the association between gender and environment factors affecting sleep. From this graph we found that females are more affected than males by bed position and in i.v.set.However the difference is not statistically significant.Chi square test:Pearson chi square value is 0.057, p value is 0.972(>0.05). Figure 8 shows that Psychological factors like lack of privacy affects 48%, concern to medical expenses affects 22%, due to fear of infectious diseases affects 30% of the patients sleep.

Figure 4: Pie chart shows the results on physiological factors affecting the quality of sleep in hospitalized patient 50% by pain(blue),24% discomfortable(Green) and 26% fatigue(red)

Figure 6: Pie chart shows the results on environmental factors affecting the quality of sleep in hospitalized patients 36% of the study population responded to Bed position(blue),26 % to cardiac monitoring sound(red) and 38% to i.v. set(green)
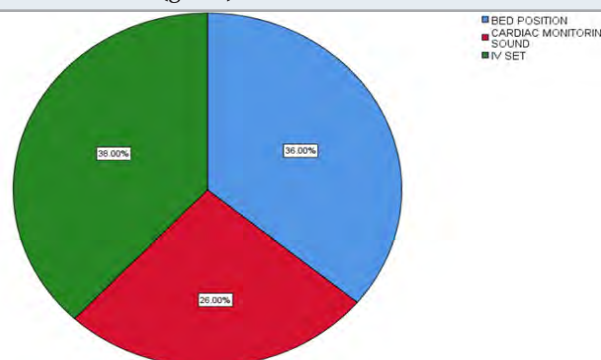
Figure 5 Bar graphs represent the association between gender and physiological factors affecting sleep. X axis represents gender and Y axis represents the number of responses.Females(36%) have been affected more commonly than males (14%)by pain. However the difference is not significant statistically. Pearson chi square value is 3.386, p value is 0.184(>0.05)

Figure 7: Bar graphs represent the association between gender and environment factors affecting sleep. X axis represents gender and Y axis represents the number of responses. From this graph we found that females are more affected than males by bed position and in i.v.set. However the difference is not statistically significant.Chi square test:Pearson chi square value is 0.057, p value is 0.972(>0.05)
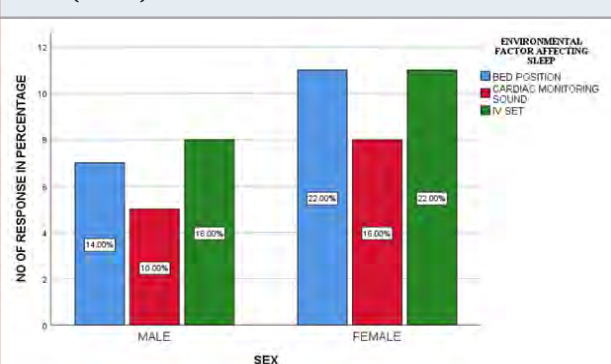
This finding is similar to the study which stated medical expenses and missing family members causes lack of sleep (da Costa and Ceolim, 2013).Figure 9 represents the

association between gender and psychological factors. Females are more affected than males by bed position and in i.v. set. Chi square test was used to find the association between the variables, Pearson chi square value is 0.442, p value is0.802(>0.05)and was found to be statistically not significant. These facts suggest that sleep disturbances are more likely due to a combination of intrinsic and extrinsic factors that affect hospitalized patients, which can include the patient's personal illness and previous experiences in hospitalization (Reid, 2001)].

Figure 8: Pie chart shows the results on psychological factor factors affecting the quality of sleep in hospitalized patient 48% lack of privacy(blue), 22% medical expensive (red) and 30% fear of infectious diseases (green)
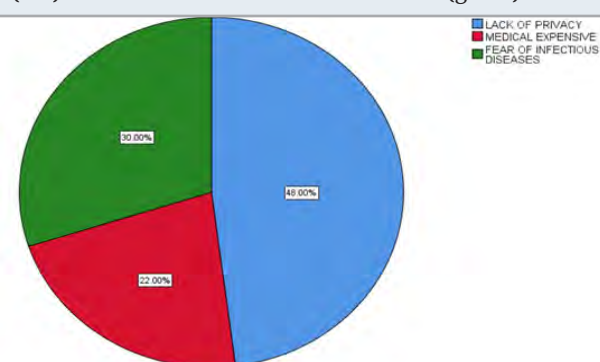
Figure 9: Bar graphs represent the association between gender and psychological factor .X axis represents gender and Y axis represents the number of responses. Females are more affected than males by bed position and in i.v. set. Chi square test was used to find the association between the variables ,pearson chi square value is 0.442, p value is0.802(>0.05)and was found to be statistically not significant
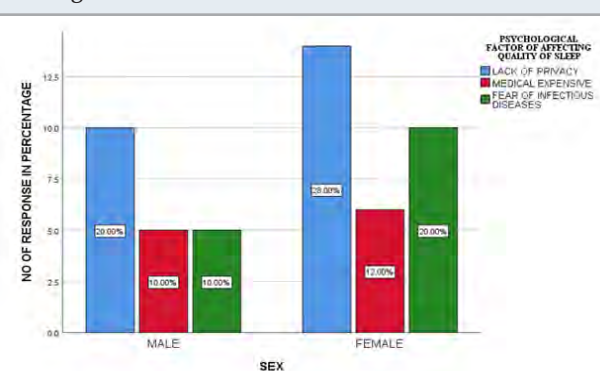
It is essential that nurses should understand the poor quality of sleep, which was reported by a large number of patients during hospitalization. The disturbed sleep pattern can have negative effects on patients' recovery. In a study undertaken in a coronary unit, lack of sleep was the second most frequent factor in increasing the recovery of patient from illness (Béphage, 2005)

(Tembo and Parker, 2009) (Marosti and Dantas, 2006; Young et al., 2008).Sleep is an important process of energy preservation, and its deprivation can cause sleepiness during the day, fatigue, altered mood and periods of disorientation(Marosti and Dantas, 2006; Young et al., 2008)(Çelik et al., 2005). It can also reduce pain tolerance due to the increase of fatigue in the sympathetic central nervous system, which may lead to increased use of pain control drugs, which can themselves contribute to sleep deprivation(Meyer et al., 1994). Sleep, therefore, constitutes a basic human need that deserves full attention and intervention by hospital health care takers (Redding, Hargest and Minsky, 1977) .As the sample of the study is small,the factors affecting the quality of sleep may differ from other articles. A clear picture of demographic data was not collected to know about their socioeconomic status.

CONCLUSION

It can be concluded that sleeping patterns of patients are affected by so many factors, especially by environmental and psychological factors. When compared to males, females were more affected by the factors affecting sleep when they are hospitalised. On analyzing all these factors, the quality of sleep can be improved by providing a comfortable environment and psychological counselling to the patients. Nurses should consult with doctors and plan accordingly to prevent sleep disturbances.

ACKNOWLEDGEMENTS

CONFLICT OF INTEREST: None to declare

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Comparision of Packed Cell Volume by Manual and Automated Methods

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ABSTRACT

The Packed cell volume [PCV] is a measurement of the proportion of blood that is made up of cells. The Packed cell volume [PCV] can be determined by centrifuging heparinized blood in a capillary tube at 10,000 RPM for a few minutes. This separates the blood into the layer. The automated hematology analyzer uses the principle in which the blood is passed between two electrodes through an aperture so narrow that only one cell can pass through at a time. The measurement depends on the number and size of the red blood cell.Hematocrit levels that are high or low indicate a blood disorder. PCV valve is normally 42% to 50% for men and 36% to 45% for women. The aim of our study is to compare the PCV value by manual and automated method. This study is a prospective study, by comparing the packed cell volume by the manual and the automated method using twenty peripheral venous blood samples, which were collected from the patient with an informed consent. It is evident that measuring the packed cell volume by the automated method was found to be more accurate when compared to the manual method.This study depicts a significant outcome in measuring the packed cell volume by the automated method could be more effective in obtaining accurate interpretation.

KEY WORDS: PACKED CELL VOLUME, MANUAL, AUTOMATED, HEMATOCRIT, RBCS.

INTRODUCTION

The packed cell volume (PCV) is a concentration of the Red blood cells in the given volume of the blood. There are other names for the packed cell volume (PCV) such as Hematocrit (Hct), the volume of packed red cells (VPRC), or erythrocyte volume fraction (EVF). The value is expressed as a percentage or fraction of cells in the blood. The packed cell volume (PCV) can be determined by centrifuging di-potassium EDTA anticoagulated blood in a capillary tube or Wintrobe's tube at 10,000- 12000 RPM for 30 minutes. This separates the blood into layers. The top most layer was the plasma, which was separated by a column of buffy coat from the packed red blood cells. The buffy coat is composed of white blood cells and platelets. The upper limit of the Red cell column was taken as PCV value in percentage. The measurement depends on the number and size of the red blood cell. PCV valve is normally 42% to 50% for men and 36% to 45% for women. It is a part of a person's complete blood count results along with hemoglobin concentration, white blood cell count and platelet count(Wennecke, 2004).

Hematocrit levels that are too high or too low can indicate a blood disorder, in cases of dengue fever, a high hematocrit is a danger sign of an increased risk of dengue shock syndrome(Morens, Halstead and Repik, 1985). Polycythaemia Vera, a Myeloproliferative disorder, Hypoxic state, reduced oxygen saturation of the red cells, individuals living in high altitudes have an increased PCV value. In these conditions, the RBC count and the concentration were increased, which in turn increased the PCV valve(Fairbanks, 1999).

In the case of low red blood cell count leads to Pregnancy women having additional fluid in the blood. This could potentially lead to a small drop in haematocrit levels(Kawthalkar, 2010). Haematocrit can vary from the determining factors of the number of red blood cells. These factors can be from the age and sex of the subject(Kertész and Hlubik, 2002). A higher packed cell volume level signifies the blood sample's ability to transport oxygen in case of hypoxia. The optimum PCV levels have been studied through combinations of assays on the given blood samples itself along with viscosity and hemoglobin level(Geetha, 2017). With modern lab equipment, the packed red cell volume is calculated by an automated analyzer and is not directly measured(Rossman, 2011). The PCV is slightly more accurate as the PCV includes small amounts of blood plasma trapped between the red cells. An estimated packed red cell volume as a percentage may be derived by tripling the hemoglobin concentration in g/dl and dropping the units(Bull and Brecher, 1974). A Wintrobe's tube is a narrow glass tube measuring 110 mm long and with the hole diameter 1 mm and graduation from 0 to 100 mm in both ascending and descending order. This method has been succeeded by the "micro-haematocrit" method which uses a small capillary tube instead of a Wintrobe's haematocrit tube(Don, 2003).

MATERIAL AND METHODS

This study is a prospective study, by comparing the Packed cell volume by the manual and the automatic method was assessed using twenty peripheral venous blood samples which were collected from the patients. The patient population was selected randomly from the clinical laboratory of Saveetha Dental College. The patients were examined, as a part of standard laboratory routine for hematological examinations, after informed consent was obtained by the patient or their responsible others. Approval was given by the ethical committee for research involving humans, Saveetha Institute of Medical and Technical Sciences. The criterion for the sample selection was the clinical request for Haemoglobin and complete blood count. No restriction was made for sex, age or clinic history of each patient under clinical care. All the procedures were carried out in the clinical laboratory of Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences.

Wintrobe's method: The macrohematocrit method uses a Wintrobe hematocrit tube, a centrifuge machine, and a Pasteur pipette. Blood is filled in the Wintrobe hematocrit tube up to 100 mm mark with the help of Pasteur pipette. Care is taken not to leave any bubble in the blood column. For this, the tube is filled slowly with the tip of the pipette being always below the highest position of the blood column. Then, the tube gets placed in the centrifuge machine. When testing a single specimen, another blood-filled Wintrobe hematocrit tube is kept on the opposite holder to counterbalance. The spin setting is 3000 rpm for 30 min. After completion of the centrifugation, the tube is taken out, and RBC column height is reported as Hematocrit (HCT). During the reporting, special precaution is necessary to omit the buffy coat, which is a combination of WBC and platelets. This layer should not be included in the HCT, as it may lead to false-positive results.

Method and Principle of automated hematology analyzer: The procedure was done as per the manufacturer's instructions m9 mind ray. The Automated hematology Analyzer used the counter principle, which blood is passed between two electrodes through an aperture so narrow that only one cell can pass through at a time. The PCV was a calculated value that was obtained from the hemoglobin level. The calculation was inserted as data modification in the automated analyzer by the system management services as per the laboratory scope and methodology.

Statically analysis: Statistical analysis was accomplished by the application of unpaired t-tests using sigma plot platform version 12, statistical significance was considered for the manual and the automatic method is p< 0.001.

RESULT AND DISCUSSION

Table 1. unpaired t – Test for both male and female by manual and automated method for PCV value. When compared, the manual method shows higher PCV value than the automated method and the difference was statistically significant (p<0.001)

Treatment name	No:of samples	Missing	Mean	STD DEV	SEM
Manual	20	0	50.55	11.194	2.503
Automatic	20	0	43.28	3.71	0.83
Difference	20	0	7.27	9.078	2.03

During the experiments, it was found that the automated method demanded special precautions such as avoiding bubbles when agitating the sample in the reagent bottle, incubating sample-stain diluent suspensions at room temperature, and protecting the sample from exposure to light. It should be emphasized that these precautions are not to be found in the manufacturer's manual. For this work, the reaction occurred after 15-minute incubation and approximately 1 minute for each measurement. The whole process was performed for over 2 hours. Despite the great number of samples processed, we were able to both meet the time limit of the standard determination

and to prevent errors, even if the suspension presented stability, as informed by the manufacturer.

Table 2. Unpaired t – Test only for male by manual and automated method for PCV value.The average PCV valve of males in this study, for Manual is 57.5% and the automated method is 45.36% with a difference of 12.14% which also showed a significant difference of p<0.001. From this, there is a significant difference between manual and automated methods

Treatment name	No:of samples	Missing	Mean	STD DEV	SEM
Manual	10	0	57.5	10.102	3.195
Automatic	10	0	45.36	3.396	1.074
Difference	10	0	12.14	7.324	2.316

Table 3. unpaired t – Test only for female by manual and automated method for PCV value.The average PCV valve for Manual is 50.55% and the automated method is 43.28% with a difference of 7.27%. The statistical analysis showed a significant difference of p>0.001. Hence we found. In females, there is no significant difference between the manual and automated method of PCV values

Treatment name	No:of samples	Missing	Mean	STD DEV	SEM
Manual	10	0	43.6	7.427	2.349
Automatic	10	0	41.2	2.811	0.889
Difference	10	0	2.4	8.224	2.601

Table 4. ANONA with linear regression analysis for P and R value. SS- Sum of square, MS- Mean square. Linear regression analysis also showed that there is a significant difference between the manual and automated PCV calculation methods with a p-value of less than 0.001 and showed systematic errors and Random error of 0.64 % in the manual method, which is higher than the automated method

	DF	SS	MS	F	P
Regression	1	1108.296	1108.296	15.675	<0.001
Residual	18	1272.654	70.703		
Total	19	2380.95	125.313		

Unpaired t-tests are done for packed cell volume by manual and automatic methods for all 20 samples from 10 males and 10 females (Table 1). The average PCV valve for Manual is 50.55% and the automated method is 43.28% with a difference of 7.27%. The statistical analysis showed a significant difference of p< 0.001. From this there is a significant difference between manual and automated methods.

Unpaired t-tests are done for packed cell volume by manual and automatic methods only for samples from 10 males (Table 2). The average PCV valve for Manual is 57.5% and the automated method is 45.36% with a difference of 12.14% which also showed a significant difference of p<0.001. From this, there is a significant difference between manual and automated methods.

Unpaired t-tests are done for packed cell volume by manual and automatic method from the peripheral blood sample was collected only for ten females (Table 3). The average PCV valve for Manual is 50.55% and the automated method is 43.28% with a difference of 7.27%. The statistical analysis showed a significant difference of p>0.001. From this, there is no significant difference between manual and automated methods.

ANOVA with linear regression analysis was done in the data retrieved from the results. This is shown in Table 4. ANOVA with linear regression analysis also showed that there is a significant difference between the manual and automated PCV calculation methods with a p-value of less than 0.001 and showed systematic errors and Random error of 0.64 % in the manual method, which is higher than the automated method. The scattered plot of the data (Figure 1) showed the distribution of the PCV values of all the 20 samples which were not distributed around the mean.

Figure 1: Scattered plot of Data showed the distribution of the PCV values of all the 20 samples which were not distributed around the mean
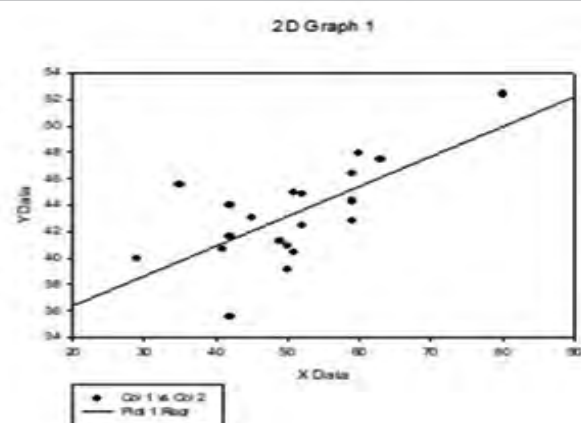
The study conducted by Ike S.O et al in 2010 (Ike et al., 2010)used the same methodology followed in our study with all the blood parameters by manual and automated methods of hematology. It showed that there was a significant difference between the manual and automated method of hematology analysis with a p-value of <0.05 and an error of R=0.91%. The study concluded that automated values were more reliable than the manual method. By comparing our study, the error was R=0.64% for the PCV valve and similarly, our study also showed a significant difference between the two methods with lower error with automated value.

Kakel et al in 2013(Kakel, 2013) was done a comparison of manual and automated hematology for all the parameters. It showed a significant difference between the manual and automated method of hematology analysis with PCV value of 53% and 45% for automated and manual method respectively. The study concludes that the automated PCV value is more than the manual method. By comparing our study, with the PCV value of 43.3% and 52.3% for an automated and manual method for PCV value. This showed a difference in the PCV value from the value of Kakel's study.

Karem et al(Karem, Sabour and Kulaifa, 2016) performed a comparison of manual and automated hematology for all the parameters. It showed that there was a significant difference between the manual and automated methods of hematology analysis with a p-value of <0.001. The study concludes that the automated PCV value is more than a manual method. By comparing our study, with the Significant difference between the Manual and automated method of Haematology analysis with a p-value of < 0.001. Zandecki M et al(Zandecki et al., 2007) did a comparison of manual and automated hematology for all the parameters. It showed that there was a significant difference between the manual and automated methods of hematology analysis with a p-value of <0.001. The study concludes that the automated PCV value is more than the manual method. Both the studies were showing that the automated value was higher than the manual method value in case of Packed cell volume. In our study we found in inverse that the manual method value was higher than the automated method value.

CONCLUSION

With the limitations of the study we conclude that the PCV value in the manual method is higher than the automated method and it is showing a significant difference in males than females. The present study depicts a significant outcome in measuring the packed cell volume by the automated method could be more effective in obtaining accurate interpretation.

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Awareness on Usage of Antiviral Group of Drugs Among Dental Students

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ABSTRACT

Members of the human herpesvirus (HHV) and human papillomavirus (HPV) families cause the most common primary viral infections of the oral cavity. Acyclovir is an antiviral drug that is primarily used for the treatment of HSV (herpes simplex virus) infection. It has higher activity towards both HSV-1 and HSV-2 as compared to the latter viral infections. Acyclovir remains the drug of choice for prophylaxis and treatment of HSV infection and is available in numerous forms such as tablet, suspension, intravenous injection, and ophthalmic ointment. The aim of the study is to determine the awareness of usage of antiviral groups of drugs among dental students. It is an online based questionnaire study in which 10 questions were circulated through an online forum through google forms and results were analysed using SPSS. In this study it is observed that about 63% of the dental students say that herpes is the most common virus they encounter in their dental environment. 68% of them say that herpes labialis is the common viral infection they commonly encounter in their dental environment. 45% say that they use acyclovir as the first line of antiviral drug. Nearly 52% of the dental students are aware of antiviral groups of drugs used in dentistry and still 47% of them are unaware of the antiviral drugs. Hence, it is important to create awareness among dental students.

KEY WORDS: ANTIVIRAL DRUGS, HERPES SIMPLEX VIRUS, HERPES LABIALIS, ACYCLOVIR, VALACYCLOVIR.

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INTRODUCTION

Antiviral drugs are a group of medications used for treating viral infections. Most antivirals target specific viruses, while a broad spectrum antiviral is effective against a wide range of viruses. Unlike antibiotics, antiviral drugs do not destroy their target pathogen, instead they prevent their development. Antiviral drugs are a class of antimicrobials, which also includes antibiotic, antifungal and antiparasitic drugs, antiviral drugs. Most antivirals are considered relatively harmless to the host, and therefore can be used to treat infections. Most common viruses in the dental environment are human herpes virus and human papillomavirus.

Herpes simplex virus 1 (HSV 1) and Herpes simplex virus 2 (HSV 2) which are DNA viruses of Herpesviridae family are the causative agent of HSV infections. These viruses infect both orofacial and pubic areas, HSV-1 affects the orofacial region while HSV-2 affects the pubic region(Azodo and Umoh, 2015). Herpes labialis is the most common orofacial form of recurrent HSV infection. It is a common worldwide affliction on which neither public health procedures, vaccines, nor antiviral chemotherapy have had a significant clinical impact('172 The natural history of experimental ultraviolet radiation(UVR)-induced herpes labialis, a human model of recurrent herpes simplex virus infection: Clinical, virologic and serologic observations following multiple exposures', 1993). Herpes labialis is a benign infective condition associated with the formation of vesiculo ulcerative lesions around the mouth which is often preceded by prodromal symptoms including pain, tingling and burning sensation(Capodiferro, 2019).

Risk factors such as ultraviolet light of both natural and artificial sources as in sunlight and tanning beds, lip chapping, lip trauma or abrasion, fever, physical and emotional stress(Jensen, Hoehns and Squires, 2004; Ensor, 2005; Marques-Silva et al., 2007). The diagnosis of herpes labialis is based on case history clinical appearance and the site of the lesions in immunocompetent patients while confirmatory laboratory diagnosis such as viral culture, polymerase chain reaction, serology, can be taken in immunocompromised patients(Arduino and Porter, 2007).

Acyclovir and valacyclovir are purine nucleoside analogues and both drugs act against herpes simplex 1 and 2. Neither acyclovir nor valacyclovir cures infection, but they decrease the symptoms associated with the viral infection. Both the drugs impair viral growth by inhibiting replication of the viral DNA(Margolis et al., 2007). The virus infected cells absorb more drugs compared to normal cells. Nausea, vomiting, and diarrhea can occur with both drugs. Patients on acyclovir should avoid acyclovir with amphotericin B. Valacyclovir should not be prescribed with SSRIs. Famciclovir is a pregnancy category B antiviral drug that is active against the herpes viruses('Antivirals Commonly Used in Dentistry: Assessment, Analysis, and Associated Dental Management Guidelines', 2017).

Other medications such as analgesics and antibiotics are the most common self medicated drugs among dental healthcare providers which help to control the associated pain and prevent secondary bacterial infection(Kalyan et al., 2013; Honore et al., 2020). The use of lubricant will help in decreasing discomfort associated with the condition and also helpful in preventing perioral scarring which is a rare complication of herpes labialis(Bose, 2007; Öztekin and Öztekin, 2019). Pediatricians are more familiar with antiviral drugs and provided with specific recommendations for treatment of viral infections. These drugs include acyclovir, amantadine, trisodium phosphonoformate, ganciclovir, ribavirin (Balfour, 1989).

Figure 1: Bar chart depicting the awareness about antiviral groups of drugs in the dental environment of the participants. Shows 52.5% of the students were aware about the usage of an antiviral group of drugs, 47% of them are not aware about its usage
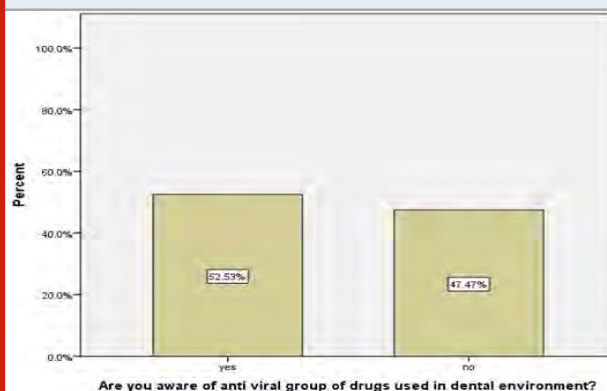
Figure 2: Bar chart depicting the awareness of the participants about herpes virus in the dental environment. Shows 61.6% of them are aware that the herpes virus is the most common virus seen in the dental environment and 38.3% disagree with it
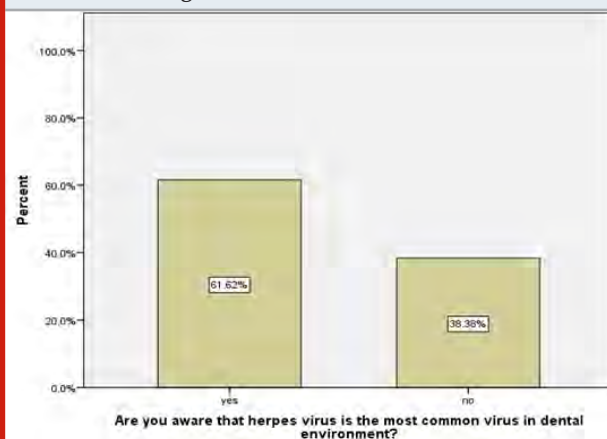
MATERIAL AND METHODS

It is a descriptive cross sectional study it includes 10 questions circulated among 100 population of dental students in chennai and the response was collected

through google forms and the data was analysed statistically and the result was obtained. Analysis software used was SPSS.

Figure 3: Bar chart depicting that awareness of the participants about acyclovir drug against herpes labialis. Shows 66.6% of them are aware that acyclovir provides better cure for herpes labialis and 33% of them disagree with it.
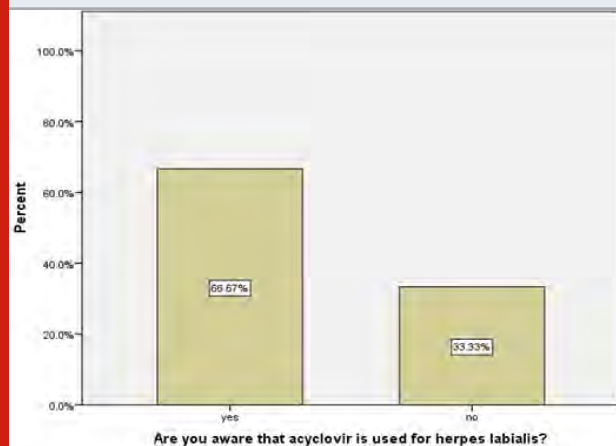
Data collection: An online platform known as survey planet was used. The questionnaire was uploaded on this site and the data was verified by an external viewer. Data was reported to excel and later exported to SPSS for analysis. The results were analysed and the responses were tabulated in the form of bar charts.

RESULTS AND DISCUSSION

By the results tabulated, it is seen that the level of awareness and knowledge about antiviral groups of drugs among dental students is good. In this study 17% 2nd year undergraduate, 30% 3rd year undergraduate, 35% final year undergraduate, 17% intern undergraduate were participated. In this study 52.5% of the students were aware about the usage of an antiviral group of drugs, 47% of them are not aware about its usage (figure 1). About 61.6% of them are aware that the herpes virus is the most common virus seen in the dental environment and 38.3% disagree with it (figure 2). About 62.6% of them are aware that antiviral drugs are effective against herpes simplex 1 and 37% of them are not aware of it. This study shows about 65% of them are aware that HSV1 is the etiological agent for herpes labialis and 34% of them are not aware of it. About 64.6% of them agree that herpes is contagious, 35% of them disagree with it. In this study 72.7% of them say that the most common site for herpes labialis is lip, 22% say that the common site for herpes labialis is buccal mucosa, and 5% say that the common site for herpes labialis is tongue.

In this study 66.6% of them are aware that acyclovir provides better cure for herpes labialis and 33% of them disagree with it (figure 3). About 44% say that acyclovir is the most common drug used in dentistry, 20% say that valacyclovir is the common drug used in dentistry

(figure 4). Third year undergraduates are more aware of antiviral groups of drugs used in dentistry, final year and intern undergraduates are not aware of all antiviral drugs in dentistry (figure 5). Third year undergraduates are more aware that herpes labialis is the common oral viral infection followed by final year undergraduates (figure 6). Higher numbers of the third year undergraduates say that acyclovir is the most commonly used drug in dentistry, higher numbers of the final year undergraduates say that both acyclovir and valacyclovir are the commonly used drugs in dentistry (figure 7).

Figure 4: Bar chart depicting the distribution of the participants about common antiviral drugs used in dentistry. 44% say that acyclovir is the most common drug used in dentistry, 20% say that valacyclovir is the common drug used in dentistry
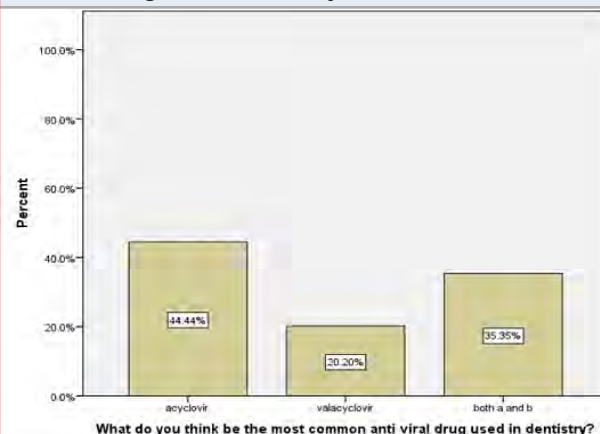
Figure 5: Bar chart represents the association of awareness of antiviral drugs and year of the study. Where the blue colour denotes 2nd year undergraduates, green colour denotes 3rd year undergraduates and cream colour denotes final year undergraduates and violet colour denotes intern undergraduates. The X axis represents the question "Are you aware of antiviral groups of drugs used in dental environments?" and the Y axis represents the year of study. Third year undergraduates are more aware of antiviral groups of drugs used in dentistry, final year and intern undergraduates are not aware of all antiviral drugs in dentistry. Pearson chi square value =63.483, p=0.00<0.05, significant association.
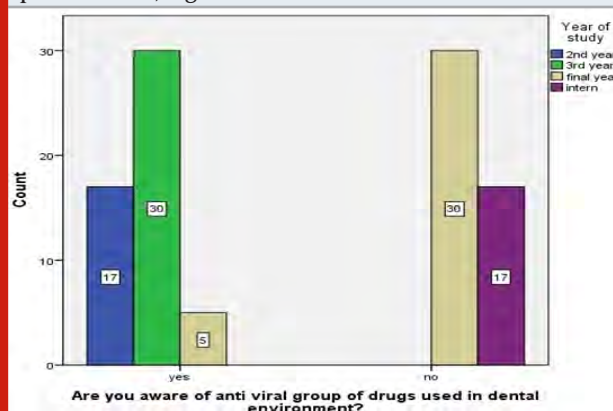
Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research awareness and knowledge about usage of antiviral group of drugs among dental students.

Figure 6: Bar chart represents the association of awareness of herpes labialis and year of study. Where the blue colour denotes 2nd year undergraduates, green colour denotes 3rd year undergraduates and cream colour denotes final year undergraduates and violet colour denotes intern undergraduates. The X axis represents the question "Are you aware that herpes labialis is the most common oral viral infection?" and the Y axis represents the year of study. Third year undergraduates are more aware that herpes labialis is the common oral viral infection followed by final year undergraduates. Pearson chi square value = 59.817, p=0.00<0.05, significant association.
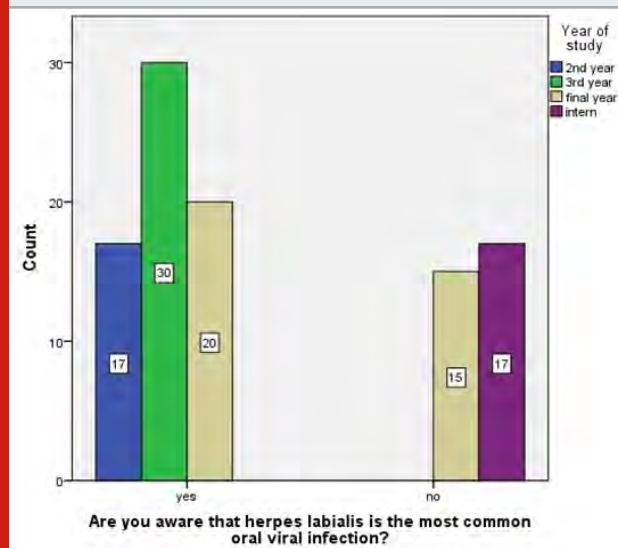
In this study 61.6% of the participants are aware that herpes virus is the most common virus in the dental environment. In the study of(Tabery, 2010), says that herpes simplex virus is the common virus they encounter in their dental environment. The study of(Dreno, Malkin and Saiag, 2013), also says that herpes virus is the common virus they encounter commonly in dentistry. Thus overall consensus of the study agrees with most of the articles.

In this study 66.6% of the participants stated that acyclovir provides better cure for herpes infection. The study(Rooney, 1993), says that they prescribe acyclovir as their first line of drug for herpes infection as it

aids in quicker relief. In the study of(Beutner, 1992), they say they prefer acyclovir for herpes as it helps in decreasing the lesion caused by herpes infection. Thus overall consensus of the study agrees with most of the articles. In this study 44% of the participants commonly use acyclovir as their first line of drug for oral viral infections. In the study of(Tallury, Alimohammadi and Kalachandra, 2007), it says that acyclovir is the most commonly used drug in dentistry for oral viral infections. Overall consensus agrees with most of the articles.

The study(Spruance, J. c. B. Stewart, et al., 1990; Spruance, J. C. B. Stewart, et al., 1990), shows the observation with both ACV cream and penciclovir cream that efficacy occurs independently of the lesion stage at the initial treatment is paradoxical. It is intuitive that interruption of virus replication prior to the development of major pathological processes in the epidermis would be more likely to preserve the skin from virus induced damage and abbreviate the lesion course than application of treatment at a later stage. This concept received support from two prior clinical trials with peroral ACV and topical idoxuridine in dimethyl sulfoxide which showed that antiviral nucleoside efficacy was limited to the patients who initiated treatment in the prodrome or erythema lesion stage.

Figure 7: Bar chart represents the association of commonly used antiviral drug and year of study. Where the blue colour denotes 2nd year undergraduates, green colour denotes 3rd year undergraduates and cream colour denotes final year undergraduates and violet colour denotes intern undergraduates. The X axis represents the question "What do you think is the most common antiviral drug used in dentistry?" and the Y axis represents the year of study. Higher numbers of the third year undergraduates say that acyclovir is the most commonly used drug in dentistry, higher numbers of the final year undergraduates say that both acyclovir and valacyclovir are the commonly used drugs in dentistry. Pearson chi square value = 110.553, p=0.00<0.05, significant association.
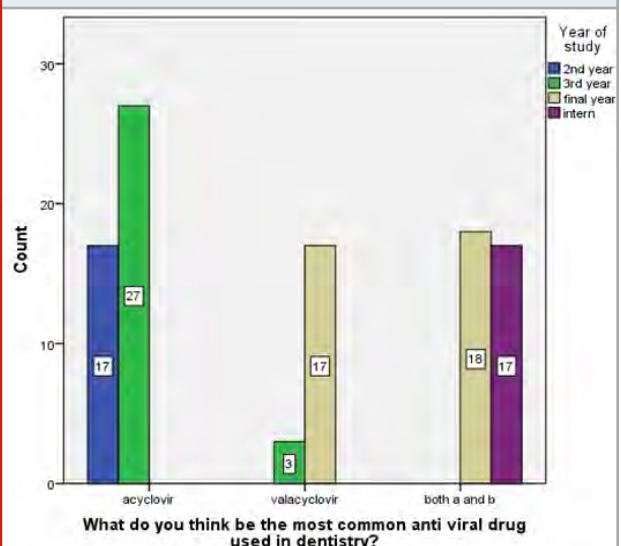
The study(Nilsen et al., 1982), says although formation of new lesions is very rare in herpes labialis, it was observed that topical acyclovir had no effect on new lesions, as local applications were limited to the expected site for the initial lesions, it serves as a one disadvantages of topical treatment. This use of topical treatment will also be limited in patients with multiple lesions at different sites, lesions in inaccessible places. Oral acyclovir is effective for recurrent mucocutaneous herpes simplex infections at other sides, and studies evaluating the prophylactic use of oral acyclovir for frequent recurrences of herpes labialis and genital herpes are currently in progress.

CONCLUSION

In this study it shows, nearly 52% of the dental students are aware of antiviral groups of drugs used in dentistry and still 47% of them are unaware of the antiviral drugs. About 44% of the dental students say acyclovir is the most commonly used drug in dentistry followed by valacyclovir(20%). Hence, it is important to create awareness among dental students about other classes of antiviral drugs for providing them better treatment.

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Awareness of Bell's Palsy Among Dental Students

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ABSTRACT

Awareness of Bell's palsy is important in dentistry as it deals with the facial nerves on the facial regions. Being a dentist, we should need to have knowledge about the signs of Bell's palsy which is caused by inflammation developing around the nerve of the facial and as it passes through the skull from the brain the inflammation compresses the nerve as it passes through the skull. The aim of our study is to assess the awareness and knowledge on Bell's palsy among dental students. This study was conducted by assessing responses to seven questions among dental students through a survey planet. A detailed questionnaire is related to awareness and knowledge of participants about Bell's palsy. The results were recorded and analyzed. Nearly 95 % of the students claimed that they have an excellent knowledge about Bell's palsy and the remaining 5 % not aware of the term Bell's palsy. About 93% answered that they are aware of the causes of Bell's Palsy and 7 % of the students answered that they have no clue about the causes of Bell's Palsy. About 63% do not have an idea about the chances of recurrence for a Bell's palsy patient and the rest 27 % of the students were confident that they were well versed with the precautions that should be followed while handling a Bell's palsy patient. As a conclusion, awareness regarding Bell's palsy has to be improved among dental students and they should be able to plan a proper treatment plan in managing Bell's palsy in future.

KEY WORDS: AWARENESS, BELL'S PALSY, FACIAL MUSCLES, MANAGEMENT.

INTRODUCTION

Bell's palsy is a condition that suddenly affects movement of the facial muscles on one side of the face. (Meslet et al., 2019). Bell's palsy is named after the discovery by Scottish anatomist Charles Bell's Palsy

(Harini and Prabu, 2019) It affects men and women equally. It may occur in between ages of 10 to 60. People who have diabetes and pregnant women are more likely to develop Bell's palsy. It is reported that about 1 in 70 people have Bell's palsy in their life and in 10% of cases family history may also be the cause of Bell's Palsy. (Salinas et al., 2010)

Bell's palsy develops around the nerve of facial and as it passes through the skull from the brain the inflammation compresses the nerve as it passes through the skull and the nerve stops working until inflammation goes away. Cranial nerves and muscles will stop working. The virus that causes herpes simplex, herpes zoster, Respiratory

illnesses (adenovirus) German measles (rubella), Mumps (mumps virus), Flu (influenza B) has been linked to Bell's palsy.(Sullivan et al., 2007).

Bell's palsy influences ear infection, cold, eye infection. The symptoms appear rapidly and might notice them on waking, eating or drinking. Bell's palsy is marked by one side droopy appearance and the inability to open/ close eyes on the affected side. In some cases it may affect both sides of the face(Lancaster and Crow, 2006) The drugs of choice for Bell's palsy corticosteroid used which reduce inflammation, antiviral medication if virus is the cause and pain medication ibuprofen or acetaminophen for mild pain are used. Vitamin B-12 and B-6 are B-complex vitamins that are important for preventing Bell's palsy. Physical therapies can and exercise facial muscles helpful for preventing this from occurring and plastic surgery may be needed to correct lasting facial nerve problems. Good nutrition and rest helpful for body as it heals.(Miles, 1992) In some cases Bell's palsy is a "one-off" and about 1 in 10 people have a Bell's palsy can have a further episode in the future happen often several years afterwards and no ways to prevent the development of this disease.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the awareness of bell's palsy among dental students.

MATERIAL AND METHODS

Participants and study design: A questionnaire-based survey study that was conducted engaged a self-administered questionnaire at the Saveetha Dental College and Hospital. The participants were informed in priory about the objective of the study. The participants were entirely non-mandatory and their identities were kept anonymous.

Data Collection Methods: A study was conducted to assess the responses to 7 selected questions regarding Bell's palsy among dental students through survey planet among 100 dental students. The questionnaire is about the awareness and knowledge toward Bell's palsy. They were asked about the details of causes, signs and management of Bell's palsy and exclusion of study is incomplete responses. The results were recorded and analyzed.

RESULTS AND DISCUSSION

Awareness of participants related to Bell's palsy was evaluated to assess the first set of questions; only 95 %

of the students knew about it and the rest 5% were not aware of the term Bell's palsy. About 93% participants were aware of causes of Bell's palsy and the remaining 7% participants have no clue about the causes of Bell's palsy. About 89% of the participants know about the signs and symptoms of Bell's palsy and 11% were not aware of signs and symptoms for Bell's palsy. About 82% answered that they were aware of treatment of Bell's palsy and rest Nearly 63% of the participants about the chances of recurrence for a Bell's palsy patient. Only 27 % of the students were confident that they were well versed with the precautions that should be followed while handling a Bell's palsy patient and the rest of 46% were not aware of the precautionary methods that should be taken while treating a Bell's palsy patient for dental treatment.

Figure 1: Awareness of Bell's Palsy. The pie chart shows the awareness towards the term of bell's palsy among 100 students. 95 students answered Yes(blue) while 5 students answered No (Red).
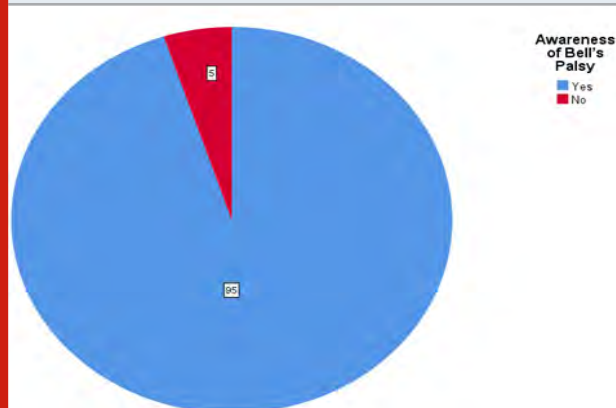
Figure 2: Causes of Bell's Palsy. The pie chart shows the distribution of students towards the awareness of causes of bell's palsy among 100 students. 93 students answered Yes(blue) while 7 students answered No (Red)
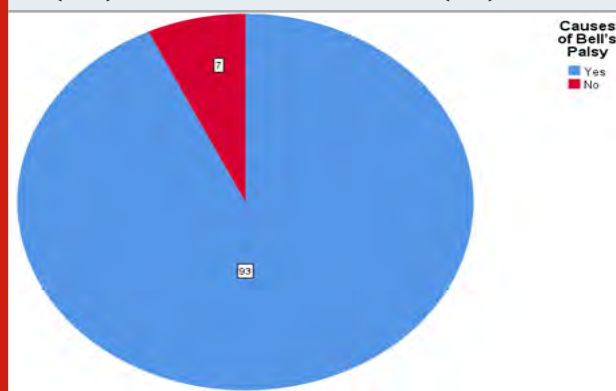
The present study is to assess knowledge and awareness of Bell's palsy among dental students in Saveetha Institute of Medical and Technical Sciences. According to this study the dental undergraduates and intern's awareness of bell's palsy was satisfactory, the participants generally

have reasonable information about bell's palsy so they are aware enough about the disease. This present study examines the knowledge and attitude among the dentists on Bell's palsy, to our knowledge there have almost no reported studies on knowledge and attitude of Bell's palsy among dental students. A study was conducted in Karachi, Pakistan on the knowledge and awareness of Bell's palsy among students of pharmacy, science and arts faculties. It is observed that out of 120 students, only 61.67% students knew about Bell's palsy. Knowledge and awareness of Bell's palsy among students was inadequate.(Naveed and Tasleem, 2014)

of bell's palsy is low they are not aware enough. (Apostolides and Carr, 2000). The main cause of the disease is not yet clear, it is linked to exposure to a viral infection such as the varicella-zoster virus and Epstein-Barr viruses, both of herpes family (Brandenburg and Annegers, 1993), in this study 38% have awareness about the etiology. Another study was conducted in Riyadh, Kingdom of Saudi Arabia (KSA) in 2016 on the awareness and knowledge of neurological complications while administering local anesthesia among the dental professionals which included students and practitioners.(AlYahya, Al-Qernas and Al-Shaheen, 2018); (Hasan, Ganapathy and Jain, 2018)

Figure 3: Signs and symptoms of Bell's Palsy. The pie chart shows the distribution of students towards the awareness of the signs and symptoms of bell's palsy among 100 students. 89 students answered Yes(blue) while 11 students answered No (Red)

Figure 5: Recurrence chance of Bell's Palsy. The pie chart shows the distribution of students towards the awareness of the chance of recurrence of bell's palsy among 100 students. 37 students answered Yes(blue) while 63 students answered No (Red)
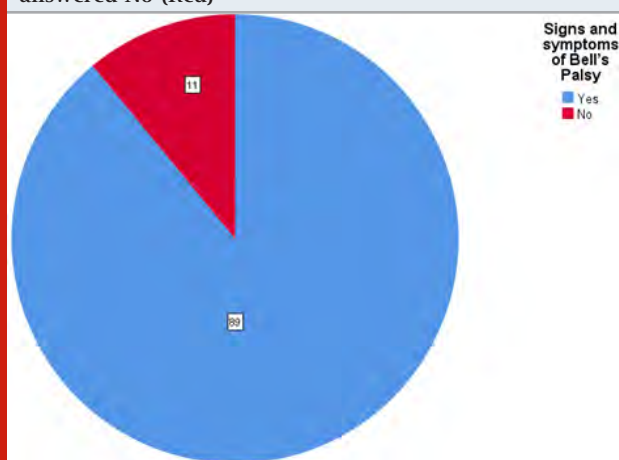
Figure 4: Treatments of Bell's Palsy. The pie chart shows the distribution of students towards the awareness of treatments for bell's palsy among 100 students. 82 students answered Yes(blue) while 18 students answered No (Red)
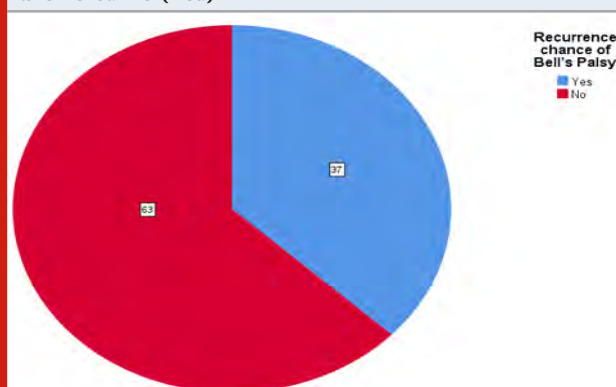
Figure 6: Precautions for patients with Bell's Palsy. The pie chart shows the distribution of students towards the awareness of precautions of bell's palsy among 100 students. 27 students answered Yes(blue) while 73 students answered No (Red)

Costa et al. 2000 reported that the level of knowledge about Bell's palsy risk factors and its treatment was poor with the participants generally have limited information about bell's palsy and the community awareness
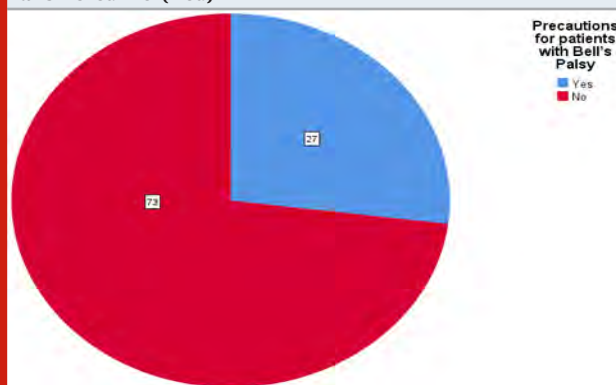
In a case report study by Chevalier et al., it was found that after two hours of administration of inferior alveolar nerve block the patient felt the complete onset of paralysis on the left-side of the facial muscles which the neurologists diagnosed as Bell's palsy after looking into other medical history of the patient (Ilea et al., 2014; Aravinth and Ganapathy, 2019). It is important that a dentist has adequate knowledge on

Bell's Palsy as he may be treating a patient with existing facial palsy, or may be the first medical professional to observe it in a patient, or may be the one to induce iatrogenic reactions causing Bell's palsy to the patient during dental treatment (Jd, 2007; Prakash, Ganapathy and Mallikarjuna, 2019). In a study on Bell palsy and its clinical significance, it was concluded that knowledge of the anatomy and clinical significance of Bell's palsy may help to make accurate diagnosis and give proper treatment.

Figure 7: Awareness on the precautionary methods for patients with Bell's Palsy. The pie chart shows the distribution of students towards the awareness of precautionary methods to be followed while dealing with bell's palsy among 100 students. 54 students answered Yes(blue) while 46 students answered No (Red)
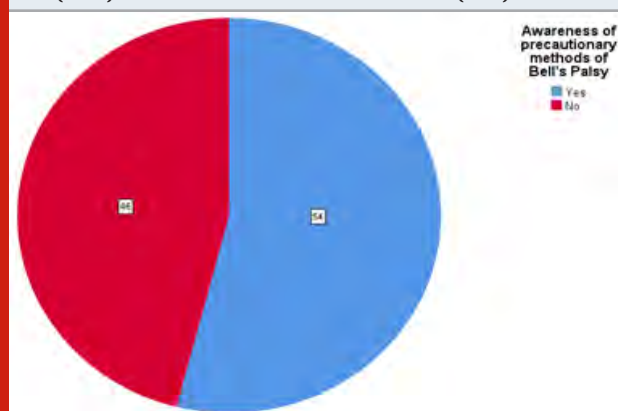
CONCLUSION

Within the limits of our study, it is concluded that the knowledge of Bell's palsy in students is not enough to dial uncertain mishap pining of the disease & the must aware to the disease to treat other more better otherwise they will not cover fully to this disease. Unfortunately, dental consideration of Bell's palsy, the participant not aware to manage patients with Bell's palsy if it is happened immediately after dental procedure. Knowledge of the anatomy and clinical significance of Bell's palsy may help to make accurate diagnosis and provide appropriate treatment. We recommend that dental students and dentists should be exposed to any medical conditions that could happen because of iatrogenic reasons.

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Authors Contribution

Sivesh Sangar contributed to the study design, data collection, data analysis, preparation of the manuscript.

Dhanraj Ganapathy contributed to the study design , data collection, and preparation of the manuscript.

Kiran Kumar contributed to the study design, preparation of the manuscript and proofreading.

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Denture Stomatitis : A Comprehensive Diagnostic Approach

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ABSTRACT

Denture stomatitis is one of the most commonly recurring problems of the denture wearers. Denture stomatitis is a term used to describe an array of pathological changes in the oral mucosa in relation to the denture bearing tissues. The aetiology of the disease includes infection, trauma and probably a defect in the host defence mechanism as well. Current school of thought suggests an interplay of most of these factors in the pathogenesis and development of the disease. The extent of interplay of these factors is still a controversy. Candida albicans has been implicated as the causative organism. However, in the light of recent research it is debatable if it is the only causative organism for denture stomatitis. Recently, cases resistant to antifungal therapy have been reported. In such cases other microorganisms have been isolated. At the moment, comprehensive management includes good denture hygiene together with antifungal or antibacterial therapy and correction of denture faults.

KEY WORDS: DENTURE,FUNGAL,STOMATITIS,TISSUES.

INTRODUCTION

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019;

Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about Denture Stomatitis. Denture stomatitis is a frequent aftermath that is noted in denture-wearing patients.(BUDTZ-JöRGENSEN, 1974) Microbial studies indicate that the condition is associated with a quantitative as well as qualitative increase of yeasts on the mucosal surface of the denture.

Denture stomatitis is a term used to describe an array of pathological changes in the oral mucosa in relation to the denture bearing tissues(NEWTON and V, 1962).These changes are characterized by an area of erythema and are found under complete or partial dentures in both dental arches, but more infrequently in the maxilla. The occlusion of the denture bearing mucosa by the denture prevents the normal cleansing action provided by the

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movement of the tongue and the flow of saliva. This may explain the higher incidence of denture stomatitis in the maxilla. Although the tissues appear raw and inflamed, the patient is rarely aware of the condition and seldom complains of pain.

Prevalence: The exact point prevalence of denture stomatitis is not known. Various authors have quoted figures ranging from 11 per cent to 67 per cent. Nyquist(Nyquist, 1953)found that 27 per cent of 601 cases that were included in the study were affected. Chrigstrom, Hedegard and Markens (Chrigström, Hedegård and Marken, 1970) found that the prevalence of denture stomatitis was only 11 per cent among 160 Swedish pensioners. Love, Gusta and Nixon(Love, Goska and Mixson, 1967) found that 43 per cent of 522 denture wearers that were affected. Budtz-Jorgensen (Budtz-jørgensen, 1972) found the prevalence of denture stomatitis to be 67 per cent of 303 patients. The lesions were more prevalent in women than in men through different studies and the relative frequency declined with age.(Nyquist, 1953)

Aetiology: There are three main features which may be implicated in the initiation and progression of denture stomatitis. They are:
1. Trauma.
2. Infection.
3. Allergy.

Nyquist (Nyquist, 1953) considered trauma to be the most common and dominant aetiological factor, as denture stomatitis was seen frequently under ill-fitting dentures with a traumatic occlusion. Investigators that believe trauma to be a significant aetiological factor for denture stomatitis have advocated the use of tissue conditioners and the construction of new, properly fitting dentures replacing the ill fitting ones (CAHN and LR, 1936; Nyquist, 1953). It was shown that by removing trauma, lesions of the localized simple type (Type I) were completely or partly healed. On the other hand, candida-induced lesions were almost unaffected by prosthetic treatment.(CAWSON and A, 1963)

The first author to relate the presence of Candida species with denture stomatitis was Cahn.(CAHN and LR, 1936) There is conflicting evidence as to whether wearing of dentures at night influences the occurence of denture stomatitis. Nyquist (Nyquist, 1953) found complications to be more common and Love, Gusta and Nixon(Love, Goska and Mixson, 1967) found it more severe in subjects who did not remove their dentures at night. On the other hand, Budtz-Jorgensen and Bertram (Budtz-Jørgensen and Bertram, 1970) found no difference in the denture wearing frequency of a group with denture stomatitis as compared with a control group. However, Williamson (Williamson, 1972) showed that patients who wore their

dentures at night had a tenfold increase in the number of candida colonies as compared with patients who wore their dentures in the daytime only. All of these studies suggest that Candida albicans is the main causative organism in denture stomatitis. Candida albicans is the most common and most invasive fungal organism in the oral cavity. It is more adherent to human buccal epithelial cells than any other Candida species.(King, Lee and Morris, 1980).

The yeast form of most dimorphic hngi is considered to be the pathogenic form but an association between the presence of filamentous forms of Candida and candidiasis has been noted.(Kimura and Pearsall, 1980)The yeast form of Candida albicans may be pathogenic and with clinical infection, the altered micro-environment favours change to the filamentous form. The pathogenic effects of Candida albicans in candidiasis are uncertain. Hasenclever and Mitchell (Hasenclever and Mitchell, 1962) suggested that Candida albicans produces endotoxin, and immunity to endotoxin may confer immunity to the disease.

However, Chattaway, Odds and Barlow(Chattaway, Odds and Barlow, 1971)found that the levels of endotoxin found in vivo may not be sufficient to produce toxic effects. Pugh and Cawson(Pugh, Ra and Others, 1977) stated that invasion of epithelial cells by Candida albicans depended on hydrolytic enzyme activity and mechanical forces. Some evidence suggested that toxic products of the organism do not initiate candidiasis but act as irritants, aggravating tissue lesions. Cell-mediated immunity plays a role in the protection against Candida, as up to 80 per cent of the population without evidence of infection have cellular immunity to Candida antigen. (Taschdjian, Seelig and Kozinn, 1973).

Several reports indicate that specific immune imbalance in response to Candida albicans may play a role in the pathogenesis of oral candidiasis. Indeed, humoral antibodies in excess may suppress the cell mediated response.(Mackie, Parratt and Jenkins, 1978) There are studies in which other microbes such as D. pneumoniae, Streptococcus mitis, Streptococcus salivarius, Streptococcus faecalis, haemolytic Streptococcus and Klebsiella have been isolated.(Reenen and JF, 1973; Holbrook, Russell and Others, 1979) MacFarlane and Helenerake (MacFarlane, Tw and Sj, 1976)isolated Staphylococcus aureus in 79 per cent and Candida albicans in 44 per cent of angular cheilitis lesions. Helstrom and Balish (Helstrom and Balish, 1979) suggested that Candida extract may have contained materials which simply improved the nutritional environment for the infecting micro-organism rather than resulting in suppression of host immune responses. All these later studies may implicate other microbes in the aetiology of denture stomatitis.

Therefore, there remain questions that are unanswered

1. If, in fact, Candida infection causes suppression of cell-mediated immunity, then an obvious question about the cause and effect relationship will be raised. That is, which arises first, the immune defect or the Candidal infection?
2. Is Candida albicans the primary invading microorganism or does Candida make the environment suitable for other microorganisms to flourish and exert a pathogenic effect in the chronic inflammatory process?
3. Are Candida albicans and other microorganisms secondary invaders of traumatized tissues?

Allergy to denture base material was thought to be a possible cause of denture stomatitis (Smith and Bains, 1956) However, any inflammatory response, due to the leaching out of monomer, was transient and occurred immediately. Therefore it would be expected that any allergic response would be immediate, whereas in denture stomatitis the inflammation occurs under old and unkempt dentures.

The alteration from commensalism to parasitism of Candida albicans may be due to changes in the host rather than in the parasites. Candida infection can arise either because conditions are favourable for growth of the hngus or because of a depressed defence mechanism. (Austin and Rm, 1980)

1. Malnutrition: The importance of iron in maintaining the health and capability for repair of oral tissues is well known. Iron deficiency causes an impairment of the iron-dependent enzyme system, thereby upsetting metabolism and reproduction of epithelial cells and is thus favourable to the growth of Candida albicans. Joynson and co-workers (Joynson et al., 1972)demonstrated an impaired cell mediated immune response to Candida albicans in iron-deficient patients. The immune response was restored once the iron level was normal. Other systemic disorders like diabetes mellitus and leukaemia may contribute to the incidence of denture stomatitis. A high intake of carbohydrate was presumed to be a direct cause of oral candidiasis in denture wearers. That a high carbohydrate intake might predispose to a candida-induced stomatitis was suggested in an in vitro study showing that the addition of glucose to nutrient-depleted saliva produced an exceptional growth of Candida albicans, despite the presence of a nutrient competing bacterial (Knight and Fletcher, 1971)

2. Oral antibiotics: Antibiotics increase the susceptibility to infections with Candida albicans. Systemic antibiotics do not affect Candida in the healthy edentulous mouth as the concentration of antibiotics in the oral cavity must be above a certain level to alter the balance of the mixed oral flora. However, if the barrier action of the epithelium breaks down because of inflammation, antibiotics will gain access to the oral microflora, hence encouraging Candida infection. Increasing use of antibiotics, corticosteroids and immunosuppressive drugs may result in an increase in oral candidiasis.

3. Hormonal imbalance: Neil stated that there might be an endocrine influence in denture stomatitis. He based it on the findings that this condition was more commonly found in women than in men.During a month period he saw nine cases, all of whom were women who had passed menopause. He also noted that there was a traumatic factor. He found that in all these patients there was an altered activity of the adrenal cortex. The neutral ketosteroid excretion of the urine and blood ascorbic acid levels were abnormal in affected patients. This supported the view that the tolerance of oral tissues to trauma was altered when there was a hormonal imbalance.

Diagnostic considerations: Diagnosis of denture stomatitis depends upon the clinical signs, the presence of the organism in a direct smear, the salivary culture of a significant number of micro-organisms and the presence of specific antibodies to Candida antigen.

Clinical features: Denture stomatitis may be graded clinically into three types.(Stickle, Kaufman and Blumer, 1972)

Type I: Pinpoint hyperaemia and diffUse inflammation of a limited area of the mucosa in an otherwise normal tissue.

Type II: Diffuse erythema of most of the denture bearing area.

Type III: Granular inflammation or inflammatory papillary hyperplasia. The mucosa has a nodular appearance with a hyperaemic surface normally present over the entire denture-bearing area but is more commonly restricted to the central areas and, in particular, under relief areas.

If untreated, it is felt that the disease will progress from Type I through Type II to Type III. There is, however, some doubt concerning this progression. Type I has been related to denture trauma only, as compared with Type II and III which have a multi-factorial aetiology. Denture stomatitis is associated frequently with angular cheilitis and glossitis and the patient may complain of a burning sensation in the palate However, many patients may not be aware of the condition.

Laboratory diagnosis of denture stomatitis: Clinical diagnosis of denture stomatitis can be confirmed by mycological and immunological examinations. Several methods have been used in identification.

1. Mycological examination: (a) Microscopic examination of smear Direct smears are prepared from scrapings taken with a sterile wooden spatula from the palatal mucosa and the fitting surface of the denture. The fured smears are stained with Periodic acid-Schiff (PAS),which demonstrates the presence or otherwise of the yeast cells. Another method is to obtain scrapings of the oral mucosa with a wooden spatula, smear the material obtained on a glass slide and place immediately in 95 per cent ethanol and stain with Papanicolaou stain. A differential count is made of 200 randomly selected cells on each slide. In denture stomatitis the differential count consists entirely of nucleated cells.

(b) Isolation and identification by culture could be employed. There are two types of culture technique that

1. Imprint cultures: Sterile square pieces of plastic foam are dipped in Sabouraud's broth and placed on various oral mucosal and denture surfaces. The pieces of plastic foam are then pressed firmly onto a Sabouraud's agar plate. They are then incubated for 48 hours at 37 "C. After incubation, the Candida colonies are counted.

2. Replica cultures: Two layers of plastic foam are sandwiched between the upper denture and palatal mucosa. The two layers of foam are pressed into separate Sabouraud's agar plates and incubated at 37 "C for 48 hours and then examined for the presence of Candida albicans." An alternative method of making replica cultures is by making a Sabouraud's cast from an alginate impression of the materials

Salivary counts: Both stimulated and unstimulated saliva with the dentures in the mouth and out of the mouth can be used. Dilutions of the saliva are prepared in saline and samples placed on a Sabouraud's dextrose agar plate and spread with a Pasteur spreader. The plates are incubated aerobically at 37°C for 48 hours. The Candida colonies are then counted to obtain the number of colonies per mL of saliva.

CONCLUSION

Review of the literature has unravelled the possible role of a mixed microflora in the pathogenesis of denture stomatitis. Extensive work in the field of immunology revealed that cell-mediated immunity is probably the important defence mechanism. Humoral antibodies have been detected in the diseased state which may indicate a response to antigenic loading. However, such antibody levels decreased following antifungal therapy. This may confirm the non-protective role of humoral antibodies and the possible aetiological role of Candida albicans. Management involves denture hygiene in conjunction with anti-fungal therapy and correction of denture faults.

Presently, denture hygiene has not been well publicized to individuals. This is unfortunate as the effects of denture cleanliness on oral health have been explored for more than 30 years. Therefore, dentists should accept responsibility for providing adequate instruction in denture home care as an essential part of patient preparation to receive dentures. Recall appointments to assess and reinforce denture hygiene are a requirement. Such a programme will be beneficial to both the patient and the dentist in preserving the health of the denture-bearing tissue.

ACKNOWLEDGEMENTS

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Awareness of Osteosarcoma of Jaws Among Dental Students

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ABSTRACT

Osteosarcomas are rare, malignant, bone tumors defined by the presence of malignant mesenchymal cells which produce immature bone. Osteosarcomas of the jaws are rare, representing about 7% of all the osteosarcomas and 1% of all head and neck malignancies The mandible and maxilla are almost equally involved, but in some studies mandibular tumors have better prognosis than maxillary tumors. Osteosarcoma is a disease of childhood and adolescence peaking in the second decade of life. The aim of this study is to assess and create awareness about osteosarcoma of jaws among dental students.The survey is an online based questionnaire made using survey planet and a total of 106 responses were received.The data was tabulated in excel and statistically analysed using SPSS. About 92.5% of dental students are aware about the malignant primary tumour of bone, osteosarcoma. About 87.7% of dental students agree that fluoride in drinking water leads to greater risk of osteosarcoma of jaws. 73.6% of dental students are well aware of the symptoms of osteosarcoma of jaws . The awareness about osteosarcoma among dental students is high among dental students.

KEY WORDS: OSTEOSARCOMA ; DENTAL STUDENTS; MALIGNANT; SWELLING.

INTRODUCTION

Osteosarcomas are rare, malignant, bone tumors defined by the presence of malignant mesenchymal cells which produce immature bone. Osteosarcomas of the jaws are rare, representing about 7% of all the osteosarcomas and 1% of all head and neck malignancies (August et al., 1997;

Vadillo et al., 2011). The mandible and maxilla are almost equally involved, but in some studies mandibular tumors have better prognosis than maxillary tumors (August et al., 1997). Osteosarcoma is a disease of childhood and adolescence peaking in the second decade of life. Despite many efforts, the etiology of osteosarcoma remains largely unknown.

Osteosarcoma of jaw is generally uncommon and despite its histopathologic similarities with long bone tumour , it is biologically different (Baghaie and Motahari, 2003) .The gene associated with osteosarcoma was the p53 gene where the mutations in the p53 gene were first observed in sporadic osteosarcoma (Friend et al., 1986; Iavarone and Matthay, 1992). In most cases, this type of tumour

pursues an aggressive course. Osteosarcoma of the jaws is slightly more common in males and occurs at a later age compared to that occurring in long bones (Khorate et al., 2010).

The most common presentation of osteosarcoma in the head and neck region is swelling (Nissanka et al., 2007) . Pain has also been reported in approximately 50% of patients with osteosarcoma (Mark et al., 1991). CT can be helpful in visualizing extension of soft-tissues involvement and is essential for early diagnosis of osteosarcoma (Givol et al., 1998) . Marx et al. reported that the prognosis of a jaw osteosarcoma is better than that of long bones osteosarcoma . The reason could be histologically better differentiation of jaw osteosarcoma than long bone osteosarcoma . As jaw osteosarcoma occurs among older aged patients have less chance of developing metastasis (Marx and Stern, 2012) .Osteosarcoma of jaws gives rise to distant metastasis less frequently compared to osteosarcomas of the long bones (Campanacci, 1999; Guadagnolo et al., 2009).

The early lesion of osteosarcoma of the jaw usually involves the surface of the bone with attachment of the lesion to the cortex and with very minimal or no trabecular involvement. Whereas, An advanced lesion may show extensive trabecular infiltration (Bras et al., 1980; Donaldson et al., 2004) . Proper surgical excision of the primary lesion combined with postoperative radiotherapy or chemotherapy is considered as the mainstay of treatment for osteosarcoma of the jaw bone (Amaral et al., 2008).

It is very important for dental students to be aware of osteosarcoma affecting jaws in order to provide early diagnosis. Previously our department has published extensive research on various aspects of prosthetic dentistry (Anbu et al., 2019; Ariga et al., 2018; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Ganapathy et al., 2017; Gupta et al., 2018; Jain, 2017a, 2017b; Ranganathan et al., 2017; Varghese et al., 2019; World Journal of Dentistry, 2017), this vast research experience has inspired us to research about the awareness of osteosarcoma of jaws among dental students.

MATERIAL AND METHODS

The present study is an online based survey conducted among the dental students.The participants were from 1st, 2nd, 3rd, 4th and Intern years of BDS. Questionnaires were prepared and distributed among dental students through an online link from the survey planet. The total number of participants was 106 dental students. Participation in this study was voluntary. The questionnaire contained 15 questions. Independent variables were demographics such as year of study of participants. Dependent variables were osteosarcoma of jaw, dental students . Only the completed surveys were included for analysis. The collected results were entered in Microsoft excel. Data analysis was done using SPSS software 20.0. Statistics used for analysis was Descriptive statistics and comparison of variables were done using

chi square test where $p < 0.05$, statistically significant.

RESULTS AND DISCUSSION

Osteosarcoma is the most common malignant bone tumor , with mandibular and maxillary osteosarcomas accounting for only 6% of all osteosarcomas (Baumhoer et al., 2014) . Osteosarcoma of the jaw has a better prognosis than that of long bone osteosarcomas (Daffner et al., 2002; Yamamoto et al., 2011). Swelling is the most common symptom in osteosarcoma. Pain, paresthesia, and ulcerations are usually less common (Jasnau et al., 2008) .

Students from different years participated in the survey. The highest number of participants were from third years (37.74%) (Figure 1). About 92.5% dental students were aware of osteosarcoma whereas 7.5% dental students were still not aware of malignant primary tumours of bone , osteosarcoma (Figure 2). 89.6% of dental students were aware that osteosarcoma of jaws constitutes 7% of all sarcomas (Figure 3). About 74.5% dental students were aware that radiation, rapid bone growth, genetic predisposition are all the risk factors causing osteosarcoma of jaws (Figure 4).

Figure 1: Pie chart depicting the distribution of year of study of the dental students participated in the survey. Blue colour indicates 1st year students (4.72%). Green colour indicates 2nd year students (19.81%). Brown colour indicates 3rd year students (37.74%). Violet colour indicates 4th year students (16.04%). Yellow colour indicates intern students (21.70%). The highest number of participants were from third years (37.74%).
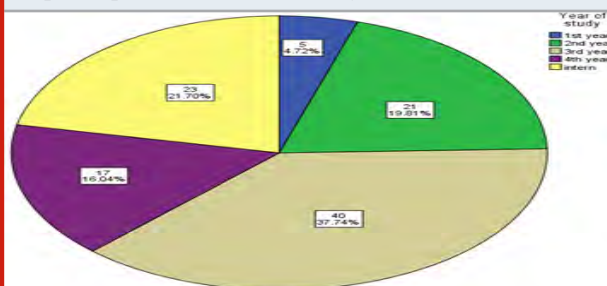
Figure 2: Pie chart depicting the awareness of osteosarcoma among the dental students participated in the survey. Blue colour indicates students who were aware of osteosarcoma (92.45%). Green colour indicates students who were not aware of osteosarcoma (7.55%). About 92.5% dental students were aware of osteosarcoma .
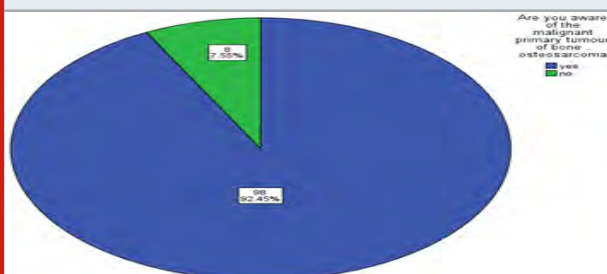
Figure 3: Pie chart depicting the awareness of students on jaw osteosarcoma which constitutes about 7% of all sarcomas among the dental students participated in the survey. Blue colour indicates students who were aware that jaw osteosarcoma represents about 7% of all sarcoma (89.62%). Green colour indicates students who were aware that jaw osteosarcoma represents about 7% of all sarcoma (10.38%). 89.6% of dental students were aware that osteosarcoma of jaws constitutes 7% of all sarcomas.
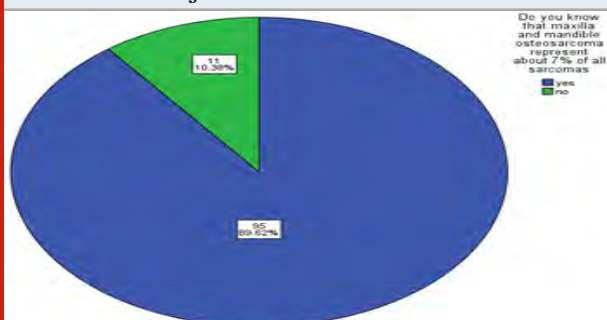
Figure 4: Pie chart depicting the risk factors causing osteosarcoma of jaws. Blue colour indicates genetic predisposition (4.72%). Green colour indicates rapid bone growth (7.55%). Brown colour indicates radiation (12.26%). Violet colour indicates none of the above (0.94%). Yellow colour indicates all of the above (74.53%). About 74.5% dental students were aware that radiation, rapid bone growth, genetic predisposition are all the risk factors causing osteosarcoma of jaws.
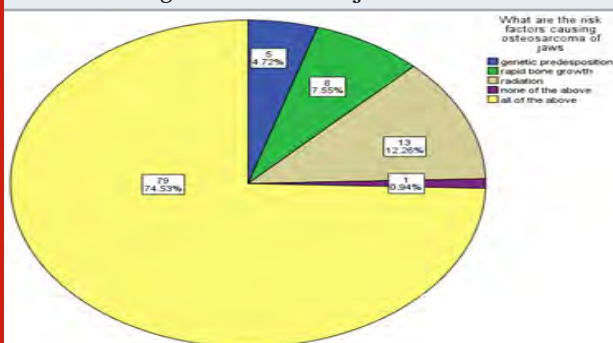
Figure 5: Pie chart depicting the gender most affected by osteosarcoma according to the participants . Blue colour indicates male (65.09%). Green colour indicates female (24.53%). Brown colour indicates both gender equally affected (10.38%). About 65.1% dental students responded that males are most affected by osteosarcoma.
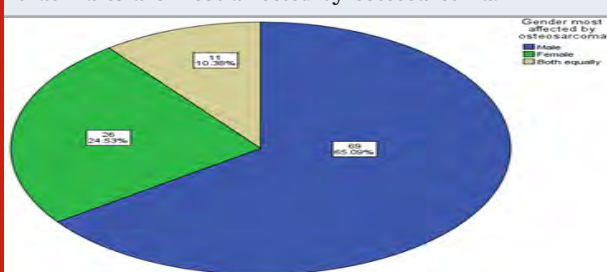
About 65.1% dental students responded that males are most affected by osteosarcoma, 24.5% responded that females are most affected by osteosarcoma and 10.4% responded that both genders are affected equally (Figure 5). About 78.3% dental students were aware that occurrence of osteosarcoma of jaws are related to dental extractions (Figure 6). 79.25% were well aware that the commonest findings of osteosarcoma of jaws was swelling (Figure 7). About 96.2% dental students were aware that the survival rate of osteosarcoma has increased on using chemotherapy as an adjuvant to surgery (Figure 8).

Figure 6: Pie chart depicting the awareness of the dental students on extraction as a cause for osteosarcoma . Blue colour indicates students who agreed that osteosarcoma is caused by extraction (78.30%). Green colour indicates students who did not agree that osteosarcoma is caused by extraction (21.70%). About 78.3% dental students were aware that occurrence of osteosarcoma of jaws are related to dental extractions.
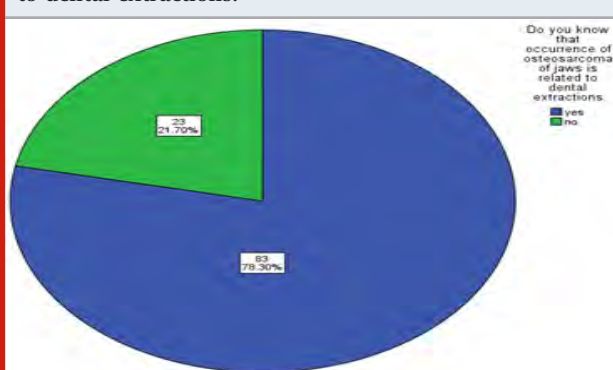
Figure 7: Pie chart depicting the awareness of the dental students on swelling as the most common clinical presentation of osteosarcoma of jaws . Blue colour indicates students who agreed that swelling is the common finding of osteosarcoma of jaws (78.25%). Green colour indicates students who did not agree that swelling is the common finding of osteosarcoma of jaws (20.75%). 79.25% were well aware that the commonest findings of osteosarcoma of jaws was swelling.
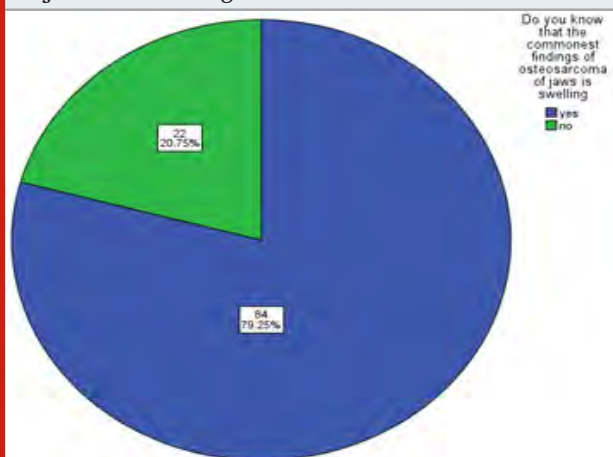
Figure 8: Pie chart depicting the awareness of the dental students on chemotherapy as an adjuvant for surgery in treatment for osteosarcoma of jaw. Blue colour indicates students who agreed that chemotherapy can be used as an adjuvant for surgery(96.23%). Green colour indicates students who did not agree that chemotherapy can be used as an adjuvant for surgery (3.77%). About 96.2% dental students were aware that the survival rate of osteosarcoma has increased on using chemotherapy as an adjuvant to surgery.

Figure 9: Pie chart depicting the awareness of the dental students on higher levels of fluoride as a cause for osteosarcoma of jaws. Blue colour indicates students who agreed that fluoride causes osteosarcoma of jaws (78.30%). Green colour indicates students who did not agree that fluoride causes osteosarcoma of jaws (21.70%). About 78.3% students were aware that higher levels of fluoride content in drinking water can lead to osteosarcoma of jaws.
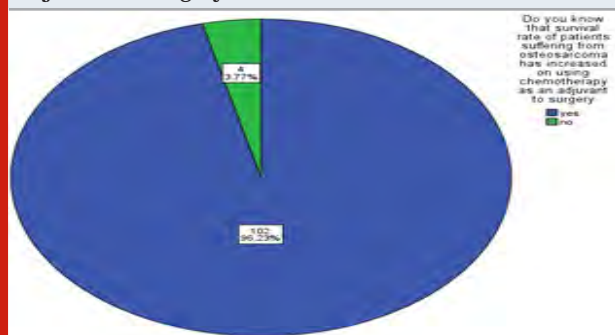
About 78.3% students were aware that higher levels of fluoride content in drinking water can lead to osteosarcoma of jaws (Figure 9). 76.42% were aware that peak incidence of osteosarcoma was found in the second and fourth decades (Figure 10). About 76.42% dental students were aware that patient age, tumour grade, tumour size, response to chemotherapy all these factors affects prognosis of osteosarcoma of jaws (Figure 11). According to 73.58% of the study participants swelling, loosening of teeth are the symptoms of osteosarcoma of jaws (Figure 12).

Figure 10: Pie chart depicting the awareness of the dental students on higher incidence of osteosarcoma of jaws seen in the second and fourth decades . Blue colour indicates students who agreed that higher incidence of osteosarcoma of jaws was seen in the second and fourth decades (76.42%). Green colour indicates students who did not agree that higher incidence of osteosarcoma of jaws was seen in the second and fourth decades (23.58%). 76.42% were aware that peak incidence of osteosarcoma was found in the second and fourth decades.
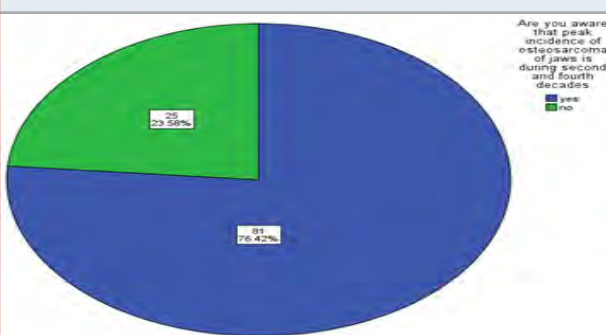
Figure 11: Pie chart depicting the factors affecting prognosis of osteosarcoma according to the participants . Blue colour indicates response to chemotherapy (2.83%). Green colour indicates none of the above (0.94%). Brown colour indicates patient age (4.72%). Violet colour indicates tumour grade (3.77%). Yellow colour indicates tumour size (11.32%). Red colour indicates all of the above (76.42%). About 76.42% dental students were aware that patient age, tumour grade, tumour size, response to chemotherapy all these factors affects prognosis of osteosarcoma of jaws
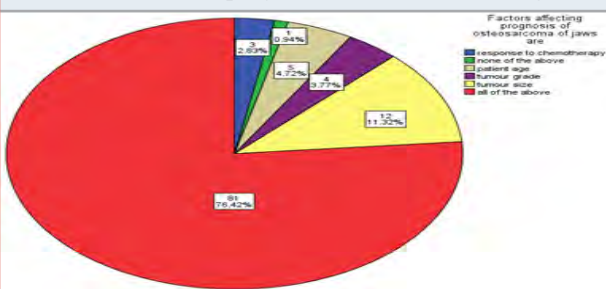
Figure 12: Pie chart depicting the symptoms of osteosarcoma of jaws according to the participants. Blue colour indicates swelling (5.66%). Green colour indicates loosening of teeth (7.55%). Brown colour indicates facial dysesthesia (13.21%). Violet colour indicates all of the above (73.58%). According to 73.58% of the study participants swelling, loosening of teeth are the symptoms of osteosarcoma of jaws.
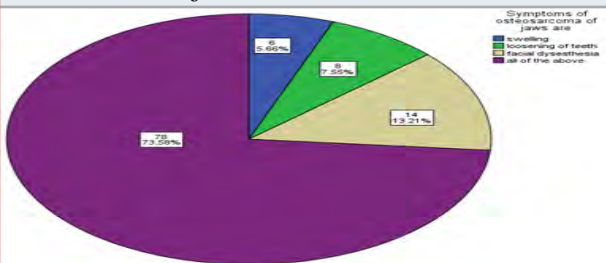
About 85.8% dental students were aware that osteosarcoma of jaws occurs secondary to Paget's disease (Figure 13). 93.4% dental students agreed to the fact that obtaining disease free resection margins in osteosarcoma is difficult (Figure 14). About 83% dental students were aware of the ways to manage osteosarcoma of jaws (Figure 15).

Figure 13: Pie chart depicting the awareness of the dental students on osteosarcoma occurring secondary to Paget's disease. Blue colour indicates students who agreed that osteosarcoma occurred secondary to Paget's disease (85.85%). Green colour indicates students who did not agree that osteosarcoma occurred secondary to Paget's disease (14.15%). About 85.8% dental students were aware that osteosarcoma of jaws occurs secondary to Paget's disease.
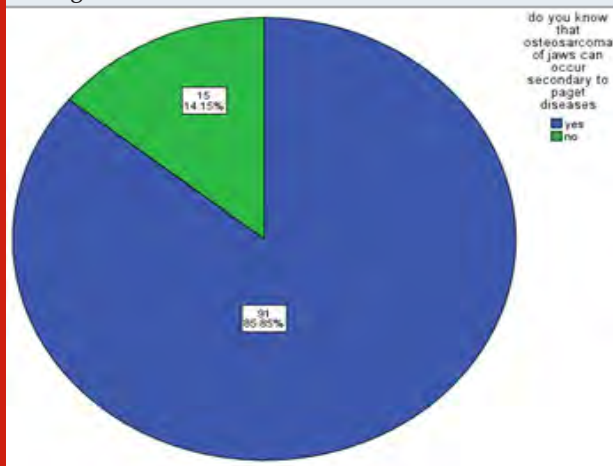
Figure 14: Pie chart depicting the awareness of dental students on obtaining disease free margin in osteosarcoma of jaws is difficult. Blue colour indicates students who agreed that obtaining disease free margin in osteosarcoma of jaws is difficult (93.40%). Green colour indicates students who did not agree that obtaining disease free margin in osteosarcoma of jaws is difficult (6.60%). 93.4% dental students agreed to the fact that obtaining disease free resection margins in osteosarcoma is difficult.

Figure 15: Pie chart depicting the awareness of dental students on ways to manage osteosarcoma of jaws. Blue colour indicates students who were aware of ways to manage osteosarcoma of jaws (83.02%). Green colour indicates students who were not aware of ways to manage osteosarcoma of jaws (16.98%). About 83% dental students were aware of the ways to manage osteosarcoma of jaws.
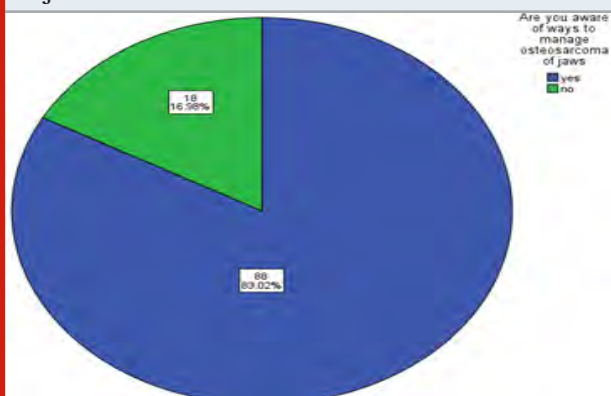
Comparison of year of study of participants and awareness of osteosarcoma of jaws was done and awareness was seen more among third years (37.14%) compared to other years (p=0.001, statistically significant) (Figure 16). Comparison of year of study of participants and awareness of chemotherapy as an adjuvant for surgery as a treatment for osteosarcoma of jaws was also done and awareness was seen more among third years (37.74%) compared to other years (p=0.011, statistically significant) (Figure 17). Comparison of year of study of participants and awareness of ways to manage osteosarcoma of jaws and awareness was seen more among third years (35.85%) compared to other years (p=0.001, statistically significant) (Figure 18).

Figure 16: Bar graph depicts the comparison of year of study of participants and awareness of osteosarcoma of jaws. X axis denotes the year of study of the participants and Y axis denotes the frequency distribution for the response of the question 'Are you aware of malignant primary tumour of bone, osteosarcoma'. Blue colour depicts the participants who are aware of osteosarcoma of jaws and green colour depicts the participants who are not aware of osteosarcoma of jaws . Awareness was seen more among third years (37.74%) compared to other years. This was found to be statistically significant. (Chi square test,P=0.001).
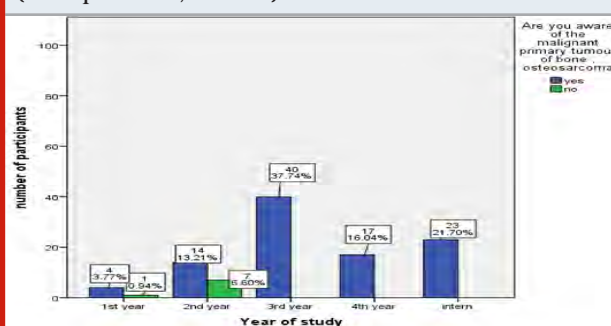
Figure 17: Bar graph depicts the comparison of year of study of participants and awareness of chemotherapy as an adjuvant for surgery as a treatment for osteosarcoma of jaws. X axis denotes the year of study of the participants and Y axis denotes the frequency distribution for the response of the question 'Do you know that survival rate of patients suffering from osteosarcoma has increased on using chemotherapy as an adjuvant for surgery'. Blue colour depicts the participants who are aware of that chemotherapy as an adjuvant for surgery and green colour depicts the participants who are not aware of chemotherapy as an adjuvant for surgery. Awareness was seen more among third years (37.74%) compared to other years. This was found to be statistically significant. (Chi square test, P=0.011).
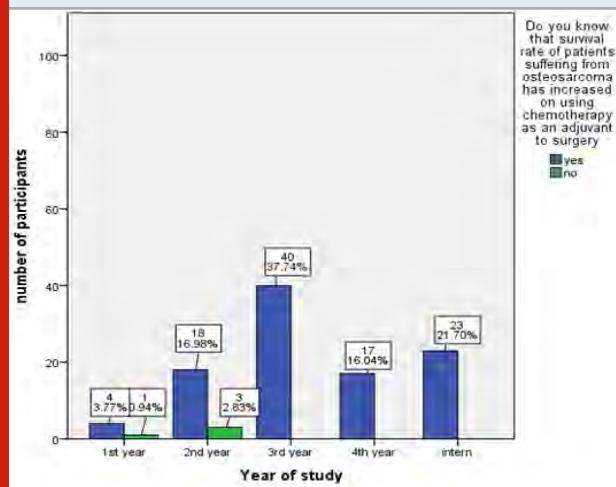
Figure 18: Bar graph depicts the comparison of year of study of participants and awareness of ways to manage osteosarcoma of jaws. X axis denotes the year of study of the participants and Y axis denotes the frequency distribution for the response of the question 'Are you aware of ways to manage osteosarcoma of jaws'. Blue colour depicts the participants who are aware of ways to manage osteosarcoma of jaws and green colour depicts the participants who are not aware of ways to manage osteosarcoma of jaws. Awareness was seen more among third years (35.85%) compared to other years. This was found to be statistically significant. (Chi square test, P=0.001).
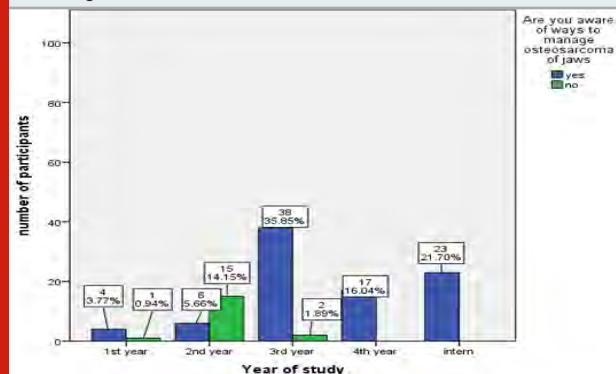
CONCLUSION

This survey aims in creating awareness among dental students about the primary malignant tumour of bone osteosarcoma. It also creates awareness about management of osteosarcoma of jaws. From the results of the survey it is clear that most of the dental students were well aware of osteosarcoma of jaws and also had proper knowledge about the ways to diagnose and manage osteosarcoma.

ACKNOWLEDGEMENTS

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Awareness on Platelet Rich Plasma Among Dental Students – A Survey

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ABSTRACT

Platelet rich plasma (PRP), also called as autologous platelet gel, is nothing but plasma rich in growth factors , platelet concentrate. In other words, it is an increased concentration of platelets suspended in a small amount of plasma after the process of centrifugation. This survey aimed at assessing the knowledge and awareness of platelet rich plasma among dental students. The study was done in an online setting among the dental students of the Chennai population. The sample size of 150 participants of age group 20-23 years, both males and females were selected by a simple random sampling method. Both descriptive (frequency of the responses) and inferential statistics (Chi - square tests) were done and the results were presented in the forms of graphs. According to this survey based study it was noted that the females (64%) have participated in higher numbers compared to males (36%). It was noted that 59.33% of the population participated in the study were aware of the term PRP (ie. platelet rich plasma) whereas 40.67% of the population was not aware of the term. The association of gender and awareness of platelet rich plasma among the participants was found to be statistically significant, p=0.000(<0.05). Within the limitations of this study, it was inferred that the knowledge and awareness of platelet rich plasma was different among both the genders. More appropriately , females were much aware compared to males. Association of gender and awareness of platelet rich plasma among the participants was found to be statistically significant.

KEY WORDS: AWARENESS; PLATELET RICH PLASMA; GENDER; GROWTH FACTORS.

INTRODUCTION

Platelet rich plasma (PRP), also called as autologous platelet gel, is nothing but plasma rich in growth factors, platelet concentrate. In other words, it is an increased concentration of platelets suspended in a small amount of plasma after the process of centrifugation. Basically, a patient's own blood is collected and is made to undergo the process of centrifuging at varying speed until it separates into 3 different layers i.e platelet poor plasma, platelet rich plasma, and red blood cells. Usually 2 spins are required. The first spin also known as the hard spin separates the platelet poor plasma from the red fraction and platelet rich plasma. The second spin also known as the soft spin separates the red fraction from the platelet rich plasma. The material with the highest specific gravity (platelet rich plasma) will be deposited at the bottom of the tube. Immediately prior to application of this process , a platelet agonist such as the 10% calcium chloride and

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topical bovine thrombin is added to activate the clotting cascade, producing a platelet gel.

This whole process of preparation takes approximately 12 minutes and produces a platelet concentration of 3–5 times that of native plasma(Marx et al., 1998; Petrungaro, 2001). Platelets play a very fundamental role in hemostasis and are a natural source of growth factors. Growth factors, present within platelet α-granules, comprise platelet derived growth factor (PDGF), insulin like growth factor (IGF), vascular endothelial growth factor (VEGF), platelet derived angiogenic factor (PDAF), and transforming growth factor beta (TGF-β) (Bennett and Schultz, 1993). The release of these growth factors is triggered by the activation of platelets that can be initiated by a variety of substances or stimuli such as thrombin, calcium chloride, or collagen. Growth factors are concerned in main stages of wound healing and regenerative processes including chemotaxis, proliferation, differentiation, and angiogenesis. Consistent with the definition of platelet rich plasma, it's going to be assumed that these growth factors are present at increased concentrations in PRP.

In addition to growth factors (GFs), platelets release numerous other substances (e.g., fibronectin, vitronectin, sphingosine 1-phosphate, etc.) that are vital in wound healing. An advantage of platelet rich plasma over the utilization of single recombinant human protein delivery is that the release of multiple growth factors and differentiation factors upon platelet activation (Sánchez et al., 2003). Recently, the morphologic and molecular configuration of PRP was reported, it showed PRP may be a fibrin framework over platelets that has the potential to support regenerative matrix(El-Sharkawy et al., 2007; Fernández-Barbero et al., 2006). The underlying principle for using PRP in soft and hard augmentation are to hasten vascularization of the graft, advance soft tissue healing, reduce postoperative morbidity, and enhance bone regeneration(Anitua, 1999). Advantages of using an autologous PRP include no risk of cross reactivity, immune response or disease transmission(Weibrich et al., 2001). Furthermore , the utilization of PRP improve behavior of particulate graft materials and easier stuffing into a grafting site, thus facilitating space maintenance and potential bone regeneration(Freymiller and Aghaloo, 2004; Jakse et al., 2003).

Platelet-rich plasma (PRP) is currently considered as one of the main strategies to promote musculoskeletal tissues/collagen repair. There are several reports in the review of literature evidencing its potential in clinical trials as well as in vitro analysis(Hammond et al., 2009; Kajikawa et al., 2008; Schallmoser et al., 2007; Weibrich et al., 2001) . It is deployed as a cost-effective source of autologous growth factors that might affect stem cells proliferation and differentiation, as it is being increasingly investigated as an adjuvant or scaffold for stem cells-based therapeutics. However, the lack of standardization for the methodology of obtaining and using platelet rich plasma among different groups may hamper the development of this trending technology.

Previously our department has published extensive research on various aspects of prosthetic dentistry (Anbu et al., 2019; Ariga et al., 2018; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Ganapathy et al., 2017; Gupta et al., 2018; Jain, 2017a, 2017b; Ranganathan et al., 2017; Varghese et al., 2019; World Journal of Dentistry, 2017), this vast research experience has inspired us to research on the awareness platelet rich plasma among health practitioners. The present study aimed at assessing the knowledge and awareness of platelet rich plasma among dental students.

MATERIAL AND METHODS

The study was done in an online setting among the dental students of the Chennai population during December 2019. Institutional review board approval was obtained for this survey based analysis. 2 reviewers [Primary investigator & guide] were involved in this study. The sample size of 150 participants of age group 20-23 years, both males and females were selected by a simple random sampling method. Students pursuing internships in various dental institutions were given access to an online link and the responses were collected through an online database. Randomisation [for all variables] was followed to minimise the bias. Pretested questionnaires where the internal validity was the homogenisation and replication of experiment. Cross verification with existing studies was the external validity of this study. The results were collected and tabulated . Then the results were exported for statistical analysis to SPSS statistical software. Both descriptive (frequency of the responses) and inferential statistics (Chi - square tests) were done and the results were presented in the forms of pie charts and bar graphs.

RESULTS AND DISCUSSION

According to this survey based study it was noted that the females(64%) have participated in higher numbers compared to males(36%) [Figure 1]. It was noted that 59.33% of the population participated in the study were aware of the term PRP (ie. platelet rich plasma) whereas 40.67% of the population was not aware of the term[Figure2]. When the students were asked about application of platelet rich plasma in dentistry 36.67% of the population opted for endodontic followed by 28% for the field of surgery , 21.33% for the field of implants and 14% for the field of periodontics[Figure3]. 36% of the population participated in the study were not aware of the components of platelet rich plasma[Figure 4]. Regarding the method of preparation of platelet rich plasma, only about 43.33% of the population were aware about the proper protocol for preparation of platelet rich plasma and 28.67% of the population had no idea about the preparation of platelet rich plasma[Figure 5]. About 36% of the population were aware that platelet rich plasma is completely safe and does not face any host rejection[Figure 6].

Figure 1: Pie chart showing percentage distribution of the population according to gender participated in the study. 64% were females (Blue) whereas only 36% males(Green) participated in the study. N=150. Females have participated in higher numbers in this survey.
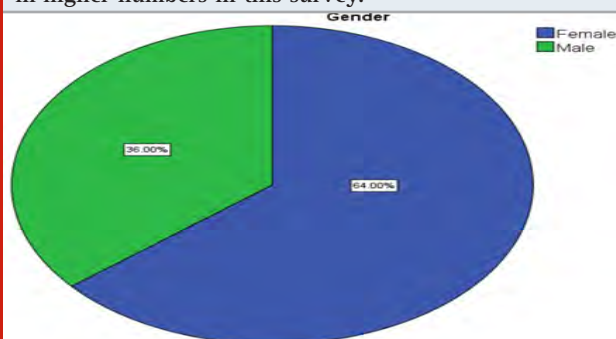
Figure 2: Pie chart showing percentage distribution of the awareness of the term Platelet rich plasma among the participants participated in the study. 59.33% were aware of the term (Blue) whereas 40.67% were not aware of the term(Green). N=150. There is increased awareness of Platelet rich plasma among the study participants.
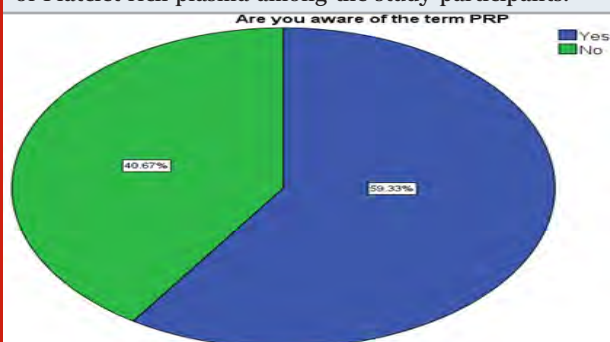
Figure 3: Pie chart showing percentage distribution of the awareness of the application of Platelet rich plasma in different fields of dentistry. 36.67%(Purple) of the population opted for endodontics followed by 28%(Green) for the field of surgery, 21.33%(Beige) for the field of implants and 14%(Blue) for the field of periodontics. N=150. There was no clear idea of the application of Platelet rich plasma among the study participants.
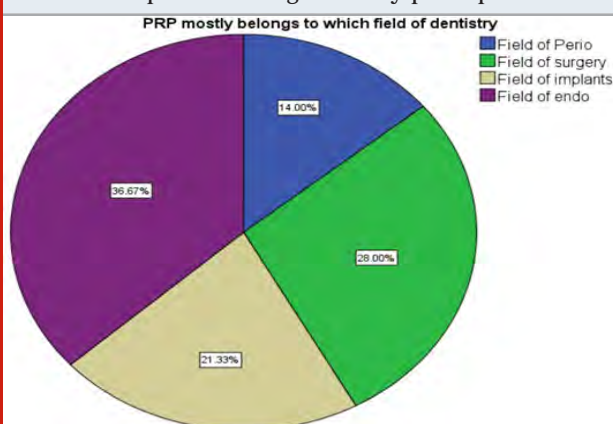
Figure 4: Pie chart showing percentage distribution of the awareness of the components of Platelet rich plasma among the participants participated in the study. 64% were aware of the term (Blue) whereas 36% were not aware of the components(Green). N=150. There is increased awareness of the components of Platelet rich plasma among the study participants.
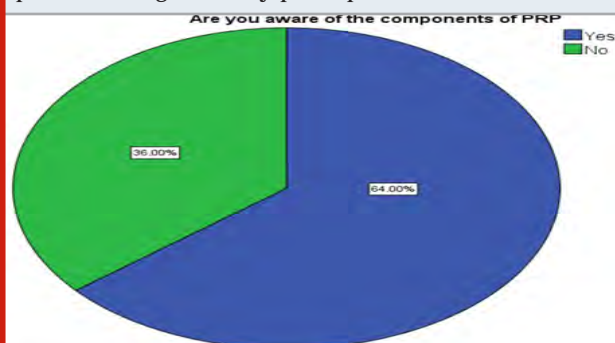
Figure 5: Pie chart showing percentage distribution of the awareness of the method of preparation of Platelet rich plasma. 43.33%(Blue) of the population were aware about the proper protocol for preparation of platelet rich plasma and 28.67%(Purple) of the population had no idea about the preparation of platelet rich plasma. N=150. There is awareness of the method of preparation of Platelet rich plasma among the study participants.
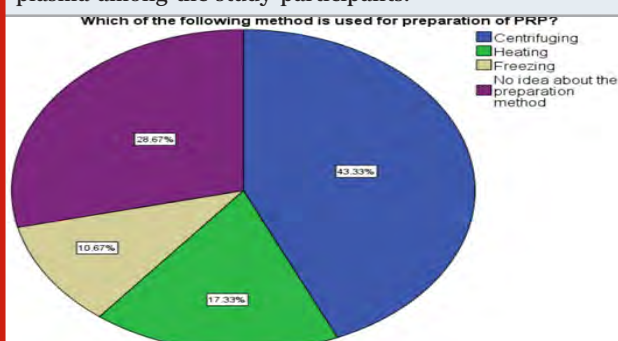
Figure 6: Pie chart showing percentage distribution of the awareness of Platelet rich plasma regarding host rejection among the participants participated in the study. 64% were not aware (Green) whereas 36% were aware of it (Blue). N=150. There is not much knowledge regarding the compatibility of Platelet rich plasma among the study participants.
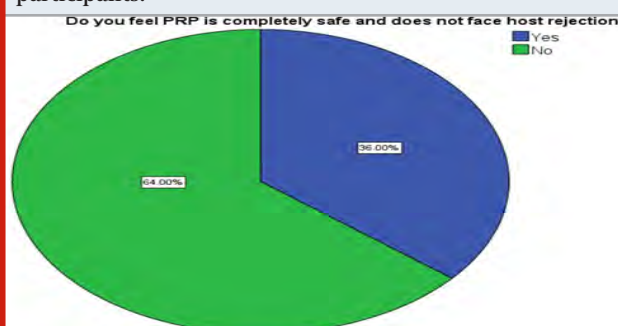
About 56% of the participants included in the study were aware that platelet rich plasma can be used to treat BRONJ(Bisphosphonates related radionecrosis of the jaw)[Figure 7]. 52% of the population did not know that PRP injections are used to treat certain joint diseases like osteoarthritis [Figure 8]. Students were aware about the term fibrin sealants(67.33%)[Figure 9]. 53.33% of the patients knew that PRP is superior to fibrin sealants in their characteristics[Figure 10]. Association of gender and awareness of platelet rich plasma was found to be statistically significant with a p value of 0.000[Figure11]. Association between gender and the field of dentistry in which platelet rich plasma is mostly applied was found to be statistically significant(p=0.007)[Figure12]. Association of gender and awareness of fibrin sealants was found to be statistically significant with a p value of 0.000[Figure13].within the study were aware of the term PRP (ie. platelet rich plasma) whereas 40.67% of the population wasn't aware of the term[Figure2].

Figure 7: Pie chart showing percentage distribution of the awareness of Platelet rich plasma in BRONJ (Bisphosphonates related radionecrosis of the jaw) treatment among the participants participated in the study. 56% were aware (Blue) whereas 44% were not aware of it(Green). N=150. There is knowledge regarding the use of Platelet rich plasma for BRONJ among the study participants.

Figure 8: Pie chart showing percentage distribution of the awareness of Platelet rich plasma in treatment of joint disease among the participants participated in the study. 48% were aware (Blue) whereas 52% were not aware of it(Green). N=150. There is less knowledge regarding the use of Platelet rich plasma for treatment of joint diseases among the study participants.
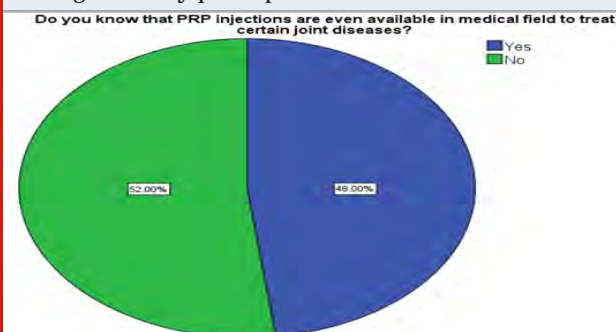
Figure 9: Pie chart showing percentage distribution of the awareness of fibrin sealants among the participants participated in the study. 67.33% were aware (Blue) whereas 32.67% were not aware of it(Green). N=150. There is knowledge regarding fibrin sealants among the study participants.

Figure 10: Pie chart showing percentage distribution of the awareness of properties of fibrin sealants versus platelet rich plasma among the participants participated in the study. 53.33% were aware that platelet rich plasma is superior to fibrin sealants(Blue) whereas 46.67% were not aware of it(Green). N=150. There is knowledge regarding fibrin sealants among the study participants.
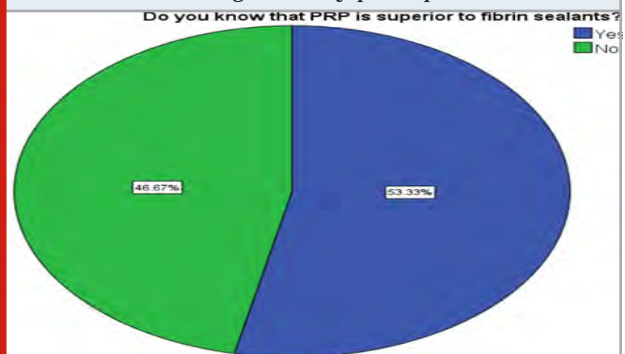
Figure 11: The bar graph represents the association of gender and awareness of platelet rich plasma among the participants. The X - axis represents the gender and the Y - axis represents the number of participants with their responses. Among the total participants, 46% of the females were aware of platelet rich plasma. This association was statistically significant.(Pearson Chi square value:17.384, p=0.000(<0.05). Hence it is statistically significant.

When the students were asked about application of platelet rich plasma in dentistry 36.67% of the population opted for endodontic followed by 28% for the world of surgery , 21.33% for the world of implants and 14% for the world of periodontics[Figure3]. 36% of the population participated within the study weren't aware of the components of platelet rich plasma[Figure 4]. Regarding the tactic of preparation of platelet rich plasma, only about 43.33% of the population were conscious of the proper protocol for preparation of platelet rich plasma and 28.67% of the population had no idea about the preparation of platelet rich plasma[Figure 5]. About 36% of the population were aware that platelet rich plasma is completely safe and doesn't face any host rejection[Figure 6]. About 56% of the participants included within the study were aware that platelet rich plasma are often used to treat BRONJ(Bisphosphonates related radionecrosis of the jaw)[Figure 7]. 52% of the population didn't know that PRP injections are used to treat certain joint diseases like osteoarthritis [Figure 8].

Figure 12: The bar graph represents the association of gender and awareness of the field of application of platelet rich plasma in dentistry among the participants. The X - axis represents the gender and the Y - axis represents the number of participants with their responses. Among the total participants, 30% of the females opted that platelet rich plasma was used in endodontics . This association was statistically significant.(Pearson Chi square value:12.111, p=0.007(<0.05). Hence it is statistically significant.
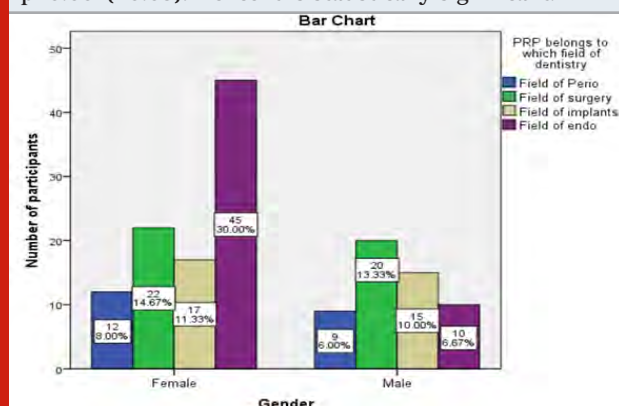
Students were conscious of the term fibrin sealants(67.33%) [Figure 9]. 53.33% of the patients knew that PRP is superior to fibrin sealants in their characteristics[Figure 10]. Association of gender and awareness of platelet rich plasma was found to be statistically significant with a p value of 0.000[Figure11]. Association between gender and thus the sector of dentistry during which platelet rich plasma is typically applied was found to be statistically significant(p=0.007)[Figure12]. Association of gender and awareness of fibrin sealants was found to be statistically significant with a p value of 0.000[Figure13].

According to this survey, it was inferred that the knowledge of platelet rich plasma was different among both the genders. More appropriately , females were much aware compared to males.

Figure 13: The bar graph represents the association of gender and awareness of application of fibrin sealants among the participants. The X - axis represents the gender and the Y - axis represents the number of participants with their responses. Among the total participants, 64% of the females were aware of fibrin sealants. This association was statistically significant. (Pearson Chi square value:129.373, p=0.000(<0.05).Hence it is statistically significant.
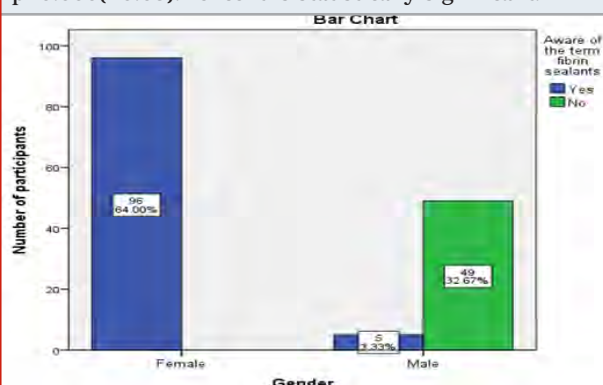
Figure 14: The bar graph represents the association of gender and awareness of properties of fibrin sealants versus platelet rich plasma among the participants. The X - axis represents the gender and the Y - axis represents the number of participants with their responses. Among the total participants, 53.3% of the females were aware that platelet rich plasma is superior to fibrin sealants. This association was statistically significant. (Pearson Chi square value:96.429, p=0.000(<0.05). Hence it is statistically significant.
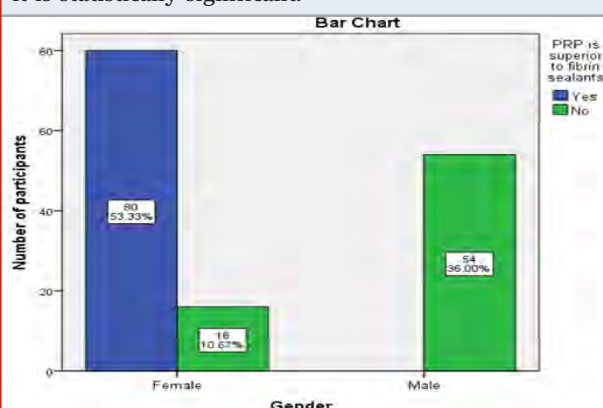
Platelet rich plasma can be used in different fields of dentistry and not specific to any particular field as such. The development of an autologous platelet rich plasma is proved to be relatively easy and ultimately effective as a surgical supplement, in order to retain desired levels of the growth factors after preparation. The potential use of Platelet rich plasma is to be clinically effective in acceleration of postsurgical healing in both periodontal and oral surgery applications mainly (Carlson and Roach, 2002).

Figure 15: The bar graph represents the association of gender and awareness of the components of platelet rich plasma among the participants. The X - axis represents the gender and the Y - axis represents the number of participants. Among the total participants, 64% of the females were aware of the components of platelet rich plasma. This association was statistically significant. (Pearson Chi square value:150.000, p=0.000(<0.05).Hence it is statistically significant.
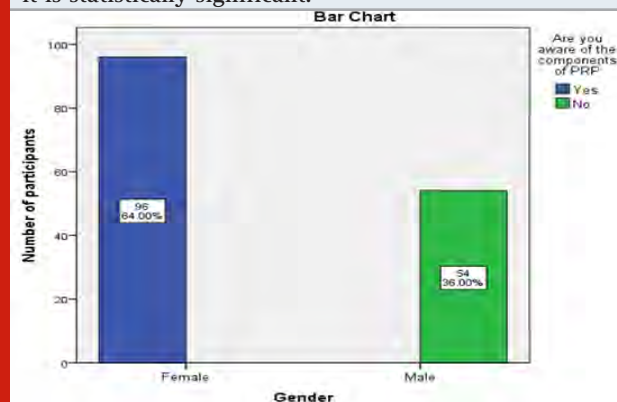
Components of platelet rich plasma are mainly the platelets, leucocytes, and growth factors. Several authors have tried to characterize and classify the numerous techniques available in the present use in terms of preparation (use of anticoagulant;centrifugation speed), components , and its applications (Anitua, 1999; Dohan Ehrenfest et al., 2009). Regarding the techniques of preparation most of the responses said it was centrifuging. Though it is correct the method of preparation is explained briefly as follows: Open technique: the product is exposed during preparation to the environment and comes in direct contact with different materials that are to be used for their production, like the pipettes or any kind of product-collecting tubes. It is specifically ensured that with the open technique, it is not to be contaminated during any kind of microbiological handling. Closed technique: it involves the use of commercial available devices with markings in which the preparation is not exposed to the environment . closed technique is the most safe and preferred method of preparation of platelet rich plasma.

Platelet rich plasma has a wide range of applications other than dental field. It is used in the dermatological field for the purpose of alopecia treatment, in BRONJ, in Osteoarthritis and so on. A study done by Mauceri et al (Mauceri et al., 2018) , showed that platelet rich plasma as an adjunct to laser can cause effective healing. In this study in order to manage BRONJ patients performing the conservative type of treatment through Er,Cr:YSGG laser combined platelet rich plasma,will enhance the bone and mucosal healing, with a successful outcome of 80%.The use of laser technology for BRONJ treatment and its advantages on tissue healing capacity has been widely investigated in the past years (Ghidini et al., 2017; Latifyan et al., 2016). It can improve post surgical wound healing by stimulating the release of growth factors

;promoting angiogenesis and bone healing. It is also implicated in the treatment of osteoarthritis . platelet rich plasma in addition to hyaluronic acid, dehydrated human amniotic/chorionic membrane tissue, have started to gain traction for osteoarthritis. Since platelet rich plasma is considered to have both anti-inflammatory effects through growth factors such as transforming growth factor-β and insulin-like growth factor 1, and stimulatory effects on mesenchymal stem cells and fibroblasts they can play a pivotal role(Southworth et al., 2019) .

Fibrin sealant back in the 90's was the first modern era material approved as a hemostat in the. It was the only agent approved as a hemostat, sealant, and adhesive by the Food and Drug Administration (FDA)(Spotnitz, 2014). The product is presently supplied in forms of patches additionally to the primary liquid formulations. However, with the passage of time newer products came into use. One such thing was platelet rich plasma. In an in vitro study in the dogs(Hermeto et al., 2012) showed that platelet rich plasma is clinically superior to the fibrin sealants , when these agents were used on full-thickness skin grafts. It has been emphasized that the histological analysis demonstrated greater presence of fibroblasts in the group treated with platelet-rich plasma.

PRP is now being widely used as a new therapeutic option in the field of dermatology, such as trichology, wound healing, and cosmetic medicine. In this manner, understanding the biological characteristics and mechanism of action of this platelet rich plasma will help clinicians in selecting a system that meets their specific needs for a given indication. Further clinical trials and studies need to be evaluated for the purpose of usage of platelet rich plasma.

CONCLUSION

Within the limitations of this study, it was inferred that the knowledge and awareness of platelet rich plasma was different among both the genders. More appropriately, females were much aware compared to males. Association of gender and awareness of platelet rich plasma among the participants was found to be statistically significant.

Conflict of Interests: None declared.

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Comparative Evaluation of Analgesic Efficacy of NSAID and Opioid Post-Extraction

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ABSTRACT

Extractions are associated with postoperative pain and swelling at the extraction site. Postoperative pain is usually moderate to severe in the first 12 h postoperatively and lasts for 3–5 days. However, with pain killers, these symptoms usually subside within 24 h. The aim of the study was to compare and evaluate the analgesic effects of Ketorolac and tramadol post operatively. Total of 100 patients requiring surgical extraction under local anesthesia were taken in the study. The study group consisted of patients aged between 25-40 years undergoing extraction of the mandibular molars. The patients were randomly divided into two groups (Group A & Group B) of 50 each. Group A patients were given Tramadol 50 mg and Group B patients were given ketorolac 10 mg postoperatively. Pain intensity was recorded after 30 minutes, 1st hr., 4th hrs, 6th hrs, 12th hrs and 24 hrs using the visual analog scale. Telephonic interviews were conducted to record the pain intensity of the patients. Pain was recorded on VAS (visual analogue scale). The data were coded and entered into IBM SPSS for statistical analysis. Descriptive and analytic approaches were used in the data analysis. Independent sample t test was used to compare the pain intensity in both the groups. On comparing the mean of the Visual Analog Scale it was found that the mean of Group B (Ketorolac) was found to be lesser than that of Group A (Tramadol) thus proving that Ketoralac had more analgesic effects compared to tramadol. Independent sample t test showed that the results were statistically significant. (p=0.021, p<0.05). Within the limits of the study, it was found that the maximum analgesic effect of Ketorol was achieved in 48 hours and the maximum analgesic effect of Tramadol was achieved in 72 hours and the results were statistically significant.

KEY WORDS: ANALGESIC EFFECT; KETOROLAC; TRAMADOL; PAIN INTENSITY; VISUAL ANALOG SCALE.

INTRODUCTION

Pain is a subjective symptom and can be influenced by various factors like age, sex, anxiety, pain threshold and surgical difficulty etc. pain experienced after extraction under local anesthesia has been shown to be of short duration and reaches its maximum intensity in early post-operative period which requires analgesics for relief. (Becker and Phero, 2005)Post-operative pain can cause distress to the patient and affect the patient's quality of life after surgery. So various research studies have been done for better pain control following extraction and different types of medications have been proposed. (Hyrkäs et al., 1993) Pain management for extraction should be treated before the development of significant intensity of pain. Longer the pain remains uncontrolled, more sensitive the patient may become to painful stimuli. Pain following extraction reaches a severe intensity

or peak within the first 5-8 hrs after the surgery. (Revathy et al., 2018)

Many clinicians have attempted to reduce the post-operative pain by using anti-inflammatory drugs. The anti-inflammatory drugs broadly categorized into steroidal (Narcotic analgesics) and non-steroidal (NSAIDS). Narcotic analgesics, which act directly on the central nervous system opiate receptors, but can cause drug dependence, respiratory depression, constipation, nausea, vomiting and sedation. Non-steroidal anti-inflammatory drugs (NSAIDs), which act by prostaglandin synthesis to achieve analgesic and antiinflammatory actions, (Colletti et al., 1998) but associated with poor gastrointestinal and renal tolerance and risk of interference with coagulation systems. (Gan, 2010) The best postoperative medication is one that provides long analgesic cover, is easily administrable, should be safe and cost economical. Ketorolac is a first-generation non-steroidal anti-inflammatory drug (NSAID) of family heterocyclic acetic acid derivatives, used for short-term management of moderate to severe pain and usually not prescribed for longer than five days. Ketorolac is a non-selective COX inhibitor. Its mode of action is by inhibiting the bodily synthesis of prostaglandins by competitive blocking of the enzyme cyclooxygenase (COX). Its onset of action is approximately 30 minutes and reaches its peak effects in 45-60 minutes having a half-life of 4-6 hours. (Lee and Seo, 2008)

Tramadol is a synthetic opioid of the benzenoid class used to treat moderate to severe pain both acute and chronic. Its effectiveness is equivalent to that of morphine and analgesics effects last for approximately 6 hrs. It acts by two different mechanisms. (Grond and Sablotzki, 2004) First, it works by binding to the μ-opioid receptor. Secondly, it acts as a serotonin–norepinephrine reuptake inhibitor (SNRI). (Lee et al., 1993)

The use of tramadol has not reported very widely after extraction. However Ketorolac has been used successfully to replace opioid in mild-to-moderate postsurgical pain like surgical extraction. As postoperative pain after surgical extraction is moderate to severe, pain relief or control is often challenging to achieve. However, this condition offers an opportunity to study and evaluate the potency of analgesics in validated clinically relevant models. (Lustenberger, Grätz and Mutzbauer, 2011)

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the analgesic effect of Tramadol and Ketorolac post

extraction.

MATERIAL AND METHODS

Data Collection: Total of 100 patients requiring surgical extraction under local anesthesia were taken in the study. The study protocol received institutional approval from the Ethics Committee of the university. The study group consisted of patients aged between 25-40 years undergoing extraction of the mandibular molars. Inclusion criteria were the patient undergoing extraction of the mandibular molars. Exclusion criteria includes medically compromised patients, pregnancy, steroid therapy, metabolic disorder patients, those who had taken any type of analgesic in the past 48 hrs, patients allergic to the drugs and impaction extraction. All the patients who were included in the study were informed about the treatment procedure and possible complications were also explained to them. Informed consent was taken from them.

Sampling: The patients were randomly divided into two groups (Group A & Group B) of 50 each. Group A patients were given Tramadol 50 mg and Group B patients were given ketorolac 10 mg postoperatively. Pain intensity was recorded after 30 minutes, 1st hr., 4th hrs, 6th hrs, 12th hrs and 24 hrs using the visual analog scale. Telephonic interviews were conducted to record the pain intensity of the patients. Comparison of pain intensity was also done on 1st, 2nd and 3rd postoperative days. Pain was recorded on VAS (visual analogue scale) [0-no pain, 2-mild pain, 4- tolerable, 6-distressful pain, 8-severe pain and 10-totally disabling pain].

Statistical Analysis: The data were coded and entered into IBM SPSS for statistical analysis. Descriptive and analytic approaches were used in the data analysis. Independent sample t test was used to compare the pain intensity in both the groups.

RESULTS AND DISCUSSION

A total of 100 patients were enrolled in the study to compare the analgesic efficacy of Ketorolac versus Tramadol and were equally divided into Group A (Tramadol) and Group B (Ketorol) included 34 males (68%), 16 females (32%) whereas Group B included 30 males (60%), 20 females (40%)

The mean of Visual Analog Scale in the first 30 minutes for Group A (Tramadol) was 7 and that of Group B (Ketorolac) was 6. After 12 hours, the mean of Group A (Tramadol) was 6 and that of Group B (Ketorolac) was 5. The mean at the end of 24 hours of Group A (Tramadol) was 5 and that of Group B (Ketorolac) was 6. The mean of Group A (Tramadol) and Group B (Ketorolac) was 4 after 36 hours. At the end of 48 hours and at 60 hours, the mean of Group A (Tramadol) was 3 and that of Group B (Ketorolac) was 1. End of 72 hours the means of both Group A (Tramadol) and Group B (Ketorolac) were 1. On comparing the mean of the Visual Analog Scale it was found that the mean of Group B (Ketorolac) was found to

be lesser than that of Group A (Tramadol) thus proving that Ketoralac had more analgesic effects compared to tramadol. Independent sample t test showed that the results were statistically significant. (p=0.021, p<0.05)

Figure 1: Bar chart with error bar shows the mean of the Visual Analog Scale of both the analgesics, Ketorolac and Tramadol. X axis shows the time at which the pain intensity was calculated and Y axis shows the mean of the Visual Analog Scale. It was found that the maximum analgesic effect (1) of Ketorol (red) was achieved in 48 hours and the maximum analgesic effect (1) of Tramadol (blue) was achieved in 72 hours. Independent sample t test showed that the results were statistically significant. (p=0.021, p<0.05)
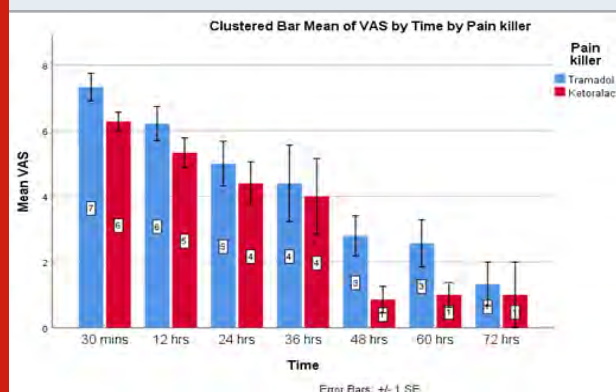
Within 24 hours, the patients using Ketorolac had a tolerable pain and the same was observed in the patients using tramadol only after 36 hours. Similar results are observed by Shaik Kim K et al. and Mario et al. Both the medications provide good analgesic effects. (Kim et al., 2009)(Isiordia-Espinoza et al., 2011) Gopal Raju et al. observed intravenous ketorolac 30 mg provides better pain control postoperatively as compared to 50 mg of tramadol after extraction. (Gopalraju et al., 2014) In the double-blind, randomized, clinical trial Mishra et al. 2012 proved that 100 mg of tramadol is equally effective as 20 mg of ketorolac in the relief of postoperative pain. (Mishra and Khan, 2012) Shah et al. 2013 in their study concluded that intramuscular 30 mg ketorolac gives better pain management, if given prior to oral surgical procedure than intravenous 50 mg tramadol. (Shah et al., 2013) Ong et al. 2004 showed ketorolac had better pain scores and total postoperative analgesic consumption than tramadol. (Ong et al., 2004)

Effective and safe analgesia is one of the main challenges in the healthcare industry. Tramadol is a relatively new opioid drug with better analgesic property and without the risk of tolerance and physical dependence. It is known to be a one of the safest postoperative analgesic medicine used for chronic pain management. However systematic review and meta-analysis showed that a single dose of tramadol has a lower analgesic efficacy and safety than NSAIDs in oral surgery. Ketorolac is a commonly used NSAID for the short term management of acute postoperative pain in dentistry. (Isiordia-Espinoza,

de Jesús Pozos-Guillén and Aragon-Martinez, 2014) Main focus of the study was to compare the analgesic efficacy on pain intensity after tooth extraction of the commonly used analgesics, tramadol and ketorolac. The better analgesic efficacy of ketorolac in comparison to tramadol is attributed to the pathogenesis of dental pain, which is largely inflammatory and is different from general surgical pain. The evidence-based medicine has also shown that dental pain is better treated with NSAIDs than opioids.

The limitations of the study are the small sample size and the body weight which is one of the important criteria for the analgesic effect was not taken into study. Future studies can be conducted with a larger sample size and also with other criteria that influence the analgesic effect.

CONCLUSION

Within the limits of the study, it was found that the maximum analgesic effect of Ketorol was achieved in 48 hours and the maximum analgesic effect of Tramadol was achieved in 72 hours and the results were statistically significant.

Authors Contributions: First author (Keerthana R) performed the analysis, and interpretation and wrote the manuscript. Second author (Dr. Dhanraj. G) contributed to conception, data design, analysis, interpretation and critically revised the manuscript. Both the authors have discussed the results and contributed to the final manuscript.

Conflict of Interest: No conflict of interest.

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Awareness of Herpangina and its Managements Among Dental Students

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ABSTRACT

Herpangina or otherwise known as hand-foot and mouth disease (HMFD) is caused by enteroviral infection and are two common related clinical syndromes. These diseases are mostly seen in paediatric population (7 to 10 years). It is occasionally seen among adult patients. Herpangina is caused by one particular strain of coxsackievirus A (CV-A) and Enterovirus -A71 (EV-A71). Herpangina is an acute upper respiratory tract infection. A survey with 9 close ended questions and 3 multiple choice questions were formed and distributed to dental students These responses to these questions were tabulated then analyzed and studied. The study showed that 86% of the students are aware of the disease herpangina. 57% of the students were not aware of the other name of herpangina. 89% of the students were aware that herpangina is a contagious disease and that it is a viral infection.The overall awareness and knowledge level of the students were good however further knowledge and awareness can be emphasized. Awareness of dental students can always be enhanced by promoting more educational programmes regarding various diseases such as herpangina. It is important as they will play an important role in the medical field in the future.

KEY WORDS: AWARENESS, DENTAL STUDENTS, HERPANGINA.

INTRODUCTION

Herpangina or otherwise known as hand-foot and mouth disease (HMFD) is caused by enteroviral infection and are two common related clinical syndromes. These diseases are mostly seen in paediatric population (7 to 10 years).

It is occasionally seen among adult patients (Corsino and Linklater, 2019) Herpangina is caused by one particular strain of coxsackievirus A (CV-A) and Enterovirus -A71 (EV-A71). Herpangina is an acute upper respiratory tract infection . It was found that patients/ individuals with latent infections are the ones who can easily spread the infection (Li et al., 2018; Yu et al., 2020) Typical spread of this disease is via fecal-oral route. Transmission can be from the ingestion of infected saliva, respiratory droplets or direct contact with fluid from vesicles. Incubation period of 3-5 days. (Repass, Palmer and Stancampiano, 2014; Corsino and Linklater, 2019)

There are various clinical manifestations to this disease. Herpangina is an acute disease which is characterised by a sudden onset of fever and sore throat followed by

fever which may last up to 2-4 days. Cough, rhinorrhoea, vomiting, diarrhoea and sometimes headache, abdominal pain or myalgia and dysphagia in severe sore throat cases can be seen (Yu et al., 2020) Skin eruptions is manifested as papules or vesicles or petechiae on the hand and/or feet or as aphthae on the tongue and oral mucosa.(Wang et al., 1999; Wang and Liu, 2009) There are various oral manifestations as well to this disease such as vesicles, ulceration and diffuse erythema on the soft palate, fauces and tonsillar area(Van Heerden, 2006) Various differential diagnosis can be given to this disease such as herpetic gingivostomatitis, ulcerative stomatitis, measles and varicella. (Yu et al., 2020)

Table 1. Closed ended questions			
1.	Are you aware of the disease known as herpangina?	Yes	No
2.	Are you aware of its other name?	Yes	No
3.	Is herpangina contagious?	Yes	No
4.	Is herpangina a viral infection?	Yes	No
5.	Is there antiviral therapy for herpangina?	Yes	No
6.	Can herpangina be prevented?	Yes	No
7.	Does herpangina cause any signs in the oral cavity?	Yes	No
8.	Will mouthwashes help control mouth pain in a herpangina patient ?	Yes	No
9.	Will a change of diet aid in treatment ?	Yes	No

The only treatment available for this disease is primary supportive treatments. There is no prophylaxis for herpangina or HFMD (Corsino and Linklater, 2019)) Since herpangina and HFMD disease are self-limiting or short duration and do not require treatment. Symptomatic treatment is indicated in very severe cases of herpangina in which non-aspirin antipyretics and topical anaesthetics can be used. (Van Heerden, 2006) Lidocaine or topical therapies are not recommended due the risks for toxicity

associated with these medications. The use of intravenous immunoglobulin (IVIG) in Asia to treat patients with herpangina has shown major outbreaks however it has no prospective data collected about the use of this drug. (Chea et al., 2015; Corsino and Linklater, 2019; Jiao et al., 2019) The aim of this study is to determine if dental students are aware of the various managements done for herpangina.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the level of awareness herpangina and its managements among dental students

MATERIAL AND METHODS

A survey with 9 close ended questions and 3 multiple choice questions were formed and distributed to dental students (3rd Yrs, 4th Yrs and Interns) as shown in Table 1 and Table 2 respectively. These responses to these questions were tabulated then analysed and studied. Their responses will determine the level of awareness of students regarding the management of herpangina.

RESULTS AND DISCUSSION

A total of 100 students have participated in this survey. The results were obtained and tabulated. Table and charts are done to depict clearly the level of knowledge the students have towards the disease as well as its management.

Table 2. Multiple choice questions				
Question:	A	B	C	D
10. Which age group? of people are mostly affected	3-10 yrs	11-19yrs	20-30yrs	31-40yrs
11. Which organism causes herpangina?	Group A coxsackie viruses	Staphylococcus	Streptococcus	
12. What medications are advised?	Antibiotics	antivirals	No medications. Only analgesics	

It was found that around 86% of the students are aware of this disease. It is a very well-known disease and it was found that in 1998, an epidemic of EV71 infection caused HFMD and herpangina in thousands of people in Taiwan, including 405 severe cases and 78 deaths(July, 1998; Wang et al., 1999) Due to this epidemic, the existence of this disease was known by the population.

However, it was found that only 57% of the students were aware that herpangina had another name. As we all know herpangina was also referred to as hand foot and mouth disease (HFMD). There is still some confusion among the students regarding this fact. It was found that only 55% of the students have correctly identified that this disease mainly affects children, more accurately

children lesser than 6 years old (Yu et al., 2020) There has been a case report of herpangina done in Nagpur, India which shows that a total of 4 cases were reported, (2 male and 2 female), all these patients had the classic clinical manifestation of oral and skin lesion. The age group of these patients were 3-4 year old children. (Saoji, 2008).

Table1a. Shows the level of knowledge and awareness of students regarding herpangina. 86% of the students are aware of the disease herpangina. 57% of the students were not aware of the other name of herpangina. 89% of the students were aware that herpangina is a contagious disease and that it is a viral infection. Only 53% of the students were aware that there is no available antiviral therapy for herpangina. It was found that 93% of the students were aware that herpangina can be prevented. 97% of the students were aware that herpangina can produce signs in the oral cavity. 79% of the students have knowledge that there are mouthwashes which will help control the mouth pain in herpangina patients. There were only 69% of the students that agreed that a change in diet can help in the treatment of herpangina.

Questions	Yes	No
Are you aware of the disease known as herpangina?	86%	14%
Are you aware of its other name?	43%	57%
Is herpangina contagious?	89%	11%
Is herpangina a viral infection?	89%	11%
Is there antiviral therapy for herpangina?	47%	53%
Can herpangina be prevented?	93%	7%
Does herpangina cause any signs in the oral cavity?	97%	3%
Will mouthwashes help control mouth pain in herpangina patient ?	79%	21%
Will a change of diet aid in treatment ?	69%	31%

Figure 1: Pie chart shows the responses of students based on the most affected age group for herpangina. The highest response was 3-10yrs (55%) and the remaining 45% belongs to the remaining age groups.
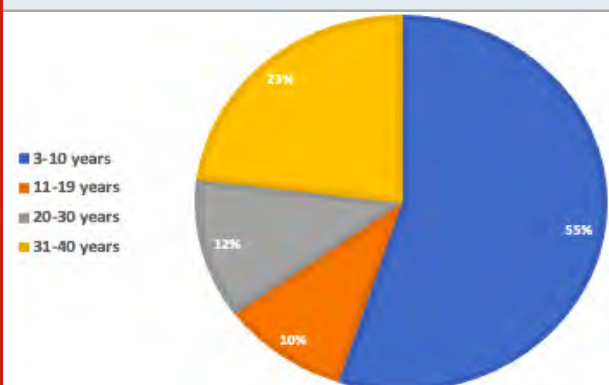
It was found that about 89% of the students are aware that herpangina is a viral infection and 89% of the students are aware that this disease can be contagious. Various articles have discussed that this disease is transmitted through the gastrointestinal tract (fecal-oral route) and respiratory route or through contact with an infected person.(Li et al., 2018; Yu et al., 2020) Knowledge regarding what type of infection it is should be known by the students so that they can take preventive measures as these dental students deal with patients day in and day out. 75% of the students have correctly identified the causative organism of this disease which is Group A coxsackieviruses. Knowledge regarding the causative organisms distinguished this disease from other diseases as well as it can help plan the future treatments needed to be taken.

Figure 2: Pie chart shows the responses of students for the causative organism of herpangina. 75% of the students selected group A coxsackieviruses.
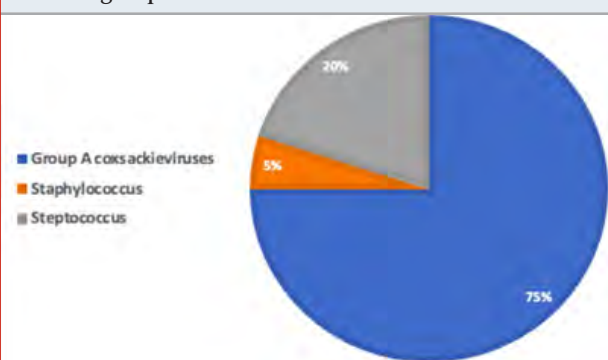
Herpangina can be prevented and about 93% of the students were aware of this fact. A study was done and found that a strong protective effect of hand washing could be expected as the main transmission rate is by hand contact. (Ruan et al., 2011) As we know the transmission of herpangina is by ingestion of infected saliva, respiratory droplets or direct contact with fluid from vesicles. Thus importance regarding the knowledge on how to prevent this disease should be known by the students as we can spread the knowledge to our paediatric patients. 97% of the students are aware that herpangina shows oral manifestations. It is important for dental students to be aware of diseases that show oral lesions such as herpangina.

Regarding the management and treatment of herpangina, 53% of the students have stated that there is not antiviral therapy available for this disease and it is true. There are no drugs indicated for Evs. Broad spectrum antiviral drugs are generally given for clinical treatments Antiviral drugs such as acyclovir, ganciclovir and monosodium phosphate vidarabine should not be given to herpangina patients are they are anti-DNA viral drugs which has no effect on RNA viruses (Yu et al., 2020)However about 83% of the students have chosen antivirals as a choice of medication for herpangina. Even though a specific antiviral therapy was not found for herpangina students should not give any antivirals available. These antivirals

have no effect on herpangina. Dental students should be made vigilant about drug prescription as it may have other effects on the patient. Better understanding of the disease will aid its treatment.

Figure 3: Pie chart shows the responses of students for the advised medication for herpangina. 87% have selected only analgesics.
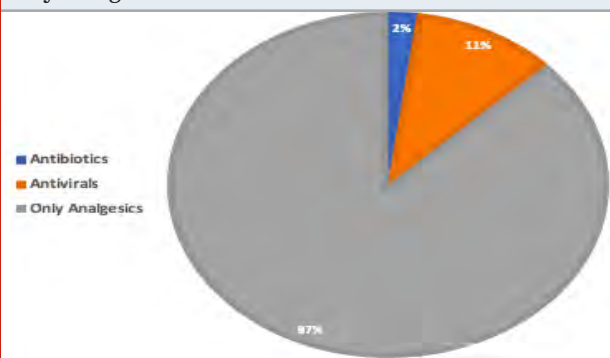
Diet plays an important role in treating herpangina and 69% of the students do believe this. The patients are advised to have a light meal, advised not to have any hot, spicy, sour, coarse, hard or irritating foods. Liquid or semi-liquid food at small frequent meals are advised. 79% of the students believe that the use of mouthwashes aids in the treatment of herpangina. Oral care is important as herpangina has many oral manifestations. Lightly salted water or normal saline are recommended for the patients to rinse their mouths after meals(Yu et al., 2020) These maintain oral hygiene and prevent any other further oral disease and also prevent the spread of the existing disease.

CONCLUSION

Awareness of dental students can always be enhanced by promoting more educational programmes regarding various diseases such as herpangina. It is important as they will play an important role in the medical field in the future. Within the limit of the study, the overall awareness regarding herpangina and its management is good. In the future, this study can be done in a larger scope to determine the level of knowledge of students regarding herpangina

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Awareness on Diagnosis of Fluorosis Stains Among Dental Students

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ABSTRACT

Dental fluorosis occurs due to ingestion of excess fluoride during tooth formation stage. Fluoride decreases the incidence of dental caries but when exceeded above normal limit, it causes fluorosis. Fluorosis stains appear as white opaque stains. If the dental fluorosis is more severe, it appears brown due to secondary staining. The aim of the present study is to analyse the awareness levels on diagnosis of fluorosis stains among dental students. The present study is a survey based study. A set of 12 questionnaires were prepared and distributed among students of Saveetha Dental College. The questionnaires are about fluorosis, its diagnosis and treatment. We found that only a smaller number of people are not aware of fluorosis stains and majority of them say that the cause is consumption of drinks. Majority of the students are aware of the diagnosis and treatment plan for fluorosis stains. Hence the present study showed that there is proper awareness on fluorosis stains among dental students. Though there is proper awareness of fluorosis stains, there are few populations who are not aware of its diagnosis. Hence proper awareness on fluorosis should be created among students and other populations.

KEY WORDS: FLUOROSIS, SA/GAG TEST, STAINS, WHITE.

INTRODUCTION

Fluorosis occurs as a result of excess fluoride ingestion. It appears initially as white opaque surface and leads to brownish discolouration of the tooth. Fluorosis occurs due to changes happening during tooth formation. The changes are related to cell/matrix/mineral interactions as the teeth are forming. Fluoride also appears to enhance mineral precipitation in forming teeth, resulting in hypermineralized bands of enamel, which are then followed by hypomineralized bands (DenBesten and Li, 2011). Enamel fluorosis causes damage to the enamel surface (El Mourad, 2018).

Excess fluoride causes metabolic alteration in ameloblasts eventually leading to defective matrix and improper calcification of teeth and causing fluorosis of teeth (El Mourad, 2018). In moderate dental fluorosis, yellow to light brown staining is observed. Severely fluorosed teeth are more susceptible to decay, due to the loss of the outer protective layer (T. and B., 1955; DenBesten and Li, 2011).

Some of the sources of fluoride are foods, water, topical applications and fluoride toothpastes (Rigo, Lodi and Garbin, 2015). The etiological agents of dental fluorosis are exposure to high levels of fluoride in drinking water, mouth rinses and dentifrices, ingestion of foods with high fluoride contents like bananas, fish, tea, potatoes (Clovis and Hargreaves, 1988).

Fluorosis is a major health problem in India and common in children (Susheela, 2018). It was identified in 1937 in Nellore, Andhra Pradesh (Shortt, Pandit and Raghavachari, 1937). Uttar Pradesh is considered as the endemic area of fluorosis in India (Pahuja, Pradhan and Nagar, 2019). In Tamil Nadu, Madurai is a known endemic fluorosis area (Meenakshi, Meenakshi and Maheshwari, 2006). Esthetics changes in permanent dentition are the greatest concern in dental fluorosis. Early manifestation of dental fluorosis is increased enamel porosity (Fejerskov, Johnson and Silverstone, 1974). Enamel hypomineralization in fluorosed teeth may be due to aberrant effects of fluoride (Aoba and Fejerskov, 2002). Diagnosis of dental fluorosis can be affected by various factors like index validity, improper drying of teeth, duration of drying, cleaning of teeth (Martins et al., 2009; Rigo, Lodi and Garbin, 2015). Differential diagnosis between fluorosis and non-fluoride-induced opacities needs to establish differences between symmetrical and asymmetrical or discrete patterns of opaque defects (Alvarez et al., 2009).

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the awareness of diagnosis of fluorosis stains. Awareness should be created among people to prevent dental diseases like caries, fluorosis and other diseases for better diagnosis and to formulate a better treatment plan (AlDaiji et al., 2018). Hence in the present study we analysed the level of awareness on diagnosis of fluorosis stains among dental students.

MATERIAL AND METHODS

The present study is a survey. A set of 12 questionnaires were prepared and distributed among students of Saveetha Dental College. The questionnaires are about fluorosis, its diagnosis and treatment. The responses are recorded and made into a pie chart.

List of questions and options:
1) Are you aware of the term fluorosis?
   Yes/No
2) What do you think that causes fluorosis?
   Food/Drinks/Bacteria/None

3) Is fluorosis stains good for our teeth?
   Yes/No
4) How do you find that the tooth contains fluorosis stains?
   By checking whether the white streaks are present/ By checking the colour of the teeth/ Both/ None
5) Do you use fluoride rich toothpaste?
   Yes/No
6) Are you aware of how fluorosis stains are treated?
   Yes/No
7) Do you think fluorosis goes away by brushing teeth?
   Yes/No
8) Do you think fluorosis weakens the tooth?
   Yes/No
9) Can you get rid of white spots on teeth?
   Yes/No
10) Do you think vitamin contents affect fluorosis?
    Yes/No
11) Are you aware of any specific diagnostic test for fluorosis?
    Yes/No
12) Are you aware of the SA/GAG test for fluoride toxicity?
    Yes/No

RESULTS AND DISCUSSION

In the present study, 64% participants were males and 36% were females. We observed that 94% were aware of fluorosis whereas 6% were not aware [Figure 1]. 54% participants agreed that fluorosis is caused by drinks and 23% agreed that it is caused by food intake [Figure 2]. 56% agreed that fluorosis stains are bad for our teeth [Figure 3]. Majority of the participants were aware of how to differentiate fluorosis on teeth [Figure 4] and 79% participants were aware of treatment of fluorosis stains [Figure 6]. 74 % participants use fluoride rich toothpaste [Figure 5]. 57% participants believe that fluorosis goes away by brushing the teeth [Figure 7]. 75% participants were aware that fluorosis weakens the tooth [Figure 8]. 71% participants were aware that white spots can be treated [Figure 9]. 77% participants were aware that vitamin content affects fluorosis [Figure 10]. 62% participants were aware of the diagnostic measures [Figure 11] and 55% participants were aware of the SA/GAG test, which is used to check fluoride toxicity [Figure 12].

From the results obtained we observed that only less people were not aware of fluorosis stains and majority of them were aware of the cause of fluorosis. Most of them said that the cause is consumption of drinks. Majority of the students are aware of the diagnosis and treatment plan for fluorosis stains.

There are similar studies conducted to know the level of awareness on fluorosis stains and diagnostic measures.

A study was conducted by Fasil Kenea Duguma et al where they reported the awareness level on fluorosis was as high (concordant to the present study) but the awareness on treatments and their success rate were relatively low (Duguma and Jeylan, 2019). Most of the respondents in the present study mentioned the cause of fluorosis as drinking water and this is in concordant to the study conducted by Fasil Kenea Duguma et al (Duguma and Jeylan, 2019). Fasil Kenea Duguma et al also have reported that dental fluorosis causes impact on general health (Duguma and Jeylan, 2019). Reem Aldaigy et al conducted a similar study where they reported the diagnosis based on dean's fluorosis index (AlDaiji et al., 2018).

Figure 1: Pie chart representing the awareness level on fluorosis. Blue denotes participants who are aware and red denotes participants who are not aware. 94% participants were aware of the term fluorosis whereas 6% were not aware
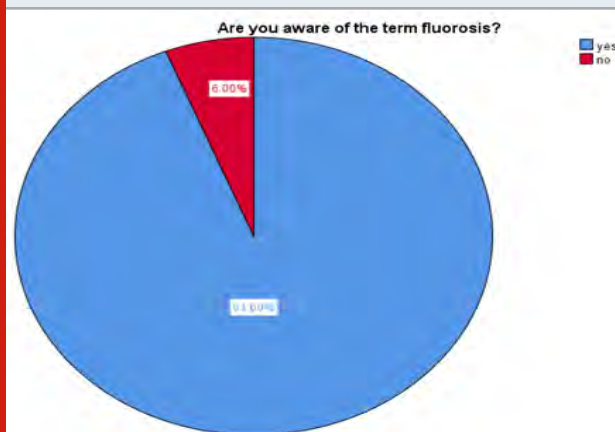
Figure 2: Pie chart representing the cause of fluorosis. Blue denotes participants saying food, red denotes participants saying drinks, green denotes participants saying bacteria and orange denotes participants saying none. 54% participants said that the cause is drinks, followed by food (23%), bacteria (16%) and none being the least (7%).
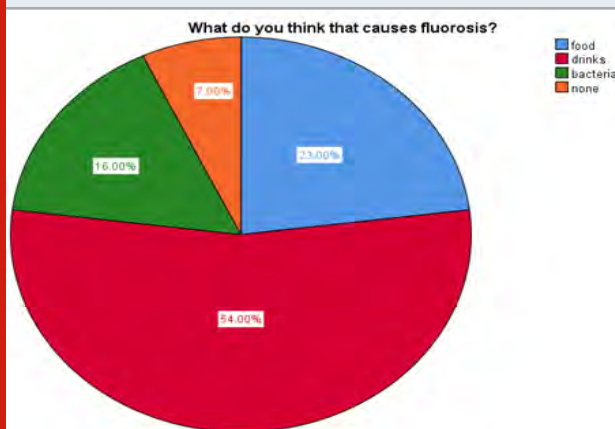
Figure 3: Pie chart representing the status of fluorosis on our teeth. Blue denotes participants who are saying yes and red denotes participants who are saying no. 44% participants said yes and 56% said no
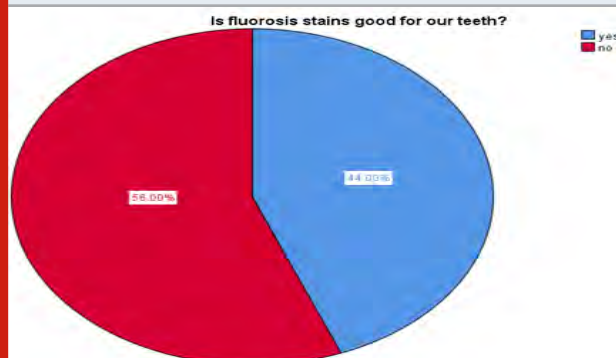
Figure 4: Pie chart representing the way to identify the fluorosis stains in our teeth. Blue denotes participants who are saying that they can identify by checking whether the white streaks are present, red denotes participants who are saying that they can identify by checking the colour of the teeth, green denotes participants who are saying both the options and orange denotes participants who are saying none of the options. 52% participants said both the options followed by participants who are saying that they can identify by checking the colour of the teeth (27%), participants who are saying that they can identify by checking whether the white streaks are present (19%) and participants who are saying none (2%).
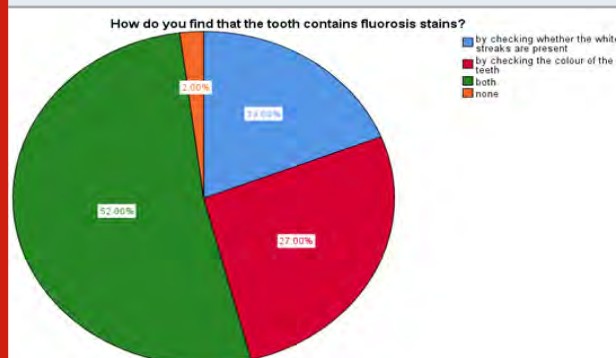
Figure 5: Pie chart representing the number of participants using fluoride rich toothpaste. Blue denotes participants who are saying yes and red denotes participants who are saying no. 74% participants said yes and 26% participants said no
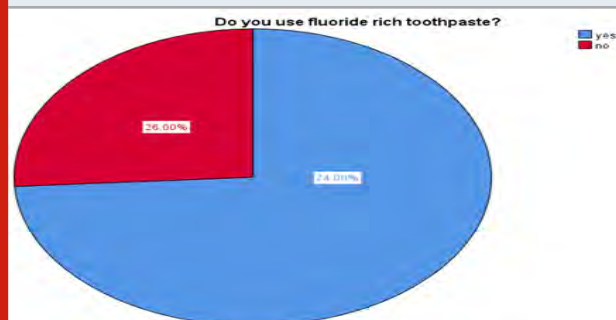
Figure 6: Pie chart representing how many of the participants are aware of treating the fluorosis stains and how many of them are not aware. Blue denotes participants who are saying yes and red denotes participants who are saying no. **79%** participants said yes and 21% participants said no
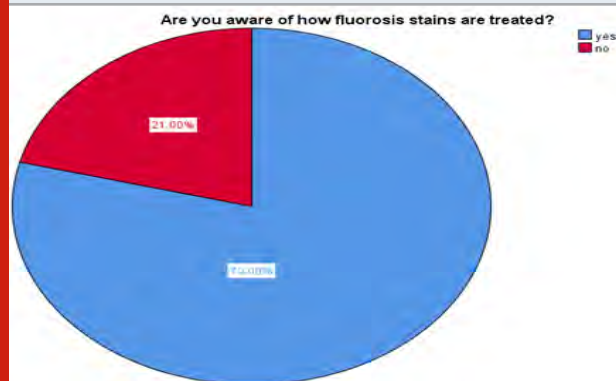
Figure 9: Pie chart representing the number of participants who believe that they can get rid of white spots on teeth. Blue denotes participants who are saying yes and red denotes participants who are saying no. **71%** participants said yes and 29% participants said no
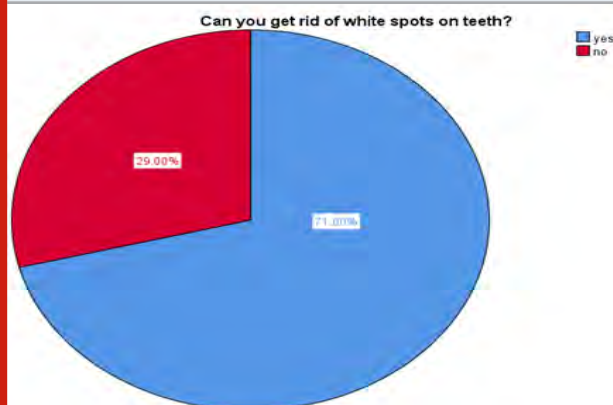
Figure 7: Pie chart representing the number of participants who believe in treating fluorosis stains by brushing the teeth. Blue denotes participants who are saying yes and red denotes participants who are saying no. **57%** participants said yes and 43% participants said no
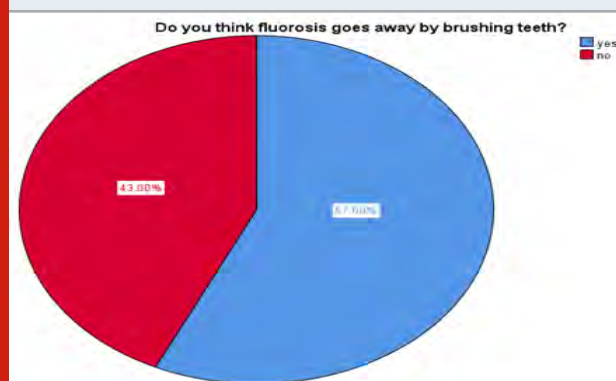
Figure 10: Pie chart representing the number of participants who believe that vitamin content can affect fluorosis. Blue denotes participants who are saying yes and red denotes participants who are saying no. **77%** participants said yes and 23% participants said no
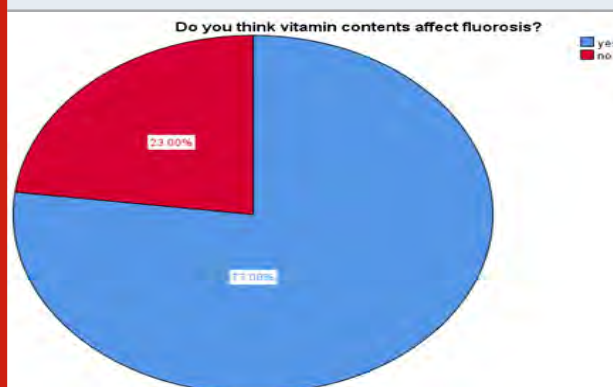
Figure 8: Pie chart representing how many participants are aware that fluorosis stain weakens the tooth and how many of them are not aware. Blue denotes participants who are saying yes and red denotes participants who are saying no. **75%** participants said yes and 25% participants said no
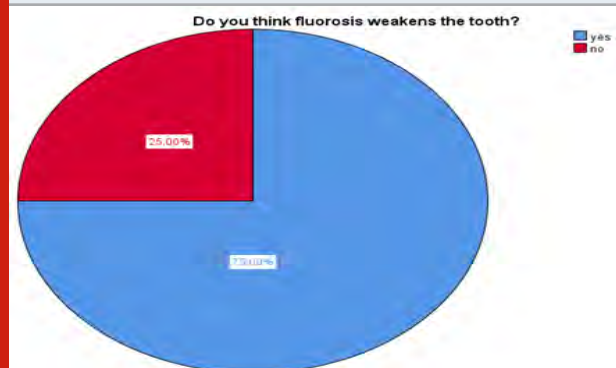
Figure 11: Pie chart representing the participant's awareness level on specific diagnostic tests. Blue denotes participants who are saying yes and red denotes participants who are saying no. **62%** participants said yes and 38% participants said no
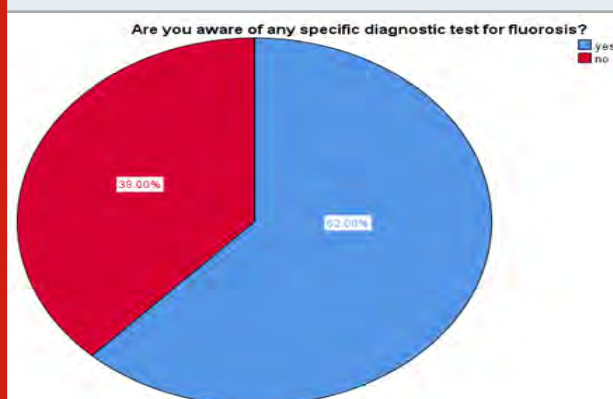
Figure 12: Pie chart representing the participant's awareness level on SA/GAG test for fluoride toxicity. Blue denotes participants who are saying yes and red denotes participants who are saying no. 55% participants said yes and 45% participants said no.

Are you aware of the SA/GAG test for fluoride toxicity?
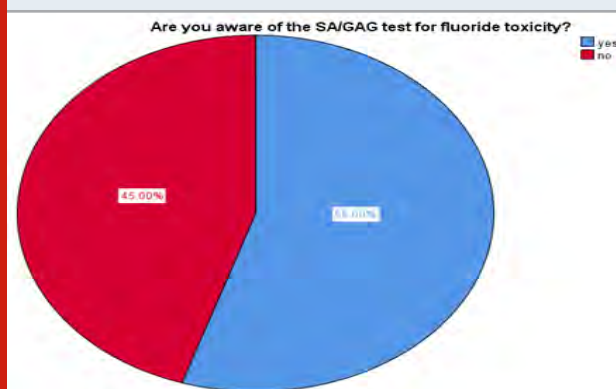
Majority of the respondents in the present study use fluoride rich toothpaste and some studies have reported the prevalence of fluorosis due to usage of fluoride rich toothpaste. Hence the fluoride composition in the toothpaste should be present at a limited range to prevent fluorosis (Tiwari, Kaur and Sodhi, 2010). SA/GAG test is a diagnostic test used to measure fluoride toxicity (Jha et al., 1982) and the present study showed that the majority of the respondents were aware of the diagnostic test. The SA/GAG test can also be used as a diagnostic test for ankylosing spondylitis (Susheela et al., 1988).

Pahuja M et al conducted a study where they assessed the awareness level among the rural population and they reported that the majority of the participants were aware of dental fluorosis and treatments done but they were not aware of its consequences and did not consult a dentist which is contrary to the present study as majority of the respondents were aware that fluorosis stains weaken the tooth (Pahuja, Pradhan and Nagar, 2019). Another study was conducted by Yadav R et al where they conducted a survey among children and reported that most of the children were not aware of fluorosis and most of the children worried about esthetic concerns (Yadav, Yadav and Oberoi, 2014). Hence a proper awareness should be created among the people about its consequences and treatment plans (Pahuja, Pradhan and Nagar, 2019), (Yadav, Yadav and Oberoi, 2014).

One of the main etiologies for fluorosis is consuming fluoride rich foods and water resulting in fluorosis and the study conducted by Anand Verma et al have reported this (Verma et al., 2017). Even in the present study most of the respondents were aware of the cause. Treatment plan should be formulated based on severity of fluorosis and this can be achieved by Dean's fluorosis index, which is widely used to measure the severity of fluorosis (Akpata, 2001). The present study is a single centered study with a small sample size. The future scope includes multi centered study with a large population and including

other diagnostic measures for creating awareness in all kinds of population.

CONCLUSION

Thus the present study showed that there is proper awareness on fluorosis stains and its diagnosis among dental students. Though there is proper awareness of fluorosis stains, there are few populations who are not aware of the diagnostic measures. Hence proper awareness on fluorosis should be created among students for proper diagnosis and treatment planning.

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Conflict of Interest: The authors declare that there were no conflicts of interest in the present study.

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Awareness on Bone Marrow Depressors Among Dental Students

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ABSTRACT

The aim of the study is to know the knowledge and awareness on the bone marrow depressors among the dental students Bone marrow suppression also known as myelotoxicity or myelosuppression, is the decrease in production of cells responsible for providing immunity (leukocytes), carrying oxygen (erythrocytes), and/or those responsible for normal blood clotting (thrombocytes). Bone marrow suppression is a serious side effect of chemotherapy and certain drugs affecting the immune system such as azathioprine. Non steroidal anti-inflammatory drugs (NSAIDs), in some rare instances, may also cause bone marrow suppression. The decrease in blood cell counts does not occur right at the start of chemotherapy because the drugs do not destroy the cells already in the bloodstream (these are not dividing rapidly). Instead, the drugs affect new blood cells that are being made by the bone marrow. The present study is an online based survey conducted among the dental students.The participants were from 1st, 2nd, 3rd, 4th and Intern years of BDS. Questionnaires were prepared and distributed among dental students through an online link from the survey planet. About 66.67% of the students were well aware that bone marrow depression can be caused by drugs. From the results of the survey it is clear that most of the dental students were well aware of bone marrow depressors and also had proper knowledge about the bone marrow depressions and its complications.

KEY WORDS: BONE MARROW DEPRESSORS, DRUGS , COMPLICATIONS, DENTAL STUDENTS.

INTRODUCTION

Bone marrow depression is a laboratory finding indicating decreased number of hematopoietic cells in the bone marrow. It may result from decreased proliferation of all or part of the hematopoietic series. Microscopically, the hematopoietic cells are replaced by adipocytes. Bone marrow suppression also known as myelotoxicity or myelosuppression, is the decrease in production of cells responsible for providing immunity (leukocytes), carrying oxygen (erythrocytes), and/or those responsible for normal blood clotting (thrombocytes). (Inman, 1977) (d'Onofrio and Zini, 2014) Bone marrow suppression is a serious side effect of chemotherapy and certain drugs affecting the immune system such as azathioprine. (Snow and Gibson, 1995) The risk is especially high in cytotoxic chemotherapy for leukemia. Non steroidal anti-

inflammatory drugs (NSAIDs), in some rare instances, may also cause bone marrow suppression. (Graumlich, 2001) The decrease in blood cell counts does not occur right at the start of chemotherapy because the drugs do not destroy the cells already in the bloodstream (Weeks et al., 2012). Instead, the drugs affect new blood cells that are being made by the bone marrow.(Brown and Carbone, 1970) When myelosuppression is severe, it is called myeloablation.(Hirbe et al., 2007).

Many other drugs including common antibiotics may cause bone marrow suppression.(Langdon, Crook and Dantas, 2016) Unlike chemotherapy the effects may not be due to direct destruction of stem cells but the results may be equally serious. The treatment may mirror that of chemotherapy-induced myelosuppression or may be to change to an alternate drug or to temporarily suspend treatment. (Antman et al., 1988) (Friberg et al., 2002) Because the bone marrow is the manufacturing center of blood cells, the suppression of bone marrow activity causes a deficiency of blood cells.(Punjabi, Moore and Ralph, 1983) This condition can rapidly lead to life-threatening infection, as the body cannot produce leukocytes in response to invading bacteria and viruses, as well as leading to anaemia due to a lack of red blood cells and spontaneous severe bleeding due to deficiency of platelets. (Nicholson-Weller, Spicer and Austen, 1985).

Pain management is an everyday challenge in dentistry. Analgesics are the group of drugs prescribed for effective pain management, of which nonsteroidal anti-inflammatory drugs (NSAIDs) are drugs commonly prescribed in dental practice for the management of pain and swelling. Of these substances, paracetamol and ibuprofen are the most widely used (Poveda Roda et al., 2007). The non-selective inhibition of cyclooxygenase induced by the conventional NSAIDs induces a reduction in thromboxane A2 synthesis, which in turn leads to the inhibition of platelet aggregation – an important step in hemostasis . (Armijo et al., 1977). Previously our department has published extensive research on various aspects of prosthetic dentistry (Anbu et al. 2019; Ashok and Ganapathy 2019; Ganapathy et al. 2017; Jain 2017; Ariga et al. 2018; Evaluation of Corrosive Behavior of F...; Ranganathan et al. 2017; Jain 2017; Duraisamy et al. 2019; Gupta et al. 2018; Varghese et al. 2019), this vast research experience has inspired us to research about to research about the awareness on bone marrow depressors among dental students.

MATERIAL AND METHODS

The present study is an online based survey conducted among the dental students.The participants were from 1st, 2nd, 3rd, 4th and Intern years of BDS. Questionnaires were prepared and distributed among dental students through an online link from the survey planet. The total number of participants was 89 dental students. Participation in this study was voluntary. The questionnaire contained 15 questions. Independent variables were demographics such as year of study of

participants. Dependent variables were bone marrow depressors, dental students . Only the completed surveys were included for analysis. The collected results were entered in Microsoft excel. Data analysis was done using SPSS software 20.0. Statistics used for analysis was Descriptive statistics and comparison of variables were done using chi square test where p<0.05, statistically significant .

RESULTS AND DISCUSSION

Students from different years participated in the survey. The participants were from the first years (27.45) second years(25.49) third years(25.49) and fourth year(21.57) dental students (Figure 1). About 84.3% of students are aware of the importance of the bone marrow functioning in our body and about 15.69% were not aware of the importance of the bone marrow functioning in our body. (Figure 2). About 68.63% of students were aware of the conditioning called bone marrow depression and about 31.37% were not aware of the conditioning called the bone marrow depression. (Figure 3).

About 66.67% of the students were well aware that bone marrow depression can be caused by drugs and about 33.33% of the students were not aware that bone marrow depression can be caused by drugs.(Figure 4). About 52.94% of students were aware that the NSAID group of drugs may induce bone marrow suppression and about 47.06% of students were not aware that the NSAID group of drugs may induce bone marrow suppression (Figure 5). About 66.67% of students were aware that some antibiotics could cause bone marrow depression and about 33.33% of students were not aware that some antibiotics could cause bone marrow depression (Figure 6). About 52.94% of students were aware that the aceclofenac may induce bone marrow suppression and about 47.06% of students were not aware that the aceclofenac may induce bone marrow suppression(Figure 7).

About 60.68% of the students were aware of the complications that may take place due to bone marrow depression and about 39.22% of the students were not aware of the complications that may take place due to bone marrow depression.(Figure 8). About 84.31% of the students were aware that the bone marrow depression may lead to lack of immunity and 15.69% of the students were not aware that the bone marrow depression may lead to lack of immunity (Figure 9). About 76.47% of the students were aware that risk of infection increases in patients with bone marrow suppression and about 23.53% of the students were not aware that risk of infection increases in patients with bone marrow suppression (Figure 10)

About 54.9% of the students were aware of the clinical features that present along with bone marrow depressions and about 45.1% of the students were not aware of the clinical features that present along with bone marrow depressions.(Figure 11). About 39.22% of the students were aware of the treatment to be given to patients with

bone marrow depression and 60.78% of the students were not aware of the treatment to be given to patients with bone marrow depression(Figure 12). About 78.43% of the students were aware that bone marrow suppression may lead to life threatening conditions and 21.57% of the students were not aware that bone marrow suppression may lead to life threatening conditions.(Figure 13). We know that bone marrow depression may lead to various complications and thus handling the drugs which induce the bone marrow depression must be dealt carefully. (Masamoto et al., 2016)

Our study was carried out with the aim of appraising the attitude and awareness of dentists toward the knowledge on bone marrow depressors and bone marrow depression and suggest alternative measures to overcome the same. (Kulasekararaj, Mufti and Marsh, 2013) We can observe that the students were aware of bone marrow depression. And the students also had proper knowledge about the bone marrow depressions and its complications.

Figure 1: Pie chart depicting the distribution of year of study of the dental students participating in the survey. Blue colour indicates 1st year students (27.45). Green colour indicates 2nd year students (25.49%). Yellow colour indicates 3rd year students (24.59%). Purple colour indicates 4th year students (21.57%).
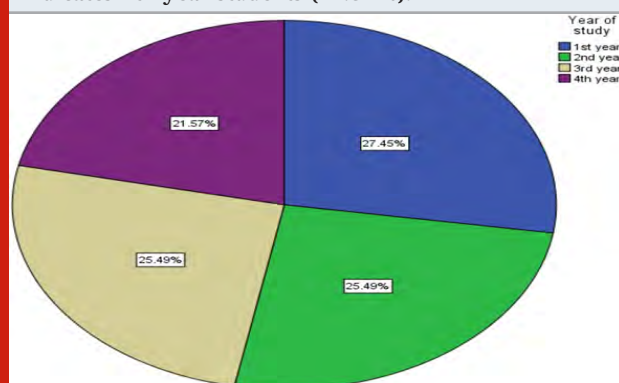
Figure 2: Pie chart depicting the awareness of importance of bone marrow among the dental students participated in the survey. Blue colour indicates students who were aware of importance of bone marrow(84.31%) Green colour indicates students who were not aware of importance of bone marrow (15.69%).
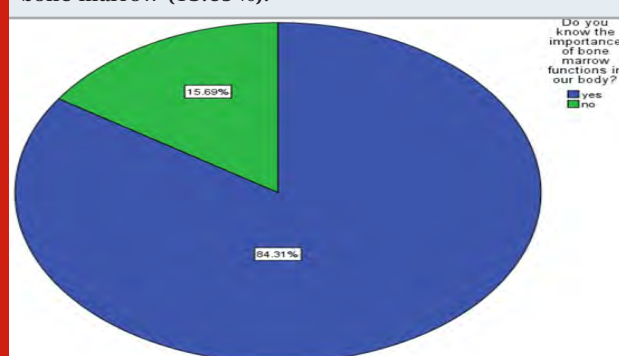
Figure 3: Pie chart depicting the awareness of bone marrow depression among the dental students participated in the survey. Blue colour indicates students who were aware of bone marrow depression (68.63%). Green colour indicates students who were not aware of bone marrow depression (31.37%).
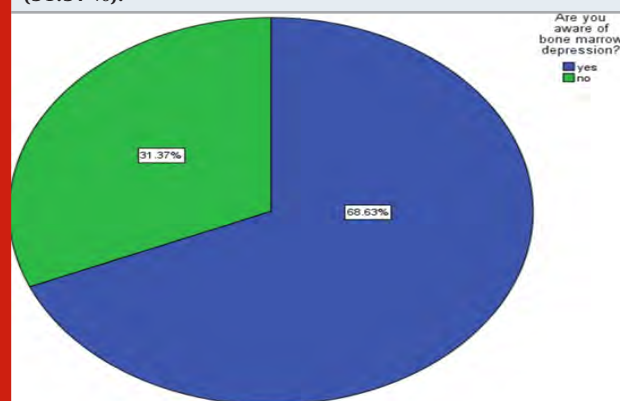
Figure 4: Pie chart depicting the awareness that certain drugs that can cause bone marrow depression among the dental students participated in the survey. Blue colour indicates students who were aware of certain drugs that can cause bone marrow depression (66.67%). Green colour indicates students who were not aware that certain drugs that can cause bone marrow depression (33.33%).
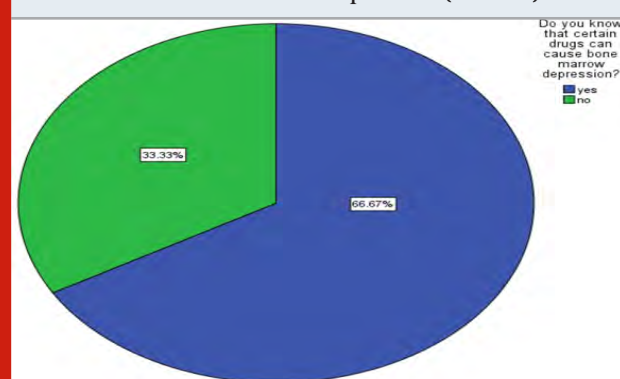
Figure 5:Pie chart depicting the awareness that NSAIDS can induce bone marrow depression among the dental students participated in the survey. Blue colour indicates students who were aware that NSAIDS can induce bone marrow depression (52.94%). Green colour indicates students who were not aware that NSAIDS can induce bone marrow depression (47.06%).
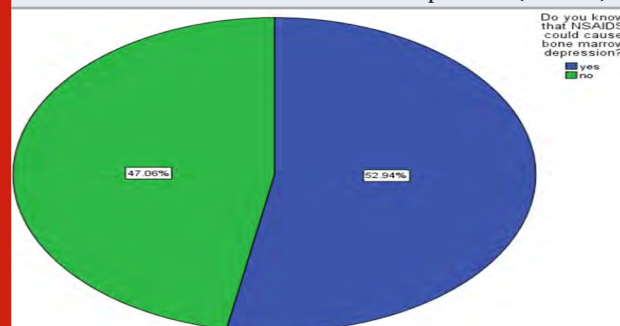
Figure 6: Pie chart depicting the awareness that antibiotics can cause bone marrow depression among the dental students participated in the survey. Blue colour indicates students who were aware that antibiotics can cause bone marrow depression (66.67%). Green colour indicates students who were not aware that antibiotics can cause bone marrow depression (33.33%)

Figure 7: Pie chart depicting the awareness that aceclofenac bone marrow depression among the dental students participated in the survey. Blue colour indicates students who were aware that aceclofenac bone marrow depression (52.94%). Green colour indicates students who were not aware that aceclofenac bone marrow depression (47.06%)

Figure 8: Pie chart depicting the awareness on complications caused by bone marrow depression among the dental students participated in the survey. Blue colour indicates students who were aware of complications caused by bone marrow depression (39.22%). Green colour indicates students who were not aware on complications caused by bone marrow depression (60.78%)

Figure 9: Pie chart depicting the awareness on bone marrow depression can cause lack of immunity among the dental students participated in the survey. Blue colour indicates students who were aware of bone marrow depression can cause lack of immunity (15.69%). Green colour indicates students who were not aware on bone marrow depression can cause lack of immunity (84.31%)

Figure 10: Pie chart depicting the awareness of patients with bone marrow depression are prone to high risk of infections among the dental students participated in the survey. Blue colour indicates students who were aware of patients with bone marrow depression are prone to high risk of infections(76.47%). Green colour indicates students who were not aware of patients with bone marrow depression are prone to high risk of infections (23.54%)

Figure 11: Pie chart depicting the awareness of clinical features seen in bone marrow depression among the dental students participated in the survey. Blue colour indicates students who were aware of clinical features seen in bone marrow depression (54.9%). Green colour indicates students who were not aware of clinical features seen in bone marrow depression (45.1%)
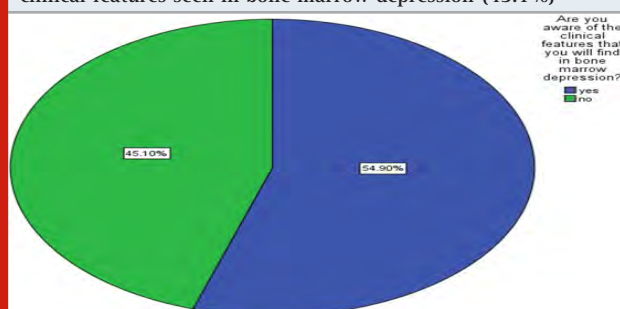
Figure 12: Pie chart depicting the awareness of treatment for bone marrow depression among the dental students participated in the survey. Blue colour indicates students who were aware of treatment for bone marrow depression (39.2%). Green colour indicates students who were not aware of treatment for bone marrow depression (60.78%)
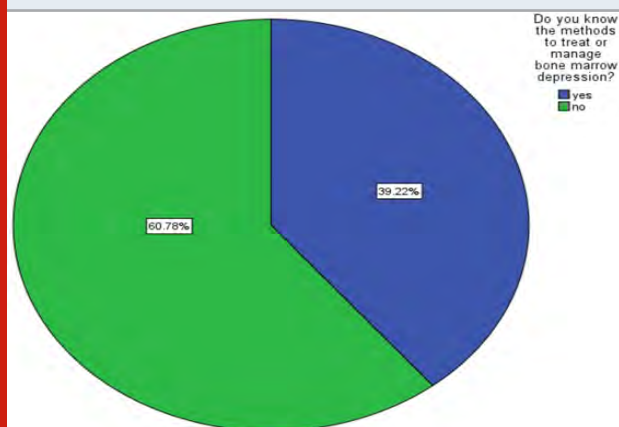
Figure 13: Pie chart depicting the awareness that bone marrow depression can lead to life threatening conditions among the dental students participated in the survey. Blue colour indicates students who were aware that bone marrow depression can lead to life threatening conditions (78.43). Green colour indicates students who were not aware that bone marrow depression can lead to life threatening conditions (21.57%)
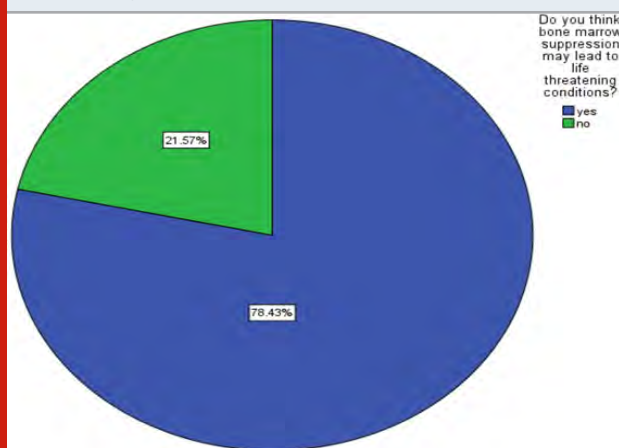
CONCLUSION

This survey aims in creating awareness among dental students about bone marrow depressors. It also creates awareness about Complications of bone marrow depression. From the results of the survey it is clear that most of the dental students were well aware of bone marrow depressors and also had proper knowledge about the bone marrow depressions and its complications.

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Awareness on Usage of Skeletal Muscle Relaxants in Dental Practice Among Dental Students

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ABSTRACT

A muscle relaxant is a drug that affects skeletal muscle function and decreases the muscle tone.it may be used to alleviate symptoms such as muscle spasm, pain, and hyperreflexia. Muscle relaxants in dentistry are often used in treating temporomandibular joint disorders.Temporomandibular disorders result from musculoskeletal dysfunction of the orofacial region affecting masticatory muscles, temporomandibular joints, and associated structures. The aim of the study is to Evaluate awareness on usuage of skeletal muscle relaxants in dental practise among dental students. A set of questionnaire was framed and online survey was conducted among 100 dental students. The answers given by dental students were collected and the use of skeletal muscle relaxants in dental practise was determined. And the results were statistically analysed. The results showed that many dental students were not aware of proper usage of SMRs in the field of dentistry. Baclofen was the most common skeletal muscle relaxant prescribed and the common reason for prescription of skeletal muscle relaxant was TMJ disorder. It is concluded that it is important to create awareness on usage of skeletal muscle relaxants which includes the dosage, methods of administration, advantages and disadvantages.

KEY WORDS: DENTAL STUDENTS; DENTISTRY; SKELETAL MUSCLE RELAXANTS; TMJ DISORDERS.

INTRODUCTION

Skeletal muscle relaxants are a diverse group of medications that are not chemically related like other drug classes and work through a variety of mechanisms.(See

and Ginzburg, 2008) The term "muscle relaxant" is used to refer to two major therapeutic groups: neuromuscular blockers and spasmolytics.(Witenko et al., 2014) They can further be divided into antispastic and antispasmodic medications and are used for different indications.(Dillon et al., 2004) Since these drugs primarily work through the central nervous system, they have accompanying adverse effects such as sedation and dizziness that may limit their use.(Chou, 2010) The antispasticity agents-baclofen, tizanidine, dantrolene, and diazepam-aid in improving muscle hypertonicity and involuntary jerks. Antispasmodic agents, such as cyclobenzaprine, are primarily used to treat musculoskeletal conditions. (See and Ginzburg, 2008; Ledowski et al., 2018)

In general, antispasticity agents and antispasmodics are not interchangeable and should not be substituted for one another.(Chisholm-Burns et al., 2019) Limited evidence exists for comparing one agent with another, so selecting an optimal agent relies on important patient-specific factors such as risks for side effects, potential drug interactions with concomitant therapies, and total cost.(Shaheed et al., 2017)

Common musculoskeletal conditions causing tenderness and muscle spasms include fibromyalgia, tension headaches, myofascial pain syndrome, and mechanical low back or neck pain.(Beebe, Barkin and Barkin, 2005) If muscle spasm is present in these conditions, it is related to local factors involving affected muscle groups.(Moody, Fu and Fang, 2018) These conditions are commonly encountered in clinical practice and can cause significant disability and pain in some patients. Skeletal muscle relaxants are one of several classes of medications frequently used to treat these conditions. (Kumbham, Ghate and Lewis, 2019)

Muscle strains and other musculoskeletal disorders (MSDs) are a leading cause of work absenteeism. Muscle pain, spasm, swelling, and inflammation are symptomatic of strains. The precise relationship between musculoskeletal pain and spasm is not well understood. Temporomandibular disorders (TMD) result from musculoskeletal dysfunction of the orofacial region affecting masticatory muscles, temporomandibular joints (TMJ), and other associated structures. The main characteristics of these problems are facial and TMJ pain, headache, earache, dizziness, masticatory muscle hypertrophy, limited mouth opening, locked jaw, abnormal teeth wear, joint sounds, and others.The muscle relaxants used in treating temporomandibular disorders are carisoprodol, cyclobenzaprine, diazepam, metaxalone, alprazolam and tizanidine. Diazepam appears to reduce spasticity by enhancing the inhibitory effects of neurotransmitter GABA(Gonzalez et al., 2009)

In general, muscle relaxants are controversial alternatives that have efficacy in nonspecific back pain but carry risks of adverse effects and increased cost.(Li et al., 2020) Much of the evidence from clinical trials regarding skeletal muscle relaxants is limited because of poor methodologic design, insensitive assessment methods, and small numbers of patients.(Reeves and Burke, 2010; Lumba-Brown et al., 2018) Recent literature analyzing the prevalence of muscle relaxant use is scarce. Some clinicians would agree that the medications in this class tend to be used more frequently than necessary, but clear data is lacking.(Trueman, Castillo and Hoie, 2020) All clinicians should be fully aware of the recent trends in their speciality to enable them to provide effective and successful treatment to their patients. This study aims at evaluating the awareness on usage of skeletal muscle relaxants in dental practice among dental students.

Previously our team had conducted numerous clinical trials(Ganapathy et al., 2016; Selvan and Ganapathy, 2016; Subasree, Murthykumar and Others, 2016; Jyothi et al., 2017; Ranganathan, Ganapathy and Jain, 2017; Duraisamy et al., 2019; Jain, Nallaswamy and Ariga, 2019), lab animal studies(Ashok et al., 2014; Venugopalan et al., 2014; Ashok and Suvitha, 2016; Ganapathy et al., 2016; Vijayalakshmi and Ganapathy, 2016) and in-vitro studies(Ajay et al., 2017; Basha, Ganapathy and Venugopalan, 2018; Kannan and Venugopalan, 2018) over the past 5 years. Now we are focussing on epidemiological surveys. The idea for this survey stemmed from the current interest in our community.

MATERIAL AND METHODS

This research was conducted in Saveetha dental college and hospitals, Chennai. The data collection included standardized questionnaires consisting of 8 questions. The online survey using surveyplanet was conducted among 100 dental students. The questions were based on knowledge of usage, prescription, common skeletal muscle relaxant used, reason for prescription, calculation of dosage, side effects, combination of other drugs, and route of administration of skeletal muscle relaxants in dental practice among dental students. The responses were collected and analysed for statistical differences. The questionnaire and the response collected was represented in the form of pie charts.

RESULTS AND DISCUSSION

According to the study results, around 63.64% of dental students were not aware of usage of skeletal muscle relaxants in the field of dentistry (FIGURE 1). Out of 100 dental students 85% of them had not prescribed any skeletal muscle relaxants in dental practice (FIGURE 2). Baclofen (53.54%) was the most commonly prescribed skeletal muscle relaxant, followed by dantrolene (36.36%) (FIGURE 3). TMJ disorder(69.70%) was the most common reason for prescription of skeletal muscle relaxants followed by anxiety (15.15%) (FIGURE 4). Around 59.60% of dental students calculated the dosage of the drug based on age of patients and 23.23% of them calculated the dosage based on gender and 17.17% calculated the dosage based on body weight of the patient (FIGURE 5). 43.43% of dental students were aware of the side effects of the skeletal muscle relaxants and 56.57% of dental students were not aware of the side effects associated with skeletal muscle relaxants (FIGURE 6). In FIGURE 7, 37.37% of dental students were aware of using skeletal muscle relaxants in combination with other drugs and 62.63% of dental students were not aware of using skeletal muscle relaxants in combination with other drugs. In FIGURE 8, 58.59% dental students preferred the intravenous route of administration , 26.26% preferred the intramuscular route of administration while 15.15% of dental students preferred oral route of administration of skeletal muscle relaxants (FIGURE 8).

Skeletal muscle relaxants are used medically as adjuncts to rest, physical therapy, and other measures for the relief of discomfort associated with acute, painful musculoskeletal conditions.Most clinical guidelines list skeletal muscle relaxants as optional agents for use

individually or in combination with an NSAID. The Agency for Health Care Policy and Research (AHCPR) guidelines, published in 1995, specifically noted that skeletal muscle relaxants alone or in combination with an NSAID are no more effective than using an NSAID alone.(Hersh, Balasubramaniam and Pinto, 2008) In study conducted by Eric chang et al.,Baclofen is considered the first-line treatment for spasticity.(Chang et al., 2013) Moreover, in study conducted by Herman et al., cyclobenzaprine was superior to placebo or 0.5 mg clonazepam when added to self-care and education in the management of TMD.(Herman et al., 2002).

Figure 1: Pie chart depicting the knowledge among dental students regarding the use of skeletal muscle relaxants in the field of dentistry.The blue colour depicts that the participants were aware of usage of skeletal muscle relaxants in the field of dentistry and black colour denotes that that the participants were not aware of usage of skeletal muscle relaxants in the field of dentistry.
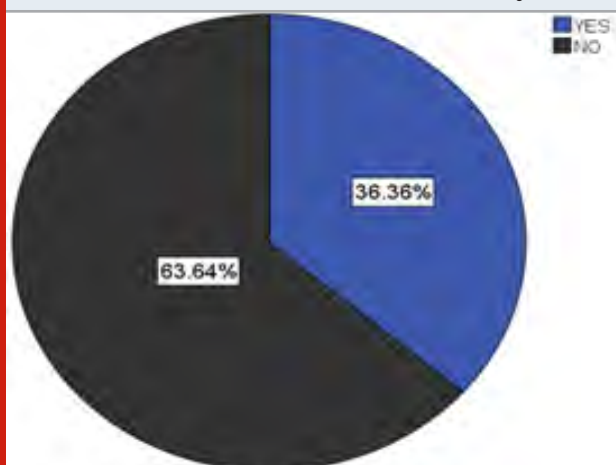
Figure 2: Pie chart depicting the responses regarding the prescription of skeletal muscle relaxants in the field of dentistry by dental students. The blue colour denotes that around 15.0% of the dental students had prescribed the skeletal muscle relaxants and the black colour denotes that around 85% of dental students have not prescribed any skeletal muscle relaxants in dental practice.
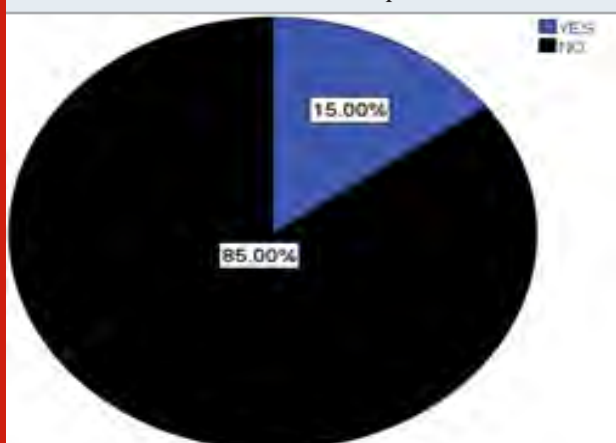
Figure 3: Pie chart depicting the common skeletal muscle relaxants prescribed by the dental students. The blue colour denotes 53.54% prescribed baclofen, green denotes that 36.36 % prescribed dantrolene,light brown denotes 4.04% prescribed cyclobenzaprine, purple denotes 3.03% prescribed chlorzoxazone and yellow denotes 3.03% prescribed other skeletal muscle relaxants.
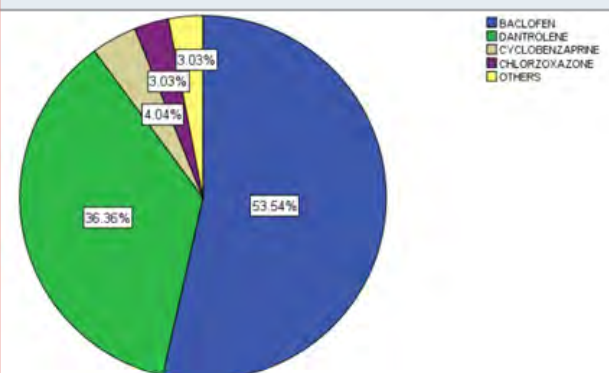
Figure 4: Pie chart depicting the common reasons for prescription of skeletal muscle relaxants in the field of dentistry by dental students. The blue denotes TMJ disorder (69.70%), green denotes anxiety (15.15%), light brown denotes bruxism (8.08%), purple denotes sedation(7.07%).
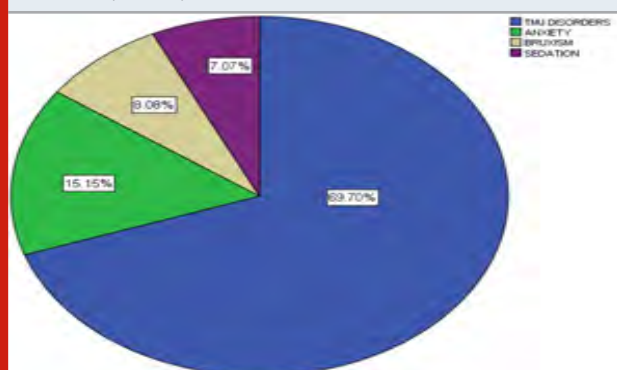
Figure 5: Pie chart depicting the calculation of dosage of skeletal muscle relaxants prescribed by dental students in the field of dental practice. The blue denotes age (59.06%), green denotes gender(23.23%), light brown denotes the body weight (17.17%).
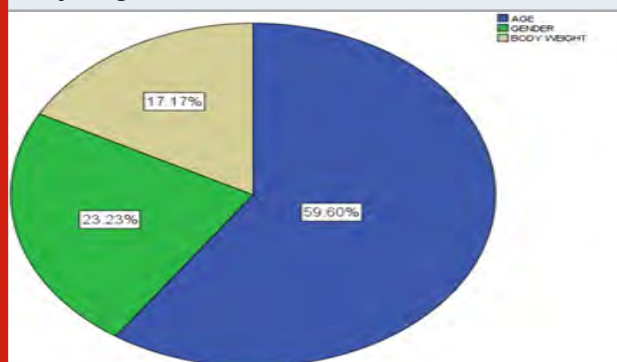
Figure 6: Pie chart depicting the knowledge of side effects of skeletal muscle relaxants among dental students. The blue denotes that 43.43%dental students were aware of side effects and black denotes that 56.57% were not aware of side effects of skeletal muscle relaxant
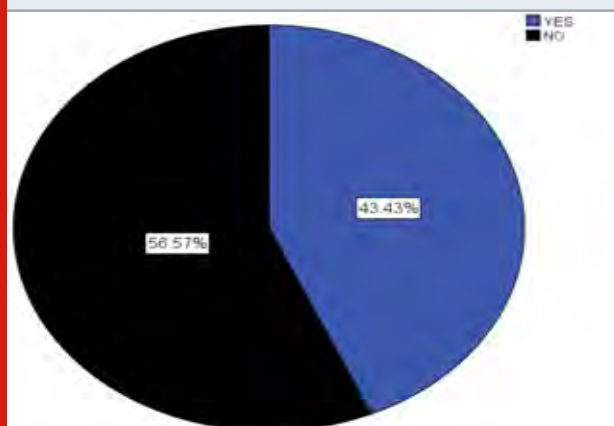
Figure 7: Pie chart depicting the knowledge of dental students about prescription of skeletal muscle relaxants in combination with other drugs. The blue denotes that 37.37% were aware of prescribing skeletal muscle relaxants in combination with other drugs. The black denotes 62.63% were not aware of prescribing skeletal muscle relaxants in combination with other drugs
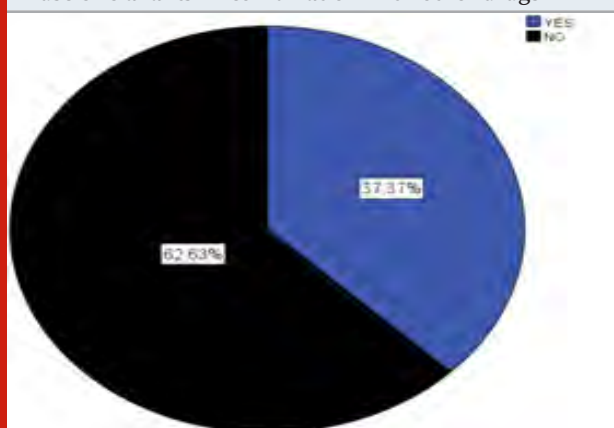
Figure 8: Pie chart depicting the mode of administration of skeletal muscle relaxants in the field of dentistry among dental students. The blue denotes intravenous route of administration (58.595), green denotes oral route of administration (15.15%), light brown denotes intramuscular route of administration (26.26%).
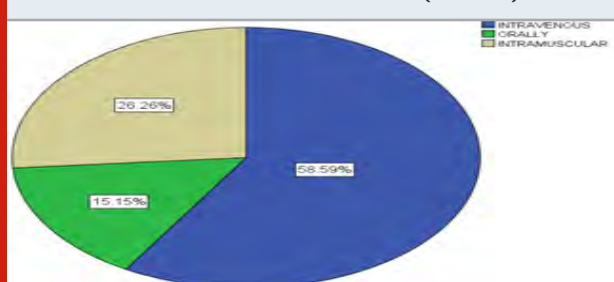
Muscle relaxants can be addictive for some people. Taking them without a prescription, or taking more than your doctor has recommended, can increase chances of becoming addicted. (Kobayashi, Hasegawa and Ono, 1996) Risk of hepatic injury appears to be greater in females, in patients >35 years of age, and in patients taking other medications in addition to dantrolene. (Waldman, 2009) In the study conducted by sharmila et al., Muscle relaxants are commonly indicated for the treatment of Treatment of TMJ disorders.(Sharmila, no date) One vital aspect of the treatment is that the clinician should constantly update his knowledge on the drugs being administered during the course of treatment and their interactions.

CONCLUSION

Within the study limits , it was concluded that the majority of dental students were not aware of usage of skeletal muscle relaxants in the field of dentistry. The risk of adverse drug events raises concern for their safety in routine use. Hence it is important to create awareness on usage of skeletal muscle relaxants which includes the dosage, methods of administration, advantages and disadvantages for better understanding of prescribing medications.

ACKNOWLEDGEMENTS

Conflict of Interest
The author declares no conflict of interest.

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Association Between Smart Phones Usage and Children Behaviour Change

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ABSTRACT

Smartphone usage has become widely increased since the past decade and has captured the eyes of many young growing children who fall precisely under the age group of 15 years and below. The over usage of the gadgets (smart phones) have prone to be a hazardous effect on them in changing the mental and physical state. This study was conducted in order to associate the smartphone usage and children's behavioral change and also to bring about awareness among the parents of the dangerous outcome provided due to prolonged usage of smartphones among the younger generation of kids. A set of questionnaires were developed and circulated among parents of children under different age groups were categorized into Group I (6- 10 years) and Group II (11-15 years) in relation to behavioural changes associated with the usage of smartphones. A total 100 responses were collected and analyzed through SPSS software and Chi square test was done. The study concludes that parents found that children were very much addicted towards usage of smartphones and found behavioural changes in them and there is a significant difference between the Group I parents and Group II parents though they perform very good in academics with the help of learning through study apps they had eye related health problems and often throw tantrums when the smartphones are being snatched away from them. The study also includes that parents must be aware of the effects caused by over usage of smartphones among the younger generation, in order to minimize the level of usage..

KEY WORDS: MOBILES, OVER USAGE,MENTAL WELL BEING, LOW CONFIDENCE, CONCENTRATION.

INTRODUCTION

The development of mobile phones in recent times is found to produce smartphone addiction.The prevalence of smartphone addiction increases day by day. It causes psychological and behavioral dependence(Panova and Carbonell, 2018). Studies show chronic smartphone users are affected with headaches, impaired memory and concentration, fatigue, dizziness and disturbed sleep(Al-Khlaiwi and Meo, 2004). It also stated that, some people may develop electrosensitivity from excessive exposure to electromagnetic fields.Although these symptoms may be primarily psychological in origin due to the nocebo effect(Carpenter, 2014).The psychological symptoms of the people who are addicted to smartphones might possess depression.Depression is a medical illness that adversely influences people in emotion, imagination, and action(Zwanenburg, no date).

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Children are most affected among all the age groups. Nowadays, children are spending more time-with smart phones-which reduces their learning and play time. It is also noted that doctors and educators are worried about the impact of overexposure to touch-screen technology in developing brains. Mobile phones primarily function on electromagnetic waves for all forms of communication(Frey, 1962). The brain has its own electric impulses and communication is carried out in the neural network. In children, the waves from the phone can easily penetrate right into the brain, as they do not have a strong shield.Research has shown that by merely talking on the phone for 2 minutes, the electrical activity inside a child's brain can be changed. This erratic activity can cause changes in mood patterns and behavioral changes and children may have trouble learning new things or focusing properly on studies(Ting and Chen, 2020).

Unstrained use of technology or smart phones has an effect on children's development both in social and physical well being and result in symptoms related to other behavioral addiction(Ryding and Kaye, 2018). Unrestricted use of technological devices among children are prone to have effect on development due to lack of recognition and consensus of concepts(Cha and Seo, 2018).A survey done by a group of researchers-relieved that 43% of people underage of 15 years experiences anxiety and even irritation when they are not able to access phones when they want(Walker, 2019). Recent studies have also found association between behavioral changes in children in relation with using smart phones for a longer duration of time(Hawi and Samaha, 2016). Also over the past decade there has been an increase in smartphone usage among children(Tinkler, 2015) resulting in increased rise of common mental and physical health related problems(Han et al., 2017).

The current study is conducted among a group of parents having children under the age group of 15 years, to assess the usage level of smart phones by their children, the factors influencing the behavior and the impact of smartphone usage in their academic performance.

MATERIAL AND METHODS

A cross- sectional questionnaire survey was conducted to parents of children below 15 years Questions are set on two levels. First set of questions were based on demographic data including age, sex, class of study, education level and occupation of parents, etc. Second set of questions were based on their social behavior, academic performance, intellectual thinking, physical activity, etc. Children belonging to the age group above 15 years and physically challenged are excluded from the study. The questionnaire containing 20 questions were circulated to the parents. The data was collected and further analysed using SPSS software and Chi square test was done. The results are given in the form of percentages and depicted in bar graphs. For better understanding the study population was split into two groups, group 1 parents with children between the age of 6-10 years and

group 2 of parents with children between the age of 11-15 years .The obtained results are statistically analyzed and charts were prepared.

RESULTS AND DISCUSSION

Prevalence of exposure to cell phones to young children is increasing day by day (Divan et al., 2012). Single children and parents are becoming more addicted to smartphone usage as they don't have a better companion to play. In most nuclear families, both parents are going to work and they don't have much time to spend with their children. This makes their children lonely and becomes addicted to smartphones. Figure 1 shows the class studied by the children participating in the study. Among 100 participants, out of which 23% of their children are from 1st grade class, 21% of their children were from other grades that fall in the category of above the age of 15 years.Figure 2 shows that students though are seen in with handling smart phones for a very long time, 60% of them have scored good performance in academics thus the results of data show that smart phones though being used widely by younger generation for a long period of time, they were able to show a great significant effect in their academic performance. There are certain education apps that have been introduced to make the difficult subject easier. Even if they miss their class or are absent from their class, they follow the apps and study.

Figure 1: Bar graph depicting the responses collected for the question to what class their children are studying. Where X axis represents the grade and Y axis represents the number of responses for which 12% responded kindergarten, 17% for 2nd grade, 30% for 1st grade, 16% for 3rd grade, 10% for 4th grade, 4% for 5th grade and 11% for 6th grade
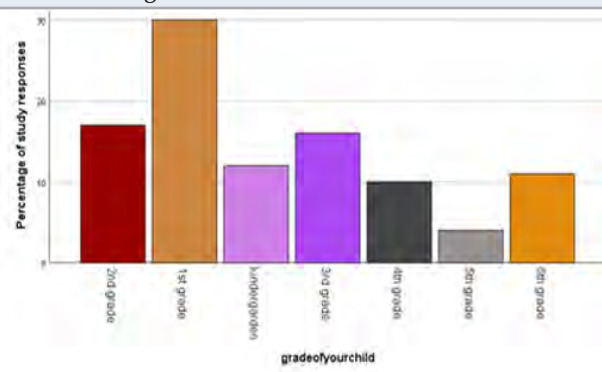
Smart phones provide a variety of gateway to children in whiling away their time that is to be spent among with friends and neighbors. According to this study, it shows that 70% of children are isolated from their friends and neighbors due to the addiction of smartphones, while the rest 30% do not prefer to play with neighbors and friends (Figure 3). There are many game apps which engage the children for many hours.Smartphones affect the communication and emotional stability of a child, if a child is dependent on a smartphone to express their

feelings they risk weakening their communication skill. According to the results, 60% of their parents agree saying that children show temper tantrums when phones are being snatched away from them while 40% of them do not show any kind of behavioral change while their phones are being snatched away from them (Figure 4).

Figure 2: Bar graph depicting the responses for the question whether their children are good at studies. Where the X axis represents the options and Y axis represents the options for which 60% stated yes(red) and 40% stated that their children were not good in studies (blue)
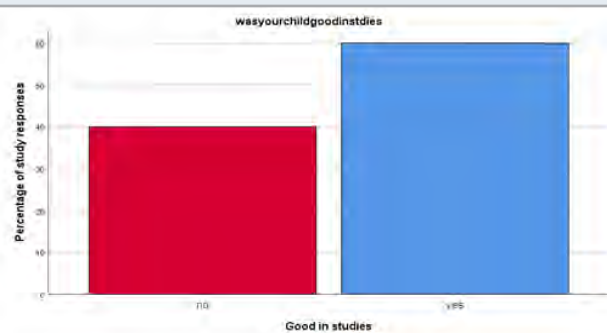
Figurer 3: Bar graph depicting the responses for questions for which parents were asked if smart phones isolate your children from neighbors and friends. Where X axis represents options and Y axis represents the responses for which 70% of the parents stated yes and 20% of the parents stated no
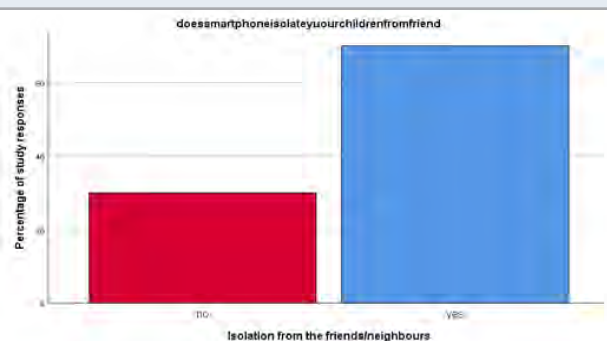
Figure 4: Bar graph depicting the responses collected for the question whether their children shows temper tantrums when the phones are fetched away where X axis represents the options and Y axis represents the options for which 60% stated yes and 40% stated no
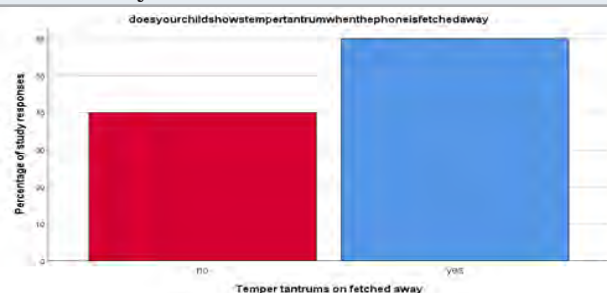
The smartphone usage is highly noted during the leisure time, in which 38% of parents have stated that children prefer playing outside with their fellow mates, while the majority of children (41%) play with their smartphones and 21% prefer sleeping in their free time as shown in figure 5. Smart phones are being widely used among children for the main usage of apps that are being downloaded for their own purposes of happiness, according to the study conducted frequently used apps among children are majority of 44% of children most commonly use it for studying and learning conceptual based videos to understand and for better learning, while 38% of them use it for gaming and the rest 18% use it for social media pleasure as shown in Figure 6.

Figure 5: Bar graph depicting the results collected on what will their kids do at their free time where X axis represents the options and Y axis represents the responses for which 39% opted outdoor games, 40% opted on playing with smart phones and 21% opted for others such as sleeping or staying indoor
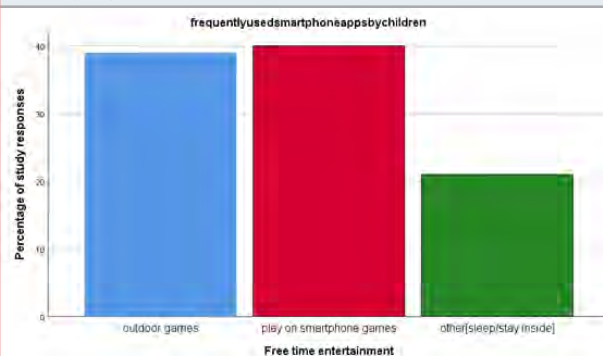
Figure 6: Bar graph depicting the responses collected for frequently used smartphone apps by their children where X axis represents the options and Y axis represents the number of responses for which 39% opted for gaming apps, 44% on study apps and 17% on social media

Usage of smartphones have been highly notable and the respective outcomes have also seen negative outcomes. From figure7, it shows that majority of the children (40%) were suffering from eye problem due to prolonged usage of smart phones than the required time of use, 30% of children suffer from head aches due to long time exposure of the eyes that are strained more during use age of smart phones and the rest 30% are obese since they spend more time in playing and watching over

phones in their leisure time rather than playing outside with their friends.

Figure 7: Bar graph depicting the responses collected on whether the child has any of the following health related problems where X axis represents the options and Y axis represents the number of responses for which 40% opted eye problems, 30% opted headaches and 30% opted obesity

Figure 8 shows the majority of the parents of children between 6-10 years observed the behavioural changes in their children when snatching away the smart phones than the parents of children aged between 11 - 15 years and the difference was also significant statistically(p value-0.00<0.05). Figure 9 shows the majority of the parents of children between 6-10 years observed that their children frequently use games apps than the other games and that was higher than parents of children between 11-15 years(opt for study apps) and the difference was also significant statistically(p value 0.000(<0.05)).Figure 10 shows the majority of the group 2 parents observed that their children were isolated from the friends and neighbours than the group 1 parents. There was a significant difference found in association between parents groups and their behavioral changes (p value- 0.00<0.05).

Figure 8: Bar graph showing association between parent group and their child's behavior when the phone is being snatched away. X axis represents the parent group and Y axis represents the responses. Majority of the parents of children between 6-10 years observed the behavioural changes in their children when snatching away the smart phones than the parents of children aged between 11 –15 years and the difference was also significant statistically. Pearson chi square test was done; p value-0<0.05.
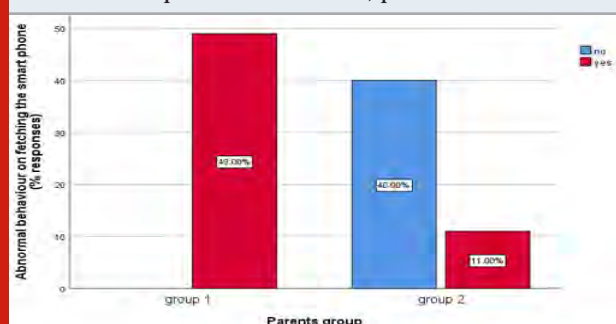
Figure 9: Bar graph showing association between parents group and the frequently used apps. X axis represents the parent group and the Y axis represents the responses. Majority of the parents of children between 6-10 years observed that their children frequently use games apps than the other games and that was higher than parents of children between 11-15 years(opt for study apps) and the difference was also significant statistically. Pearson Chi-square test was done; p value 0.000(<0.05).
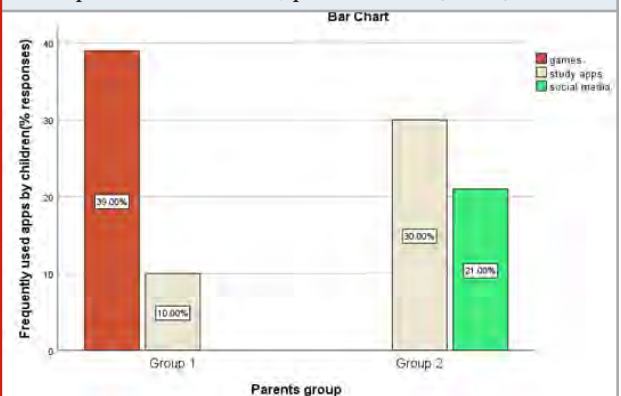
Figure 10: Bar graph showing association between parents group and whether the smart phone isolates their children from their friends and neighbors. X axis represents the parents group and Y axis represents the options. Majority of the group 2 parents observed that their children were isolated from the friends and neighbours than the group 1 parents. There was a significant difference found in association between parents groups and their behavioral changes. Pearson Chi-square test was done; p value-0<0.05
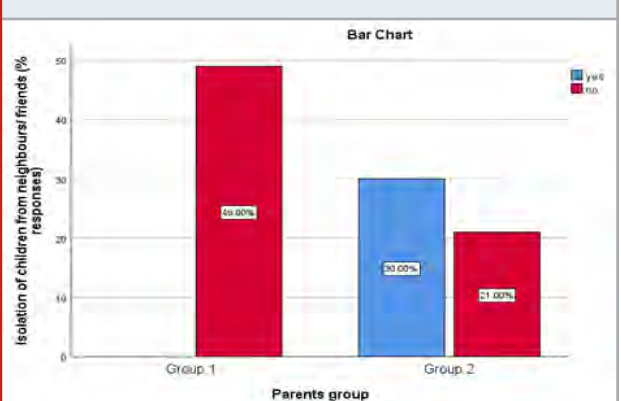
Through this study it can be concluded that children were showing good academic performance. But their social behavior and physical activity are declining gradually. Prolonged usage of smartphones also has some negative impact on their health. Few are suffering from eye problems and some encounter headaches. Chronic addiction to smartphones makes the children lazy and they don't prefer outdoor games. This affects their health. Inadequate physical activity make them obese and lethargic. As this study is a pilot study with 100 responses, we cannot conclude that smartphones

promote their performance in academic studies, because the chosen population are below 15 years of age. Further study must be conducted to assess the prevalence of addiction to smartphones among school going children of various ages.

CONCLUSION

Thereby the study concludes that smart phones usage is more among the children under 6-10years for the purpose majorly than the children of 11-15 years. The parents of children aged 11-15 years observed that their children were isolated from their friends and neighbours because of constant smartphone usage than parents of children aged 6-10 years. All observed the temper tantrums among their children while snatching away the smartphones. From this study, we also found that the majority of the parents are taking utmost care in the child's lives and monitoring the use of phones.

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Synthesis of Triphala Incorporated Zinc Oxide Nanoparticles and Assessment of its Antimicrobial Activity Against Oral Pathogens : An In-Vitro Study

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ABSTRACT

Triphala, a traditional Ayurveda herbal formulation consisting of dried fruits of three medicinal plants, is known to have effective antimicrobial properties. Inorganic elements like zinc oxide have also been known to have antimicrobial properties against strains of gram positive and gram negative bacteria, both. Green synthesis of nanoparticles is being encouraged, because of its positive effects on the environment and its cost-effectiveness. Hence, the study was conducted to synthesize Triphala augmented Zinc oxide nanoparticles and assess its antimicrobial activity against oral pathogens. Aqueous extract of Triphala was formulated and incorporated to zinc oxide solution to formulate the nanoparticle. Agar well diffusion method was used to assess the antimicrobial activity against S. Mutans, C. albicans, S. aureus, E.faecalis. Triphala incorporated zinc oxide nanoparticles produced a zone of inhibition more than that of ampicillin/cycloheximide against S. aureus and at 50 µl was almost as effective as antibiotic against the gram positive bacteria. Triphala incorporated ZnONPs as a cost effective, eco-friendly yet efficient method and they show great potential as oral antimicrobial agents.

KEY WORDS: GREEN SYNTHESIS NANOPARTICLES, HERBAL DENTISTRY, NANO-SCIENCE, TRIPHALA, STREPTOCOCCUS MUTANS.

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INTRODUCTION

Dental caries can be defined as a multi-factorial microbial disease characterized by de-mineralization of the inorganic and destruction of the organic substance of the tooth. Dental caries start with bacterial adherence to the tooth structures gradually leading to formation of plaque followed by de-mineralization of enamel due to fermentation of dietary carbohydrates (Mittal et al., 2011; Snehal and Srinivasan, 2015) . The initial caries lesion manifest as white spot lesion and it occurs mainly due to major mineral loss at the subsurface area beneath a relatively intact area(Welbury, Duggal and Hosey, 2018), caused by microorganisms like Streptococcus mutans, Lactobacillus acidophilus which encourage the accumulation and adherence of plaque biofilm by metabolizing sucrose into sticky glycan (Loesche, 2007). Studies have shown that dental caries is not a continuous process, but rather a cyclic phase of demineralization and remineralization (Carounanidy and Sathyanarayanan, 2009). Since 1980, fluorides have been known to control carious lesion facilitating the re-mineralization process in enamel, but high concentration of fluoride in dentifrices and systemic fluorides led to fluoride toxicity, which in turn gave rise to the non-fluoride based re-mineralizing agents like CPP-ACP, Bioactive glass, CPP, Xylitol, nanoparticles (Arifa, Ephraim and Rajamani, 2019).

Among these, nanoparticles have gained popularity in the field of scientific research, owing to their size (1-100 nm), it has shown tremendous potential even as an antibacterial agent because of their enhanced physicochemical properties, large surface area to mass and increased chemical reactivity (Saafan et al., 2018). Among the nanoparticles, metal oxide such as Zinc Oxide (ZnO) has gathered attention from researchers, as it is found to be stable under varying environments, also it has shown antimicrobial activity against both gram positive and gram negative microorganisms and antibacterial activity against spores. Also, they are non toxic, biocompatible in nature which makes it a desirable choice of material (Tiwari et al., 2018). Synthesis of ZnO nanoparticles can be achieved through physical processes, chemical processes like sol-gel, pyrolysis, electro-deposition, which are useful for mass synthesis but at the same time prove to be detrimental to the environment (Su and Chang, 2018).

That's when green synthesis of nanoparticles were introduced where secondary metabolites of plant products were used as reducing agents for synthesizing and stabilizing the nanoparticles. Triphala is a botanical preparation consisting of equal parts of three herbal fruits, known to have excellent antibacterial, antimicrobial, antiviral properties, also exhibits potent antioxidant properties due to its essential phytochemicals (Jagadish, Anand Kumar and Kaviyarasan, 2009). We have successfully completed numerous epidemiological studies for the betterment of our community (Prabakar, et al., 2018a, 2018b; Prabakar et al., 2018; Vishnu Prasad et al., 2018; Khatri et al., 2019; Manchery et al., 2019; Shenoy, Salam and Varghese, 2019). In this research

we are studying/analyzing   the Therefore, this study was conducted to synthesize Triphala incorporated zinc oxide nanoparticles and assess its antimicrobial activity against oral pathogens.

MATERIAL AND METHODS

Study design: In-vitro

Ethical approval: Prior to the start of the study, ethical approval was obtained from Scientific Review Board, Saveetha Dental College, SIMATS.

Study method
1. Synthesis of Triphala incorporated zinc nanoparticles: Tripahla was obtained from a dedicated ayurvedic pharmacy and inspected for purity and phytochemical composition prior to use. Aqueous extract of Triphala was prepared by boiling 10gm of Triphala powder in 100 ml of double distilled water in a water broth at 70 0C for ten minutes to obtain 1% of the Triphala extract and it was filter paper was used to filter the solution and the obtained filtrate was used for nanoparticle synthesis. 1 ml of the filtrate was mixed with the solution zinc oxide acid solution and ascorbic acid. The solution was then placed in an incubator at 250 rpm until there was evidence of colour change suggestive of nanoparticle synthesis, following which the solution was centrifuged at 10000 rpm for 30 minutes. The pellet obtained was washed with double distilled water, followed by absolute ethanol and dried in a hot air oven for 2 hours and stored in an air-tight container. Confirmation of the ZnONPs was performed using UV-Visible spectrophotometer at 1, 12, 18, 24, 48 and 72 hours.

2. Antimicrobial activity of Triphala incorporated zinc nanoparticles: Agar well diffusion method was used to determine the antibacterial activity of different concentrations of ZnONPs against oral pathogens such as *S. mutans, E. faecalis, C. albicans* and *S. aureus.* Secondary cultures of microbial suspension were dispersed evenly on the surface of Muller Hinton agar and rose Bengal agar plates using a sterile spreader. Different concentrations of nanoparticles (25, 50 & 100 μl) were incorporated through a sterile micropipette into the wells created on the agar plate using sterile cork borer. The plates were then incubated at 37°C for 24 h to 48 h. Commercial antibiotic ampicillin (50mg/ml) was used as positive control for *S. mutans, E. faecalis, S. aureus* but for *C. albicans* cycloheximide was used and the zone of inhibition (mm) was recorded for each plate and compared with control. All the tests were replicated in triplicate for analysis.

RESULTS AND DISCUSSION

Zinc oxide nanoparticles have proved to be one of the most important metal oxide nanoparticles, owing to their peculiar physical and chemical properties, (Smijs and Pavel, 2011). From being used in rubber industries (Kołodziejczak-Radzimska and Jesionowski, 2014),

skin products (Newman, Stotland and Ellis, 2009), food additives (Rasmussen et al., 2010), it has received much recognition in the field of biomedical research. In comparison to other metal oxide nanoparticles, zinc oxide NPs have relatively less toxicity and excellent biomedical applications, like drug delivery, antibacterial, anticancer, anti-inflammation (Mishra et al., 2017). Of many methods of preparation, green synthesis of nanoparticles by biological systems (Fakhari, Jamzad and Kabiri Fard, 2019) by plant extracts has become an emerging field in nanotechnology. In this study, Triphala, an ancient herb with equiproportional mixture of *Terminalia chebula*, *Terminalia belerica*, and *Emblica officinalis*, was incorporated into Zinc nanoparticles and its antimicrobial activity was assessed against oral pathogens. Previous research also shows efficacy of Triphala against potent microorganisms (Chainani et al., 2015), (Prabhakar et al., 2014) (Srinagesh, Krishnappa and Somanna, 2012). Similarly, studies involving the antimicrobial efficacy of zinc oxide nanoparticles have also been conducted (Siddiqi et al., 2018) (Souza et al., 2019).

The green synthesis of the zinc oxide nanoparticles, was confirmed after visual observation, where after the addition of the zinc oxide solution with Triphala plant extract, the colour changed to brown with slight viscosity in nature, indicating the formation of zinc oxide nanoparticles, similar to other studies (Rajeshkumar et al., 2018). In the current study, the mean zone of inhibition (ZOI) was found to increase as the concentration of NPs increased. Maximum ZOI for St.mutans was observed at 100μl concentration, 25mm, which was even more than that of the commercial antibiotic used (Figure I). Against St. Aureus, Triphala incorporated ZnONP showed a zone of inhibition maximum of 30 mm with the commercial antibiotic, however at 100μl and 25μl concentrations also it showed good potential with 26 mm and 24 mm of ZOI (Figure II). Similarly, for E.faecalis maximum ZOI was observed with the commercial antibiotic at 27 mm, followed by 24 mm at 100μl concentration and 20 mm for 50μl concentration (Figure III).

However, in the current study Triphala incorporated ZnONPs were not as potent as the commercial antibiotic against C.albicans, as the zone of inhibition was highest at 30 mm for AB, and 20 mm at 100μl concentration (Figure IV). Various other studies have reported efficacy of Triphala against gram positive bacteria, gram negative bacteria and yeast as well (Bajaj and Tandon, 2011) (Azizi-Lalabadi et al., 2019). Zinc oxide nanoparticles have also proven to be effective against a variety of gram positive and gram negative bacteria in other studies (Santhoshkumar, Venkat Kumar and Rajeshkumar, 2017) (Happy Agarwal et al., 2018). However, the current study is the first of its kind where antimicrobial efficacy of Triphala incorporated ZnONP is tested against oral pathogens, hence evidence is less. Therefore, further animal studies/in-vivo research should be conducted to validate the above findings.

Figure 1: Zone of inhibition at different concentrations against *St. mutans*
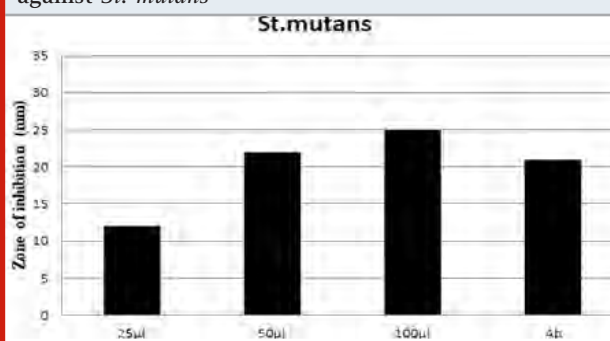
Figure 2: Zone of inhibition at different concentrations against St. aureus
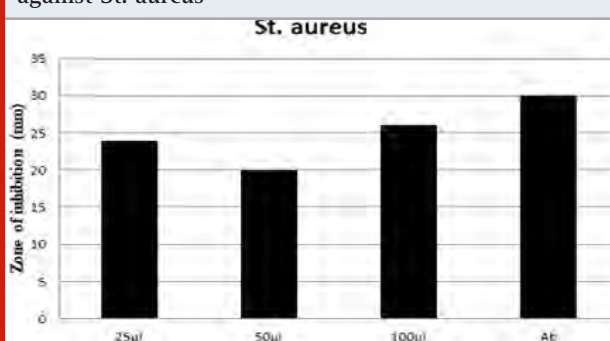
Figure 3: Zone of inhibition at different concentrations against E. faecalis
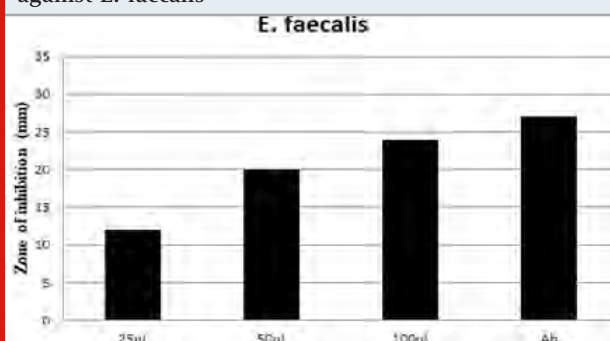
Figure 4: Zone of inhibition at different concentrations against C.albicans
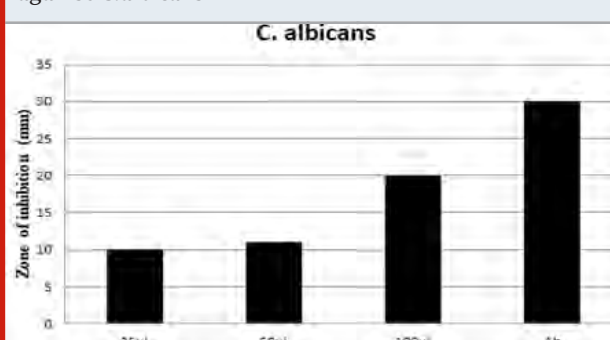
CONCLUSION

The synthesized Triphala incorporated Zinc Oxide nanoparticles show excellent potential as an oral antimicrobial agent against strains of gram positive bacteria and are also bio-friendly and inexpensive in nature. However, animal studies and in-vivo research has to be conducted to establish the above findings.

Conflict of interest: Nil.

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Dental Communication

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Knowledge and Awareness of Presence of Microgap at the Implant Abutment Interface and the Use of Sealing Agents Among Dentists

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ABSTRACT

The study aims to evaluate the knowledge and awareness of the presence of micro gaps at the Implant Abutment Interface (IAI) and the use of various sealing agents among dentists. The study was conducted all over India among dentists and dental students using an online questionnaire assessing their knowledge on the subject.Descriptive statistics followed by the Chi-square test were used to describe the association of the results obtained from the survey.The responses to the survey showed that the awareness regarding the presence of a micro gap at the IAI was quite significant among dentists and so was the knowledge regarding the consequences of micro gap at IAI. It also revealed that there was moderate to poor awareness regarding the various sealing agents available and their clinical protocols and indications. Awareness regarding the presence of micro gaps at the IAI showed a positive association with the practitioner group. The awareness of the presence of micro gaps at the IAI is quite high among general dentists. But the awareness of various sealing agents like gap seal and O-ring and the clinical steps associated with their use seems to be lacking

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KEY WORDS: IMPLANT ABUTMENT INTERFACE, IAI, SEALING AGENTS, GAP SEAL, MICRO GAP, O-RING.

INTRODUCTION

For over 35 years implants have proved to be a promising option as a fixed replacement for missing teeth(Rismanchian et al., 2012). Implant systems consist of an endosteal fixture that Osseo integrates with the bone and a trans mucosal connection (abutment) supported restoration that is screwed on to the fixture(Binon, 2000). Two staged implant processes help minimize early exposure to stress and aids in obtaining osseointegration(Nakahara et al., 2017). The implant abutment connection for a two-piece implant system can be of two types; External connection or Internal connection (Hagiwara and Carr, 2015). External connection comes with an increased vulnerability to off axial loads due to short and narrow geometry leading to deformation of IAI(Gracis et al., 2012). Compared to external connection, internal connection lowered the rotation centre, improved mechanical stability and also

reduced marginal bone loss when incorporated with platform switching(Sailer et al., 2009).

Misfit in two-piece implants at the IAI is unavoidable due to precision limits during production(Alves et al., 2016). This could lead to micro motion at the interface and could lead to accumulation of bacteria which acts as a challenge for implant success. Gaps and hollow spaces at the IAI act as bacterial reservoirs and are predisposing factors for peri-implantitis which is one of the major challenges to implant success.(Nayak et al., 2014) Peri implantitis results in marginal bone loss, recession and compromised esthetics and in worse case scenarios implant failure.

To seal the gap, various sealing agents are available. These include Gap seal (Hagerwerken, Duisburg, Germany), O-ring (ORMCO, Milan, Italy), Berutemp 500 T2, Kiero Seal. Sealing agents in the gel form flow better due to the low viscosity sealing the interface efficiently than the O-ring. (Podhorsky et al., 2016) Knowledge regarding the presence of microgap at the implant abutment interface, and its consequences best enables the dentist to incorporate measures to limit the sequelae that follows when microgap is present at the IAI. To provide a hermetic seal at the IAI in a two-piece implant may not be possible(Quirynen et al., 1994) however incorporation of a sealing agent reduces the bacterial leakage to a great extent. Hence this study aims to evaluate the knowledge and awareness regarding the presence of microgap at IAI and the use of sealing agents among dentists.

MATERIAL AND METHODS

A cross- sectional electronic questionnaire survey was conducted among dentists all over India in the month of January 2020.The questionnaire was designed in a way to assess the knowledge and awareness regarding the presence of micro gap at the IAI, it's possible complications and the commercially available sealing agents. The survey forms were generated on an online platform Google Docs (Google Business Suite) and were circulated using various social media platforms to over 150 dentists. The survey comprised 13 close ended questions and 2 open ended questions formulated to be wholesome, and assessing the general academic as well as clinical knowledge of the practitioners in the field of implantology specifically implantitis and the factors affecting it. The content of the questionnaire and the phrasing of the questions were discussed and pre-tested among the staff and postgraduate students "?". The questions in the survey fell into broad categories such as:

Demographic data: Data including name, age group, and the level of dentistry practiced ranging from undergraduate students to Prosthodontists and Implantologists.

Knowledge and awareness: Questions assessing the knowledge regarding the presence of microgap, the factors related to it, the normal values of this microgap were assessed using a combination of 'yes' or 'no' and multiple-choice questions. The awareness regarding the presence of various sealing agents was also assessed with a combination of open and close ended questions.

Questions were explained whenever necessary, and assurance of confidentiality of their identities was given. Guidelines followed were as per the Helsinki declaration(World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects, 2004). All the collected data were analyzed using SPSS version 20 (SPSS, IBM, Chicago, USA). Association of knowledge and awareness regarding presence of microgap and sealing agents was made between the different practitioner groups using Chi-square test. The statistically significance level was set at <0.05 with a confidence interval of 95%.

RESULTS AND DISCUSSION

A total of 120 dentists responded to the survey majority of whom belonged to the age group of 20-30 years (77.5%) (Table 1). The dentists who responded consisted mainly of post graduate students in prosthodontics (20.8%), PG students in the departments of periodontics, Surgery and implantology (25%) and general practitioners (17.5%) (Table 1). Majority of dentists are aware of the presence of microgap at the IAI, (84.2%) and consider acceptable micro gap to be 2-4 microns (49.2%) (fig 4). The major factor that determines the extent of gap at the IAI, according to most dentists, was the geometry of contact area (42.5%), followed by the force used to tighten the abutment (27.5%). 73.3% of the dentists are aware of the consequences of the microgap at the IAI interface and consider peri- implantitis and marginal bone loss as the major consequences.

The dentists who responded to the survey considered the microgap to be minimum in internal connection as compared to external connection. The awareness regarding the availability of various sealing agents was significant among the dentists (50%), and the most familiar agent among them was Gap seal. While the dentists were aware of the use of Gap seal at the IAI and considered peri implantitis as a major indication, there was a significant lack of knowledge regarding the clinical steps associated with it. There was moderate awareness regarding the use of O-ring as an alternative agent for sealing the gap at the IAI (54.2%). Dentists who answered the survey also favored Gap seal over O-ring as a better alternative to control the complications associated with the presence of microgap at the implant abutment interface. Association between the practitioner group and the awareness regarding the presence of microgap at the IAI showed a positive association (p value=0.014) (fig 1). Similar correlation was also observed with awareness of O-ring in different practitioner groups (p value = 0.005) (Table 2). No such significant association was found for general awareness of sealing agents, specifically for gap seal. (Fig2)

The key objective of this survey was to raise awareness among clinicians regarding the presence of microgap

at the IAI in two-piece implants, its consequences, and measures to prevent these sequelae. This is of utmost importance as it is almost impossible to create a hermetic seal at the IAI, which could lead to microbial leakage that opens doors to the major complications encountered in implant dentistry(Garrana et al., 2016).

Figure1: Graph shows the awareness of presence of micro gap among different practitioner groups
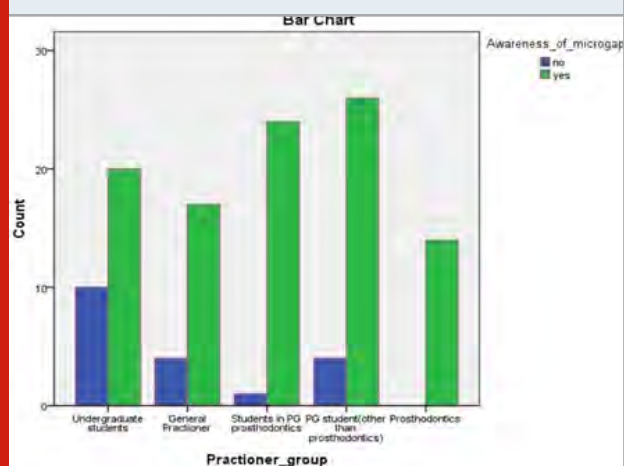
Figure 2: Awareness of sealing agents among different practitioner group
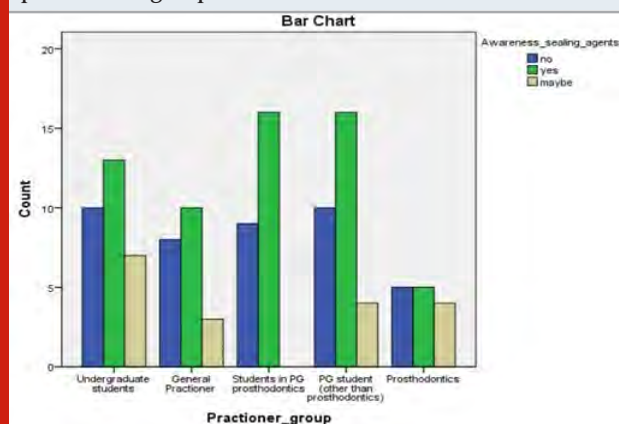
Figure 3: Shows awareness of Gap seal among different practitioner groups
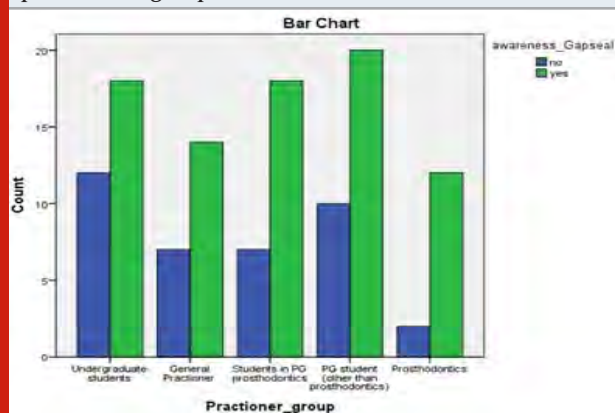
Microgap at IAI: The microgap at the IAI could range from anywhere between 0.1μm-50μm (Nascimento et al., 2014)(Turkyilmaz et al., 2017) and this depends on geometry of contact area, the type of connection, the abutment material and the force used to secure the abutment . In a study done by Verdugo CL et al., a gap of 10 μm was presented by an external connection implant which was more than Morse taper implants with a gap of 2-3 μm(Verdugo et al., 2014). Mangano and his colleagues revealed that the use of Morse taper internal hex connection minimized the IAI gaps and increased mechanical stability which eventually reduced crestal bone loss and prosthetic complications(Mangano et al., 2009). Furthermore, the use of platform switching abutments keeps the microleakage and micromotion at the IAI distant from the alveolar ridge(Canullo et al., 2011; Wang et al., 2015).

In terms of the material used for an abutment Smith NA et al, showed that titanium abutments showed smaller microgap (2μm)as compared to zirconia abutments(26.3μm) (Smith and Turkyilmaz, 2014). In a similar study, RismanchianM et al found that pre machined Ti abutments showed lesser microgap in comparison to castable abutments, and this was attributed to the lack of precision in finishing and polishing of the custom abutments.(Rismanchian et al., 2012)There is also an observed decrease in microleakage when a torque force of 30Ncm or more is used, (Verdugo et al., 2014) as there is friction locking at the connection (Olin, 2006). This survey showed a clear understanding among most of the dentists regarding the presence of microgap at the IAI, that it is unavoidable, could range from 2-4μm, and that most of them considered the geometry of the contact area as a major factor that determines the microgap. They also considered the internal connection to have a minimal gap at IAI.

Microleakage at IAI: In a five year study conducted by Canullo et al, in humans, for different implant connections under functional loading, showed less bacterial leakage in the internal connection than external connection.(Canullo et al., 2011) Similar conclusions were made in a study done by Koutouzis T et al.(Koutouzis et al., 2014) The influence of dynamic loading on microleakage was studied by Hermann et al (Hermann et al., 2001) and the study concluded that dynamic loading increases the penetration of bacteria as there was micro movement at the IAI which causes a pumping effect and this leads to detrimental effects on the marginal bone stability. Contrary to these, studies done by Ranieri R et al.,(Ranieri et al., 2015),Guerra E et al(Guerra et al., 2016) showed there was no significant difference in microleakage in internal and external connection.

Sealing agents: Sealing agents were developed to minimize the microgap at IAI, and are available in various forms. Materials such as 1% chlorhexidine(D'Ercole et al., 2009; Guerra et al., 2016), Composites(do Nascimento et al., 2017), Gutta Percha, tetrafluoroethylene tapes (Cavalcanti et al., 2016) have been used as sealing agents and showed reasonable closure of space. An interesting

concept of "chemical locking" was described by Selato et al (Seloto et al., 2018) where he used resins with mono components, without solvents, that polymerize at room temperature in the absence of oxygen, when trapped between the parts.

S.no	Question	Options	Frequency (%)
Table 1. Shows the frequency of entries obtained from the survey			
1.	Age	20-30years	93(77.5%)
		30-40years	19(15.8%)
		40-50years	8(6.7%)
1	Which of the practitioner groups do you belong to?	Undergraduate students	30(25%)
		General practitioner	21(17.5%)
		Student in PG prosthodontics	25(20.8%)
		PG student (other than prosthodontics)	30(25%)
2	Type of implant preference?	Prosthodontist	14(11.7%)
		one-piece implant	28(23.3%)
		two-piece implant	92(76.7%)
3	Are you aware of the micro gap present at the implant abutment interface?	No	19 (15.8%)
		Yes	101(84.2%)
4	How much gap at the implant and abutment interface would you consider to be normal?	Less than 1 micrometer	18(15%)
		1-2 micrometer	33(27.5%)
		2-4micrometer	59(49.2%)
		>5 micrometer	10(8.3%)
5.	What are the factors that according to you determine the gap at implant abutment interface?	Implant system	27(22.5%)
		Geometry of contact area at IAI	51(42.5%)
		Amount of force used to tighten the abutment	33(27.5%)
		others	9(7.5%)
6	Are you aware of the consequences of presence micro gap at the implant-abutment interface?	No	15(12.5%)
		Yes	88(73.3%)
		Maybe	17(14.2%)
7	What do you think are the consequences of micro gaps at implant abutment interfaces?	Periimplantitis	47(39.2%)
		Marginal	34(28.3%)
		Bone Loss Both	39(32.5%)
8	In what connection do you think the microgap at IAI is minimum?	Internal connection	96(80%)
		External Connection	24(20)
9	Are you aware of various sealing agents used to control micro leakage at IAI?	No	42(35%)
		Yes	60(50%)
		Maybe	18(15%)
10	Are you aware of the use of 'Gap seal ' at implant abutment interface?	Yes	82(68.3%)
		No	38(31.7%)
11	Are you aware of the clinical steps for using 'Gap seal'?	Yes	67(55.8%)
		No	53(44.2%)

12	Are you aware of the use of 'O-ring' to control micro leakage at IAI?	Yes	65(54.2%)
		No	55(45.8%)
13	Which according to you would be a better sealing agent?	Gap Seal	73(60.8%)
		O-ring	24(20%)
		Others	23(19.2%)

Table 2. Depicts the association of knowledge and awareness of presence of microgap and sealing agent with respect to different practitioner groups

		PRACTITI ONER GROUP
Awareness of micro gap present at the IAI	Chi-square dff P value	12.458 4 0.014
Awareness on factors that determine the micro gap	Chi-square Df P value	23.099 12 0.027
Awareness on the consequences of presence of micro gap	Chi-square Df P value	16.184 8 0.040
Connection where minimum micro gap is found	Chi-square Df P value	14.304 4 0.006
Awareness of sealing agents	Chi-square Df P value	9.944 8 0.269
Awareness of Gap Seal	Chi-square Df P value	3.138 4.535
Awareness of O-ring	Chi-square Df P value	14.985 4 0.005
Choice Of sealing agent	Chi-square Df P value	11.094 8 0.196
df- Degree Of freedom		

Some of the popular commercially available sealing agents include Gap seal (Hagerwerken, Duisburg, Germany), O-ring (ORMCO, Milan, Italy), Berutemp 500 T2, Kiero Seal. An in vitro study done by Podhorsky A et al(Podhorsky et al., 2016) evaluated the influence of Kiero seal and Berutemp on bacterial colonization of the IAI, and showed a marked reduction in the bacterial cell count in comparison to the control group with no sealing agent. The efficacy of Gap seal and O-ring was also compared in a similar study by Nayak AG et al(Nayak et al., 2014). The study showed that the leakage of the bacteria can be reduced to a negligible number by using a gel rather than an O-ring, as its body prevents complete seating of the abutment. The rubber can deteriorate over time, which may increase leakage.

The survey showed that the dentists are moderately aware of the uses of sealing agents, and its indications. The most popular option for most of the dentists was Gap seal and they considered it slightly superior to O-ring as was shown in the studies discussed earlier. Yet there is lack of knowledge regarding the spectrum of options available, and the clinical steps involved in their application.

Limitations: The major limitations of this study are the sample size, a larger population of dentists could have given a wider perspective and a better knowledge regarding the awareness regarding the presence of microgap and the commercially available sealing agents among dentists.

CONCLUSION

As two-piece implants are the commonly chosen treatment option by most dentists, it is essential to understand the implications of the presence of microgap at the IAI, and to take measures to prevent the consequences of microleakage. Within the limitations of the study we were able to conclude that there was average to poor awareness regarding the various sealing agents commercially available in the market, and their clinical use. Improvement in dental curriculum for the students and extended learning opportunities for the practicing dentists could increase the awareness of sealing agents and could aid in better management of the microgap at IAI.

Conflict of Interest: There is no conflict of interests.

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Awareness of Intraoral Scanners and Knowledge of Effects of Different Lights on the Accuracy of Intraoral Scanners Among Dental Students and Practitioners

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ABSTRACT

Digital dentistry is an emerging branch which aims on improving the efficiency of the outcome of the treatment. One of the newly used instruments which has gained a lot of popularity is an intraoral scanner. An intraoral scanner helps in recording digital impressions which overcomes the limitations of conventional impressions. Hence, it is important to increase the awareness about all the aspects of intraoral scanner to utilize it to its full potential. The objective of this study is to evaluate the knowledge and awareness of intraoral scanners and the effects of different lights on its accuracy among dentists. The present study was done among the dental practitioners and dental students in India. A questionnaire was made and given to the dentist to check their knowledge and awareness about intraoral scanners and the effects of different lights on its accuracy. It was found that most of the dental practitioners and dental students had knowledge about intraoral scanners but were not aware about the limitations and effects of different lights on the accuracy of intraoral scanners. The data obtained from the above study shows that the dentists are not aware of the effects of different lights on accuracy of different intraoral scanners and need to be educated on the same for obtaining better results.

KEY WORDS: INTRAORAL SCANNERS, LIGHT, ACCURACY.

INTRODUCTION

Digital dentistry is an emerging avenue in the field of dentistry. It refers to the use of digital technology and computer aided systems to carry out dental procedures in contrast to the manual methods (Neville and van der Zande, 2020). It is gaining popularity because of its accuracy and efficiency when compared with mechanical tools. The digital revolution has made a significant impact in changing the workflow which in turn affects the operating procedures (Mangano, Shibli and Fortin, 2016). The need of the hour is digitizing our work to obtain maximum efficiency (Kudva, 2016). There are different tools which have helped make digital dentistry an easier podium to work with. One such equipment is the use of intraoral scanners. Intraoral scanners (IOS) are devices for recording direct optical impressions in dentistry (Mangano et al., 2017). Like other three dimensional scanners, intraoral scanners project a light source onto

the object which has to be scanned (Zimmermann et al., 2015). It can be a dental arch, prepared tooth or scan bodies of implants (Martin et al., 2015). The images of the dentogingival system or the scan bodies are captured by the sensors and processed by the sensors in the form of point clouds. The cloud points are then analyzed by the software which makes it into 3D models (Imburgia et al., 2017).

Advantages of using optical impression with intraoral scanners

- Less discomfort for the patient(Means and Flenniken, 1970; Ahlholm et al., 2018)
- Time efficient(Yuzbasioglu et al., 2014; Burhardt et al., 2016)
- Better communication with the patient and dental technician(Kugel, 2014; Lawson and Burgess, 2015)
- No errors due to errors in cast pouring(Patzelt et al., 2014; Joda and Brägger, 2015)
- The procedure becomes simplified(Park et al., 2015; Lecocq, 2016)

Disadvantages of using optical impression with intraoral scanners

- Subgingival finish lines are difficult to detect(Mandelli et al., 2017; Lim et al., 2018)
- Costly and difficult to maintain(Aragón et al., 2016)

The main feature of an intraoral scanner is its accuracy (Goracci et al., 2016)(Chochlidakis et al., 2016). There are certain factors that affect the accuracy of the intraoral scanners (Patzelt et al., 2013; Rutkanas et al., 2017). Firstly, the saliva plays an important role in scanning with an intraoral scanner as it can wash away the spray particles and reduce the efficiency. Also, there can be some error in scanning as the saliva film created on the tooth will cause misreading of the object geometry (Kurz, Attin and Mehl, 2015). Secondly, the scanning protocol plays an influential role. Inadequate scanning leads to errors in the final prosthesis (Müller et al., 2016). Thirdly, the ambient light affects the coordinates measured by the intraoral scanner (Blanco et al., 2009). This survey was conducted to know about the awareness of intraoral scanners and the effects of different lights on the accuracy of intraoral scanners among dental practitioners and dental students.

MATERIAL AND METHODS

A questionnaire survey was conducted among different dental practitioners and dental students in India during January, 2020. The questionnaire was formulated in google forms. A total of 289 subjects were sent the questionnaire consisting of questions regarding the awareness about intraoral scanners and the effects of different lights on the accuracy of intraoral scanners out of which 117 subjects responded. Validation was done among post graduate students of the department of prosthodontics in XYZ Dental College. Ethical approval was obtained from the ethical board of XYZ Dental College. A simple random sampling was done. The survey was sent online to individuals and none were forced to fill the questionnaire. Guidelines followed as per the Helsinki declaration(Kemperman, 1982).

All the data was collected in Google sheets and analyzed using SPSS 21 (SPSS Inc., Chicago, IL). Chi square test was done to statistically analyze the data and visual representations of the data were plotted with the extracted data. The independent variables in this survey would be sex of the subject, the intraoral scanner used and the light used while using the scanner. The dependent variable in this survey would be the age and experience of the subject.

RESULTS AND DISCUSSION

As the application of digital models has broadened into many areas, the accuracy of 3D images acquired on an intraoral scanner has become an important topic in research (Auskalnis et al., 2019). Accuracy refers to precision and trueness of the object (Chandran et al., 2010). Hence it is important to adjust all the factors influencing the accuracy of intraoral scanners to maximize the effect. Ambient light has a great impact on the accuracy of the intraoral scanner (Revilla-León et al., 2020). Several in vitro studies have demonstrated the effect of ambient light on the accuracy of different intraoral scanners (Revilla-León et al., 2019a, 2019b). Based on these reports, a scanning accuracy difference of 37%-44% can be seen when under different light conditions(Revilla-León et al., 2019a).

A total of 289 subjects were sent the questionnaire out of which 117 subjects responded. Out of the 117 subjects, 70 (59.8%) were females and 37 (40.2%) were males. The mean age range of the study subjects were from 18 to 75 years. Out of the 117 responses, 35.5% were post graduate other than prosthodontics, 31.6% were general practitioners, 22.8% were prosthodontics postgraduate, 8.5% students were undergraduate students and remaining were prosthodontist). Out of the 117 responses, 70.0% were aware about the use of intraoral scanners, 20.0% were not aware about the use of intraoral scanners and 10.0% were aware about intraoral scanners to some extent (Figure 1). Out of 117 responses, 83 (70.1%) were not aware about the effects of different lights on the accuracy of intraoral scanners, 25 (21.4%) were aware about the effects of different lights on the accuracy of intraoral scanners to some extent whereas only 9 (7.7%) were aware about the effects of different lights on the accuracy of intraoral scanners (Figure 10). There was a statistically significant difference in the responses of the questions with respect to the practitioner groups (p<0.05).

In the current survey, most of the dental students and dental practitioners were aware about intraoral scanners (Figure 4), its indications (Figure 5) and its limitations (Figure 6). Now, when digital dentistry is taking over, it

is important for all dentists to be well versed with the latest equipment and techniques. More than half of the dentists, who were given the questionnaire do not use intraoral scanners in their clinical practice (Figure 7). With the use of intraoral scanners, the workload becomes quite dwindled. Hence, more number of clinicians should use intraoral scanners to reduce the workload and increase the efficiency. More than half of the dentists, who were given the questionnaire were not aware about the effects of different lights on the accuracy of intraoral scanners. Without proper knowledge, using any equipment can lead to errors and hence can negatively impact the results. Each scanner has its own advantages and disadvantages which a clinician should be aware of before using them. One of them is the effect of different lights on the accuracy of intraoral scanners. It is important to know about all the factors to maximize the potential of the system.

Table 1. Showing the correlation between different groups of dental practitioners and the awareness about intraoral scanners.

Questions	Options	Which practitioner group do you belong to?					Cumulative response percent	Chi square value	P value
		UG Students	PG Students (Prosthodontics)	PG Students (Other Departments)	General practitioner	Prosthodontist			
Are you aware about intraoral scanners?	No	70.0%	0.0%	22.0%	21.6%	0.0%	20.5%		
	To some extent	10.0%	3.8%	14.6%	8.1%	0.0%	9.4%	27.094	0.001*
	Yes	20.0%	96.2%	63.4%	70.3%	100.0%	70.1%		
Are you aware about the indications of intraoral scanners?	No	70.0%	0.0%	24.4%	18.9%	0.0%	20.5%		
	To some extent	30.0%	50.0%	43.9%	73.0%	33.3%	53.0%	37.961	0.001*
	Yes	0.0%	50.0%	31.7%	8.1%	66.7%	26.5%		
Are you aware about the limitations of intraoral scanners?	No	70.0%	3.8%	34.1%	21.6%	0.0%	25.6%		
	To some extent	30.0%	50.0%	43.9%	75.7%	33.3%	53.8%	39.302	0.001*
	Yes	0.0%	46.2%	22.0%	2.7%	66.7%	20.5%		
Do you use intraoral scanners in your clinical practice?	No	80.0%	15.4%	75.6%	48.6%	0.0%	52.1%		
	Sometimes	10.0%	23.1%	12.2%	8.1%	33.3%	13.7%		
	Yes	10.0%	61.5%	12.2%	43.2%	66.7%	34.2%	32.753	0.001*
Which intraoral scanner do you use?	None	70.0%	5.0%	60.0%	35.1%	0.0%	40.9%		
	I Tero Element	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		
	CEREC	30.0%	60.0%	25.0%	62.2%	100.0%	46.4%	45.596	0.001*
	Trios	0.0%	25.0%	2.5%	2.7%	0.0%	6.4%		
	EzScan	0.0%	0.0%	2.5%	0.0%	0.0%	0.9%		
	Aoralscan	0.0%	0.0%	5.0%	0.0%	0.0%	1.8%		
	Others	0.0%	10.0%	5.0%	0.0%	0.0%	3.6%		
Which light do you use while scanning with the intraoral scanner?	No light	66.7%	21.1%	36.1%	18.9%	0.0%	29.1%		
	Sunlight	33.3%	31.6%	16.7%	64.9%	100.0%	0.0%		
	Tubelight	0.0%	15.8%	8.3%	16.2%	0.0%	39.8%	40.566	0.001*
	Chairside light	0.0%	31.6%	38.9%	0.0%	11.7%	19.4%		
Do you know the effects of different lights on intraoral scanners?	No	90.0%	50.0%	73.2%	81.1%	33.3%	70.9%		
	To some extent	10.0%	38.5%	19.5%	13.5%	33.3%	21.4%	12.870	0.116
	Yes	0.0%	11.5%	7.3%	5.4%	33.3%	7.7%		

Continue Table

Are you aware about the unit in which the intensity of light is measured?	No	90.0%	57.7%	56.1%	91.9%	33.3%	70.1%	17.947	0.001*
	Yes	10.0%	42.3%	43.9%	8.1%	66.7%	29.9%		

Figure 1: Bar graph representing the association between awareness about intraoral scanners and the practitioner group.
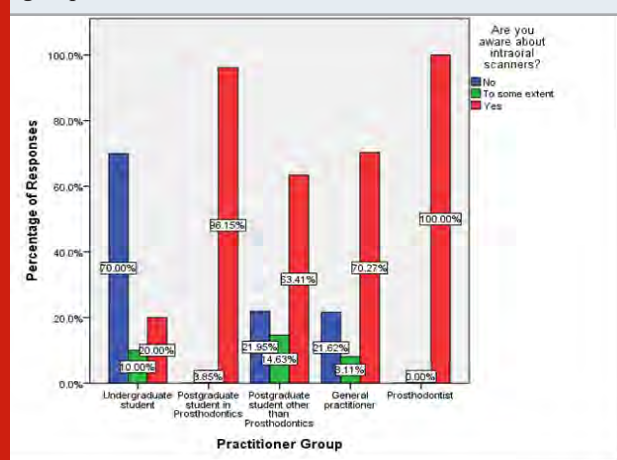
Figure 2: Bar graph representing association between usage of intraoral scanners in clinical practice and practitioner groups
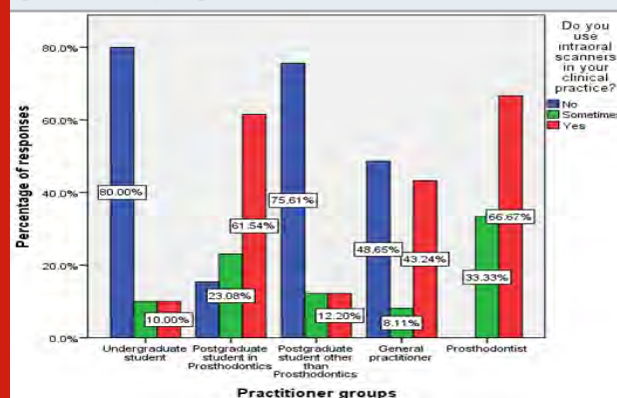
In one study, it showed that iTero Element, using chair and room light conditions resulted in better accuracy, whereas, for CEREC Omnicam, zero light resulted in better accuracy and for TRIOS 3, room light gave the best accuracy(Revilla-León et al., 2019a). In a similar study by Arakida et al(Arakida et al., 2018), they concluded that the most accurate results with a high-accuracy noncontact three-dimensional coordinate measuring machine like Infinite focus G5 was seen with 500 lux and 2500 lux of light. The 500 lux condition represents the illumination by a room light in a clinic, while the 2500 lux condition represents the illumination by a dental unit light(Viohl, 1979). Clinicians should understand the ambient lighting condition as a critical influencing factor on the scanning accuracy of IOSs, and a light

meter should be included into the armamentarium of the digital device.

Although this study gives adequate information on the awareness regarding the intraoral scanners, there are limitations to the study. The major limitation is that the number of people who responded were very less. Additional studies are needed to fully understand the impact of lighting conditions on the accuracy of the available intraoral digitizer systems.

Figure 3: Bar graph representing the association between awareness of effects of different lights on intraoral scanners and practitioner groups.
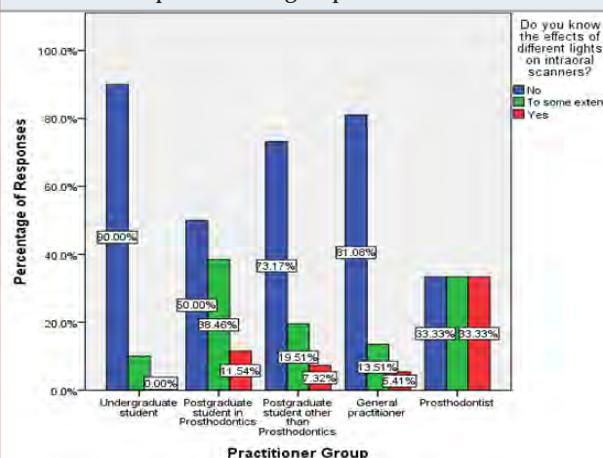
CONCLUSION

The data obtained from the above study shows that the dentists, mostly the undergraduate students and postgraduate students other than prosthodontics are not aware of the effects of different lights on accuracy of different intraoral scanners. It is very important for dental practitioners and students to know this as it can affect the outcome of the final prosthesis. The dental students and practitioners should be educated about the different aspects of intraoral scanners so that they can harness the full potential of intraoral scanners with minimum errors. The undergraduate and postgraduate students should be taught about the latest equipment and their proper use in their curriculum and there should be more lectures and seminars by the speakers for increasing the awareness about the proper use of latest techniques and equipment among the dental practitioners. More webinars and online lectures should be conducted for dental practitioners who are not able to attend the seminars. Critical analysis of the topic and panel discussion should be arranged for better understanding of the topic. After any lecture taken in

a conference, a written questionnaire should be given to the audience to verify their understanding about the topic of the lecture. More frequent surveys should be circulated in the colleges to increase the awareness among the students.

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APPENDIX
Questions asked

1. Name
2. Sex
3. Age
4. Which of the practitioner groups you belong to?
5. Are you aware about intraoral scanners?
6. Are you aware about the indications of intraoral scanners?
7. Are you aware about the limitations of intraoral scanners?
8. Do you use intraoral scanners in your clinical practice?
9. Which intraoral scanner do you use?
10. Which light do you use while scanning with the intraoral scanner?
11. Do you know the effects of different lights on intraoral scanners?
12. Are you aware about the unit in which the intensity of light is measured?

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Knowledge, Attitude and Practice on Cytotoxicity of Intracanal Medicaments Among Dental Students

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ABSTRACT

The main objective of a root canal treatment is to get rid of bacteria inside the root canal treatment. Placement of an intracanal medicament is an integral step in the treatment procedure. Cytotoxicity is a characteristic of being toxic to cells.In some cases if the intracanal medicament extrudes beyond the root canal, it is seen to cause damage to the cells of the periapical tissues that subsequently lead to the damage or inflammation of the periapical region. This study aims at assessing the knowledge, attitude and practice among dental undergraduates on the cytotoxic effects of intracanal medicaments. A Knowledge, Attitude and Practice based survey was conducted in January 2020 among dental students (Third years, Final years, Interns). The questionnaire consisted of 10 Knowledge, awareness and practice based questions and were equally distributed among Third years, Final years, Interns. The total sample size was 150 dental students. The data collected was entered in an Excel sheet and subjected to statistical analysis using SPSS version 20. From the responses obtained it was seen that 33.33% of the interns had a knowledge of intracanal medicaments being used whereas only 26.67% of final years and 10% of third years had a knowledge. 33.33% of the interns had used an intracanal medicament on the patient and only 26.67% of final years and 4.67% of third years had used a medicament. 21.33% of the final years said that they use an intracanal medicament for all patients whereas 20.67% of interns and 4% of third years have given a response of yes. 30.67% of interns, 22.67% of final years, 4.67% of third years knew the mechanism of action of the medicament. 33.33% of interns, 33.33% of final years and 8.67% of third years were aware of the term cytotoxicity. Chi square test shows $p<0.05$, significant. It was seen that Knowledge, awareness and practice on the cytotoxicity of intracanal medicaments was higher among interns, followed by the final years and then third years

KEY WORDS: CALCIUM HYDROXIDE; CYTOTOXICITY; MEDICAMENTS; PERIAPICAL TISSUES.

INTRODUCTION

The main goal of endodontic treatment is removal of bacteria along with its byproducts, and pulpal remnants from infected root canals and completely sealing of disinfected root canals. Intracanal medicaments play an important role in killing the bacteria in root canals (Iftekhar, Kumar and Tamanna, 2019). To eliminate all the bacteria from the entire root canal system, a combination of mechanical instrumentation and irrigation should be used to remove or dissolve organic and inorganic debris, to destroy bacteria, to remove the smear layer and to maintain dentine permeability (Abbott, 1990). Postoperative pain is generally due to inflammation of the periradicular tissues caused by irritants egressing from the root canal during treatment. Calcium hydroxide intracanal medicament has been proven to have pain

preventive properties because of its antimicrobial effects (Anjaneyulu and Nivedhitha, 2014).

Intracanal medicaments are made of various compounds like the phenolic compounds which includes crestatin, camphorated monochlorophenol and aldehydes that includes formocresol and glutaraldehyde, as well as other materials such as calcium hydroxide and some antibiotics (Johnson and Noblett, 2009) A successful outcome of root canal therapy relies on effective disinfection of the root canal system, including the use of intracanal medicaments, which vary in their bactericidal and cytotoxic properties (Selis et al., 2019). Intracanal medications need to be biocompatible as they come in direct contact with periapical tissues during endodontic treatment. These medications can be cytotoxic (de Paula Farias et al., 2016).

Calcium hydroxide is a commonly used intracanal medicament. Chlorhexidine gluconate (2%) is now recommended as an effective alternative to calcium hydroxide (Basrani, Ghanem and Tjäderhane, 2004). Intracanal medicament speeds up the natural healing of periapical lesion, regardless of the bacterial status of the root canal at the time of placement of the material in the canal (Ellerbruch and Murphy, 1977; Peters et al., 2002) It possesses several advantages such as tissue dissolving ability (Hasselgren, Olsson and Cvek, 1988) and antibacterial properties (Siqueira and Lopes, 1999). Triple antibiotic paste (TAP) composed of ciprofloxacin, metronidazole, and minocycline is also being used as an effective intra canal medicament (Hoshino et al., 1996). This mixture has been used for disinfection of the root canal system during root canal treatment and pulpal regeneration (Özan and Er, 2005; Bose, Nummikoski and Hargreaves, 2009). One disadvantage of using this is that the minocycline present might cause discoloration of the teeth. In recent times, cefaclor has replaced minocycline in this paste , and the paste is called a modified triple antibiotic paste (mTAP). After canal disinfection and the medication period depending upon the condition of the tooth, the intracanal medicament should be removed from the root canal completely before the placement of the filling or repair material.

Cytotoxicity is a characteristic of being toxic to cells. When a cell gets exposed to a cytotoxic compound, it can result in various alterations in a cell. The cells then necrosis and lose its membrane integrity and die as a result of cell lysis. The cells can stop actively growing and dividing or the cells can activate a genetic program of controlled cell death known as apoptosis. Cells undergoing necrosis show rapid swelling, subsequently loses its membrane integrity, shut down all its metabolism and releases all its contents into the environment. Cells that undergo rapid necrosis in vitro do not have sufficient time or energy to activate its apoptotic machinery and doest express apoptotic markers. Cells in culture that are undergoing apoptosis eventually undergo secondary necrosis in the next step. They will shut down metabolism, lose membrane integrity and lyse the cell (Riss and Moravec, 2004).

Some endodontic intracanal medicaments which including camphorated Cresatin, para-monochlorophenol and Acriphen were tested for its cytotoxic effect and all three drugs showed extreme toxicity to the tissue culture cells even when the concentration of each drug was in a dilution of 1:1,000 (Kantz, Ferrillo and Zimmermann, 1974). Thus the efficient use of intracanal medicament needs to be highlighted in order to carry on safe and effective treatment without injuring any periapical tissues. Apical periodontitis, in the situations where the periapical tissues are injured is likely to occur and it is known as the inflammation of the periodontium caused by trauma, irritation or due to infection through the root canal, regardless of whether the pulp is vital or non-vital (Antony, Thomas and Nivedhitha, 2020).

We have numerous highly cited publications on well designed clinical trials and lab studies (Govindaraju, Neelakantan and Gutmann, 2017; Azeem and Sureshbabu, 2018; Jenarthanan and Subbarao, 2018; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Teja, Ramesh and Priya, 2018; Janani and Sandhya, 2019; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Poorni, Srinivasan and Nivedhitha, 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique and Nivedhitha, 2019; Siddique et al., 2019; Siddique, Nivedhitha and Jacob, 2019). This has provided the right platforms for us to pursue the current study. Our aim is to assess the knowledge, attitude and practice among dental students on the cytotoxic effects of intracanal medicaments.

MATERIAL AND METHODS

Study design: Knowledge, Attitude and Practice based survey.

Data collection: A survey was conducted in January 2020 among dental students (Third years, Final years, Interns). It was an online questionnaire based study, conducted to assess the knowledge, attitude and practice of cytotoxicity of intracanal medicaments. 150 dental students (Third years, Final years, Interns) participated in this study. The data collection was done via google forms.

Survey instrument: A pretested, self administered, closed ended questionnaire comprising the following sections formed the survey instrument. A structured questionnaire containing 10 questions which was adopted from a validated questionnaire developed by the World Health Organisation. The questionnaire was equally distributed among Third years, Final years, Interns. The goal of developing this questionnaire was to know about the knowledge the dental students had on intracanal medicaments and its cytotoxic behaviour. The questions had to be answered with a Yes or No response.

Ethical approval: Ethical approval was obtained from the Institutional Ethical Committee.

Data analysis: The data collected was entered in Excel sheet and subjected to statistical analysis using SPSS version 20. Chi square test was done. The independent variables are age and gender while dependent variables are knowledge, attitude and practice of cytotoxicity of intra canal medicaments.The level of significance was set at $p<0.05$.

Questionnaire given is as follows:
Year of study:
1. Do you know the available intracanal medicaments that are being used?
2. Have you used an intracanal medicament on the patient?
3. Do you use a medicament for all patients undergoing root canal treatment?
4. Do you know the mechanism of action of the medicament that you use?
5. Are you aware of the term cytotoxicity?
6. Do you place an intracanal medicament more than 2 weeks?
7. Do you take swabs/ radiographs to ensure the activity of the medicament?
8. Have you faced any complication that has arised due to placement of the medicament for a long duration into the root canal?
9. Do you know the cytotoxic effects of the medicaments that are being used?
10. Are you aware of the procedure on management of cytotoxic effect of produced by intracanal medicaments?

RESULTS AND DISCUSSION

From the responses obtained it was seen that 33.33% of the interns had a knowledge of intracanal medicaments being used whereas only 26.67% of final years and 10% of third years had a knowledge, Chi square test shows $p=0.000$, significant (Figure 1). 33.33% of the interns had used an intracanal medicament on the patient and only 26.67% of final years and 4.67% of third years had used a medicament, Chi square test shows $p=0.000$, significant (Figure 2). 21.33% of the final years said that they use an intracanal medicament for all patients whereas 20.67% of interns and 4% of third years have given a response of yes, Chi square test shows $p=0.000$, significant (Figure 3). 30.67% of interns, 22.67% of final years, 4.67% of third years knew the mechanism of action of the medicament (Figure 4). 33.33% of interns, 33.33% of final years and 8.67% of third years were aware of the term cytotoxicity, Chi square test shows $p=0.000$, significant (Figure 5). 30.67% of interns, 32% of final years and 29.33% of third years have never placed an intracanal medicament more than 2 weeks, Chi square test shows $p=0.337$, not significant (Figure 6).

22% of interns,32% of final years and 30.67% of third years never take a swab or a radiograph to ensure the activity of the medicament, Chi square test shows $p=0.000$, significant (Figure 7). 26.67% of interns, 31.22%

of final years and 30.67% of third years have never faced a complication due to long duration of placement of the medicaments, Chi square test shows $p=0.058$, not significant (Figure 8). 31.33% of interns, 27.33% of final years and 12% of third years were aware of the cytotoxic effects of the medicament being used, Chi square test shows $p=0.000$, significant (Figure 9). 6% of the interns, 30% of the final years and 33.33% of the third years weren't aware of the procedure of management of the cytotoxic effects produced, Chi square test shows $p=0.000$, significant (Figure 10).

Figure 1: Bar graph denotes association between year of study of the participants and number of students who have knowledge on the available intracanal medicaments. X axis denotes the year of study of the participants and Y axis denotes the number of dental students. Majority of the interns have given a response of yes (green) and majority of the third years have given a response of no (blue). Chi square test shows $p=0.000$, significant. Hence proving that there is significant association between the year of study of the participants and number of dental students who have knowledge on the available intracanal medicaments
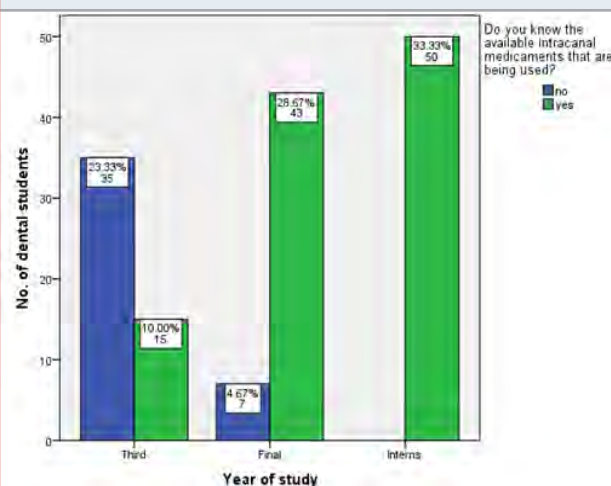
It was seen that in our study 33.33% of the interns had a knowledge of intracanal medicaments being used whereas only 26.67% of final years and 10% of third years had a knowledge. It was said that Intracanal medicaments have traditionally gone hand-in-glove with endodontics. They are generally considered to be an integral part of treatment and important to the success of root canal therapy (Yassen, Eckert and Platt, 2015; Afkhami et al., 2019). Various other medicaments like calcium hydroxide, phenolic preparations, formaldehyde, chlorhexidine (CHX), halogens, and steroids preparation are also being used nowadays (Iftekhar, Kumar and Tamanna, 2019). 33.33% of the interns had used an intracanal medicament on the patient and only 26.67% of final years and 4.67% of third years had used a medicament in the study conducted. In contaminated canals generally placement of an intracanal dressing to the full length of the canal is the treatment of choice. Intracanal medication is placed in teeth with large

periapical lesions and in cases where it is necessary to control the passage of periapical exudates into the canal (Tanomarufilho, Leonardo and Bezerradasilva, 2002).

Figure 2: Bar graph denotes association between year of study of the participants and number of students who have used an intracanal medicament. X axis denotes the year of study of the participants and Y axis denotes the number of dental students. Majority of the interns have given a response of yes (green) and majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and number of dental students who have used an intracanal medicament

Figure 3: Bar graph denotes association between year of study of the participants and number of students who use an intracanal medicament for all patients. X axis denotes the year of study of the participants and Y axis denotes the number of dental students. Majority of the interns have given a response of yes (green) and majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and number of dental students who use an intracanal medicament for all patients
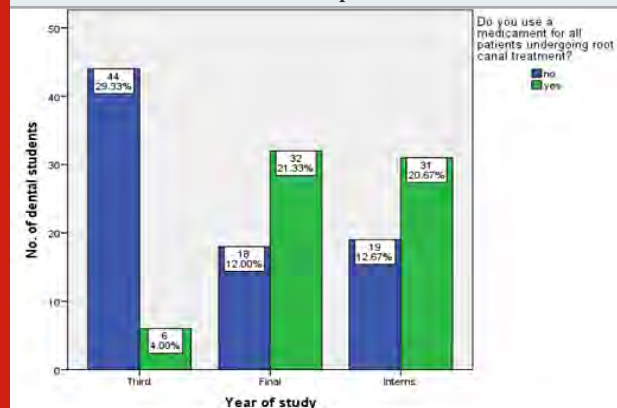
Figure 4: Bar graph denotes association between year of study of the participants and number of students who had knowledge on the mechanism of action of the medicaments. X axis denotes the year of study of the participants and Y axis denotes the number of dental students. Majority of the interns have given a response of yes (green) and majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and number of dental students who had knowledge on the mechanism of action of the medicaments

Figure 5: Bar graph denotes association between year of study of the participants and number of students who are aware of the term cytotoxicity. X axis denotes the year of study of the participants and Y axis denotes the number of dental students. Majority of the interns and final years have given a response of yes (green) and majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and number of dental students who are aware of the term cytotoxicity
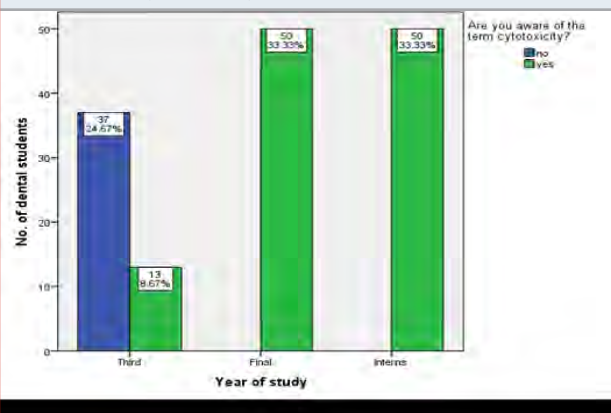
In our study, 21.33% of the final years said that they use an intracanal medicament for all patients whereas 20.67% of interns and 4% of third years have said a yes. Intracanal dressing is mostly indicated in teeth with a

large periapical lesion and where there is a necessity to control the passage of periapical exudates into the canal (Tanomarufilho, Leonardo and Bezerradasilva, 2002). Ahamad et al. stated that the proportion of those who used Intra canal medicaments after cleaning and shaping of vital cases (65.1%) was significantly greater than that of those who did not do so (34.9%) (Madarati et al., 2017).From our results, 30.67% of interns, 22.67% of final years, 4.67% of third years knew the mechanism of action of the medicament. Studies prove that intra canal medicaments are used to relieve inflammation of pulpal or periapical tissues, to neutralize tissue debris, and to obstruct microleakage from temporary restorations and dry weeping canals (Chong and Pitt Ford, 1992).

Figure 6: Bar graph denotes association between year of study of the participants and number of students who place an intracanal medicament more than 2 weeks. X axis denotes the year of study of the participants and Y axis denotes the number of dental students. Majority of the third years have given a response of yes (green) and majority of the final years have given a response of no (blue). Chi square test shows p=0.337, not significant. Hence proving that there is no significant association between the year of study of the participants and number of students who place an intracanal medicament more than 2 weeks
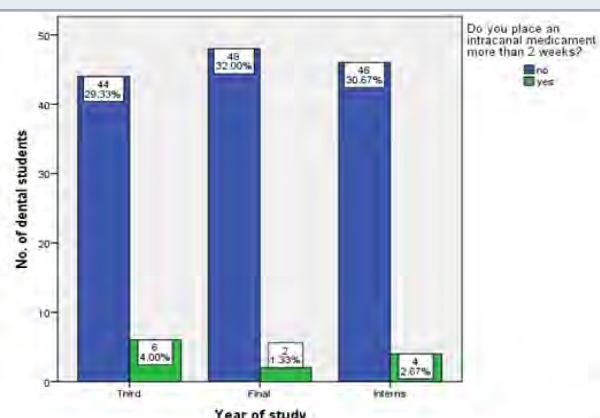
The medicament should only be used for root canal disinfection as a secondary to mechanical cleaning and shaping (Chong and Pitt Ford, 1992; Kawashima et al., 2009). Highest proportion of respondents (53.7%) used the medicaments for the disinfection of root canals (Madarati et al., 2017). From our results it was seen that 33.33% of interns, 33.33% of final years and 8.67% of third years were aware of the term cytotoxicity. It was seen that most third years were not aware of the term as being newly introduced to clinical subjects it requires experience and time to get used to terms and clinical case managements.

In our study, 30.67% of interns, 32% of final years and 29.33% of third years have never placed an intracanal medicament more than 2 weeks. Chong et al highlighted the application of intracanal medicament for asepsis control and disinfection of infected root canals (Chong

and Pitt Ford, 1992). From the results obtained it was seen that 22% of interns,32% of final years and 30.67% of third years never take a swab or a radiograph to ensure the activity of the medicament. Failure of endodontically treated teeth is usually caused by opportunistic or more resistant microorganisms such as Enterococcus faecalis, Candida albicans. Considering the existence of resistant strains in failed endodontic cases, most endodontists relied on calcium hydroxide (79%) and antibiotics (21%) (Madarati et al., 2017).

Figure 7: Bar graph denotes association between year of study of the participants and number of dental students who take swabs/radiographs to ensure the activity of the medication. X axis denotes the year of study of the participants and Y axis denotes the number of dental students. Majority of the interns have given a response of yes (green) and majority of the final years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between year of study of the participants and number of dental students who take swabs/radiographs to ensure the activity of the medication
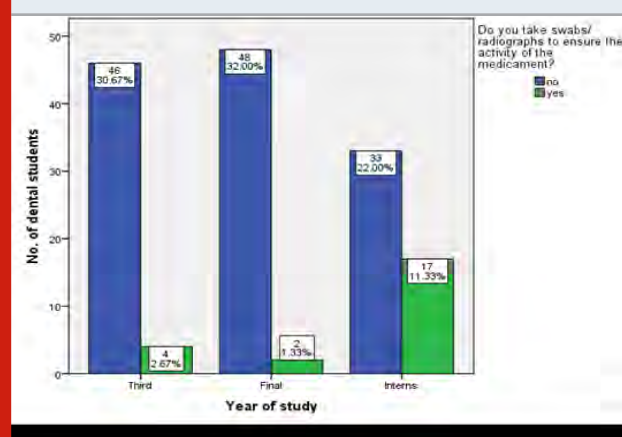
In our study conducted, 26.67% of interns, 31.22% of final years and 30.67% of third years have never faced a complication due to long duration of placement of the medicaments. In vitro studies have proved that dentin can inactivate the antibacterial activity of Calcium hydroxide. It is seen that the number of bacterial colonies in the canals increased even after 1 week of placing calcium hydroxide within the canal. Studies have also indicated that Calcium hydroxide could not predictably eliminate bacteria or that cultures changed from negative to positive after placement of calcium hydroxide intracanal medicament (Peters et al., 2002; Waltimo et al., 2005).

31.33% of interns, 27.33% of final years and 12% of third years were aware of the cytotoxic effects of the medicament being used in our study. Allergic reactions, anaphylactic shock, contact dermatitis, urticaria have been reported following direct contact of medicament to mucosal tissue or open wounds (Okano et al., 1989). When looking into the potential toxicity of surviving cells in the periapical region there is major concern as

these medicaments are in direct contact with periapical tissue and a cytotoxic medicament can lead to DNA damage of conjunctive cells eventually leading to prevention and retardation of healing along with other phenotypic changes which damages the tooth or either causes root anal failure (Geurtsen and Leyhausen, 1997). Placement of intracanal medicament in root canals that contain vital pulp tissue as these are not infected before instrumentation or in contaminated canals which are cleaned and shaped with proper instrumentation technique is said to not require medicaments. However, if a root canal is heavily infected before instrumentation, it is highly probable that a few bacteria will remain (Tanomarufilho, Leonardo and Bezerradasilva, 2002; Zerella, Fouad and Spångberg, 2005).

Figure 8:Bar graph denotes association between year of study of the participants and number of dental students who have faced a complication due to placement of the medicament into the root canal for a longer duration. X axis denotes the year of study of the participants and Y axis denotes the number of dental students. Majority of the interns have given a response of yes (green) and majority of the final years have given a response of no (blue). Chi square test shows p=0.058, not significant. Hence proving that there is no significant association between year of study of the participants and number of dental students who have faced a complication due to placement of the medicament into the root canal for a longer duration
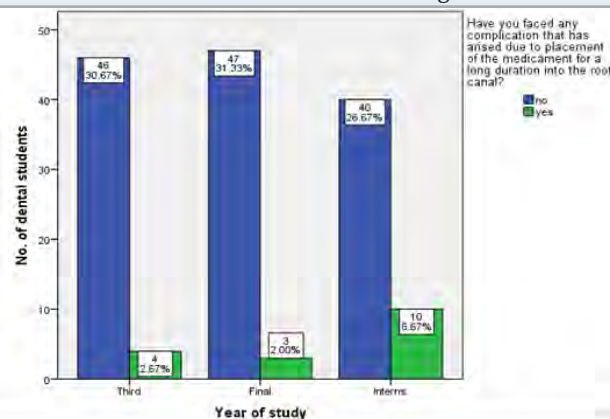
From our results, 6% of the interns, 30% of the final years and 33.33% of the third years weren't aware of the procedure of management of the cytotoxic effects produced. Root canal medicaments should be biocompatible since they may get in contact with the periapical tissues. The direct contact and the medicament over time could induce cytotoxic damage to cells and tissues and subsequently affect the outcome of the root canal treatment if placed for a very long period of time (Peters et al., 2002; Basrani et al., 2003).

Thus it is recommended to use medicaments of proper composition and placement only for the required period of time and not more than that (generally not preferred more than 2 weeks). In case of placement beyond the required time, a radiograph or a swab can be taken to

ensure that periapical tissues are not damaged. In certain cases the tooth might require Nonsurgical management if the damage is extreme (Fernandes and Ataide, 2010). Analysing the benefits and risks associated with the use of these medicaments is of extreme importance most specifically in regenerative endodontic procedures because the residual stem cells may get damaged (Selis et al., 2019).

Figure 9: Bar graph denotes association between year of study of the participants and number of dental students who are aware of the cytotoxicity of the medicament they use. X axis denotes the year of study of the participants and Y axis denotes the number of dental students. Majority of the interns have given a response of yes (green) and majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and number of dental students who are aware of the cytotoxicity of the medicament they use

Figure 10: Bar graph denotes association between year of study of the participants and number of dental students who are aware of the method to manage the cytotoxic effects produced by the medicament. X axis denotes the year of study of the participants and Y axis denotes the number of dental students. Majority of the interns have given a response of yes (green) and majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and number of dental students who are aware of the method to manage the cytotoxic effects produced by the medicament

Knowledge on the available intracanal medicaments would help the practitioners to use the apt material as an intracanal medicaments in every different clinical situations (Manohar and Sharma, 2018). The limitation was the study is that the study was conducted only in one city (Chennai) and may not be generalized to other regions.

CONCLUSION

Within the limitations of the study it was seen that Knowledge, awareness and practice on the cytotoxicity of intracanal medicaments was higher among interns, followed by the final years and then third years. This is because of the clinical expertise that the interns have acquired through clinical experience and clinical practice.

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Awareness About Pictorial Warnings on Tobacco Products Among Tobacco Users – A Questionnaire Study

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ABSTRACT

The World Health Organization has named tobacco products as one of the greatest causes for several diseases in the world . It has been estimated that 100 million deaths were caused by tobacco and its products in the 20th century. If this situation continues , there will be up to one billion deaths in the 21st century. The cigarettes packages serve as a cornerstone of tobacco marketing and advertising campaigns. The aim of this study is to assess the awareness about pictorial warnings on tobacco products in tobacco users among outpatients department of Private Dental college.The current study was a questionnaire based and it was conducted in the Saveetha Dental college ,Chennai,India . Nearly 180 tobacco users were recruited from the random sampling method .Only systemically healthy individuals with good mental health participated in the study. The data was collected by a self designed , close ended structure questionnaire which comprised 21 questions and was prepared and given to the participants. The results obtained from the participants were analysed and interpreted .Most of the study participants were males with the mean age of 30-50 years and 89% of the participants were aware of statutory and pictorial warnings present on the tobacco products. Majority of the subjects (75%) said pictorial representation on the tobacco packets does not refrain them from i tobacco intake. The pictorial warnings are helpful to some extent but require more strengthening to make pictorial health warnings easier to comprehend to assess the deleterious effects of tobacco by its consumers and general public.

KEY WORDS: TOBACCO, SMOKELESS TOBACCO, PICTORIAL WARNING, AWARENESS, KNOWLEDGE, HARMFUL EFFECTS.

INTRODUCTION

The World Health Organization (WHO) has named tobacco and its products is the world's greatest cause for several diseases . It has been estimated about 100 million deaths caused by tobacco and its products in the 20th century(World Health Organization, 2008). If this situation continues , there will be up to one billion deaths in the 21st century. The cigarettes packages serves as a cornerstone for tobacco marketing and also for the advertising campaigns (Afifi et al., 2020)

In several countries Cigarette packages carry many health warnings. Tobacco has been the first and most perilous killer of humanity in our country(Loyola, 2008). Most of the tobacco stakeholders, caretakers, producers, tobacco farmers, including tobacco consumers, all of them suffer from multiple chronic health diseases (van Mourik et al., 2020). The outcome of tobacco products is decreased life

span and a premature miserable death(Kuehnle, 2019). The major consequences of using smoked or smokeless tobacco on the oral cavity starts initially from tobacco stains on the tooth, periodontal diseases, , tooth loss and later leads to life-threatening oral cancer preceded by premalignant red and white lesions.(Ilankizhai and Leelavathi, 2018) 80% of death occurs mainly due to the consumption of tobacco. India is one among the countries with the highest use of tobacco(T, Thejus and Jayakrishan, 2009). Tobacco packages which are left in public view between users may help in curbing passive smoking as it serves as portable advertisement making nonsmokers aware of deleterious effects of inhaling tobacco smoke(Majumdar, Kumar and Selvaraj, 2017).

Many approaches have been tried to prevent and control the use of tobacco both at individual and community level. (Harini and Leelavathi, 2019) The primary goal of tobacco control policy is to communicate the hazardous effects of tobacco and also the warning labels on tobacco products help in communicating the consequences of tobacco use and also bring about behavioral changes such as quitting or reducing the tobacco consumption(Kuehnle, 2019). Tobacco packaging is not removed and discarded but it is used as a container until the contents have been consumed (Aghi et al., 2012). Therefore, warnings on tobacco packages that combine text and pictures are one of the best and effective methods to increase public awareness of the serious and hazardous health risks of tobacco use and to reduce its consumption (Arora et al., 2012).

The introduction of pictorial health warnings plays the most notable regulatory development in labelling of the products . The pictorial health warnings meant to help users visualize the nature of tobacco-related diseases(Kennedy et al., 2016). In India, the new pictorial health warnings notification was issued on October 15, 2014, but mandatory display of new health warnings covering 85% of the display area on all tobacco products was notified on September 24, 2015, This made India 3rd among countries with largest pictorial warnings on tobacco products. This initiation of prevention was implemented by the Health Ministry, from April 1 2016, on all forms of tobacco products(Kennedy et al., 2016; Cho et al., 2018). Moreover, in a country like India, where most of the people are illiterate hailing from different cultural and linguistic backgrounds, pictorial warnings along with text can help to break cultural, regional, and language barriers.(Sutton, 1999)

A successful image is that communication being transmitted to the brain is visual; it must tell the viewer the intended story, entirely by visual means of communication(Fong, Hammond and Hitchman, 2009). The visual communication has much more immediate impact than the text because text requires conscious processing and images do not need, which facilitate to empower people to make strong associations between health messages and their perceptions(Shang et al., 2015).

This study was done from the Department of the Public Health Dentistry, in a Saveetha Dental college ,Chennai,India. Since Chennai is a famous city which consists of major population from different states, the public in this area or near to these places coming with dental problems and oral health problems are more prone to get habituated to various forms of tobacco(Patturaja, Leelavathi and Jayalakshmi, 2018; Kuppusamy Sundaram Murthy and Leelavathi, 2019; Shankar and Leelavathi, 2019; Sriram and Leelavathi, 2019).

Figure 1: Depicts the gender of the participants. Blue colour represents males and green colour represents females .Males were more prevalent in tobacco use when compared to females
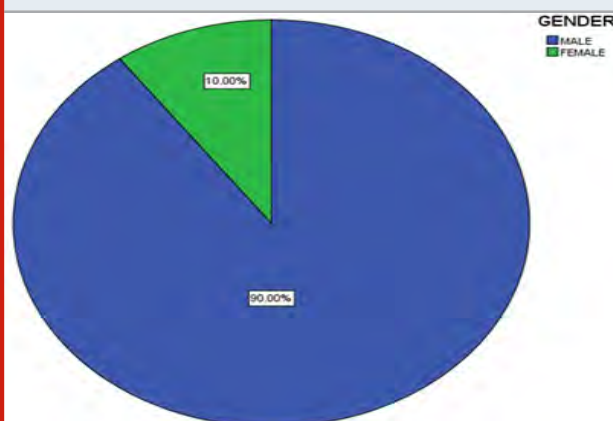
Figure 2: Depicts the age groups of the participants . Pink colour denotes 20-30 years of age. Blue colour denotes 30-50 years of age and Brown colour denotes more than 50 years of age . It is evident that participants between 30-50 years of age were found to be more prevalent
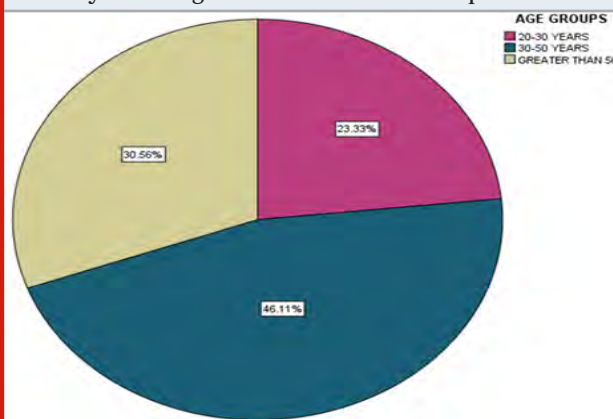
We have successfully completed numerous epidemiological studies for the betterment of our community (Prabakar, John, Arumugham, Kumar and Sakthi, 2018a, 2018b; Prabakar, John, Arumugham, Kumar and Srisakthi, 2018; Vishnu Prasad et al., 2018; Khatri et al., 2019; Manchery et al., 2019; Shenoy, Salam and Varghese, 2019). Hence the aim of this study is to create and assess the awareness about pictorial warnings on tobacco products in tobacco users .

Figure 3 represents the educational status of the participants. Pink colour denotes educational status up to primary. Orange colour denotes the educational status up to secondary . Grey colour denotes the graduate . The status upto secondary education was found to be more prevalent than other qualifications
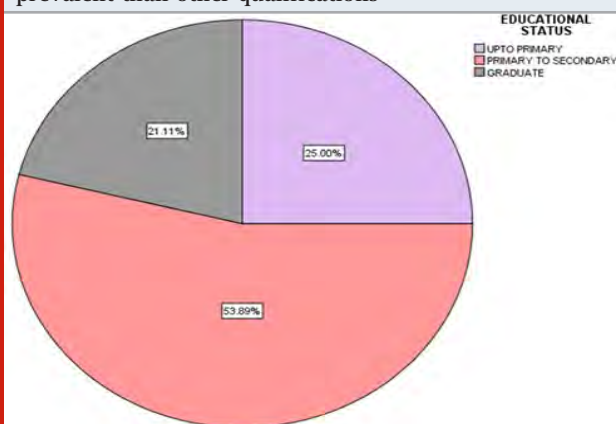
Figure 4 depicts the Awareness of warning signs on tobacco products among subjects . Blue colour denotes yes . Red colour denotes no. It is evident from the pie chart that almost 89% of the participants were aware of it and only 11% were unaware of it
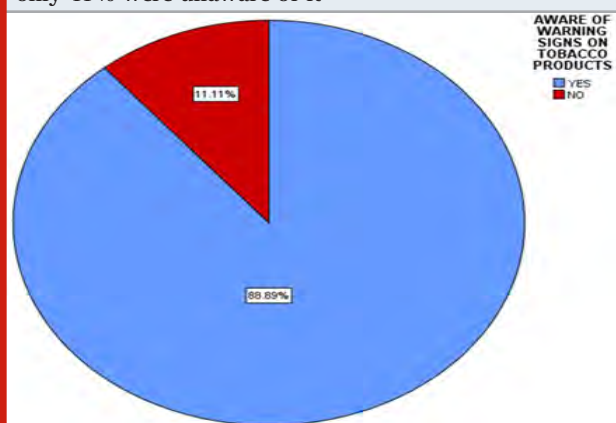
MATERIAL AND METHODS

It is a questionnaire based study that was conducted in the Saveetha Dental college ,Chennai, India . Nearly180 tobacco user subjects were recruited from the random sampling method .Only systemically healthy individuals with good mental health were participated in this study .Data were collected by the means of self designed , close ended structure questionnaire including 20 questions based on demographic details, knowledge about tobacco products, practices of tobacco habits, Awareness on tobacco products etc. Any Suggestions regarding the improvement in pictorial warning on tobacco products also welcomed from the participants. The data was entered in a methodological manner and it was tabulated in an excel sheet. The tabulated data was imported and compiled for statistical analysis using SPSS software and interpreted.

Figure 5: Represents the participants' knowledge of which side the pictorial warning should be present. Green colour denotes front. Violet colour denotes back. Light Green colour denotes sides . It is evident that nearly 49% answered pictorial warning should be present in front and 36% answered for back and the rest answered for sides
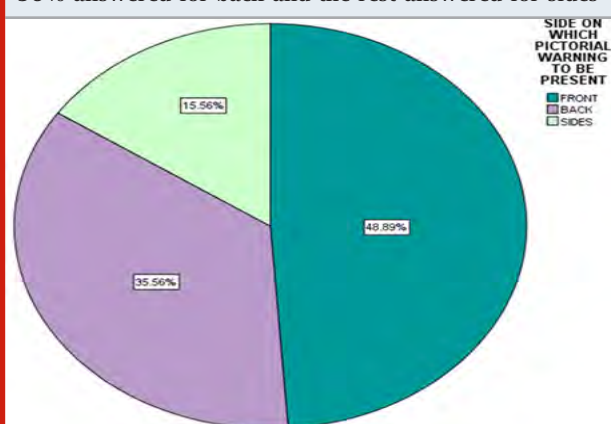
Figure 6: Depicts the association of age and awareness of warning signs on tobacco products among the participants. The x- axis represents the age groups of the participants. The y - axis denotes the number of responses. It is evident from the graph that most of the participants were aware about the warning signs on tobacco products in all age groups but some of the participants above 50 years of age were not aware of it .(Pearson chi square test = 51.136 , P Value = 0.00 , statistically significant)
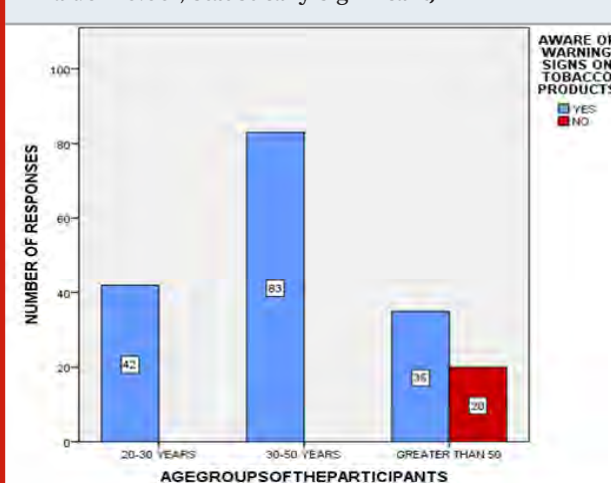
RESULTS AND DISCUSSION

The use of tobacco products was most commonly found among males between 30-50 years of age [figure 1 and 2]. The educational qualification upto secondary was more prevalent than primary[figure 3]. The usage of tobacco products was more prevalent among daily wages. The most commonly used tobacco products were cigarettes and the habit was found to be more than 5 years with the frequency of 5-10 times a day. The participants were aware about the causative nature of tobacco products [figure 4]. The participants have not taken any steps to

get rid of the habit but they are willing to participate in tobacco cessation programs and 90% of the participants were satisfied with the warning signs. Almost 70% of the participants answered that warning signs on reducing the habit did not cause any impact and did not refrain them from tobacco use and nearly 40% of the participants stated that pictorial warning of skull and bone had more

impact. The steps taken by the government were also not sufficient to educate the public even though the pictures which were in the packages were self explanatory and readable and 79% of the participants answered that the warning text should be made in different languages and the rest said it should not be made in different languages. [Table 1].

Figure 7: Depicts the association of educational status of the participants and steps taken to get rid of the habit by the participants. The x axis denotes educational status of the participants and y axis denotes number of responses . From the graph it is evident that the participants who are under primary qualification have not taken any steps to get rid of their habits but the participants whose educational qualification is more than secondary have taken some steps to get rid of the habit .(Pearson chi square test = 116.377, P Value = 0.00 , statistically significant)
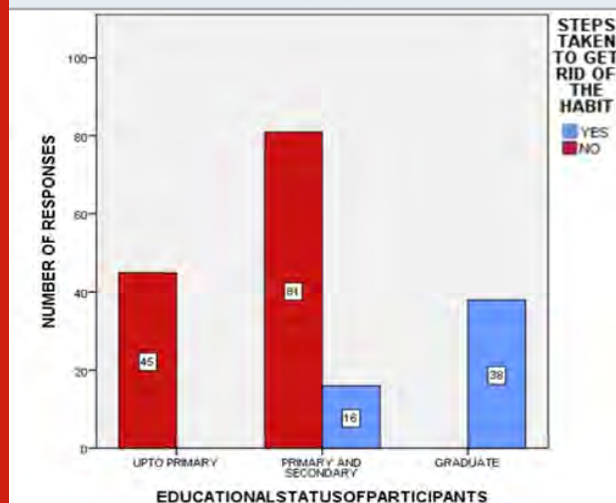
Figure 8: Depicts the association of age groups and tobacco intake refraining due to pictorial warning. The x axis denotes the age group of participants and y axis denotes the number of responses. Only the participants who are above 50 years of age were refrained from tobacco intake when compared to other age groups (Pearson chi square test =136.364, P Value = 0.00 , statistically significant)
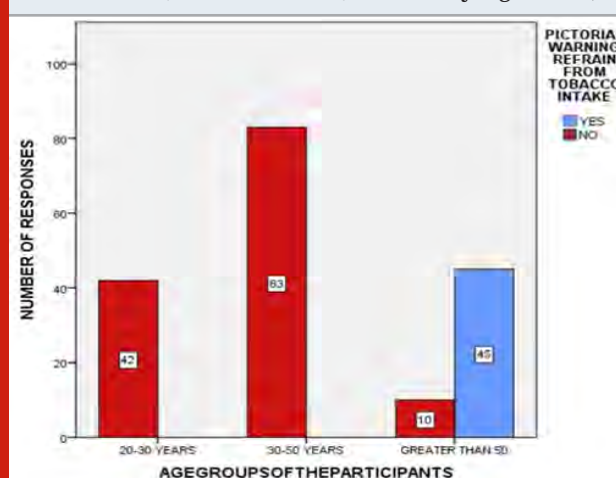
Table 1. Practice and Attitude of the participants

QUESTIONS	RESPONSES	COUNT	PERCENTAGE
Have you taken any steps to get rid of the usage?	yes	54	28.9%
	No	126	67.4%
Are you satisfied with the warning signs on tobacco products?	yes	18	9.6%
	no	162	86.6%
Is there any effect of warning signs on reducing the habit?	yes	54	28.9%
	no	126	67.4%
Do you think pictorial warning of the skull and bone had more impact?	yes	72	38.5%
	no	108	57.8%
Did pictorial warning refrain you from tobacco intake?	yes	45	24.1%
	no	135	72.2%
Are you willing to participate in the tobacco cessation program?	yes	144	77%
	no	36	19.3%
Do you think steps laid down by the government to educate the public are adequate?	yes	127	67.9%
	no	53	28.3%
Do you think warning pictures are self explanatory?	yes	131	70.1%
	no	49	26.2%
Is the warning text readable?	yes	92	49.2%
	no	89	47.1%
Do you think warning text should be made in different languages?	yes	142	75.9%
	no	38	20.3%

Almost 49% answered pictorial warning should be present in front and 36% answered for back and the rest answered for sides [figure 5] .By correlating the association of age and awareness of warning signs on tobacco products among the participants it is evident that most of the participants were aware about the warning signs on tobacco products in all age groups but more prevalent with the mean age of 30-50 years [figure 6]. By correlating the association of educational status of the participants and steps taken to get rid of the habit by the participants. It is evident that the participants

who are under primary qualification have not taken any steps to get rid of their habits but the participants who are graduate have taken some steps to get rid of the habit [figure 7]. By correlating the association of age groups and pictorial warning refrain from tobacco intake it was found that pictorial warning did not refrain from the habit and more prevalent in 30-50 years of age [figure 8].

DISCUSSION

In the present study, 90% of the participants were found to be males than females with the age group of 30-50 years [figure 1 and 2]. The educational status of the participants was more prevalent in primary – secondary education [Figure 3] . Most of the tobacco users were found to be daily wages . The prevalence of cigarettes was found to be higher than bidi and smokeless tobacco users. It could be explained by the fact that Chennai was a city and bidi smoking is usually more prevalent in rural areas. Thus the Cigarette smoking was the highest among study participants. The result of the present study was in concordance with the study done by Rahman et al.(Rahman et al., 2015) .Similar results were obtained from the study conducted by karingannanavar et al and chopra et al.(Chopra et al., 2014).

Regarding the time and frequency of usage the tobacco products were used by the participants more than 5 years with the frequency of 5-10 times per day. More than two-third of the respondents were aware of the statutory and pictorial warnings. This finding is comparable to the previous studies done to assess the awareness of health warnings which were found to be 89.9%, 74%, and 73.4% according to study done by Raute et al , Bhat and Kumar and Karibasappa et al .respectively.(Raute, Pednekar and Gupta, 2009; Oswal et al., 2011). The harmful effect of tobacco products, it was found that the bidi smoking is more harmful as compared to cigarettes. People believe that due to the presence of filters and more refined forms of tobacco, cigarettes have less harmful effect(T, Thejus and Jayakrishan, 2009).

Nearly 30% of the participants took steps to get rid of the habits even though they are not satisfied with the warning signs on tobacco products. About 70% respondents could understand pictorial warnings but found them ineffective in shunning the habit and also a disappointing and realistic fact is that the pictorial warning of skull and bone did not have any impact and had a little refrain on the users. The results of our study were found to be in concordance with the study conducted in Mumbai by Oswal et al, Arora et al ,Chopra et al. which suggest that pictorial warnings that exist on tobacco packs are perceived to be ineffective by the Indian population.(Aghi et al., 2012)(Oswal et al., 2011). A very high percentage (80%) of people indulge in tobacco habit wishes by participating in anti-tobacco and tobacco cessation programs. It shows that if we plan to organise some anti-tobacco or cessation programs in future, it will have great success. our responsibility regarding anti-tobacco programs should not be just limited to

adding pictures and text warnings on tobacco products. (Ilakkuvan et al., 2018).

In the current study the steps laid down by the government to educate the public were not adequate . Continued use of ineffective warning pictures and warning signs on tobacco products add on light to the missed opportunities as the government failed to effectively and efficiently utilise this strategy to amplify knowledge about the tobacco health hazards among the public, in addition to another educational interventions, for example anti-tobacco advertising employed by the ministry of health and family welfare in India(Vogel, 2011). It was found that pictorial warnings were self explanatory and readable. The whole objective is to communicate not only with tobacco users but also with prospective quitters and probable initiators.(Sternberg, 1988) 79% suggested that the warning text can be made in different languages. [Table 1]. The text and warning signs should be made in the front page of the package of the products [figure 5] .

By correlating the association of age and awareness of warning signs on tobacco products among the participants.. It is evident that most of the participants were aware about the warning signs on tobacco products in all age groups but higher with the mean age of 30-50 years [figure 6]. By correlating the association of educational status of the participants and steps taken to get rid of the habit by the participants. It is evident that the participants who are under primary qualification have not taken any steps to get rid of their habits but the participants whose educational qualification is more than secondary have taken some steps to get rid of the habit [figure 7]. By correlating the association of age groups and pictorial warning refrain from tobacco intake it was found that pictorial warning did not refrain from the habit and more prevalent in 30-50 years of age .

This cross sectional study limits the assessment of reduction of tobacco habits among study samples. Second, this study is single hospital based rather than being population based which hinders the better understanding of the problem. Keeping all these limitations in mind we should plan some more studies on varied samples in future.

CONCLUSION

The pictorial warnings are helpful to some extent but require more strengthening to make pictorial health warnings easier to comprehend to assess the deleterious effects of tobacco by its consumers and general public. The visual communication has much more immediate impact than the text because text requires conscious processing and images do not, which facilitate to empower people to make strong associations between health messages and their perceptions.

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Knowledge and Awareness on Various Suturing Techniques Used in Minor Oral Surgeries Among Dental Students

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ABSTRACT

There are oral surgical procedures that are part of the broad scope of general dentistry. These include routine oral surgery such as the extraction of teeth, suturing wounds, and biopsying suspicious soft tissue lesions. The ability to suture is one of the essential skills required of anyone planning to perform surgery.Learning to suture in an expert manner requires an understanding of the proper techniques and dedicated practice. The aim of the study is to evaluate the knowledge and awareness on various suturing techniques used in minor oral surgeries among dental students. An online questionnaire was prepared and circulated among the students of dental colleges.The sample size is 100. The data was tabulated and then imported to SPSS software by IBM and the statistical chi square test was done. 91% of the students were aware of the various suturing techniques practiced in dentistry. 47% of the students use simple continuous suturing technique in their practice.When the correlation was done between best suture material and best time for suture removal, P value was 0.000 which was statistically significant. Within the limits of the study, dental students were aware of various suturing techniques used in minor oral surgeries.

KEY WORDS: DENTAL STUDENTS, SUTURE MATERIAL, ORAL SURGERIES, SUTURING TECHNIQUE.

INTRODUCTION

Successful dental suturing in oral surgery is dependent on accurate coaptation of the flaps. Various methods and materials like sutures, stents, paste dressings, tissue tacks and adhesives have been used for precise flap placement. Suturing has remained the most popular method (Andrade, Weissman and Reis, 2006). The term "suture" describes any strand of material utilized to ligate blood vessels or approximate tissues. The technique of closing wounds by means of needle and thread is several thousand years old ('Atlas of cosmetic and reconstructive periodontal surgery', 1995). The history of surgical sutures can be traced back to ancient Egypt, and the literature of the classical period contains a number of descriptions of surgical techniques involving sutures (Marsh, 2001). Before catgut became the standard surgical suture material towards the end of the 19th century, many different paths had been followed to find a suitable material for sutures and ligatures (Gomez, 2007). Materials that had been tried included gold, silver and steel wire, silk, linen, hemp, flax, tree bark, animal and human hair, bow- strings, and gut strings from sheep and goats. At the beginning of the 19th century metal threads were tested as suture material(Wilson, 2006; Gomez, 2007).

At that time inertness of a material with respect to body tissues was considered an advantage. Nevertheless, metal threads had major disadvantages: their stiffness rendered knot- tying more difficult and could easily result in knot breakage; in addition, suppuration of the wound edges occurred frequently (Howe and Zamet, 1971). These negative experiences with metal contributed to the establishment of silk as the number one suture material(Kim et al., 2011). Wounds sewn with silk cicatrized within a few days, and the small knot caused no problems. For these reasons most surgeons at that time chose silk for sutures and vessel ligatures(Siervo, 2008).

A variety of suture materials and suture/needle combinations are available. The choice of suture for a particular procedure is based on the known physical and biologic characteristics of the suture material and the healing properties of the sutured tissues(Dragovic et al., 2020). The selection of suture material is based on: The condition of the wound, the tissues to be repaired, the tensile strength of the suture material, knot-holding characteristics of the suture material, and the reaction of surrounding tissues to the suture materials(Postlethwait, Willigan and Ulin, 1975).

Suturing is an important aspect of any dental or surgical procedure where there is either cutting or injury to the soft tissue in the oral cavity(Taylor and Bayat, 2003). Proper placement of sutures can help in faster and proper healing of the tissues involved(Trimbos, Van Rijssel and Klopper, 1986). It helps in primary healing of the wound site and also prevents any secondary infections. It is very important to note that the selection of the correct type of suture needle in dentistry is as important as the suturing technique as it helps in properly piercing and also maintaining the integrity of the tissue(Malik, 2016).

With a rich case bank established over 3 decades we have been able to publish extensively in our domain (Abdul Wahab et al., 2017; Eapen, Baig and Avinash, 2017; Patil et al., 2017; Jain and Nazar, 2018; J et al., 2018; Marimuthu et al., 2018; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019; Senthil Kumar et al., 2019; Sweta, Abhinav and Ramesh, 2019). Based on this inspiration we aim to estimate the knowledge and awareness on various suturing techniques used in minor oral surgeries among dental students.

MATERIAL AND METHODS

An online questionnaire was prepared and circulated among the adolescent population. This questionnaire was prepared using a survey planet. The questionnaire consists of 12 questions. The sample size for the study was 100. It was an online setting where two reviewers are involved in this study for the validity checking of the questionnaire.The data was collected, verified, tabulated and analysed. All statistical analysis was done using SPSS by IBM.The statistical Chi square test was done, where if the p value is found out to be less 0.05, it is statistically significant. The data was imported to SPSS

and the descriptive statistics with frequency analysis was done. The obtained data were represented graphically as bar charts. The dependent variables considered for the study are dental students, suturing, minor oral surgeries and the independent variables are the cause of the treatment and age of the patient.

RESULTS AND DISCUSSION

A total of 100 dental students participated in this survey. When asked if the students were aware of various suturing techniques practiced in dentistry, 91% of the students were aware and 9% of the students were not aware of various suturing techniques practiced in dentistry (Figure 1).

Figure 1: Bar chart showing responses to the question, "Are you aware of the various suturing techniques practiced in dentistry?". X axis represents the awareness on various suturing techniques practised in dentistry and Y axis represents the number of dental students participated in the survey.Majority of respondents reported "aware"(91%). Blue indicates "aware" and green indicates " not aware"
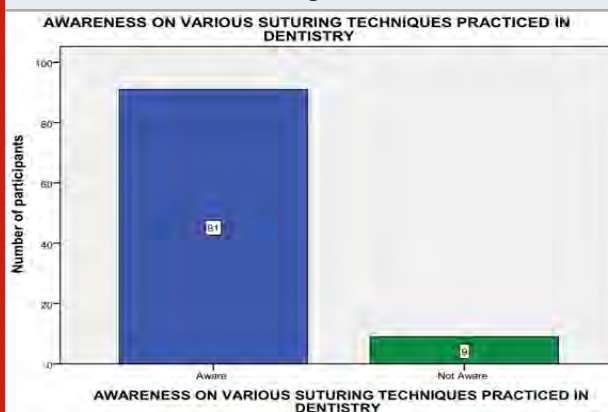
Figure 2: Bar chart showing responses to the question, " Which suturing technique do you use?". X axis represents the suturing technique used by the dental students and Y axis represents the number of dental students participated in the survey.Majority of respondents reported "simple continuous suturing technique"(47%). Blue indicates "Interrupted" , green indicates " simple continuous", white indicates "vertical mattress", violet indicates "horizontal mattress" and red indicates "criss cross"
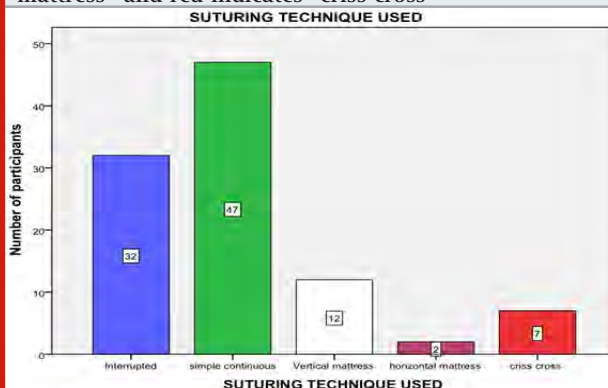
A study given by Koshak HH, 2017(Koshak, 2017), states that knowledge of the suture, needles (type, size, shape), instruments, and techniques are absolutely necessary in order to be a competent surgeon. There is no suture superior to the others in each aspect. The differences in terms of tissue reaction and bacterial adhesion between sutures should be always considered in the selection of the appropriate suturing material.

Figure 3: Bar chart showing responses to the question, "Which one of the following suturing techniques, do you think is the best?". X axis represents the best suturing technique in the opinion of dental students and Y axis represents the number of dental students participated in the survey. Majority of respondents reported "Interrupted suturing technique"(75%). Blue indicates "Interrupted" , green indicates " simple continuous", white indicates "vertical mattress", violet indicates "horizontal mattress" and red indicates "criss cross"
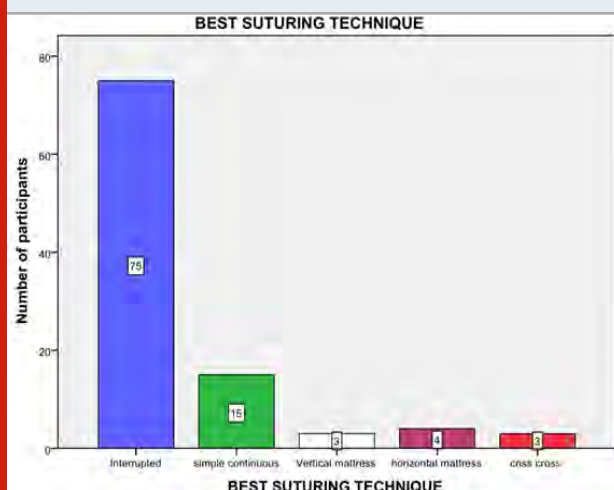
The students were asked about the suturing technique they prefer, where 47% of the students prefer simple continuous suturing technique, followed by interrupted suturing technique with 32%, vertical mattress suturing technique with 12%, criss cross suturing technique with 7% and horizontal mattress technique with 2% (Figure 2). A study given by Terrence J Griffin, et. al, 2011 (Griffin, Hur and Bu, 2011), shows that simple interrupted sutures were used in the majority for each surgical procedure.This study is not consensus to the present study, because of the multiple trends and limited sample size. Simple continuous suturing technique has advantages such as more water tight closure, distributes the tension uniformly, rapid technique and only two knots with associated tags are needed.

The students were also asked about the best suturing technique , where 75% responded as interrupted suturing technique, 15% as simple continuous suturing technique, 4% as horizontal mattress technique and 3 % as vertical mattress and criss cross suturing technique each (Figure 3). A study given by Eliason JA, et.al, 1990 (Eliason and McCulley, 1990), says that interrupted sutures are easy to place, have greater tensile strength, and have

less potential for causing wound edema and impaired cutaneous circulation. Interrupted sutures also allow the surgeon to make adjustments as needed to properly align wound edges as the wound is sutured.

Figure 4: Bar chart showing responses to the question, "Which one of the following do you think is the best suture material?". X axis represents the best suture material in the opinion of dental students and Y axis represents the number of dental students participated in the survey. Majority of respondents reported "Natural"(32%). Blue indicates "Natural" , green indicates " Synthetic", violet indicates "Monofilament" and yellow indicates "Multifilament"
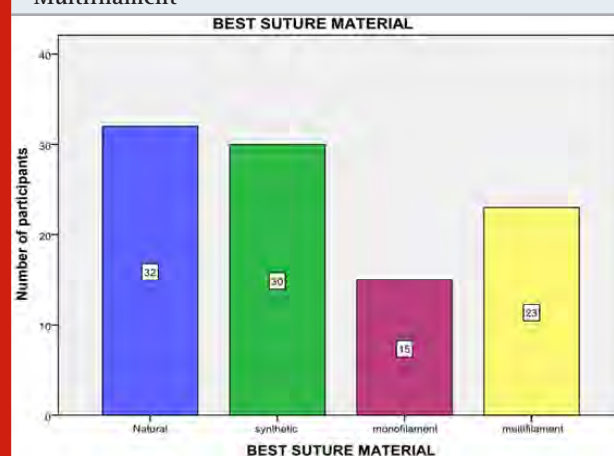
Figure 5: Bar chart showing responses to the question, "Which one of the following do you think is the best time for suture removal?". X axis represents the best time for suture removal in the opinion of dental students and Y axis represents the number of dental students participated in the survey.Majority of respondents reported "10 days"(44%). Blue indicates "1 week" , green indicates " 10 days", violet indicates " 2 weeks" and yellow indicates "more than 2 weeks"
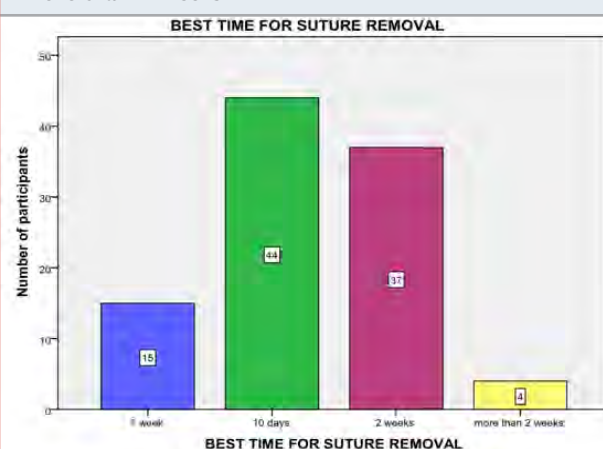
The students were asked regarding the best suture material in their opinion where 32% of students responded as natural followed by 30% as synthetic, 23% as multifilament and 15% as monofilament (

Figure 4). According to an article given by Teach me surgery,2020 (Suture Materials - Classification - Surgical Needles - TeachMeSurgery, no date), The ideal suture is the smallest possible to produce uniform tensile strength, securely hold the wound for the required time for healing, then be absorbed. It should be predictable, easy to handle, produce minimal reaction, and knot securely. Suture made of natural fibers (e.g. silk or catgut)are not regularly used as they provoke more tissue reaction, but used for securing surgical drains. Synthetic sutures (e.g. PDS or nylon) are more predictable than the natural sutures, particularly in their loss of tensile strength and absorption. Multifilament sutures (e.g braided silk or vicryl)are made of several filaments that are twisted together . They handle easier and hold their shape for good knot security, yet can cause infections. Monofilament sutures (e.g nylon, prolene).have a lower risk of infection but also have a poor knot security and ease of handling.

The students were also asked about the best time for suture removal where 44% of the students responded as 10 days , 37% of them as 2 weeks , 15% as 1 week and 4% as more than 2 weeks (Figure 5). According to the study given by Alexander T. Trott MD, 2012 (Suture Removal and Wound Aftercare, 2012), the best time for suture removal is 8-14 days. After the removal of the suture, the patient should still continue to maintain the oral hygiene tips given after the surgery for 2-3 days.

When the correlation was done between the best suture material and best time for suture removal, 32% of them chose natural suture material and 27% of them think that the best time for suture removal is 10 days. The statistical Chi square test was done and the p value was 0.000 which is statistically significant (Figure 6).

The correlation between best suturing technique and the best time for suture removal was done where 44% of the students think that 10days is the best time for suture removal and the most prevalent suturing technique was interrupted suturing technique with 74% .The statistical Chi square test was done and the p value was 0.000 which is statistically significant(Figure 7).

Figure 7: Bar graph showing the correlation between the best suturing technique and best time for suture removal. X axis represents the best suturing technique and Y axis represents the frequency of the number of dental students. Blue indicates 1 week, green indicates 10 days, violet indicates 2 weeks and yellow indicates more than 2 weeks. The graph shows that the best time for suture removal answered by the undergraduate dental students was 10 days. Chi square test was done and the association was found to be statistically significant. Pearson's value:123.872, DF:12, P value : 0.000 (P<0.05), hence significant

Figure 6 – Bar graph showing the correlation between the best suture material and best time for suture removal. X axis represents the best suture material and Y axis represents the frequency of the number of dental students. Blue indicates 1 week, green indicates 10 days, violet indicates 2 weeks and yellow indicates more than 2 weeks. The graph shows that the best time for suture removal answered by the undergraduate dental students was 10 days. Chi square test was done and the association was found to be statistically significant. Pearson's value:123.791, DF:9, P value : 0.000 (P<0.05), hence significant

Figure 8: Bar graph showing the correlation between the best suture material and best suturing technique. X axis represents the best suture material and Y axis represents the frequency of the number of dental students. Blue indicates Interrupted, green indicates Simple continuous, white indicates vertical mattress, violet indicates horizontal mattress and red indicates criss cross. The graph shows the best suturing technique answered by the undergraduate dental students which was Interrupted suturing technique. Chi square test was done and the association was found to be statistically significant. Pearson's value:91.930, DF:12, P value : 0.000 (P<0.05), hence significant.
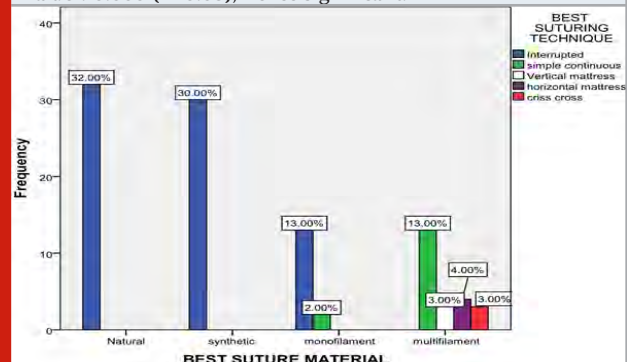
Also, the correlation between the best suture material and best suturing technique was done, where the Interrupted suturing technique showed the highest prevalence with 75% and natural suture material with 32%.The statistical Chi square test was done and the p value was 0.000 which is statistically significant (Figure 8).

CONCLUSION

Within the limits of the study, the dental students were aware of the various suturing techniques used in minor oral surgeries. More awareness should be created among the students on the suturing materials, suturing techniques and suture removal as it helps in their dental practice.Similar studies on large populations should be done in order to get the relevant results. This study will act as a guide to understand the awareness of various suturing techniques used in minor oral surgeries among dental students.

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Knowledge, Awareness, Attitude About Bio Medical Waste Management Among General Dentists and Assistants Among the Chennai Population

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ABSTRACT

The aim of the study was to demonstrate the level of knowledge, awareness, attitude about Bio Medical Waste Management among the various general dentists and assistants of the Chennai population. The study was conducted with the help of a cross sectional questionnaire through Google Forms and the target population were   dentists and their assistants of various private clinics in Chennai. The results were analysed statistically(descriptive and chisquare analysis) by using SPSS. Among 100 responses, 98% of the respondents followed the protocol at their healthcare personnel while the remaining 2% failed to practise the protocols,out of which 59% of the males have better understanding of the dental practises than females, thereby throwing   light on the existing knowledge, attitude and practice of the dental health care personnel. It indicates that there is a need to train the dental personnel regarding the same all around the country. There is a high need to urge awareness about the management of biomedical waste as inadequate and inappropriate knowledge of handling these wastes can have serious implications on the society as a whole. These bio medical waste can cause serious hazards to health and the environment. Effective bio medical waste management is not only a legal necessity but it must be considered as a social obligation.

KEY WORDS: BIO MEDICAL WASTE MANAGEMENT, AUTOCLAVE, INCINERATION, SECURED LANDFILLS.

INTRODUCTION

The Bio Medical Waste is considered to be a global issue (Cannata et al., 1997). It is as any amount of the solid, liquid waste including their containers and any other intermediate product, which is generated during diagnosis, treatment or immunization of human beings or animals, in various research activities, thereby used in the production or testing of biological and the animal wastes from slaughter houses or any other like establishments (Punchanuwat, Drummond and Treasure, 1998). In the current scenario, there is just partial or no segregation of the waste during the time of generation, which thereby could cause mixing of infectious and non infectious waste. These bio medical waste can cause serious hazards to health and the environment in cases of indiscriminate management, due to these the healthcare

personnel there is a high risk of potentially infectious diseases such as Human Immunodeficiency Virus(HIV) and Hepatitis B(HBV) and C(HCV).To avoid these health hazards ,a rigorous waste management system should be implemented in hospital infrastructure (Acharya and Singh, 2003).

The ideal ways to manage the biomedical waste include efficient segregation of different types of BMW, use of color coded and coloured bags, excellent handling and transfer of these wastes. In order to address these requirements, adequate training and awareness programmes for medical and paramedical personnel are necessary (Singh, Sood and Bhardwaj, 2015). About 40 years ago, it was suggested that in the developed countries approximately about 1-5kg of wastes were generated per bed per day, whereas in developing countries it was 1-2kg per bed per day (William A. Rutala, 2015). According to a study conducted in an Indian Hospital and published in 2005,BMW generated 2.31kg/bed/day, indicating a rise in the waste generated in recent years (Oweis, Al-Widyan and Al-Limoon, 2005).

Dental hospitals normally use instruments and materials that are directly exposed to blood and saliva which are considered to be the potential sources of infections. These include the sharps materials, used disposable items, infectious waste such as blood soaked cotton, gauze etc, lead containing wastes like lead foil packets, lead aprons and chemical wastes such as spent film developers, fixers, disinfectants (DeRoos, 1974). In the past relatively few studies were conducted in the past among dental professionals, among which a poor to good level of awareness of waste disposal were reported (Patil and Pokhrel, 2005).

From the implementation of the biomedical Waste Management Rules1998, every concerned health authority must have significant knowledge, practice and capacity to guide others for the waste collection and management and proper handling techniques (Saraf et al., 2006). The rules were amended twice in the year 2000,which made it mandatory for the health care establishments to segregate ,disinfect and dispose of their waste in an eco friendly manner. The most important prerequisite and keys to the successful waste management program is segregation which is the separation of different types of waste as per the treatment and disposal option. For effective waste management, the waste must be managed at every step, from acquisition to disposal (Sudhakar and Chandrashekar, 2008). The significance of this study is to understand the awareness among the dentists and their assistants regarding the Bio Medical Waste(BMW) Management practices,policies and to assess their attitude towards it among the Chennai population.

MATERIAL AND METHODS

The study was conducted with the help of a cross sectional questionnaire. The target population were the dentists and their assistants of various private clinics in Chennai through Google Forms in the month of November 2019. Google Forms is a survey administration app that collects and collaborates information from users via a personalized survey and automates the responses into an excel spreadsheet. The questionnaire consisted of 20 questions on assessment of knowledge, attitude and practice regarding biomedical management. All questions were close ended.The results were collected and analysed through SPSS software. The descriptive statistical analysis was carried out and chi square test was used and p values were calculated.

RESULTS AND DISCUSSIONS

Our results showed that 61% of the study population were males and 39% were females (Figure 1) and 98% of the respondents reported that they follow the protocol while 2% reported that they don't follow the protocol for the bio medical waste management (Figure 2). As in Figure 3 98% of the respondents had adequate knowledge on biomedical waste management while 2% of the respondents didn't have adequate knowledge on biomedical waste management and Figure 4, 93% of the respondents reported that general wastes are thrown into the green bag while 6% of the respondents reported that these wastes are thrown into blue bags and the remaining 1% reported that these wastes were thrown in white bags.

Figure 1: A Pie chart showing 61% of the respondents reported that they are male professionals (Red) while 39% reported that they are female professionals (Blue).
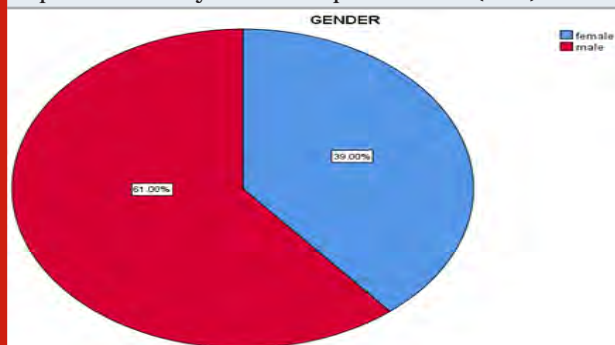
Figure 2: A Pie chart showing 98% of the respondents reported that they follow the protocol (Red) while 2% reported that they don't follow the protocol for the bio medical waste management (Blue).
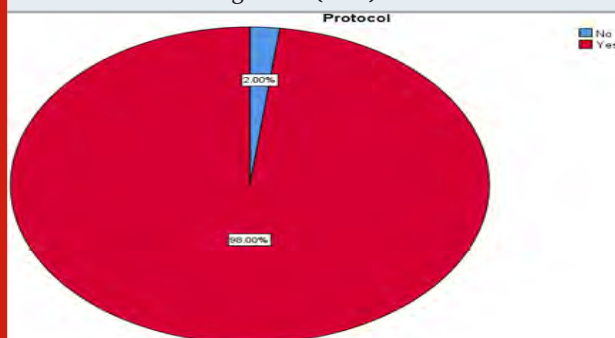
Figure 3: A Pie chart showing 98% of the respondents had adequate knowledge on biomedical waste management (Red) while 2% of the respondents didn't have adequate knowledge on biomedical waste management (Blue).

Figure 4: A Pie chart showing 93% of the respondents reported that general wastes are thrown into the green bag (Red) while 6% of the respondents reported that these wastes are thrown into blue bags (Blue) and the remaining 1% reported that these wastes were thrown in white bags (Green).
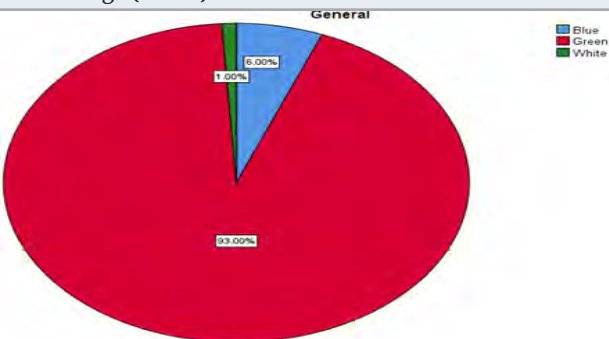
Figure 5: A Pie chart showing 94% of the respondents reported that ortho wires are disposed into white bags (Orange) while 4% reported that they are disposed into green bags (Red) and the remaining 1% reported that these wires are disposed into the black and the red bags respectively (Blue and Green).
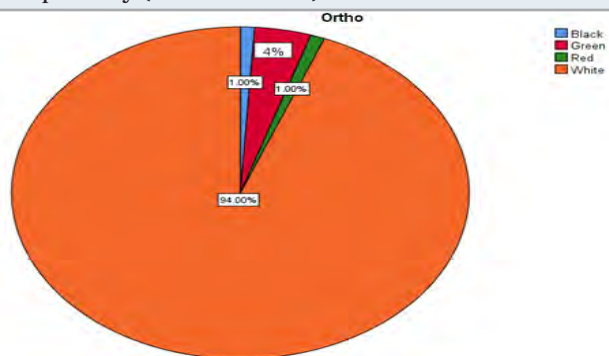
We found that 94% of the respondents reported that ortho wires are disposed into white bags while 4% reported that they are disposed into green bags and the remaining 1% reported that these wires are disposed into the black and the red bags respectively (Figure 5). As shown in Figure

6, 93% of the respondents reported that the implants are disposed into blue bags while 5% reported that they are disposed into red bags and the remaining 1% reported that these implants are disposed into the black and the yellow bags respectively. Figure 7 shows that 94% of the respondents reported that the infected wastes are disposed into the yellow bags (Green) while 5% of the respondents reported that these wastes are disposed of into the blue bags and the remaining 1% reported that these wastes are disposed into the black bags. In our study, 91% of the respondents reported that the yellow coloured bags are disposed through incineration while 8% reported that these are disposed through land filling and the remaining 1% reported that they are disposed through recycling process.

Figure 6: A Pie chart showing 93% of the respondents reported that the implants are disposed into blue bags (Red) while 5% reported that they are disposed into red bags (Green) and the remaining 1% reported that these implants are disposed into the black and the yellow bags respectively (Blue and Orange).
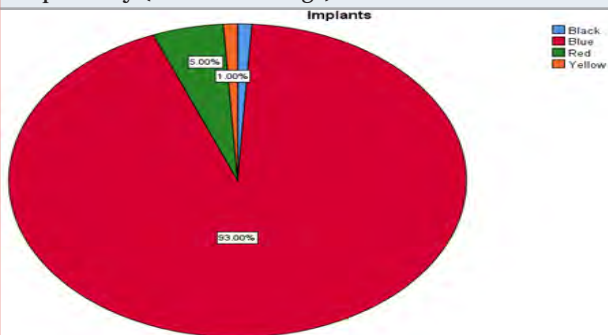
Figure 7: A Pie chart showing 94% of the respondents reported that the infected wastes are disposed into the yellow bags (Green) while 5% of the respondents reported that these wastes are disposed of into the blue bags (Red) and the remaining 1% reported that these wastes are disposed into the black bags (Blue).
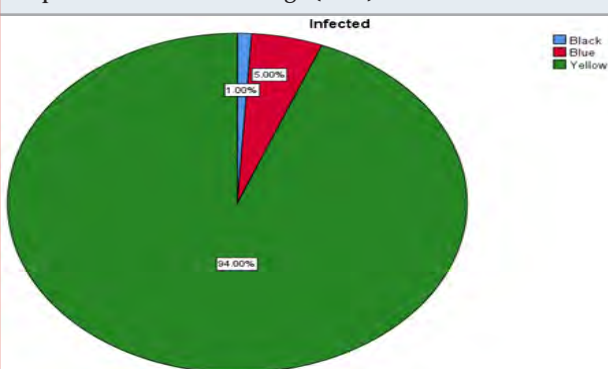
As in Figure 9, 93% of the respondents reported that the paper cups are disposed into green bags while 4% reported that they are disposed into white bags and the remaining 3% reported that they are disposed into blue bags and Figure 10 shows that 92% of the respondents reported that the antibiotic vials are disposed into blue

bags while 3% reported that they are disposed into purple and green bags respectively and the remaining 2% reported that they are disposed into black bags.

Figure 8 : A Pie chart showing 91% of the respondents reported that the yellow coloured bags are disposed through incineration (Blue) while 8% reported that these are disposed through land filling (Red) and the remaining 1% reported that they are disposed through recycling process (Green).
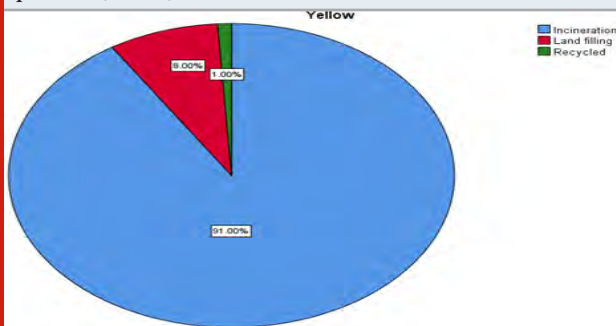
Figure 9 : A Pie chart showing 93% of the respondents reported that the paper cups are disposed into green bags (Red) while 4% reported that they are disposed into white bags (Green) and the remaining 3% reported that they are disposed into blue bags (Blue).
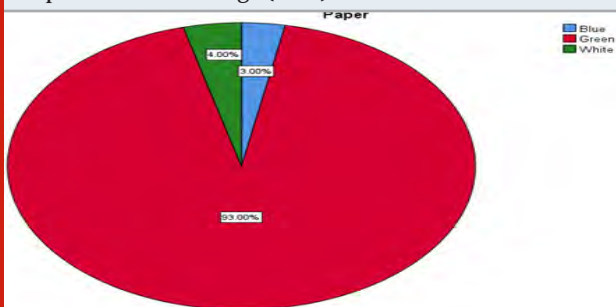
Figure 10: A Pie chart showing 92% of the respondents reported that the antibiotic vials are disposed into blue bags (Red) while 3% reported that they are disposed into purple and green bags respectively (Orange ,Green) and the remaining 2% reported that they are disposed into black bags (Blue).
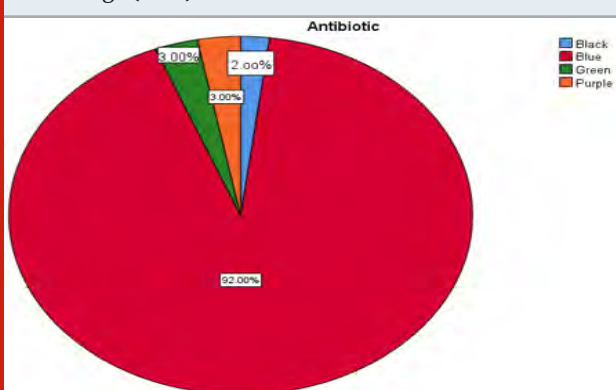
As shown in Figure 11, 93% of the respondents reported that the syringes are disposed into red bags while 5% reported that they are disposed into yellow and the remaining 1% reported that they are disposed into black and green bags respectively and the figure 13 shows 98% of the respondents reported that red bins are used for the disposal of gloves and plastics while 1% of the respondents reported that red bins are used for the disposal of anatomical, solid waste and needles,wires respectively. Figure 16 shows that 74% of the respondents reported that lab slides are disposed into blue coloured bags while 17% of the respondents reported that lab slides are disposed into yellow coloured bags about 8% of the respondents reported that lab slides are disposed into green coloured bags while 1% of the respondents reported that lab slides are disposed into red coloured bags.

Figure 11: A Pie chart showing 93% of the respondents reported that the syringes are disposed into red bags (Green) while 5% reported that they are disposed into yellow (Orange) and the remaining 1% reported that they are disposed into black and green bags respectively (blue and Red).
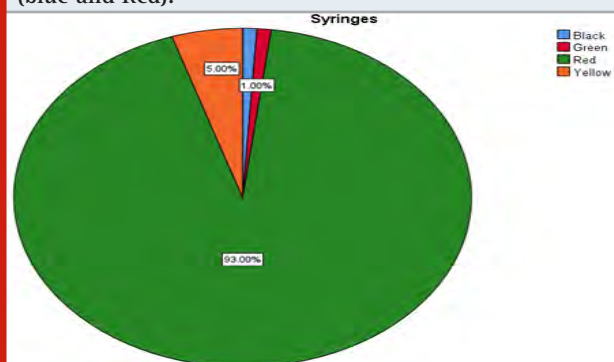
Figure 12 : The bar graph demonstrates the association between the gender of the health professionals and colour of the bio waste bags for undergoing secured landfill technique (%responses). X axis represents the gender of the dentists and their assistants and the Y axis represents the knowledge on disposal of biowastes (%responses). The highest numbers were noticed in case of males as they agreed that the green and red coloured bags were discarded through secured landfill technique. Chi square analysis was done, Pearson Chi Square Value= 1.580, the P value was 0.209 (p>0.05),which was found to be statistically not significant.
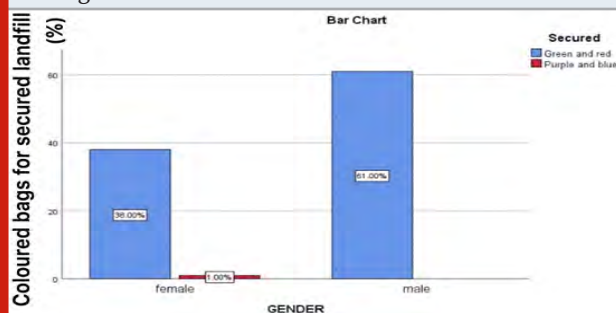
Figure 13: A Pie chart showing 98% of the respondents reported that red bins are used for the disposal of gloves and plastics (Red) while 1% of the respondents reported that red bins are used for the disposal of anatomical ,solid waste and needles,wires respectively (Blue and Green).
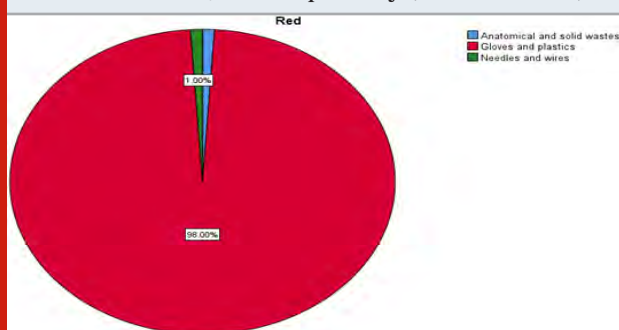
Figure 14: The bar graph demonstrates the association between the gender of the health professionals and the color of the bio waste bags which can be autoclaved and recycled (%responses). X axis represents the gender of the dentists and their assistants and the Y axis represents the knowledge on disposal of biowastes (%responses). The highest numbers were noticed in case of males as they agreed that the blue coloured bags underwent autoclave processes and thereby got recycled. Chi square analysis was done, Pearson Chi Square Value= 2.900, the P value was 0.575 (p>0.05),which was found to be statistically insignificant.
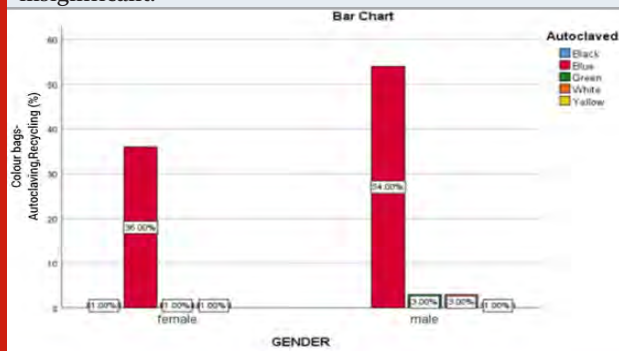
We also got that 52% of the respondents reported that blood stained cotton are disposed into red coloured bags while 45% of the respondents reported that blood stained cotton are disposed into yellow coloured bags ,while 3% of the respondents reported that blood stained cotton are disposed into green coloured bags (Figure 17) and 47% of the respondents reported that cytotoxic drugs are disposed into black coloured bags while 46% of the respondents reported that cytotoxic drugs are disposed into yellow coloured bags, about 4% of the respondents reported that cytotoxic drugs are disposed into blue coloured bags while 3% of the respondents reported that the cytotoxic drugs are disposed into green coloured bags (figure 18).

Figure 15: The bar graph demonstrates the association between the gender of the health professionals and the methods for disposal of yellow bags(%responses). X axis represents the gender of the dentists and their assistants and Y axis represents the knowledge on disposal of biowastes (%responses). The highest numbers were noticed in case of males as they agreed that the yellow bags were discarded through the process of incineration. Chi square analysis was done, Pearson Chi Square Value= 1.583 , the P value was 0.453 (p>0.05),which was found to be statistically insignificant.

Figure 16: A Pie chart showing 74% of the respondents reported that lab slides are disposed into blue coloured bags (Blue) while 17% of the respondents reported that lab slides are disposed into yellow coloured bags (Orange),about 8% of the respondents reported that lab slides are disposed into green coloured bags (Red) while 1% of the respondents reported that lab slides are disposed into red coloured bags (Green)
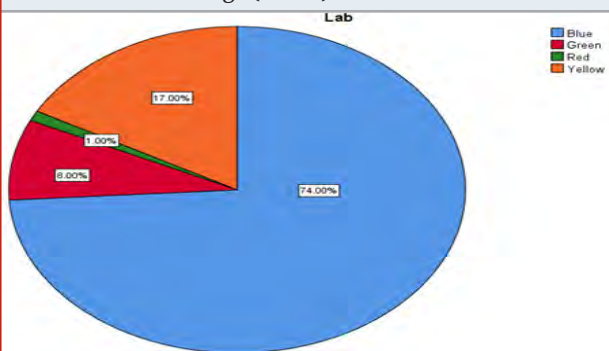
Figure 20 shows that 91% of the respondents reported that catheters are disposed into red coloured bags ,about 6% of the respondents reported that catheters are disposed into blue coloured bags while 3% of the respondents reported that catheters are disposed into green coloured bags. Finally, 97% of the respondents reported that sharp materials are disposed into white coloured bags ,about 2% of the respondents reported that sharp materials are disposed into purple coloured bags, while 1% of the respondents reported that sharp materials are disposed into green coloured bags.

Figure 17: A Pie chart showing 52% of the respondents reported that blood stained cotton are disposed into red coloured bags (Red) while 45% of the respondents reported that blood stained cotton are disposed into yellow coloured bags (Green),while 3% of the respondents reported that blood stained cotton are disposed into green coloured bags (Blue).
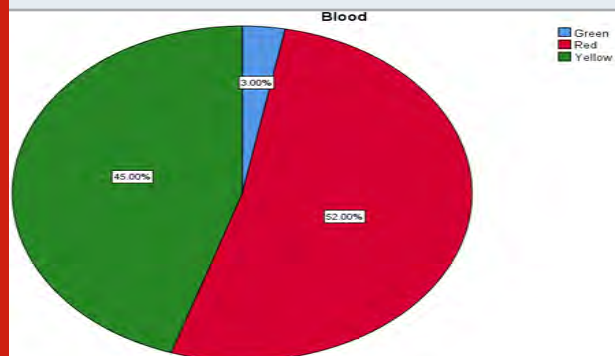
Figure 18: A Pie chart showing 47% of the respondents reported that cytotoxic drugs are disposed into black coloured bags (Blue) while 46% of the respondents reported that cytotoxic drugs are disposed into yellow coloured bags (Orange), about 4% of the respondents reported that cytotoxic drugs are disposed into blue coloured bags (Red) while 3% of the respondents reported that the cytotoxic drugs are disposed into green coloured bags (Green).
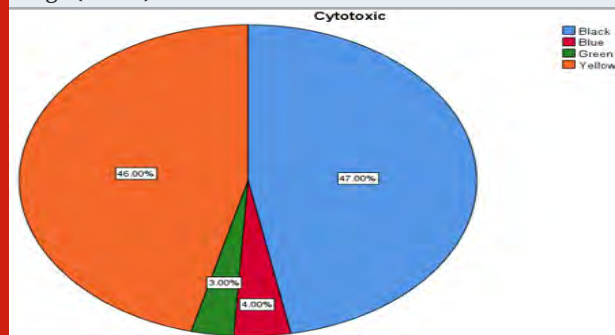
When we studied the association between the gender and the awareness of the biomedical waste disposal and colour coding of the bags related to that we found that the highest numbers were noticed in case of males as they agreed that the green and red coloured bags were discarded through secured landfill technique with a Pearson Chi Square Value of 1.580 and the P value was 0.209 (p>0.05),which was found to be statistically not significant(Figure 12). The highest numbers were noticed in case of males as they agreed that the blue coloured bags underwent autoclave processes and thereby got recycled with a Pearson Chi Square Value of 2.900, the P value was 0.575 (p>0.05),which was found to be statistically insignificant(figure 14).The highest numbers were noticed in case of males as they agreed that the yellow bags were discarded through the process of incineration with a Pearson Chi Square Value of

1.583 , the P value was 0.453 (p>0.05),which was found to be statistically insignificant (Figure 15). The highest numbers were noticed in case of males as they agreed that the blue bags were discarded and underwent the process of autoclave(figure 19).

Figure 19: The bar graph demonstrates the association between the gender of the health professionals and the disposal of the blue coloured bio waste bags (%responses). X axis represents the gender of the dentists and their assistants and Y axis represents the knowledge on disposal of biowastes (%responses). The highest numbers were noticed in case of males as they agreed that the blue bags were discarded and underwent the process of autoclave. Chi square analysis was done, Pearson Chi Square Value= 1.580 , the P value was 0.209 (p>0.05),which was found to be statistically insignificant.
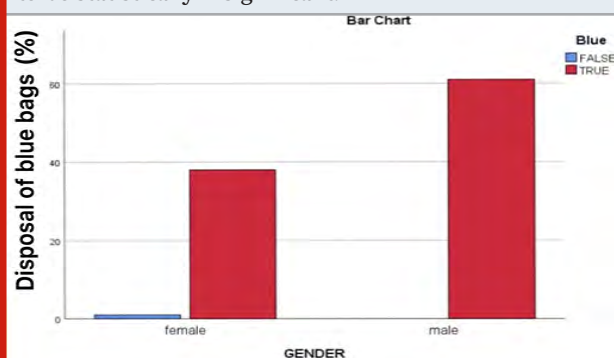
Figure 20: A Pie chart showing 91% of the respondents reported that catheters are disposed into red coloured bags (Green), about 6% of the respondents reported that catheters are disposed into blue coloured bags (Blue) while 3% of the respondents reported that catheters are disposed into green coloured bags (Red).
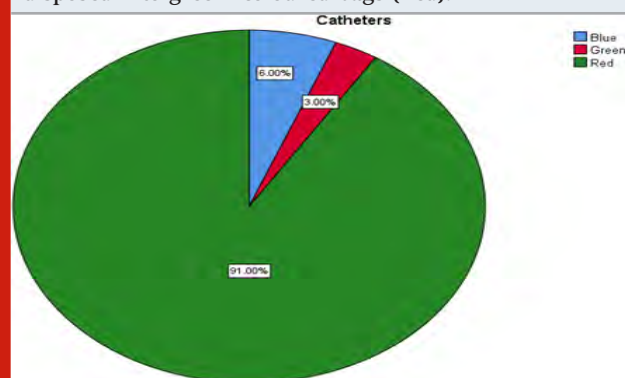
According to a study conducted in Kothamangalam (Sanjeev, Suneesh and Subramaniam, 2013), about 15.2% of the respondents disposed of mercury in general garbage while the corresponding value in Bangalore study was around 15% (Mathur et al., 2011). Poor practice scores were obtained in relation to the majority of the practice related questions in various other cities. One possible reason for this observation is that in the majority of the clinics, it is the chair-side assistants

and other auxiliaries segregate the waste who lack proper awareness of the bio medical waste management (Ingle and Charania, 2011). The study thus throws a light on the existing knowledge, attitude and practice of the dental health care personnel among the Chennai population (Sood and Sood, 2011). It indicates that there is an urgent need to train the dental personnel regarding the same all around the country. Occupational safety must be the primary concern for every health personnel (Yadavannavar, Berad and Jagirdar, 2010).

Figure 21: A Pie chart showing **97%** of the respondents reported that sharp materials are disposed into white coloured bags (Green), about 2% of the respondents reported that sharp materials are disposed into purple coloured bags (Red), while 1% of the respondents reported that sharp materials are disposed into green coloured bags (Blue).
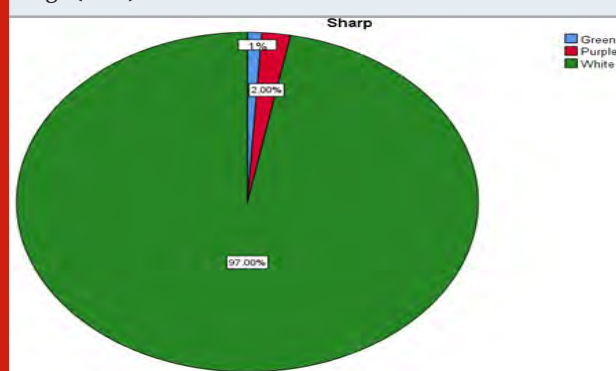
CONCLUSION

The results of this study have demonstrated a significant level of awareness of most aspects of Bio medical waste management among dental auxiliary staff in the dental hospital/clinics in Chennai while there is a lack of awareness among the dentists who work in other hospital/clinics around the country .There is a high need to urge awareness about the management of biomedical waste as inadequate and inappropriate knowledge of handling these wastes can have serious implications on the society as a whole.

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Knowledge, Attitude and Awareness of Hepatitis B Vaccine Among Medical and Dental Students

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ABSTRACT

Hepatitis B is an infectious viral disease. The symptoms of this infection are vomiting sickness, tiredness, skin appears yellow in colour (yellowish skin), dark urine and pain in abdomen. The virus is mainly transmitted by blood or body fluids which are infected with viral pathogens. Health care workers and medical students in clinical years who come in contact with the patients are at the highest risk of acquiring this kind of infection. This study deals with the knowledge, attitude and awareness of hepatitis B vaccine. Questionnaire survey was conducted among 100 medical college students by giving them 20 questions based on the awareness of hepatitis B infection, mode of its transmission, dues of vaccination, and any booster dose. The obtained results were analysed in SPSS software. Descriptive and association statistics were done with chi square test. Based on the result it is shown that 64 % of students were aware of hepatitis B. 61% of students were aware about the cause of Hepatitis B. 73 % of people were aware about the Ideal age for vaccination. 41 % of students are aware about the Hepatitis B through doctors awareness programs and 38% of students are aware through the media. From the survey done it is proven that the knowledge, attitude and awareness of hepatitis B vaccine among medical and dental students was prevalent but not followed by the students due to their negligence.

KEY WORDS: VACCINE, HEPATITIS B, STUDENTS, AWARENESS,TRANSMISSION.

INTRODUCTION

Hepatitis B is an infectious viral disease caused by hepatitis B virus. It may be a chronic or acute infection (Logan and Katherine Rice, 1987). Often the symptoms of this infection are vomiting sickness,tiredness,skin appears yellow in colour (yellowish skin),dark urine and pain in abdomen (Rubin, Strayer and Rubin, 2011).symptoms of this infection takes almost six months to appear. Often it leads to death if not treated (Pockros, 2000) . The virus is mainly transmitted by blood or body fluids which are infected with virus pathogen (Zuckerman, 1993). In order to eradicate this virus 1976 Blumberg found a vaccine for hepatitis B (Muraskin, 2002). Based on dose it is recommended to be immunized within 24 hours of birth (Blumberg, 2018). In healthy people routine immunization protects them 95 % (ALMalki, 2014). In the

case of immunosuppressed people additional doses are required (Paul and Arumugam, 2015). In case when the person is exposed to hepatitis virus but not immunized, then hepatitis B immune globulin is provided additionally to the vaccine given (Moticka, 2015). Since medical and dental students are exposed to blood and blood products frequently , the knowledge of prevention and transmission of the virus is indispensable.

Hepatitis B infection is a major global health problem affecting numerous people every year (Sayan and Akhan, 2012). Health care workers and medical students in clinical years who come in contact with the patients are at the highest risk of acquiring this kind of infection (Goldstein et al., 2005). Proper knowledge about hepatitis B infection among medical students,helps them to take appropriate precautions to prevent infection and also helps them to spread awareness about hepatitis B infection among patients, public and Healthcare professionals (Geberemicheal et al., 2013). Three doses of hepatitis B vaccine at intervals of 0 , 1 and 6 - 12 months are insisted for the basic health measure against

the virus (Ibrahim and Idris, 2014).Vaccination and use of properly sterilized Instruments are the two main ways of preventing hepatitis virus (Dawar, Yasmin and Jha, 2019).

Vaccine development: In the year of 1970s, two markable vaccines which act against Hepatitis B virus were developed in the United States and France , both the vaccines have purified antigen HBsAg which is obtained from the Serum collected from the HBsAg carrier ('Hepatitis B Vaccination Status among Medical Students at King Faisal University', 2016). These vaccines which are plasma derived and contain purified HBsAg had been subjected to a combination of aggressive biophysical and Biochemical treatments which results in the partial disruption of the surface antigen (Saini, Saini and Sugandha, 2010). A United States product contains 22 nm HBsAg particles with lack of pre-s-proteins whereas French HB vaccine contains some minimum amount of pre S2 and pre-s-1 antigens. Finally nowadays plasma derived vaccines seem to be highly immunogenicity , efficacious and safe (Bailoor, Patel and Rana, 2012).

Table 1. Depicts the development of hepatitis vaccines and its implementation (Coursaget et al., 1982)

Type	Evolution of Hepatitis vaccine Name	Envelope antigen	Dosage
Plasma-derived, SHBs	Heptavax-B (Merck & Co., USA)	SHBs	HBsAg, 5–40 µg/dose
	Hevac B (Pasteur)	SHBsAg, (±MHBs*)	HBsAg, 5–20 µg/dose
	KGC (Korea Green Cross)	SHBsa	
Recombinant, yeast-derived*	RECOMBIVAX HB (Merck & Co.)	SHBsa HBsAg	HBsAg, 2.5–10 µg/dose
	Engerix-B (SmithKline, Belgium)	SHBsaHBsAg	HBsAg, 10–20 µg/dose
	TGP 943 (Takeda Chem, Japan)d	SHBsa, MHBs HBsAg	10 µg/dose
Recombinant, mammalian	GenHevac B (Pasteur, France)b	SHBs, MHBs	HBsAg+pre-S2, 20 µg/dose
	Bio-Hep-B/Sci-B-Vac	SHBs, MHBs, LHBs	HBsAg, pre-S2, pre-S
cell-derived	(Bio-Technology General, Israel)c,e		12.5–10 µg/dose
	AG-3 (Hepagene, Hepacare)	SHBs, MHBs, LHBs	HBsAg, pre-S2, pre-S1 10–
	(Medeva, UK, Evans UK)c,f		

Effectiveness of vaccine: If three primary doses are completed , then a blood test can be taken generally after a time period of 1- 4 months , in order to check if there's any Immunological response that is basically to find The level of anti hepatitis B surface antigen, in which antibody level is literally above 100 mIU/ml and it is common in majority of the individuals ('Hepatitis B vaccine. Demonstration of efficacy in a controlled clinical trial in a high-risk population in the United StatesSzmuness, W., Stevens, C. E., Harley, E. J., Zang, E. A., Oleszko, W. R., William, D. C., Sadovsky, R., Morrison, J. M. and Kellner, A. (1980). New England Journal of Medicine, 303, 833', 1981). An average antibody level between 10 to 100 ml is considered to have Bad immune response and those kinds of people are advised to have a booster dose. These kind of poor immune response are commonly seen in obese people,celiac disease,tobacco,smoking and in alcoholic and it is considered that the dosage is effective between five to seven years but Frequently It is believed that the

long term memory is stored from the immunological memory which blast out the loss of antibody level and therefore there is no need for the testing and there is no need for the administration of Additional booster doses in case of properly vaccinated immunocompetent persons (Szmuness et al., 1981)(Salisbury, Ramsay and Noakes, 2006).

MATERIAL AND METHODS

Sample Selection: A sum of 100 students were randomly selected from the university as a participant in the survey. The age range was between 18 - 30 years of age with the mean age of 23 years . The data collection questionnaire was developed after reviewing various similar literature .

Inclusion and Exclusion Criteria: Inclusion criterion set was the age group of 18 - 30 years who are studying

in medical and dental colleges are considered to do vaccination surveys. Exclusion criterion: students except dental profession all are excluded from this study.

Sampling Method: In the present study,the sampling method used is a random sampling method.

Data Collection and Tabulation: The questionnaire which was taken on a survey planet concerns about 20 questions mainly based on the Knowledge, attitude and awareness of vaccines among medical and dental students. Their responses were entered into the excel sheets and then tabulation of the data finally and the question comparison was done. The representation of the data is through the bar graph .

Statistical Analysis: The statistical software used IBM SPSS V22.The statistical test used is Chi square test (p value).Type of analysis used were descriptive analysis,demographic data.

RESULT AND DISCUSSION

Hepatitis vaccine is mainly meant to prevent hepatitis B Infection. Based on the dose the first dose is required Within a day that is 24 hours of birth Which is followed by two or more doses of vaccine as recommended (Eisa, Eifan and Al-Sum, 2012). In the case of healthy individuals normal Routine immunization results in Protection for about 95 % of individuals. In case of immunocompromised individual additional doses are required but not necessary for all individuals. In the case of individuals who are not immunized but have been exposed to hepatitis B virus are insisted to have Hepatitis B immune globulin in addition to the vaccine (Rahman, 2015). The vaccine is taken mainly by injecting it into the muscle. In case of these injections pain may occur at the site of injection. The technique used to produce hepatitis B vaccines are recombinant DNA techniques.

Figure 1: Pie chart showing that **61%** (green)of people were aware about hepatitis B and **39%**(blue) of people were not aware of hepatitis B
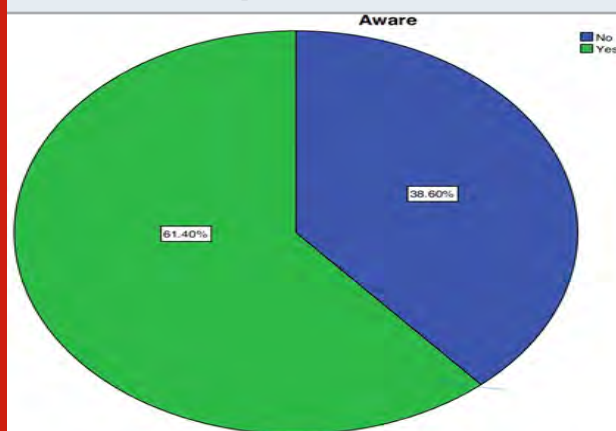
Based on the result it is shown that 45 % of students between the age of 20 - 30 years of age had attended the survey. In which male were 31 % and females were

58 % .From fig 1 it is shown that 61 % of students were aware of hepatitis B. 66% of students were aware about the cause of Hepatitis B.Previous study done among the preclinical students it had shown that 93 % of students were aware about the basic knowledge of hepatitis B.(Mathur et al., 2020) Figure 2 depicts that 74 % of people were aware about the Ideal age for vaccination. 41 % of students are aware about Hepatitis B through doctors awareness programs and 38% of students are aware through the media. In Previous study it had been shown that 56 % of doctors were aware about the vaccination significance (Ibrahim and Idris, 2014).

Figure 2: Pie chart showing that **74%** (green)of people were aware about the ideal age of vaccination and **26%**(blue) of people were not aware about the ideal age of vaccination
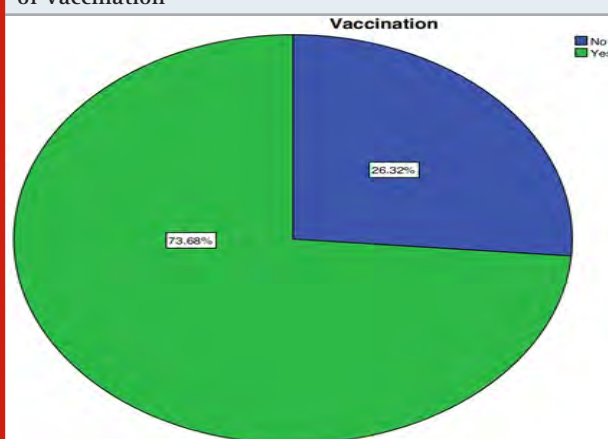
Figure 3: Pie chart showing that **30%** (khaki) of people neglected the vaccine, **29%**(blue) of people considered it as not necessary whereas **22 %** (green)of the respondents have fear of injection and **19%**(purple) of people were not aware about the vaccine
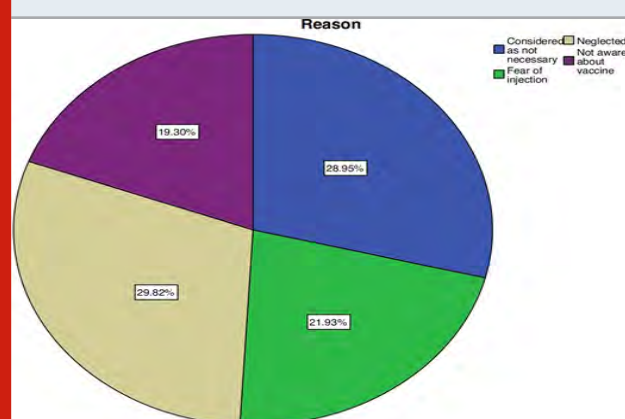
Figure 3 shows that 29 % of students think that it is not necessary to take vaccines and another 30 % of students have neglected the vaccine.Figure 4 depicts that 34 % of students thinks that the main mode of transmission of hepatitis B is by sharing of needles, 24% of people think that it is transmitted from mother to child, 23% of people think that its due to multiple sex partners and

19% of people thinks that its transmitted by transfusion of blood. Figure 5 insists that 60% of people have completed the course of vaccination whereas 40% of people have not completed the course of vaccination.In previous study it had been shown that 81 % of students thinks that hepatitis B is mainly transmitted through blood transfusions (Giri, Panda and Sahoo, 2016).this was well correlated with our study.

Figure 4: Pie chart showing that 34% of the people think that Hepatitis B is transmitted by sharing the needles(khaki), 24% of people think that it is transmitted from mother to child(blue), 23% of people think that its due to multiple sex partners(green) and 19% of people thinks that its transmitted by transfusion of blood(purple).
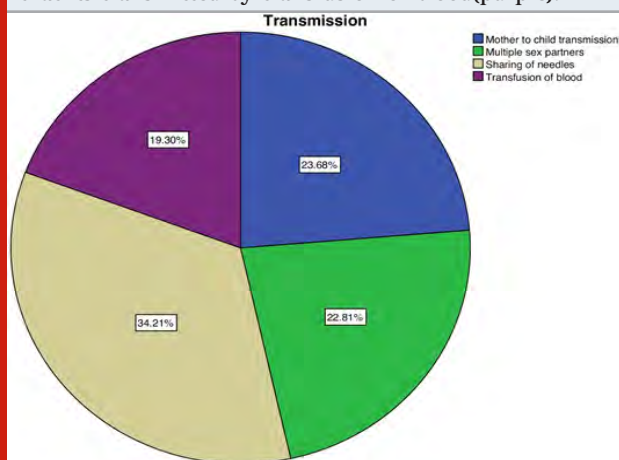
Figure 5: Pie chart showing that 60% (green)of people have completed the course of vaccination whereas 40% (blue) of people have not completed the course of vaccination
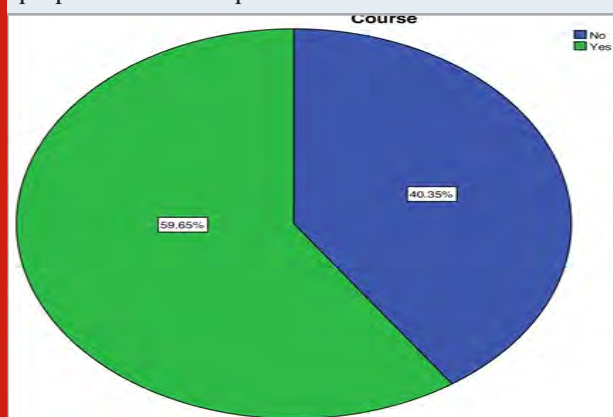
When we compared the age groups with the awareness of the Hepatitis B vaccination (Figure 6), we found that the study population aged between 18-20 years have more knowledge about Hepatitis vaccination than the other age groups in our study population. This reveals that the students of first and second year were more aware about the Hepatitis B vaccination as they need to undergo a medical fitness before admission into the institutions. This may be a reason behind the results of association between the age and awareness of Hepatitis B vaccination.

Figure 6: The bar chart represents the association between the age and awareness of hepatitis B. X axis represents the age of the respondents whereas the Y axis represents the number of respondents.Majority of the study population of aged between 18-20 years are more aware about the Hepatitis B vaccination than the other age groups and the difference was also significant statistically.Chi Square test: p = 0.00 (<0.05)
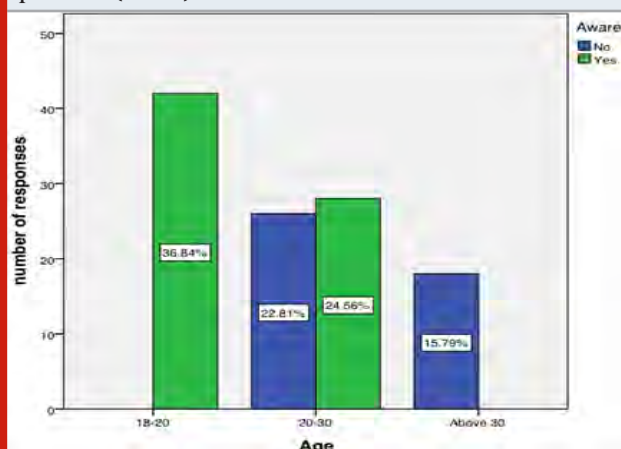
CONCLUSION

From the survey done it is proven that there was a moderate level of knowledge , attitude and awareness of Hepatitis B vaccine among medical and dental students and the study population aged between 18-20 years are more aware than the other age groups. It was also found that most of the study population are not following the vaccination schedule properly due to their negligence. Even though Hepatitis B infection is fatal to humans it can be eradicated through vaccines developed through recombinant technology but far since no proper awareness about the mode of transmission and the preventive measures it remains fatal.

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Age and Reason for the First Dental Visit of A Child-A Retrospective and Prospective Study

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ABSTRACT

According to AAPD guidelines the first dental visit of a child is within 6 months of age. The need of such early visits is to help dentists to detect and treat incipient lesions, to educate parents about proper oral hygiene maintenance and the importance of diet and fluorides. Moreover the visit helps the child to inspect, analyse, understand and adapt to the dental setup, thereby showing positive dental attitude in future visits. The present study was conducted in the Department of Pedodontics which comprised 2 phases Retrospective and Prospective. Inclusion and Exclusion Criteria were framed. A sample size of 200 (out of 225)for retrospective study and 100 for prospective study was taken by Radomised control trial. The most common age group for the first dental visit is 6-12 years. The most common reason for the first dental visit is pain followed by Dental caries and the least common reason is Habits and other reasons such as mobile tooth and lesson etc. The common age of the child's initial dental visit being at 6 -12 years. Within the limitations of the current study, the most common age of the child's first dental visit was at 6 -12 years. The common reason for seeking aid at the primary visit was found to be pain and dental caries. It is evident that the attention level concerning the importance of the primary dental visit is incredibly low among the study population.

KEY WORDS: AGE, REASON, FIRST VISIT, PREVENTIVE, PARENTS, CHILDREN.

INTRODUCTION

The first time a child visits a dental clinic is their first dental visit. As per AAPD guidelines of 2009, the recommended age for the first dental visit age was before 12 months of age(Rayner, 2003; Widmer, 2003), which in AAPD guidelines of 2013 was changed to 6 months of age.The need of such early visits is to help dentists

to detect and treat incipient lesions, to educate parents about proper oral hygiene maintenance and importance of diet and fluorides. Moreover the visit helps the child to inspect, analyse, understand and adapt to the dental setup, thereby showing positive dental attitude in future visits. The visit also helps for anticipatory guidance related to the child's craniofacial and dental development. Various literature studies have revealed increased prevalence of Early Childhood Caries in developed and developing countries(Al-Shalan, 2003). The age at which the child first visits the dental clinic and reason for it varies and depends on many factors such as parent's previous dental experience, level of knowledge and socio economic status. Planning and creating awareness about the importance of early visits play a very important role in preventing

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invasive dental procedures. Parents act like mentors and play a vital role in a child's oral health care.

The goals of this early visit are to establish a dental home for the infant, prevent ECC and introduce healthy habits that can be sustained. This visit should include an oral examination, risk assessment and anticipatory guidance. ECC is a highly prevalent chronic condition among children, specifically those with unmet healthcare needs and low socioeconomic status. The prevalence of dental caries among children is of epidemic proportions and ranges between 11.2% and 48.0% across the country. While the need for dental treatment among children is high, there is low and delayed utilisation of dental services until oral symptoms such as pain appear and persist. This observed oral health profile of the child is determined by many factors, and the most important of them include the lack of a useful model of dental healthcare aimed at preventive treatment and the low awareness of healthy behaviour among parents.

Our department is passionate about child care, we have published numerous high quality articles in this domain over the past 3 years (Govindaraju et al., 2017a, 2017b; Jeevanandan et al., 2019; Jeevanandan and Govindaraju, 2018; Nair et al., 2018; Panchal et al., 2017; Veerale Panchal et al., 2019; V. Panchal et al., 2019; Ramadurai et al., 2019; Ramakrishnan et al., 2019; Ravikumar et al., 2017, 2018, 2019; Ravindra et al., 2018, 2019; Samuel et al., 2020; Subramanyam et al., 2018; Vignesh et al., 2019; Vishnu Prasad et al., 2018). With this inspiration we planned to pursue our research with the aim to know the average age at which parents first seek dental care for their children and also to find the reasons for the first dental visit of the children in a private dental institute in Chennai.

MATERIAL AND METHODS

The present study was conducted in the Department of Pedodontics. This study consisted of 2 phases (retrospective and prospective). The inclusion criteria for retrospective phase was children below 17 years of age, no previous history of dental visits and complete cases records. The exclusion criteria were insufficient details in case records, previous history of dental treatment and any missing records of in DMFT/def index. The inclusion criteria for prospective study was children attending the private dental institute for dental treatment, children below 17 years of age and no previous history of dental visit. Exclusion criteria were children with dental emergencies to prevent delay in emergency management.

Retrospective study: From the Department of Pediatric and Preventive Dentistry, patient records from Records Management System were used for the retrospective study. A total of 225 records were taken between November 2018 to December 2018 and evaluated. Twenty five records which did not have adequate details regarding the cause of the first visit were eliminated. A total of 200 record details were considered for the study

and data were entered in a data sheet. Then the patients were divided into three age groups, 1) 3-6 years 2) 6-12 years 3) 12-17 years. The following age groups were selected based on dentition present 1) Primary dentition only (3-6) 2) Mixed dentition stage (6-12) 3) Permanent dentition only (12-17). The reasons for their visit were also divided into various categories such as

1. General checkup
2. School camp
3. Pain/ sensitivity
4. Malocclusion
5. Dental Caries
6. Trauma
7. Habits
8. Missing/extra tooth
9. Bad breath
10. Others (cleft lip & palate, mobile tooth, soft tissue lesions, other reasons not mentioned below)

Prospective study: A chief investigator in the Department of Pediatric and Preventive Dentistry screened 225 children who were screened by the investigator who visited the dental institute during January 2019 to February 2019. Based on the age, the children were divided into one of the three categories as mentioned in retrospective study. Based on the chief complaint they were categorised into one of the above mentioned reasons. The age and the reason for the visit were enquired and recorded and results were noted in percentages.

Statistical analysis: The collected data were recorded in MS Excel software and subjected to statistical analysis using SPSS software (IBM Corp) version 23.0. Chi-square test was used to compare the age and reasons and p-value of less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Retrospective study: Percentage distribution of participants in retrospective study based on age. 25.37% of the participants belonged to 3-6 years, 39.51% of them were 7-11 years, 35.12% of them were 12-16 years (Figure 1). Percentage distribution of participants in retrospective study based on reason of first dental visit. 8.29% of the participants reported for general checkup, 13.66% of them school camp, 25.17% of them pain, 8.78% of them due to malocclusion, 17.07% of them due to caries, 4.39% of them due to trauma, 3.90% of them due to habits, 7.32% of them due to missing, 5.85% of them due to bad breath, 5.37% of them due to other reasons (Figure 2). Association between the age and reason of first dental visit of a child. Chi-square test was done and association between the age and reason of first dental visit was found to be statistically significant. (Pearson Chi-Square: 30.27; p-value-0.01). 8.29% of the participants from 3-6 years, 8.78% of the participants from 7-11 years of age and 8.29% of the participants from 12-16 years of age reported pain as the reason for their first dental visit. Pain followed by caries, school camp and malocclusion were the most common

reasons for first dental visit according to retrospective study (Figure 3).

Figure 1: Pie diagram represents the percentage distribution of participants in retrospective study based on age. 25.37% of the participants belonged to 3-6 years (white), 39.51% of them were 7-11 years (grey), 35.12% of them were 12-16 years (black)
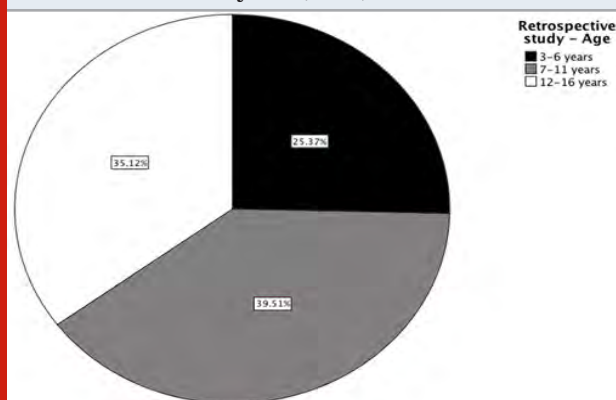
Figure 2: Pie diagram represents the percentage distribution of participants in retrospective study based on reason of first dental visit. 8.29% of the participants reported for general checkup, (light blue), 13.66% of them school camp (red), 25.17% of them pain (green), 8.78% of them due to malocclusion (orange), 17.07% of them due to caries (yellow), 4.39% of them due to trauma (turquoise), 3.90% of them due to habits (pink), 7.32% of them due to missing (purple), 5.85% of them due to bad breath (light green), 5.37% of them due to other reasons (blue)
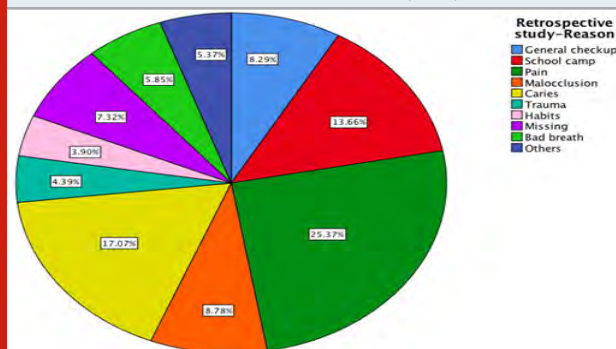
Prospective study: Percentage distribution of participants in prospective study based on age. 25.33% of the participants belonged to 3-6 years (blue), 37.78% of them were 7-11 years (red), 36.89% of them were 12-16 years (Figure 4). Percentage distribution of participants in prospective study based on reason of first dental visit. 7.56% of the participants reported for general checkup, 12% of them school camp, 34.22% of them pain, 6.22% of them due to malocclusion, 20.89% of them due to caries, 4% of them due to trauma, 2.22% of them due to habits, 4.89% of them due to missing, 4.44% of them due to bad breath, 3.56% of them due to other reasons (Figure 5).

Figure 3: Bar graph depicting the association between the age and reason of first dental visit of a child. X-axis represents the age distribution of the participants and Y-axis represents the number of participants. 8.29% of the participants from 3-6 years, 8.78% of the participants from 7-11 years of age and 8.29% of the participants from 12-16 years of age reported pain as the reason for their first dental visit. Pain followed by caries, school camp and malocclusion were the most common reasons for first dental visit according to retrospective study, which was statistically significant. (Chi-square test; Pearson Chi-Square: 30.27; p-value-0.01)
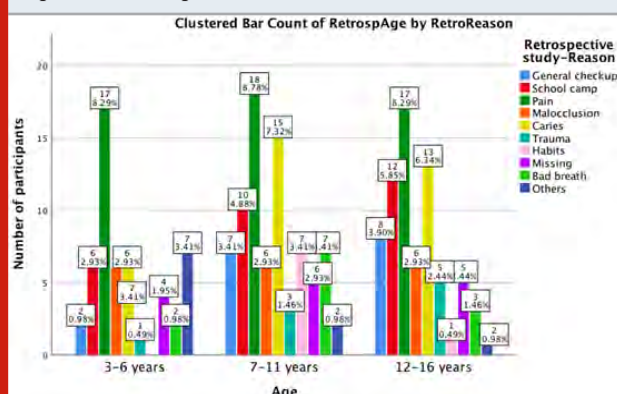
Figure 4: Pie diagram represents the percentage distribution of participants in prospective study based on age. 25.33% of the participants belonged to 3-6 years (white), 37.78% of them were 7-11 years (grey), 36.89% of them were 12-16 years (black)
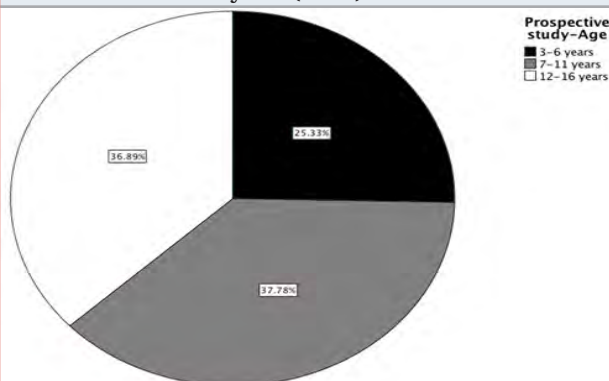
Association between the age and reason of first dental visit of a child. Chi-square test was done and association between the age and reason of first dental visit was found to be statistically significant. (Pearson Chi-Square: 28.25; p-value-0.02). 9.78% of the participants from 3-6 years, 12% of the participants from 7-11 years of age and 12.44% of the participants from 12-16 years of age reported pain as the reason for their first dental visit. Pain followed by caries, trauma and school camp were the most common reasons for first dental visit according to prospective study (Figure 6).

Parents play a key role/ responsible for maintenance of their child's oral hygiene. Their knowledge and

attitude towards dentistry reflects in their child's oral hygiene. Most of the parents still take their children to the dental practitioner for curative reasons and not for preventive reasons. A huge barrier still exists, that needs to be overcome so as to reach a large-scale reduction in the incidence of dental caries among the developing generation. Thus it's essential to observe these lesions early and intercept them and also to prevent any future occurrence. Several national associations suggest that initial dental visit for a child ought to be by the age of one year or as shortly once the first tooth erupts.The more a child's first dental visit is delayed, the more chances that he or she is to develop serious dental issues that would deteriorate the child's overall health. Caries that are left, Undetected and untreated will cause infection followed by pain, which may eventually stop children from food intake, sleeping, and pursuing their day to day activities, thereby hampering the overall well being of the child. All this would finally end up in an expensive dental treatment or even loss of teeth. All these consequences could have been overcome by one single dental visit at the right time.

Figure 5: Pie diagram represents the percentage distribution of participants in prospective study based on reason of first dental visit. 7.56% of the participants reported for general checkup, (light blue), 12% of them school camp (red), 34.22% of them pain (green), 6.22% of them due to malocclusion (orange), 20.89% of them due to caries (yellow), 4% of them due to trauma (turquoise), 2.22% of them due to habits (pink), 4.89% of them due to missing (purple), 4.44% of them due to bad breath (light green), 3.56% of them due to other reasons (blue)
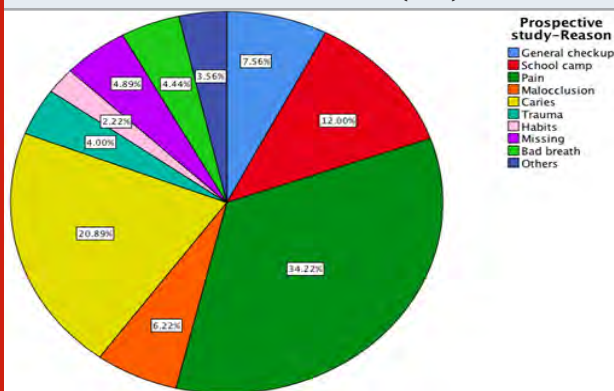
Age of first dental visit: Most of the children within the current study had their first dental visit between the ages of 6 and 12 years. Similarly, a study done in Saudi society believed that dental visitation before the age of one year was inappropriate, with the majority favoring an age range of 3–6 years for the first dental visit(Baghdadi, 2014).Perceptions regarding the appropriate age for initial dental visitation throughout the globe are remarkably diverse; the observed age vary is 2–5 years(van Palenstein Helderman et al., 2006). Older age ranges of 6–12 years(Nainar et al., 2003) and 7–11 years(Baliga, 2019) were observed from Asian countries. The results of those previous studies clearly demonstrate

parents' universal reluctance to require their infants to go to the dental practitioner at the young age recommended by the dental academics.

Figure 6: Bar graph depicting the association between the age and reason of first dental visit of a child. X-axis represents the age distribution of the participants and Y-axis represents the number of participants. 9.78% of the participants from 3-6 years, 12% of the participants from 7-11 years of age and 12.44% of the participants from 12-16 years of age reported pain as the reason for their first dental visit. Pain followed by caries, trauma and school camp were the most common reasons for first dental visit according to prospective study, which was statistically significant. (Chi-square test; Pearson Chi-Square value: 28.25; p-value-0.02)
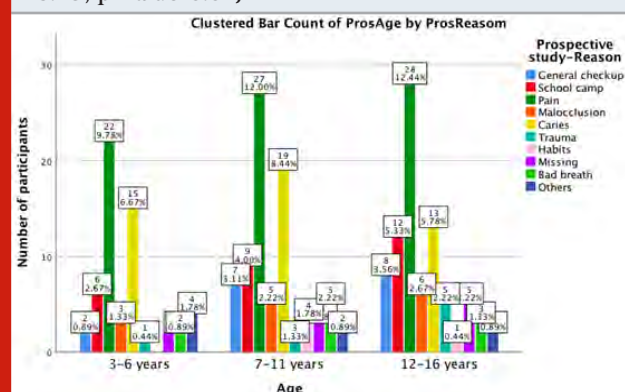
According to Fuzre and Basso, the primary dental visit should be around the fourth month of intrauterine life(Furze and Basso, 2003). Throughout this visit by the expectant mother, the medical practitioner has a chance to elucidate the importance of the dental visit at six months mature, educate the mother on eruption of teeth and preventive procedures, and to supply parent messages(Mileva and Kondeva, 2010). Nainar and Straffon in their study showed that the primary dental visit should be performed at one year age for all children from an occasional low socioeconomic background(Nainar et al., 2003). Study showed that within the US about thirty two percentage of children aged 2 to 4 years had a dental visit within the past twelve months. Slayton et al. in their Iowa halide Study reported that among children between birth to three years about two of the parents reported that their kid had a dental visit by one year of age(Gorito et al., 2019). A study by Pierce and coworkers, showed that medical aid suppliers tend to under- refer, and solely seventieth percentage of children with proof of dental illness received a referral. A study by Cunha in a Brazilian population showed that, following the associate awareness program applied by the Baby Clinic of the grad school of Aracatuba, the foremost common reported reason for infants to gain attention was the parents' desire for orientation and bar(dela Cruz et al., 2004).

Reason for first dental visit: If not for pain and alternative dental emergencies (e.g., trauma and infection), most

participants during this study might not have visited the dental clinics at the recorded ages. Alternative studies conducted in Saudi Arabia have additionally documented late exposure to aid, with considerable percentages of parents denied for dental visitation if their children weren't in pain . Results of alternative studies conducted in several places replicate identical perspectives, with pain reported as the dominant issue prompting parents to visit for initial dental appointments for their children.

Present study showed a low awareness level in the population, as the majority of the children were brought for the first dental visit at 6 to 12 years of age and the commonest reason for seeking dental care was pain and dental caries. It is also evident that parents bring their child for a dental visit only when the disease is moderate to severe. In the present study, low percentages of parents wanted initial aid for their children for preventive reasons, like check-up or fluoride application. These results demonstrate a transparent lack of dental data and unknowingness of the importance of dentition among folks of the study participants. Baghdadi in 2014 stated that similar attitudes among people in Saudi society, showing under-recovery of the role that teeth—particularly primary teeth—play within the general health and well-being of their children, further as a scarcity of data relating to the suitable time for a child's first dental visit (Bagramian et al., 2009). It is also good to notice 15% of participants reported due to referral from camps conducted in schools. This proves that practitioners/ educational institutions promote dental awareness among school children.

CONCLUSION

Within the limitations of the current study, the most common age of the child's first dental visit was at 6 -12 years. The common reason for seeking aid at the primary visit was found to be pain and dental caries. It is evident that the attention level concerning the importance of the primary dental visit is incredibly low among the study population.

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Knowledge,Awareness and Attitude About Preterm Birth and its Causes Among Females of Reproductive Age Group

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ABSTRACT

Preterm births are babies born less than 38 weeks of gestational age as opposed to the usual about 40 weeks.It is recommended that labor not to be medically induced before 39 weeks unless required for other medical reasons .Preterm birth is the most common cause of death among infants worldwide.So recent attention has been given to mortality and morbidity risk factors associated with moderate and late preterm delivery. Preterm birth not only affects infants but also the mothers. Preterm birth can be caused due to neonatal complications or maternal complications but in some cases it can be both maternal and neonatal complications. The aim of our study is to find out the awareness of preterm births and its causes among reproductive women. So a survey was conducted for a sample size of 100 samples to analyze the awareness about preterm births and its causes among reproductive women.The data was statistically analysed (descriptive and chi square analysis) and the results were interpreted. The P value was From this survey we conclude that there is awareness of preterm birth and its causes among females of the reproductive age group is about average of 65% . The age group 20-30 years females of our study sample were more aware about the causes and complications of preterm birth than the 18-20 years aged group. There are many health related problems which can lead to premature babies or preterm births. Preterm birth can be mainly caused due to stress and preterm birth can be prevented by regular checkup for both mother and foetus, good nutrition and happy surroundings

KEY WORDS: PRE TERM, BIRTH, COMPLICATIONS, AWARENESS, CAUSES.

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INTRODUCTION

A normal pregnancy is about 40 weeks.Preterm births are babies born less than 38 weeks of gestational age as opposed to the usual about 40 weeks.It is recommended that labor not to be medically induced before 39 weeks unless required for other medical reasons .Preterm birth is the most common cause of death among infants worldwide.About 15 million babies are preterm each year (5% to 18% of all deliveries).Approximately 0.5% of births are extremely early periviable births, and these account for most of the deaths.In many countries, rates of premature births have increased between the 1990s and 2010s.Complications from preterm births resulted in 0.81 lakhs deaths in 2015 down from 1.57 million in 1990.

The chance of survival at 22 weeks is about 6%, while at 23 weeks it is 26%, 24 weeks 55% and 25 weeks about 72%.The chances of survival without any long-term difficulties are lower (Iams, no date).So recent attention has been given to mortality and morbidity risk factors associated with moderate and late preterm delivery.As we all know preterm birth is a major challenge perinatal health care.Preterm birth not only affects infants but also the mothers. Preterm birth can be caused due to neonatal complications or maternal complications but in some cases it can be both maternal and neonatal complications.Some obvious reasons for early delivery is medical reason (Goldenberg et al., 2009).

Spontaneous preterm labour is being mainly caused by multiple pathological conditions that leads to 70% of the world's preterm birth.Among all the neonatal deaths occurring in our developing countries its fate is high in remote areas were preterm babies are born at home and treated.And more women in rural areas have a greater significance of eclampsia than women in urban areas (Lisonkova et al., 2016). Its known that women with very short intervals between pregnancies are at increased risk of complications such as preterm birth,neonatal death,and growth restrictions.And the etiology includes chronic ,catastrophic stress,maternal anxiety,stress which is being mostly affected and leads to premature babies. Preterm births also sometimes include lifestyle factors that favour pregnancy outcomes (Thornton, 2008).It's quite interesting to know that increase preterm birth have increased the chances of twin babies that Inturn decreases the chance of perinatal deaths in twin pregnancies of preterm delivery before 34 week of gestation.

But preterm babies are always low birth weight remain high priority in public health problems and are associated with increased risk of infant mortality as well as long term health impairments (Joseph et al., 2001).Among all the causes recent research that proved the major risk factor is stress ,emotional states of the mothers with mental anxiety,depression and adverse health risks. Infections(Brundha, 2015) are likely to be associated with infections ,and may include poor eating habits ,drinking and smoking habits that increase the early birth.So more care and attention should be given to pregnant women

during their pregnancy time to keep them away from all types of anxiety and any kind of stress that would involve pregnant women (Dietze, Rose and Moore, 2016). In most cases ,preterm labour begins unexpectedly and the cause is unknown still ,like regular ,labor, signs are mostly change in vaginal discharge ,pelvic pressure ,low and dull backache ,cramps feeling like menstrual period and abdominal cramps with or without diarrhoea.These include central and peripheral systems implicated in psychological stress(Wadhwa et al., 2011).

As we all know preterm babies are not fully developed, so they may suffer from various complications such as Respiratory distress syndrome,feeding difficulties,jaundice(Abijeth and Brundha, 2017), severe infections,brain injury, necrotising enterocolitis,retinopathy of prematurity and anemia prematurity.The main care should be to stress and amd vulnerability to stress pregnancy (Dole, 2003).Preterm birth babies facing first factor is with low birth weight but those babies are proved to have a smarter brains when compared to babies born full term of gestation .The largest improvement in survival occurs between 25 to 32 weeks (Copper et al., 1993; Benitz, 2009).Preterm birth can be diagnosed by cardio - respiratory monitoring,blood test, fluid input and output,echocardiogram ,Ultrasound scan ,and eye examination.Preterm birth can be prevented by regular health check ups ,healthy eating ,stress free surroundings,enabling early and long term tocolytic therapy (Scott, Steel O'Connor and Carr, 2001)

MATERIAL AND METHODS

Sample Collection: A questionnaire based survey was conducted for a sample size of 100 samples to analyze the awareness about preterm births and its causes among females of reproductive age group. Nearly 12 questions had been prepared and it was asked to the females of the reproductive age group(15-49 years) in the general population and answers were recorded.

Inclusion Criteria: Selection criteria include females of age between 15 to 49 years.

Exclusion Criteria: Females of age below 15 years and above 49 years and marital status were excluded.

Sampling Method: In the present study,the sampling method used is a random sampling method.

Data Collection and Tabulation: The number of questions distributed was 12.The close ended yes or no type of question were asked.Their responses were entered into the excel sheets and then tabulation of the data finally and the question comparison was done. The representation of the data is through the bar graph .

Statistical Analysis: The statistical software used IBM SPSS V22.The statistical test used is Chi square test (p value).Type of analysis used were descriptive analysis,demographic data.

RESULTS AND DISCUSSION

The results showed that the awareness of term and preterm birth, the month of preterm birth,consequences of preterm birth, causes of preterm birth , complications of preterm birth, preventive measures of preterm birth (Figure 1-11) among the females of reproductive age group is with in an average of 65%. When we compared the age groups of our study population with the knowledge of causes (Figure 12) and the knowledge on complications of premature birth (Figure 13), we found that the age group 20-30 years females of our study sample were more aware about the causes of preterm birth than the 18-20 years aged group. The p-value obtained was 0.020 (<0.05) and also the majority of the study population aged between 20-30 years were more aware of the complications of preterm birth than the other age group (18-20 years). However the difference was statistically not significant. (P-value-0.976 (>0.05)).

Figure 1: Pie chart shows the awareness about preterm birth where blue colour denotes YESand green denotes NO. 87.72% of the study participants answered they were aware of the term and preterm births.
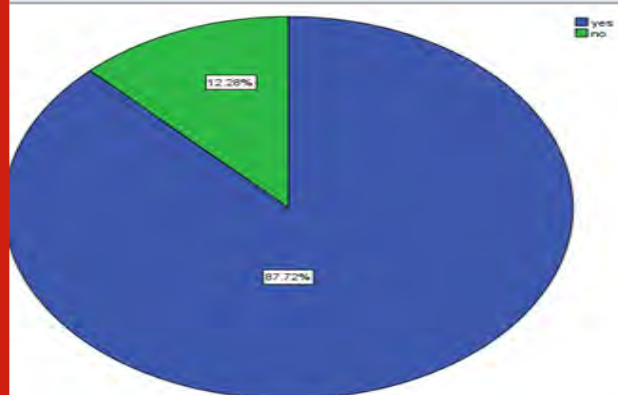
Figure 2: Pie chart shows the preterm birth month where blue colour denotes YES and green denotes NO. 91.23% of the study participants were aware of the month of preterm babies.
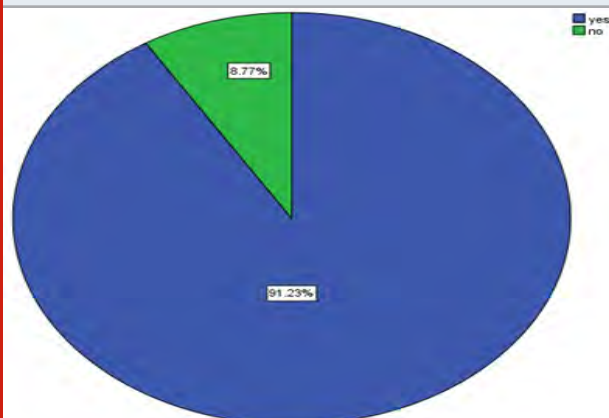
Figure 3: Pie chart shows awareness of mortality rates of preterm birth where blue colour denotes YES and green denotes NO. 56.14% of the study participants answered that they were not aware of the mortality rates of preterm birth.
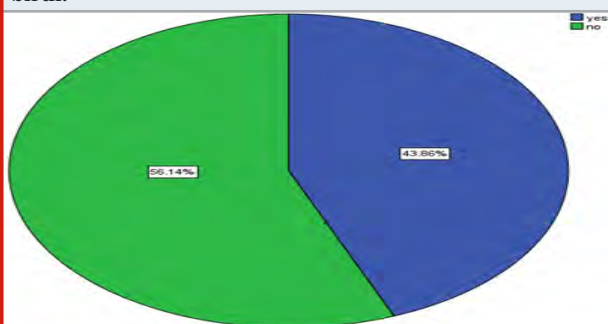
Figure 4: Pie chart shows the awareness of consequences of preterm birth where blue colour denotes YES and green colour denotes NO. 63.16% of the study participants answered that they were aware of the consequences of preterm birth.
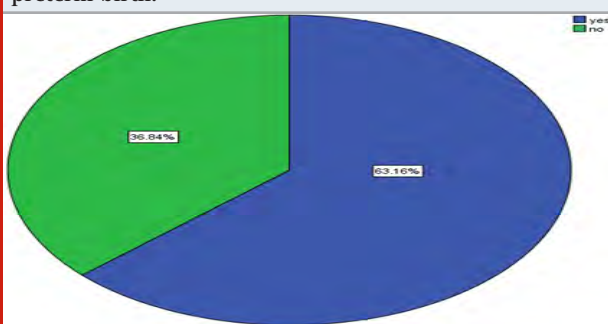
Figure 5: Pie chart shows the causes of preterm birth where blue colour denotes problem with foetus ,green denotes poor nutrition and beige denotes stress. 56.16% of the study participants answered that the main cause of preterm birth can be problem with foetus.
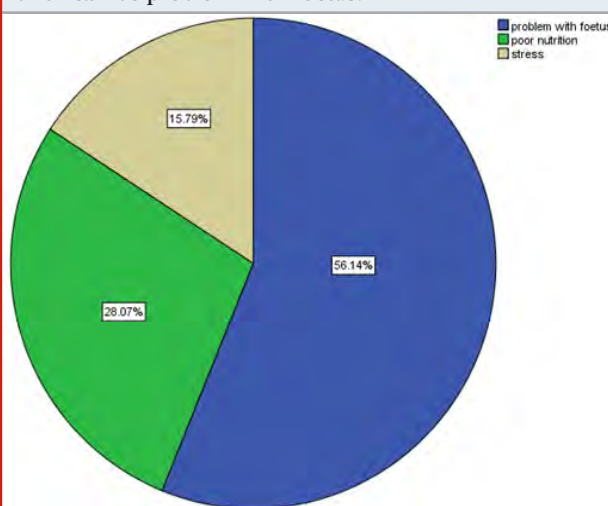
Figure 6: Pie chart shows whether preterm birth is a complication of pregnancy where blue colour denotes Yes and green denotes No. 64.91% of the study participants answered that preterm birth was a complication of pregnancy.

Figure 7: Pie chart shows the preterm birth complications were blue colour denotes maternal complication,green denotes foetus complication ,beige denotes both and purple denotes none.52.63% of the study participants answered that the complication for preterm birth can be maternal complication.

Figure 8: Pie chart shows reason for preterm birth where blue colour denotes Yes and green colour denotes No. 66.67% of the study participants answered that health related problems can affect premature babies.

Figure 9: Pie chart shows premature babies are smarter where blue colour denotes YES and green colour denotes NO. 64.91% of the study participants answered that premature babies are smarter due to faster brain growth.

Figure 10: Pie chart shows whether preterm births can be prevented where blue color denotes YES and green denotes NO. 61.40% of the study participants answered premature birth can be prevented to a certain extent.

Figure 11: Pie chart shows the various ways preterm birth can be prevented where blue colour denotes proper health education,green denotes good nutrition and beige denotes having a healthy environment. 36.84% of the study participants answered that promoting proper health education ways preterm births can be prevented.
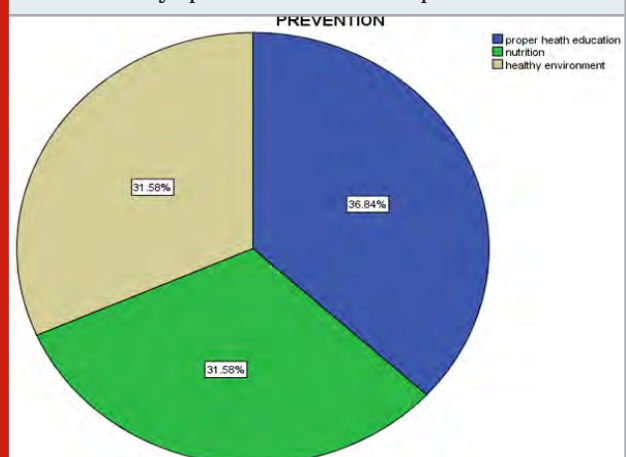
Figure 12: Pie chart shows the age group where blue colour denotes 18-20 years and green colour denotes 20-30 years of age. 61.40% of the study participants answered they were under the age group 20-30 years.
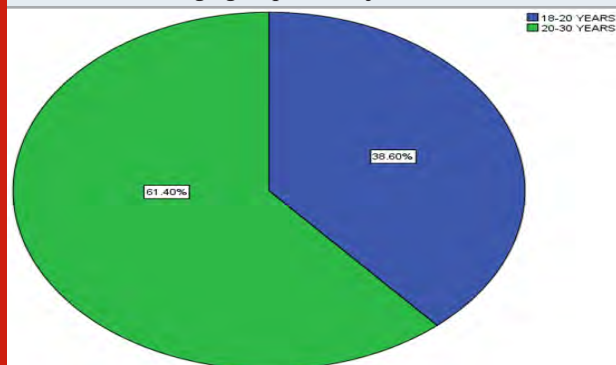
As discussed in previous article women are only aware of the term premature babies but not the complications and consequences caused by them (Scott, Steel O'Connor and Carr, 2001)Premature babies may need longer or more intense nursery care, medication and sometimes surgery. A study done by Oliveria et al showed that preterm birth is very common in recent years due to many factors which mainly include health complications . Women are not very much aware of the serious problems or complications that arise due to premature babies to them and as well as the mothers (Oliveira et al., 2020). This is well correlated with our study. As recent research has proved that stress is a leading factor contributing to a major reason for preterm birth. This stress can be emotional,financially or anything. So as discussed in previous articles preterm births can be prevented by going to regular health check ups, doing mediation,being relaxed free from stress(Schander et al., 2017). As we all know once a woman is pregnant she can't be given any medications other than recommended by the doctor for her nutrition.But sometimes doctors give corticosteroids,which helps in babies better lung maturity .

It's so clearly known that Preterm babies may or may not suffer lifelong effects such as cerebral palsy, mental retardation, visual and hearing impairments, and poor health and growth. Babies born only a few weeks early (late preterm, 34-36 weeks) often have long-term difficulties such as(Romero, Dey and Fisher, 2014).As discussed in many articles, preterm babies track with full term babies as they start growing up .Most preemies grow up to be healthy kids. They tend to be on track with full-term babies in their growth and development by age 3 or so.Even though baby's early years maybe more complicated than a full-term baby's. Because they're born before they're ready, almost all preemies need extra care(Bosworth and Dobkins, 2013). The limitation of this study was that an equal number of participants can be included with different age groups to get more accuracy in the results. The future scope of this study is that it can be expanded widely to include an equal number of

participants to assess the awareness and knowledge on the Preterm birth and its consequences.

Figure 13: Bar chart showing the comparison of responses between age groups and knowledge on causes of preterm birth. X-axis represents different age groups and Y-axis represents percentage responses for causes of preterm birth. From this chart it was found that the opinion of the both age groups was higher for foetal causes. Majority of the study population aged between 20-30 years were more aware of the causes than the other age group (18-20 years) and the difference is also statistically significant. Chi square test P-value-0.020(<0.05).
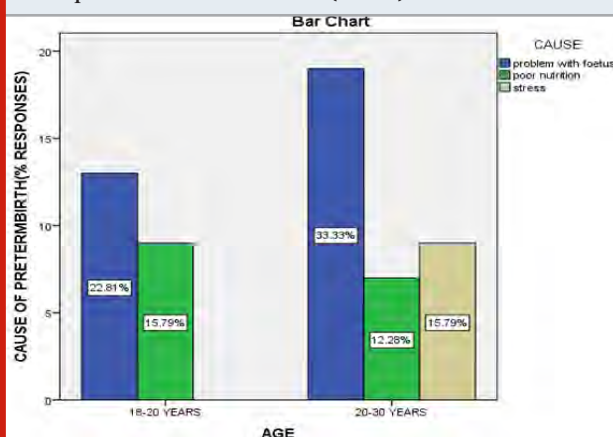
Figure 14: Bar graph depicts the association between age and knowledge on complications it causes due to preterm birth. X-axis represents different age groups and Y-axis represents percentage responses for complications of preterm birth. From this chart it was found that the opinion of the both age groups was higher for maternal complications. Majority of the study population aged between 20-30 years were more aware of the complications of preterm birth than the other age group (18-20 years). However the difference was statistically not significant. Chi square test P-value-0.976 (>0.05) statistically not significant.
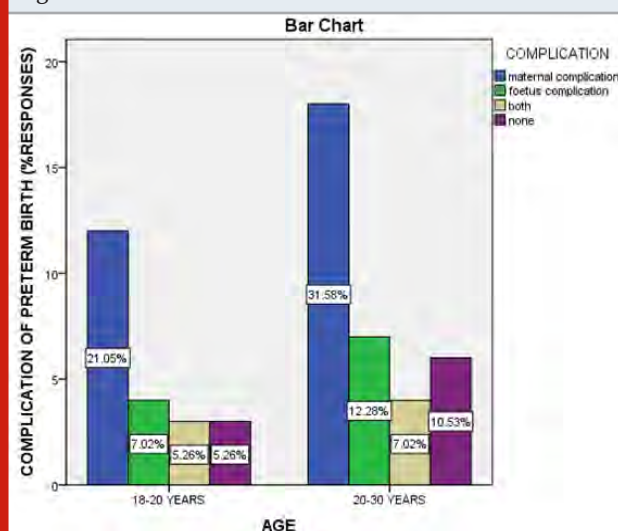
CONCLUSION

Within the limitations of our study, we conclude that an average of 65% of the females of the reproductive age group were aware of preterm birth and its causes and complication and the age group 20-30 years females of our study sample were more aware about the causes and complications of preterm birth than the 18-20 years aged group. Further studies can be done to analyse health related problems which can lead to premature babies.

ACKNOWLEDGEMENTS

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Awareness of Luxators in Dental Extraction Among Dentists

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ABSTRACT

Luxator looks like an elevator, but the tip of the instrument is significantly thinner and somewhat flatter than an elevator.One of the frequently occurring frustrating challenges when extracting teeth is breaking the tooth off at the bone level, or extracting a tooth that has decayed off at the bone level.The aim of this study is to determine the level of knowledge about the usage of luxator in dental extraction by the dentist and getting to the how aware they are about the use of luxator in their practice .The study was formulated as a questionnaire based observational study comprising 100 participants.All the subjects were requested to respond to a list of questions regarding luxators and their use in dental extraction by the dentists.More than 90% of the dentists are aware of the luxators and they prefer them during dental extraction.Luxator to be one of the most valuable instruments available for the situations of broken or decayed tooth .It is not a replacement for elevators. It is an augmentation for relatively easy removal of broken teeth. Soon after acquiring the instruments, dentists will find other uses for luxators

KEY WORDS: AWARENESS, LUXATOR, EXTRACTION, DENTISTS.

INTRODUCTION

The extraction of a tooth is probably the most traumatic event a patient can experience in the dental office, and if the extraction doesn't go smoothly, things can become quite stressful for the dentist as well.When the use of a simple surgical instrument can make the extraction process infinitely easier for both patient and dentist. (Weiss, Stern and Dym, 2011)Luxator helps the dentist to divide and conquer the forces retaining a tooth, making the extraction process an atraumatic extraction with Luxator Periotome is definitely a more predictable and stress-free process. (Tsirlis et al., 2015)The appropriate size of Luxator is chosen to match the diameter of the root,and the angle of the blade is chosen to give the best access.(Kumar et al., 2013) The tip of the Luxator is gently inserted into the gingival margin, with the blade angled slightly toward the root surface.

This ensures that the Luxator enters the periodontal ligament between the crestal bone and the root. Once in the periodontal ligament, the Luxator is worked down the length of the root with a side-to-side rocking motion and steady axial pressure. (Arashiro et al., 2020) This motion first severs the periodontal fibers, and then as the blade is introduced further, the socket is dilated to allow an easier path of removal.(Bhusari et al., 2014) Finally, as the periodontal ligament is severed and the socket dilated, bleeding and air ingress overcome the vacuum that resists tooth removal.(Sharma et al., 2015) The Luxator should be inserted around as much of the circumference of the root as possible to evenly dilate the socket. Once this has been achieved, the final delivery of the tooth may be performed with forceps, although this

is often not required with single-rooted teeth.(Tsirlis et al., 2015; Xu and Zhang, 2016)

When using a Luxator, the uniquely designed handle should sit neatly in the palm of your hand, cradled by your fingers and thumb, with the index finger extended toward the tip of the instrument . (Kang, Dym and Stern, 2009)This allows for precise control of the tip and prevents the risk of slipping. Excessive force should be avoided; the Luxator is a surgical instrument and should be used as such, not as an elevator.(Levitt, 2001) Most dentists have been taught to make a soft-tissue flap and remove bone on the facial side of such broken off teeth, allowing the teeth to be removed from the facial aspect. This bone removal is destructive, limits the possibility for placement of implants at a later date, and makes a permanent anatomical defect in the alveolar ridge.The use of luxators makes it esthetically acceptable.(Thomson, 1992; Kang, Dym and Stern, 2009) This study was undertaken in order to determine the level of knowledge about the usage of luxator in dental extraction by the dentist and getting to the how aware they are about the use of luxator in their practice.

Figure 1: The pie chart depicting the distribution of qualification of dentists participated in the survey.Blue colour indicates undergraduates (45%). Green colour indicates postgraduates (26%). Beige colour indicates oral and maxillofacial surgeons (29%).
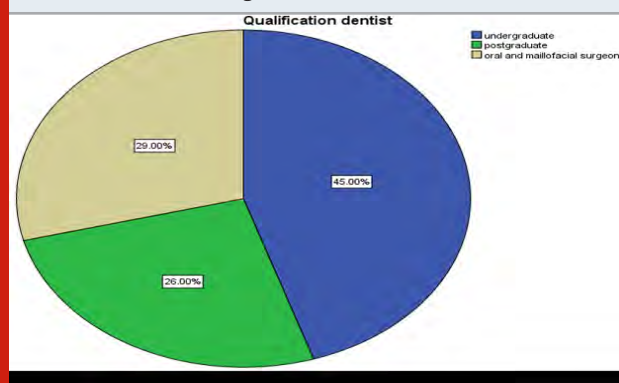
Figure 2: The pie chart depicts the use of luxator in clinical practice among the participants. Blue colour indicates yes (43%). Green colour indicates no (21%). Beige indicates sometimes (36%).
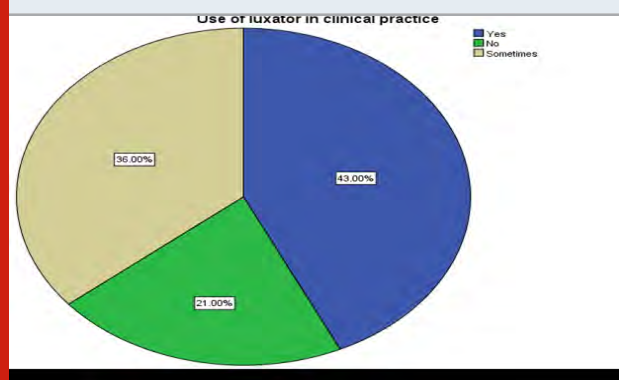
Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about awareness of luxator in dental extraction among dentists.

MATERIAL AND METHODS

The present study is an online based survey conducted among the dental students.The participants were the undergraduate students of BDS, postgraduates of oral and maxillofacial surgery and oral and maxillofacial surgeons.Questionnaires were prepared and distributed among undergraduates,postgraduates and oral maxillofacial surgeons through an online link from the google forms . The total number of participants was 100 dentists. Participation in this study was voluntary. The questionnaire contained 15 questions. Independent variables were demographics such as year of study of participants. Dependent variables were knowledge ,awareness about luxator in dental extraction and the dentists. Only the completed surveys were included for analysis. The collected results were entered in Microsoft excel. Data analysis was done using SPSS software 20.0. Statistics used for analysis was Descriptive statistics and comparison of variables were done using chi square test where $p < 0.05$, statistically significant .

Figure 3: The pie chart depicts the usage of luxator in the extraction treatment. Blue colour indicates that the luxator is used when the tooth is broken at bone level (82%). Green colour indicates that the luxator is used in normal extraction treatment (18%)
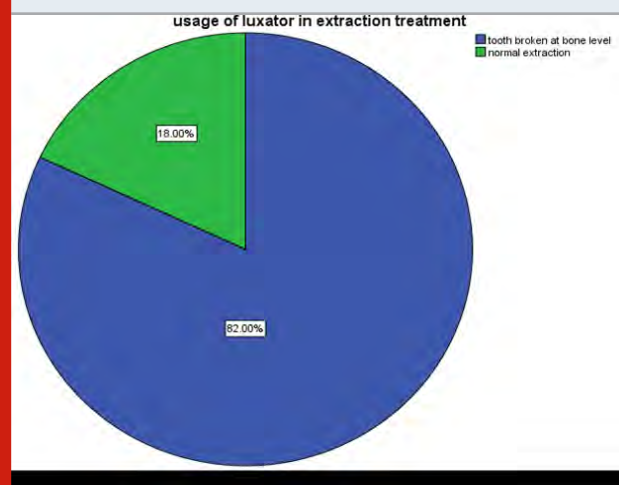
RESULTS AND DISCUSSION

The participants of the survey were the undergraduate

students of BDS , postgraduates of oral and maxillofacial surgery and oral and maxillofacial surgeons.The survey results obtained by the statistical analysis is discussed here, the participation by undergraduates is 45% and postgraduates is 26% and oral and maxillofacial surgeons is 29%. (Figure 1). The use of luxator in clinical practice by the participants shows that 43% use luxator and 21% of the participants do not use the luxator and 36% of participants use luxator sometimes during the dental extraction. (Figure 2). The luxator is used when the tooth is broken at the bone level 82% and the luxator is used in normal extraction treatment by the respondents is 18%. (Figure 3). The position of luxator placed between tooth surface and mesial and distal supporting bone is 84% ,the luxator placed between tooth surface and palatal bone is 6% and the luxator placed between tooth surface and thin piece of bone is 10% by the respondents (Figure 4).

Preference of luxator over an elevator 57% agree the use of luxator ,27% do not agree and 16% of the participants sometimes prefer luxator over elevator. The reason to choose a luxator over an elevator is that the tip is thin 69% , the tip is flat 20% and the luxator used in normal extraction by the participants is 11% (Figure 6). 82% of the participants agree that luxator is used by them when the tooth is broken at bone level and 18% disagree. (Figure 7). 76% of the participants agree that use of luxator is time consuming 14% of the participants assume that it is less time consuming. (Figure 8). 87% of the participants agree that use of luxator increases the potential implant placement and 13% disagreed.The present study consensus with (Sharma et al., 2015) (Figure 9).The awareness on use of luxator in dental extraction among the participants is higher with 92% and 8% are unaware. (Figure 10). The preference of luxator in dental instruments used in dental extraction by the dentists is 34%. (Figure 11).

Figure 4: The pie chart depicts the position of luxator in clinical practice during extraction. Blue colour indicates that the luxator is placed between tooth surface mesial and distal supporting bone (84%). Green colour indicates that the luxator is placed between tooth surface and palatal bone (6%). Beige colour indicates that the luxator is placed between the tooth surface and thin piece of bone (10%)

FIgure 6: The pie chart depicts the reason to use luxator over an elevator in dental extraction. Blue colour indicates that the tip is thin (69%). Green colour indicates that the tip is flat (20%). Beige colour indicates that it is used for normal extraction (11%)
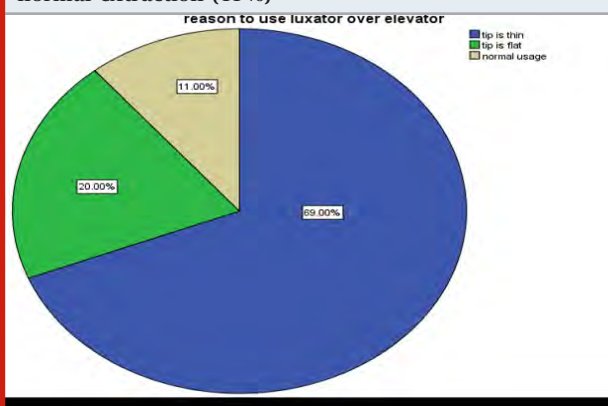
Figure 5: The pie chart depicts the preference of luxator over an elevator in dental extraction. Blue colour indicates yes (57%).Green colour indicates no (27%).Beige colour indicates sometimes (16%).
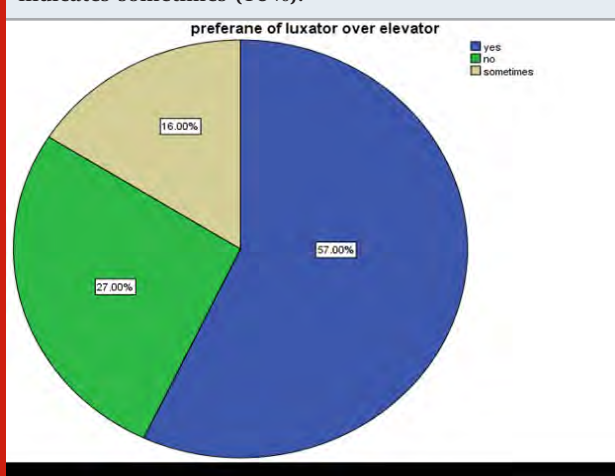
Figure 7: The pie chart depicts the use of a luxator when the tooth is broken at the bone level. Blue colour indicates yes (82%). Green colour indicates no (18%)
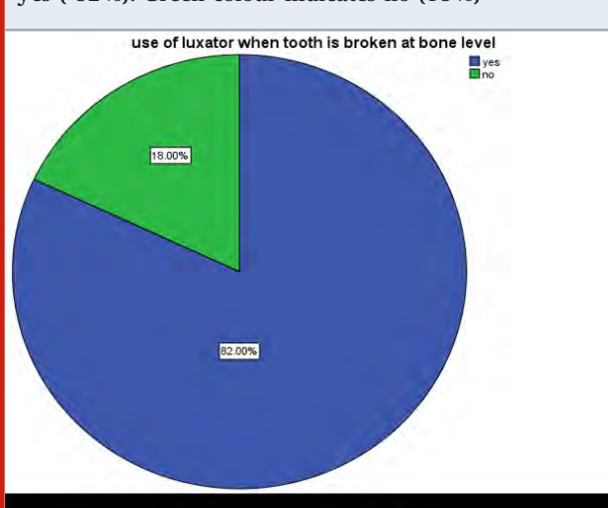
Figure 8: The pie chart depicts the time span of using a luxator in dental extraction. Blue colour indicates that it is time consuming (76%). Green colour indicates that it is less time consuming (14%). Beige colour indicates that it depends on the tooth and use by the dentist (10%)
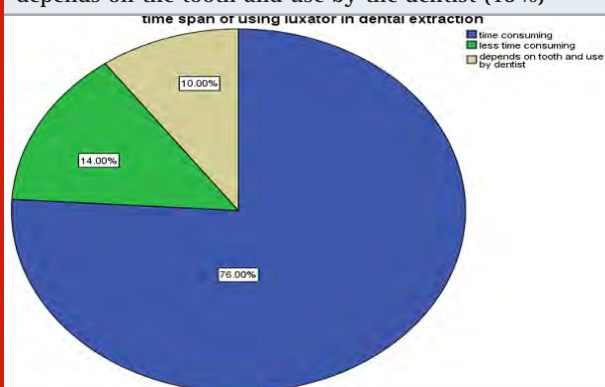
Figure 9: The pie chart depicts that luxator helps in potential implant placement. Blue colour indicates yes (87%). Green colour indicates no (13%)

Figure 10: The pie chart depicts the awareness and knowledge on luxator among the participants. Blue colour indicates that they are aware (92%). Green colour indicates that they are not aware (8%)

Figure 11: The pie chart depicts the preference of dental instruments used in extraction by the dentists. Blue colour indicates luxator (34%). Green colour indicates elevator (56%). Beige colour indicates forceps (10%)
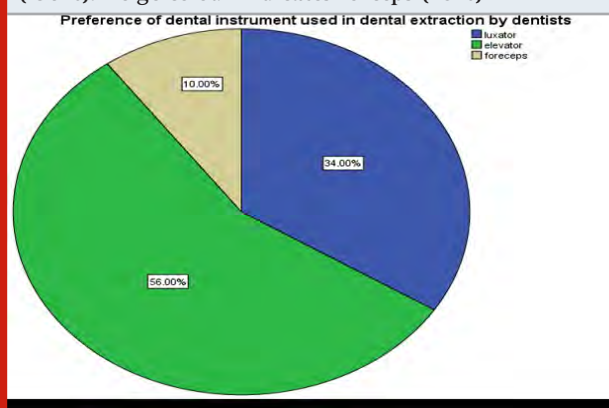
Comparison of qualification of dentist and the frequency showing the use of luxator increases the chance of implant placements was done and majority of participants agreed that the use of luxator increases the chance of implant placement (62%). This was found to be statistically significant where p=0.02.(Figure 12). Comparison of qualification of dentist and the frequency showing the use of luxator in clinical practice. The use of luxator among the undergraduates is more (25%) compared to others. This was found to be statistically not significant where p=0.38. (Figure 13).

Figure 12: The bar graph depicts the comparison of qualification of dentist and the frequency showing the use of luxator increases the chance of implant placement. X axis denoted the qualification of dentist and Y axis denotes number of participants . Blue colour depicts the participants who agree that use of luxator increases the chance of implant placement and green colour depicts the participants who do not agree and beige colour depicts that they might agree nor disagree. Majority of the participants agreed that use of luxator increases the chance of implant placement (62%). This was found to be statistically significant. Chi square test, p=0.02
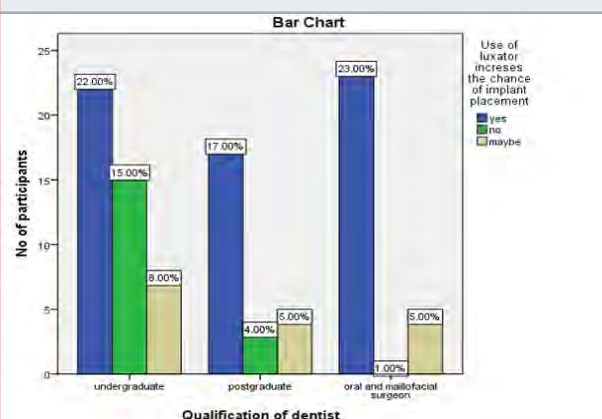
Figure 13: The bar graph depicts the comparison of qualification of dentist and the frequency of use of luxator in clinical practice. X axis denotes the qualification of dentist and the Y axis denotes the number of participants. Blue colour indicates that the dentists use luxator in their clinical practice and green colour indicates that dentists do not use luxator and beige colour indicates that the dentists use luxator sometimes during their clinical practice. The use of luxator among the undergraduates is more (25%) compared to others. This was found to be statistically not significant. (Chi square test, p=0.38)
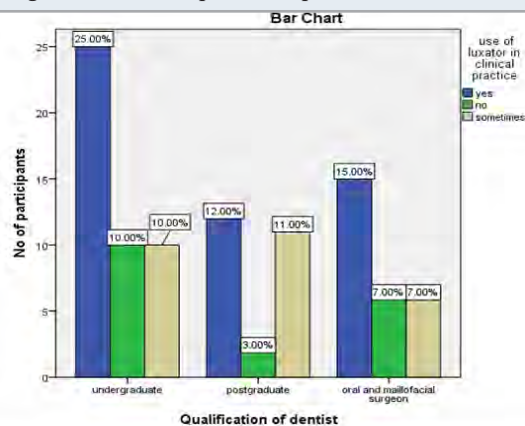
CONCLUSION

This survey aims in creating awareness among dentists about the use of luxator in dental extraction during clinical practise. It also creates awareness about the complications and advantages of using luxator in dental extraction. From the results of the survey it is clear that most of the dentists are well aware of the use of luxator in clinical practice and also proper knowledge about the complications and advantages of using luxator in dental extraction.

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Assessment of Patient's Expectations on Removable Partial Denture Prosthesis

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ABSTRACT

Tooth loss can have negative impacts on facial appearance , speech , and mastication. The replacement of missing teeth by appropriately designed prosthesis is in demand and is required to maintain a good health status and normal life . There are several modalities of treatment for rehabilitation of partial edentulous patients. These include implant supported prosthesis , teeth supported bridges and removable partial denture. RPDs are applied to restore facial form and masticatory function after loss of natural teeth . There is a lack of available information on patient satisfaction and complaints with RPD . The purpose of this retrospective study was to investigate the expectation level on removable partial denture among patients in OP of saveetha dental college. A set of 15 questionnaires in regards to assess the level of patients expectations on removable partial denture prosthesis were taken. 100 random participants of independent age and sex were selected from OP of Saveetha dental college and asked them to fill the questionnaire. The survey was conducted on an online forum. The results were obtained and analysed statistically .Among the 100 participants , 52 of them are male and 48 of them are female in which more than 50 % of participants are above 40 years old . More than 70% of the participants have edentulousness or missing teeth. In which 40 % of them have previous denture experience . The major difficulties of the participants with the edentulousness or missing teeth are discomfort in mastication (60%) , phonetic difficulties (56%) and Aesthetical problems (47%). The average level of expectation regarding the fitness of removable partial denture is 3.55/5. The average level of expectation regarding the functional limitation of RPD 3.38/5. The average level of expectation regarding the phonetical comfortness of RPD is 3.39/5 and the average level of expectation on the aesthetic comfortness is 3.48/5. More than 75% of the participants wish to undergo removable denture prosthesis with an average overall satisfactory level of 3.58/5 . Within the limitations of this study, the majority of participants have high levels of expectation with their removable partial dentures treatment. The most common expectation was fitness and aesthetic issues, which suggests that dental treatments with removable partial denture should be applied with care when patients have high aesthetics , phonetical and functional concerns.

KEY WORDS: REMOVABLE PARTIAL DENTURE ; PATIENT'S EXPECTATIONS ; FUNCTIONAL EXPECTATIONS ; AESTHETICAL EXPECTATIONS ; PHONETICAL EXPECTATIONS.

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INTRODUCTION

Tooth loss can have negative impacts on facial appearance , speech , and mastication. The replacement of missing teeth by appropriately designed prosthesis is in demand and is required to maintain a good health status and normal life . In many countries, oral health parameters have shown gradual improvement and the rate of edentulism is decreasing, which could lead to a reduction in the need for dentures. However, it is estimated that, despite the decline in edentulism rates, the number of edentulous patients will increase until the year 2020, due to an increase of the elderly population (Allen and McMillan, 2003; Carlsson, 2006). Thus, an interest in dental implants has increased rapidly over the last two decades. However, the vast majority of edentulous persons still have to accept conventional dentures, mainly due to economic factors. This outcome is attributed to the fact that toothless individuals usually belong to the poorest population stratum and have no access to treatment with implants.Therefore, most prosthetic work undertaken by dentists still consists of conventional crowns and dentures. There are several modalities of treatment for rehabilitation of partial edentulous patients . These include implant supported prosthesis , teeth supported bridges and removable partial denture.

RPDs are applied to restore facial form and masticatory function after loss of natural teeth . Acrylic polymers (polymethyl methacrylate[PMMA]) and metallic (chrome cobalt alloys) materials are routinely used. However due to the considerably low cost , ease of manipulation and utilisation of inexpensive equipment, acrylic denture bases are the most popular material for RPD framework fabricationThus, it is important to note that conventional dentures also provide benefits for edentulous patients, providing aesthetics and some function, as well as being socially acceptable for the replacement of missing teeth (Carlsson, 2006; Leles et al., 2008). Some of the advantages of removable dental prosthesis (RDP) therapy vs conventional or implant-supported fixed bridges are that RDPs usually cost less and are easier to clean (Cosme et al., 2006). Considering that patient satisfaction is the ultimate objective during oral rehabilitation, it is interesting to note that few studies have been conducted in order to verify and understand the factors that affect this satisfaction (Carlsson, 2006).

Chewing ability, comfort, aesthetics and retention are important factors for acceptance by RDP wearers (celebic and Knezovic-Zlataric, 2003; Mazurat and Mazurat, 2003). For some patients, the overall satisfaction with RDP is related to comfort and the ability to chew. For other individuals, aesthetics and reten- tion seem to be the most important factors (Zlataric and Celebic, 2008). Thus, while dentures are constructed, great emphasis is placed on technical aspects that relate to the denture's quality, which seems to play a role in the quality of life relating to oral health of RDP wearers (Inukai et al., 2008). Furthermore, it is also important to take into consideration the personality, attitude and motivation for

RDP use, which also may influence patient satisfaction (Cosme et al., 2006; Carlsson, 2009). Therefore, satisfaction with dentures is multifactorial, involving technical aspects and also those that relate to the patient (Carlsson, 2006, 2009; Bellini et al., 2009). It is important to note that patients and health professionals evaluate their expectations and satisfac- tion with removable dentures therapy in completely different ways. This fact can lead to conflict and a deterioration of the patient/ professional relationship (Marachlioglou et al., 2010), which may also influence patient satisfaction with their dentures (Carlsson, 2009).

Although RPDs are a non-invasive and reversible treatment option, with a more acceptable cost and easier oral hygiene techniques in most cases, they are associated with several oral complaints, such as speech, mastication, pain, and aesthetic issues (Khan, Khan and Others, 2015). There is a lack of available information on patient satisfaction and complains with RPD . In the light of the previous information, the present study aims to assess the level of patient's expectations on removable partial denture prosthesis

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the assessment of patient's expectations on removable partial denture prosthesis .

MATERIAL AND METHODS

The cross-sectional descriptive and analytical study design was used to assess the patient's expectations on removable partial denture prosthesis. 100 participants from OP department of Saveetha dental college of independent age and sex by random sampling method were selected for the study . A set of 15 questionnaires was designed and prepared, which was later reviewed by the experts in this field of study. The questionnaire consists of Socio-demographic information of the respondents such as Age , Gender, also sections on thoughts of the participants on removable partial denture prosthesis and grading their level of expectations . The Survey was conducted on an online forum . The results were obtained and statistically analysed.

RESULTS AND DISCUSSION

Among the 100 participants, 52 % of them were Male and 48 % of them were Female in which more than 50 % of participants were above 40 years old . 21 % of the participants were less than 30 yrs old, 23 % were 30 to 40 yrs old, 16 % were 40 to 50 yrs old, 23 % were 50 to

60 yrs old and 17 % were more than 60 yrs old . More than 71 % of the participants have edentulousness or missing teeth and 29 % don't have edentulousness or missing teeth. 39 % of the participants have previous denture experience.

them thought that it was not affordable. 32 % of the participants expect the outcome of TPD as a temporary replacement , 38 % expect the outcome as temporary and comfortable replacement and 30 % expect the outcome as uncomfortable replacement.

Figure 1: The Pie chart represents the percentage distribution of age of the participants. More than 50 % of participants were above 40 years old. 21 % of the participants were less than 30 yrs old, 23 % were 30 to 40 yrs old, 16 % were 40 to 50 yrs old, 23 % were 50 to 60 yrs old and 17 % were more than 60 yrs old
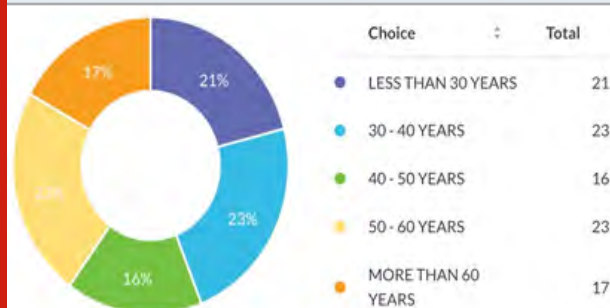
Figure 2: The Pie chart represents the percentage distribution of gender of the participants. Among the total participants, 52 % of them were Male and 48 % of them were Female
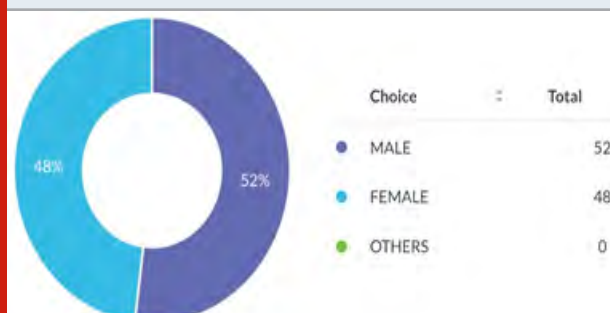
Figure 3: The Pie chart represents the percentage distribution of presence of edentulousness or missing teeth in the participants. More than 71 % of the participants have edentulousness or missing teeth and 29 % don't have edentulousness or missing teeth

Figure 4: The pie chart represents the percentage distribution of participants having family members who underwent TPD. 50 % of the participants have family members who underwent TPD and 50 % were not having such family members with TPD
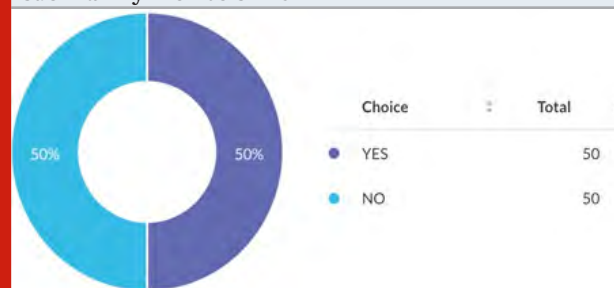
Figure 5: The Pie chart represents the percentage distribution of expectation of the participants on the outcome of TPD. 32 % of the participants expect the outcome of TPD as a temporary replacement, 38 % expect the outcome as temporary and comfortable replacement and 30 % expect the outcome as uncomfortable replacement
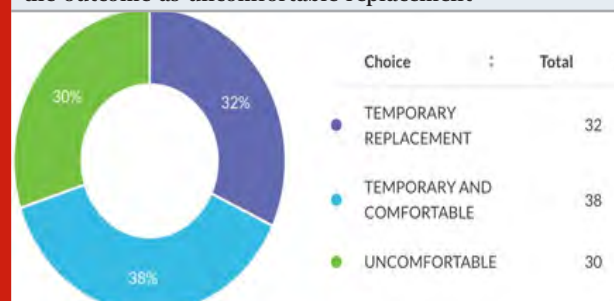
Figure 6: The Pie chart represents the percentage distribution of the participant's view regarding the cost of TPD. 44 % of the participants were having the view that the TPD was cost efficient and 56 % of them thought that it was not affordable
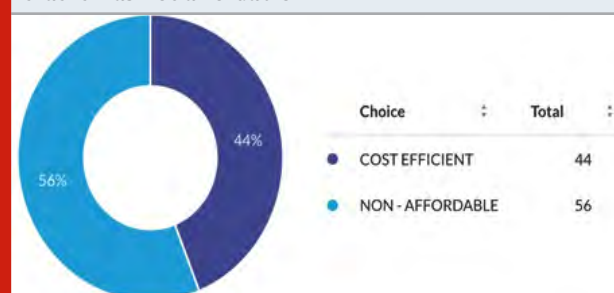
50 % of the participants have family members who underwent TPD. 44 % of the participants were having the view that the TPD was cost efficient and 56 % of

The major difficulties of the participants with the edentulousness or missing teeth are discomfort in mastication (60%), phonetic difficulties (56%) and

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Aesthetical problems (47%). The average level of expectation regarding the fitness of removable partial denture is 3.55/5. The average level of expectation regarding the functional limitation of RPD 3.38/5. The average level of expectation regarding the phonetical comfortness of RPD is 3.39/5 and the average level of expectation on the aesthetic comfortness is 3.48/5. More than 75% of the participants wish to undergo removable denture prosthesis with an average overall satisfactory level of 3.58/5.

Figure 7: The Pie chart represents the percentage distribution of participants having any previous denture experience. 39 % of the participants have previous denture experience. 61 % don't have any previous denture experience
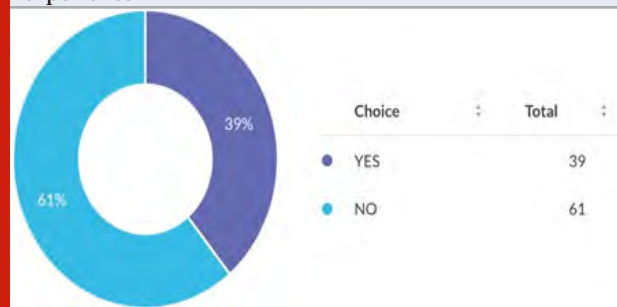
Figure 8: The Pie chart represents the percentage distribution of difficulties experienced by the participants with edentulousness or missing teeth. The major difficulties of the participants with the edentulousness or missing teeth are discomfort in mastication (60%), phonetic difficulties (56%) and Aesthetical problems (47%)
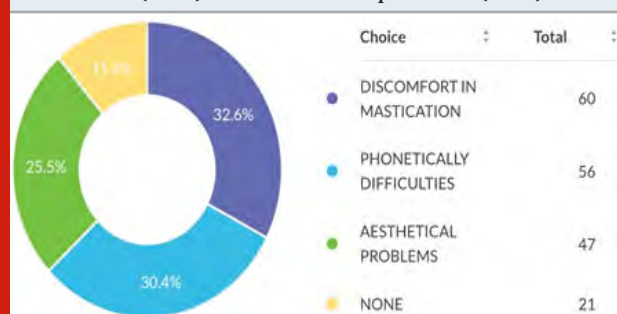
Figure 9: The Pie chart represents the percentage distribution of the willingness of the participants to undergo and consider TPD. More than29 % of the participants wish to undergo removable denture prosthesis and 25 % were not willing for TPD and 46 % of the participants answered maybe
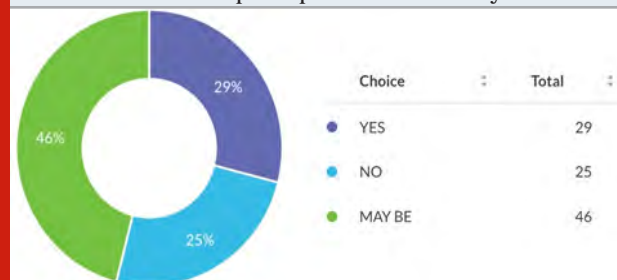
Figure 10: The bar graph represents the average level of expectations of the participants on Removable partial denture prosthesis. The X - axis represents the various different expectations and Y - axis represents the range of expectation (Out of 5). The average level of expectation regarding the fitness of removable partial denture is 3.55/5. The average level of expectation regarding the functional limitation of RPD 3.38/5. The average level of expectation regarding the phonetical comfortness of RPD is 3.39/5 and the average level of expectation on the aesthetic comfortness is 3.48/5. The average level of overall expectation on Removable denture prosthesis is 3.58/5
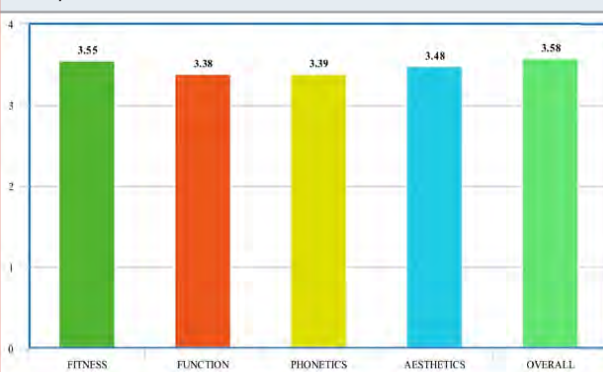
CONCLUSION

Within the limitations of this study, the majority of participants have high levels of expectation with their removable partial dentures treatment. The most common expectation was fitness and aesthetic issues, which suggests that dental treatments with removable partial denture should be applied with care when patients have high aesthetics, phonetical and functional concerns .

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Conflict of Interest: The authors declare that there is no conflict of interest

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Awareness on Various Surface Modifications of Implants Among Dental Students

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ABSTRACT

Implant surfaces are continuously being improved to achieve faster osseointegration and a stronger bone to implant interface. The adhesion and differentiation of osteoblastic cells are influenced by the surface properties of the dental implant. Surface properties include chemical composition, surface energy, roughness, and topography. In dental implants, surface roughness is often modified to modulate bone apposition. Surface roughness can be described as macro-, micro-, and nanometer-sized texture. Macro- and micrometer roughness facilitates mechanical anchorage to bone.The aim of this study is to estimate the awareness of various surface modifications of implants among dental students. A questionnaire with a set of 15 questions were prepared and an online survey was conducted among dental students using the survey planet. The sample size is 100. The results were analysed using SPSS software. From the study, 99% of the students were aware of a dental implant and 68% of the students have placed an implant. 75% of the students think that sandblasted and acid etched implants have more success rate among the microtopography implants. According to the results, students were aware about the various surface modifications of implants and also most of the students have an experience of placing an implant.

KEY WORDS: ACID-ETCHED, IMPLANT,SURFACE MODIFICATIONS,SANDBLASTED,TITANIUM.

INTRODUCTION

Dental implant surface advancement techniques have been developing rapidly to facilitate osseointegration and bone formation on the implant surface and to enhance the predictability of accelerated implant therapy. Surface modifications have been proven effective on capitalizing the features of titanium that make it the material of choice in dental implantology. Some of these features include wettability, surface area, and osteogenic potential(Amarnath et al., 2011).

An implant is a medical device which is made from one or more biomaterials, that is intentionally placed in the body either totally or partially buried beneath an epithelial surface (Jayaswal, Dange and Khalikar, 2010) Osseointegration is the foundation of implant sciences and indefinite articles have been published on the various aspects of manufacturing the implants and on the clinical and laboratory phases of implants. The implant machining, surface, designing, surgical techniques and the peri-implant considerations have all progressed from infancy to the state of art and science and continue to evolve with each passing year. The surface characteristics at the micro or nanometre level, hydrophilicity, biochemical bonding and other features

are few of the determiners which are responsible for the implant's success (Wennerberg et al., 1992). Osseointegration per se is not linked to certain defined surface characteristics, since a great number of different surfaces achieve osseointegration. However, the stronger or weaker bone responses may be related to the surface phenomenon. (Wennerberg and Albrektsson, 2010)

Osseointegration per se is not linked to certain defined surface characteristics, since a great number of different surfaces achieve osseointegration. However, the stronger or weaker bone responses may be related to the surface phenomenon. The bone implant interface can be controlled by the selection and modification of the biomaterial from which is made. These include morphological, physicochemical and biochemical methods (Amarnath et al., 2011).

The adhesion and differentiation of osteoblastic cells are influenced by the surface properties of the dental implant(EBSCOhost | 38012904 | Generalizations Regarding the Process and Phenomenon of Osseointegration. Part II. In Vitro Studies, no date) ('Osteoblast adhesion on biomaterials', 2000). Surface properties include chemical composition, surface energy, roughness, and topography. In dental implants, surface roughness is often modified to modulate bone apposition. Surface roughness can be described as macro-, micro-, and nanometer-sized texture(Jokstad, 2009). Macro- and micrometer roughness facilitates mechanical anchorage to bone. Nanometer roughness affects the adsorption of proteins and the adhesion of osteoblastic cells. It can modulate the rate of osseointegration(Turkyilmaz, 2011). A variety of surface treatments can be used to produce the desired surface topography(Brunette and Chehroudi, 1999). Commercially available implants vary in titanium composition and surface modifications having an understanding of these differences can help clinicians make an informed choice in implant selection for their patients(Nijhawan, Bali and Gupta, 2010).

Different surface modification techniques have been mainly used to improve the surface roughness and hydrophilicity. Some modified surface compositions could also contain bioactive substances. Implant morphology such as grooves, ridges, and tool marks can influence the interaction between the bone and the implant(Park et al., 2012). The implant morphology can also increase the overall surface area available for osseointegration. Rougher surfaces can stimulate attachment, differentiation, and proliferation of bone cells, thus increasing bone growth and mineralization. Rougher surfaces with an open structure have been shown to induce faster and more effective osseointegration. Unfortunately, this rougher surface substrate tends to accumulate bacteria (Olivares-Navarrete et al., 2012).

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy,

Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about awareness on various surface modifications of implants among dental students.

MATERIAL AND METHODS

This is a questionnaire based study. A questionnaire with a set of 15 questions was prepared and circulated among the dental students.This was an online survey. The questionnaire was prepared using survey planet.100 dental students have participated in this survey. The data was collected and tabulated. The data was imported to SPSS and the descriptive statistics with frequency analysis was done. The obtained data were represented graphically as bar charts.

Figure 1: Pie chart showing responses regarding the awareness on a dental implant in which 99% of them responded as "aware" and 1 % responded as "not aware". Blue indicates "aware" and green indicates "not aware"
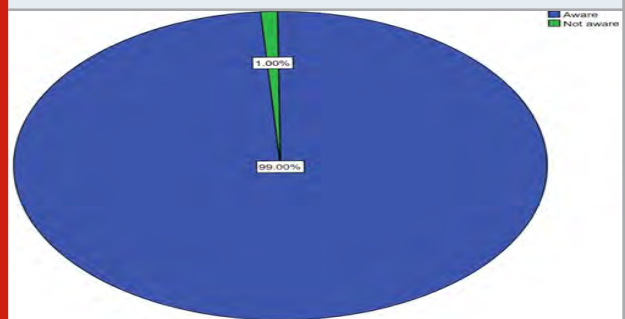
Figure 2- Pie chart showing responses regarding the placement of a dental implant in which 68% of them responded as "placed an implant" and 32% of them responded that they have 'not placed an implant'. Blue indicates "placed an implant" and green indicates "not placed an implant"
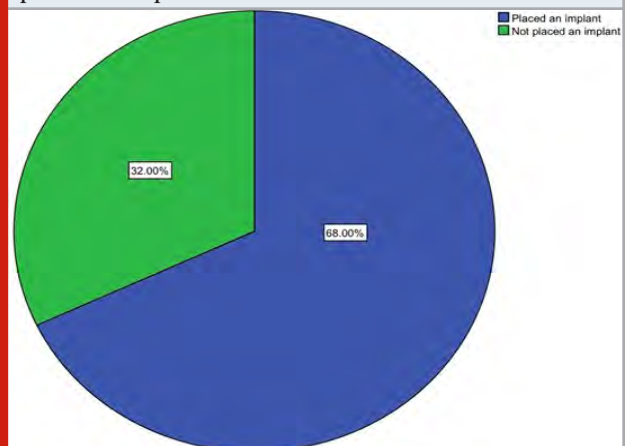
RESULTS AND DISCUSSION

A total of 100 dental students participated in this survey. When asked if the students were aware of a dental implant, 99% of the students were aware about a dental implant and only 1% of the sample were not aware of a dental implant (Figure 1). The students were also asked if they have ever placed an implant and 68% of the students have placed an implant and 32% of the students have no experience in implant placement (Figure 2). When asked about the awareness on the various surface modifications of implants, 93% of them were aware and only 7% of them were not aware of the various surface modifications of the implant (Figure 3). A study given by Arati Sharma, et. al; 2019 (Sharma et al., 2019), found that a majority of the total students perceived themselves to be moderately well informed about dental implants (54.6%). Awareness about dental implants is increasing among dental patients, which demands a higher level of competence for dental students. Awareness about dental implants is increasing among the general public and more and more patients are seeking information about dental implants.It is therefore useful to gauge the level of information about dental implants among dental students. All undergraduate dental students require basic knowledge about dental implant therapy so that they can educate and guide patients to undergo implant therapy whenever appropriate (Kohli et al., 2015).
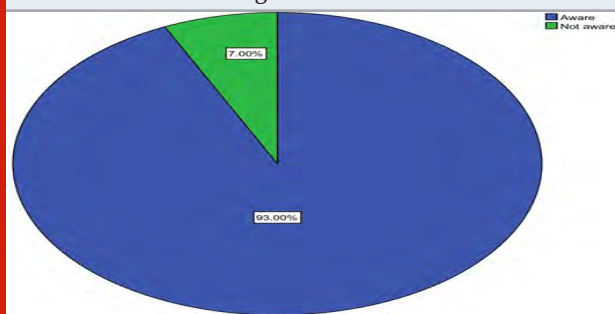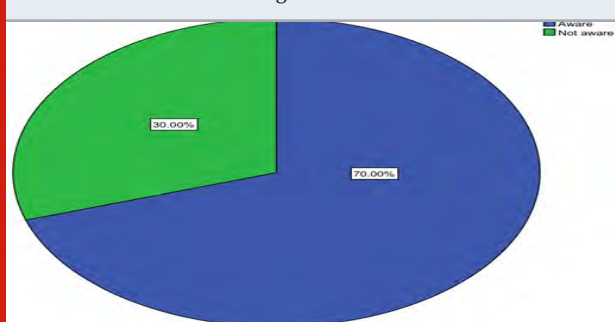
The students were asked if they were aware of dental implant topography, in which 70% of the students were aware of implant topography and 30% of them were not aware (Figure 4). Implant surface topography refers to macroscopic and microscopic features of the implant surface. Surface topography of an implant can be designed by making porous and/or by coating the implant surface with other suitable materials to increase bone-implant contact since the anatomic surface of bone cannot be controlled. A number of surface treatments are available to create controlled roughness on the surface of the implants(Kohles et al., 2004).

The students were asked if they were aware of each and every type of implant modification, where 65% of them were aware and 35% of them were not aware of the grit-blasted, acid-etched and neutralised implants (Figure 5). 52% of them were aware of discrete crystalline deposition implants and 48% of them were not aware (Figure 6). 65% of the students were aware and 35% were not aware of laser ablation implants (Figure 7). 53% of the students were aware and 47% of them were not aware of anodic oxidation implant (Figure 8). 64% of the students were aware of hydrophilic implants and 36% of them were not aware(Figure 9).Titanium oxide blasted and acid-etched implants (Figure 10) and sandblasted acid etched implants(Figure 11) show the highest prevalence of awareness among the students with 82%. A study given by Ramaglia L et.al; 2011 (Ramaglia et al., 2011), states that sandblasted and titanium oxide blasted with acid etching is the most common surface modification and it is therefore likely that specific surface properties of sandblasted-acid-etched titanium implants may modulate the biological behavior of osteoblasts during bone tissue healing.

Figure 3: Pie chart showing responses regarding the awareness of the various surface modifications of a dental implant in which 93% of them responded as "aware" and 7% of them responded that they are 'not aware'. Blue indicates "aware" and green indicates "not aware"

Figure 4: Pie chart showing responses regarding the awareness of dental implant topography in which 70% of them responded as "aware" and 30% of them responded that they are 'not aware'. Blue indicates "aware" and green indicates "not aware"

Figure 5: Pie chart showing responses regarding the awareness of grit-blasted,acid-etched and neutralised implants in which 65% of them responded as "aware" and 35% of them responded that they are 'not aware'. Blue indicates "aware" and green indicates "not aware"
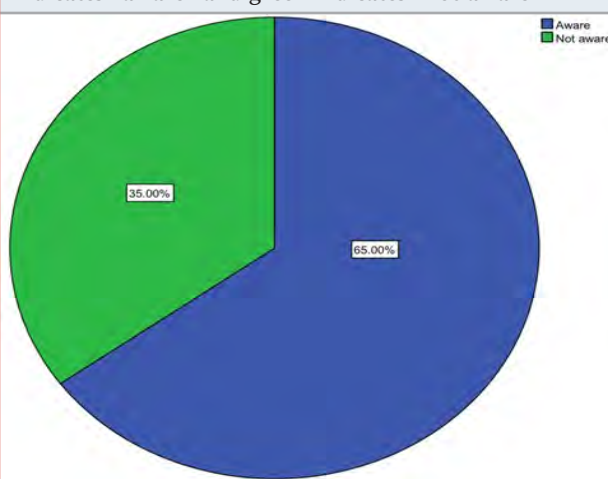
Figure 6: Pie chart showing responses regarding the awareness of discrete crystalline deposition implants in which 52% of them responded as "aware" and 48% of them responded that they are 'not aware'. Blue indicates "aware" and green indicates "not aware"

Figure 7: Pie chart showing responses regarding the awareness of laser ablation implants in which 65% of them responded as "aware" and 35% of them responded that they are 'not aware'. Blue indicates "aware" and green indicates "not aware"

Figure 8: Pie chart showing responses regarding the awareness of anodic oxidation implants in which 53% of them responded as "aware" and 47% of them responded that they are 'not aware'. Blue indicates "aware" and green indicates "not aware"
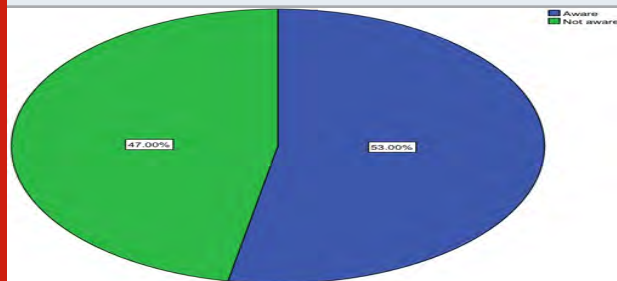
Figure 9: Pie chart showing responses regarding the awareness of Hydrophilic implants in which 64% of them responded as "aware" and 36% of them responded that they are 'not aware'. Blue indicates "aware" and green indicates "not aware".

Figure 10: Pie chart showing responses regarding the awareness of Titanium oxide blasted and acid-etched implants in which 82% of them responded as "aware" and 18% of them responded that they are 'not aware'. Blue indicates "aware" and green indicates "not aware"

Figure 11: Pie chart showing responses regarding the awareness of Sandblasted and acid-etched implants in which 82% of them responded as "aware" and 18% of them responded that they are 'not aware'. Blue indicates "aware" and green indicates "not aware"

Figure 12: Pie chart showing responses regarding the opinion of more success rate in microtopography implants in which 75% of them responded as "sandblasted and acid etched implants" and 25% of them responded that they are "grit blasted, acid etched and neutralised implants". Blue indicates "sandblasted and acid etched implants" and green indicates "grit blasted, acid etched and neutralised implants"
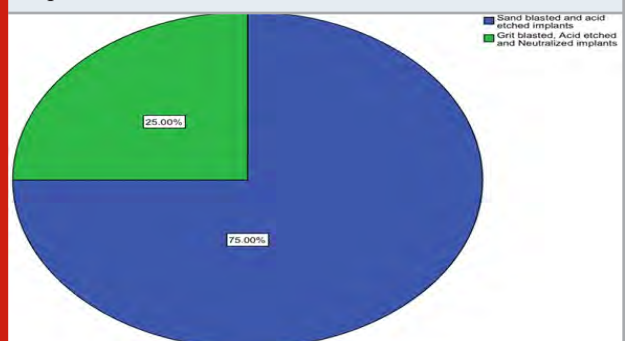
When asked about the implant with the highest success rate in microtopography implants, 75% of the students think sandblasted and acid etched implants have more success rate and 25% of the students think that grit

blasted, acid etched and neutralized implants have more success rate (Figure 12). The students were also asked about the success rate of nanotopography implants, where 49% of them think Titanium oxide blasted and acid etched implants have more success rate among nanotopography implants followed by Laser ablation with 28%, Discrete crystalline deposition with 11%, Anodic oxidation implants with 9% and hydrophilic implants with 3% (Figure13).

Figure 13: Pie chart showing responses regarding the opinion on more success rate in nanotopography implants in which 49% of them responded as "Titanium oxide blasted and acid etched implants", 28% responded as " laser ablation implants", 11% responded as "discrete crystalline deposition implants", 9% with "anodic oxidation implants" and 3% with "hydrophilic implants". Violet indicates Titanium oxide blasted and acid etched implants , green indicates laser ablation implants , blue discrete crystalline deposition implants indicates , yellow indicates anodic oxidation implants and red indicates hydrophilic implants
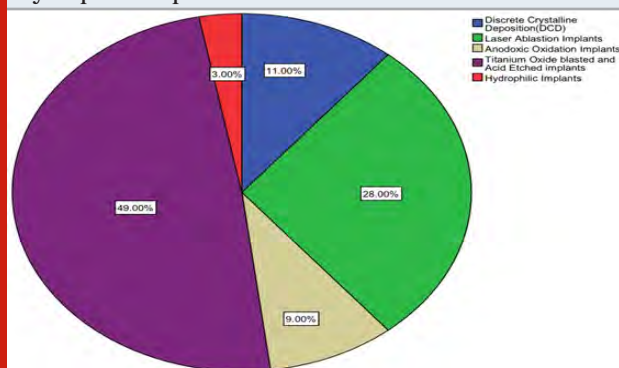
CONCLUSION

Within the limits of the study, the dental students were aware of the various surface modifications of an implant. More awareness should be created among the students and the patients are also well aware of new techniques in the field of dentistry. Similar studies on large populations should be done in order to get the relevant results. This study will act as a guide to understand the awareness of various surface modifications of dental implants among dental students.

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Evaluation of Role of Centrally Acting Skeletal Muscle Relaxants During Tooth Preparation Procedure. An INVIVO Study

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ABSTRACT

Skeletal muscle relaxants have been widely used in the medical field for carrying out various treatment procedures. There have been very few studies that have shown the use of muscle relaxants in carrying out dental procedures. This study aims at evaluating the advantage of administering centrally acting muscle relaxants (chlorzoxazone) before starting tooth preparation procedure. 40 patients who required tooth preparation procedure for example in cases of fixed partial denture, full mouth rehabilitation cases , cast partial denture cases satisfying the following inclusion and exclusion criteria were randomly allocated to two groups, A and B using coin flip method. Group A patients were administered with chlorzoxazone. Group B patients were administered with a placebo drug. The results reveal that there is a significant difference in the pain and discomfort experienced by the patients after the administration of skeletal muscle relaxants during tooth preparation procedure. The mouth opening of the patients was significantly better in patients administered with the muscle relaxant (chlorzoxazone). Centrally acting skeletal muscle relaxants can be administered during tooth preparation procedures, in order to increase patient comfort and operator efficiency.

KEY WORDS: SKELETAL MUSCLE RELAXANTS, CHLORZOXAZONE, BACLOFEN, PATIENT COMFORT, PAIN, MOUTH OPENING , MUSCLE SPASM.

INTRODUCTION

Tooth preparation is a procedure in which the tooth morphology is altered in order to receive a prosthesis. This procedure requires a lot of precision and involves a lot of steps and principles(Tiu et al., 2016). A lot of factors have to be taken into consideration in order to carry out an ideal crown preparation. It is necessary to preserve remaining tooth structure. Provision on resistance and retention form plays and integral part in crown preparation . The preparation should have good structural durability . One of the most important factors is provision of ideal margins.(Kishimoto, Shillingburg and Duncanson, 1983) All these factors make this procedure quite time consuming , especially in full mouth rehabilitation cases where multiple teeth have to be prepared .These cases are quite tiring and stressful both for the patient as well as the operator.

The patient has to keep his mouth opened for a long period of time . This by itself causes a lot of stress on the masticatory muscles and temporomandibular joint (Laskin and Block, 1986). Patient experiences muscular spasms and pain in the temporomandibular joint region due to continuous tension on the muscles. Dentist must be aware on the proper diagnosis and treatment of facial muscle pain (Cooper and Rabuzzi, 1984), because they represent one of the most frequent patient complaint during long dental procedures especially during tooth preparation appointments and root canal treatment cases(Laskin and Block, 1986). Skeletal muscle relaxants are frequently used to treat these conditions. The muscle relaxants are believed to exert their action either by treating spasticity secondary to upper motor neuron syndromes, or muscular pain and spasms(Fukushima and Ochiai, 2013). Jaw soreness and stiffness can be present due to muscle strain after any kind of dental procedure that requires you to keep your mouth open for an extended period of time.

A slightly sore jaw is considered to be normal after long dental treatments. There is a high possibility that the patient might complain of inability to keep the mouth open and also the patient might experience facial muscles becoming stiff causing a locked jaw(Love, 1970) (Domino, 1964). In order to avoid these consequences a better and a more efficient option would possibly be to prophylactically administer the patient with skeletal muscle relaxants preoperatively. This might help in carrying out the dental treatment smoothly and much more efficiently. Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018b; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019).

('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018b; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019)('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018b; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about this topic. Considering the above factors discussed, this present study aims at evaluating the role and effectiveness of skeletal muscle relaxants when they are administered preoperatively during tooth preparation procedures.

MATERIAL AND METHODS

The present study was presented before the institutional ethical and scientific review board and permission was obtained. The study protocol conformed to the ethical guidelines prescribed by the WHO and Helsinki declaration.

Study type: The present study is an invivo interventional trial involving human subjects.

Study design: Randomised control trial with parallelling group design.

Estimation of sample size:
Selection of subjects: 20 patients who required tooth preparation procedure for example in cases of fixed partial denture, full mouth rehabilitation cases , cast partial denture cases satisfying the following inclusion and exclusion criteria were randomly allocated to two groups, A and B respectively.

Inclusion criteria: Patients with preferably multiple missing teeth , age within 20 to 70 years, both male and female, without any temporomandibular joint problems or any kind of facial muscle disorders and limited mouth opening , with willingness to participate in the study.

Exclusion criteria: Patients with poor oral hygiene, patient undergoing implant supported prosthetic treatment, patients with temporomandibular joint problems , patients with limited mouth opening. Informed consent: The selected subjects were clearly explained about the study protocols and informed consent was obtained from them for participation.

Random allocation: The selected subjects were randomly allocated into 2 groups A and B respectively using the coin flip method. Patients in Group A will receive preoperative administration with chlorzoxazone. Patients in group B will receive preoperative administration with a placebo drug with looks exactly like the test drug.

Outcome measures: Amount of mouth opening after the procedure using interincisal distance as reference. Evaluation of postoperative muscle pain after the procedure using VAS scale. Evaluation of post operative muscle spasm after the procedure. Evaluation of amount of patient comfort post operatively. Single blinding of the operator was observed.

RESULTS AND DISCUSSION

The mean and standard deviation values for patients of Group A and B are 5.50 ± 1.14 and 3.50 ± 0.889 respectively in case of postoperative pain. The mean and standard deviation values for patients of Group A and Group B are 5.25 ± 1.11 and 3.40 ± 1.09 in case

of discomfort experienced. The mean and standard deviation values for patients of Group A and Group B are 38 ± 2.65 and 39 ± 1.53 respectively in case of postoperative mouth opening.

The association between the administration of skeletal muscle relaxant and post operative pain experienced by the patient was statistically significant [unpaired t test association value-0.001] [p-value>0.05]. The association between the administration of skeletal muscle relaxant and post operative discomfort experienced by the patient was statistically significant [unpaired t test association value - 0.001] [p-value>0.05]. The association between the administration of skeletal muscle relaxant and improvement in postoperative mouth opening of the patient was statistically significant [unpaired t test association value - 0.009] [p-value>0.05].

There are not many studies regarding the postoperative effects that patients experience after of tooth preparation procedures especially in full mouth rehabilitation cases where multiple teeth have to be prepared.The purpose of this study was to obtain evidence regarding the efficacy of chlorzoxazone during tooth preparation . This study intended the use of chlorzoxazone to reduce patient's discomfort and increase Intra operative functional capacity.

Muscle spasticity is seen in many clinical conditions, including trauma,, muscular and ligamentous sprains and strains, intervertebral disc disease, tetanus, neurologic disorders, and exertional rhabdomyolysis. Increased in tonic stretch reflexes originates from the CNS with involvement of descending pathways and results in hyperexcitability of motor neurons in the spinal cord. Drug therapy alleviates muscle spasms by modifying the stretch reflex arc or by interfering with the excitation-coupling process in the muscle itself. Muscle relaxants which act centrally block interneuronal pathways in the midbrain reticular activating system and spinal cord. Some drugs also have sedative effects(Fingeroth et al., 2014)

The presence of acute facial muscle pain and muscle spasm is a common finding during long dental procedures. Many centrally acting skeletal muscle relaxants are being used to relieve these conditions. Familiar members of this class of drugs include carisoprodol (Soma), chlorzoxazone (Paraflex), cyclobenzaprine (Flexeril), metaxalone (Skelaxin), methocarbamol (Robaxin), baclofen (Lioresal), and tizanidine (Zanaflex). Most commonly used among all these drugs is chlorzoxazone. (Love, 1970) . Chlorzoxazone has limited number of reported cases of significant hepatotoxicity in individuals taking this drug as compared to other muscle relaxants. Chlorzoxazone has a plasma half-life of 1 to 2 hours. Its onset of acation is within 1 hour. The duration of action is 3 to 4 hours (Williams and Leuwer, 2010).

Cyclobenzaprine, carisoprodol, and chlorzoxazone are a few drugs that have proved to be more effective than placebo in treating patients suffering from muscle spasms These drugs in combination with NSAIDs, help in augmenting the efficacy of the NSAID. NSAID and a muscle relaxant combination offers significant relief of pain when compared with other therapies, including those with narcotics. The major side effects of muscle relaxants are drowsiness, headache, dizziness, and dry mouth(Isaac and Katz, 2011). The drug of interest in this study (chlorzoxazone) being more freely available and having comparatively lesser side effects was thus chosen for the study.

Chlorzoxazone has several uses in the field of medicine. It is a synthetic compound that inhibits antigen-induced bronchospasms and, hence, is used to treat asthma and allergic rhinitis. Chlorzoxazone is mainly used in combination with acetaminophen , they do have some drawbacks and side effects(Liederman, 1967). Chlorzoxazone is used as an adjunct drug to treat conjunctivitis and to treat systemic mastocytosis and ulcerative colitis and musculoskeletal conditions. Spinal cord and subcortical areas of the brain are affected by the drug very efficiently as chlorzoxazone mainly inhibits multisynaptic reflex arc that is involved in maintaining skeletal muscle spasm of different etiology. The clinical result is a reduction of the skeletal muscle spasm with relief of pain and increased mobility of the involved muscles.(Dong et al., 2006).

Diazepam another centrally acting muscle relaxant is very efficient in relieving muscular spasms , seizures and depression(Chapa, 2018). The activity of a new muscle-relaxant, DS 103-282, was compared with that of diazepam in a randomized double-blind study on patients suffering from acute muscular spasm . It was found to reduce symptoms and improve mobility to a significant degree in all parameters evaluated and was also significantly superior to diazepam. DS 103-282 had a rapid onset of action. Both medications were well tolerated and there was no significant difference between them.(Hennies, 1981) Diazepam by itself has several side effects like severe nausea , confusion , the patient may also develop addiction. Long term use is not advisable for diazepam or rather any skeletal muscle relaxants for that matter (Craig and Fielding, 1982),(Wada, 1996)

Its mechanism of action involves inhibition of degranulation of mast cells, subsequently preventing the release of histamine and slow-reacting substance of anaphylaxis (SRS-A), mediators of type I allergic reactions. The release of inflammatory leukotrienes may also be reduced by chlorzoxazone. Chlorzoxazone may act by repressing calcium and potassium convergence which would prompt neuronal hindrance and muscle spasms (Rinaldi et al., 1987) Data available from animal experiments as well as human study indicate that chlorzoxazone acts fundamentally at the dimension of the spinal cord and subcortical zones of the brain where it hinders multisynaptic reflex segments associated with creating and keeping up skeletal muscle tone(Wan et al., 2006).

This medication may rarely cause very serious (possibly fatal) liver disease and may also develop symptoms of liver disease, including: persistent nausea/vomiting, stomach/abdominal pain, yellowing eyes/skin, dark urine. But they are mainly observed in long term usage. It does not have a lot of major side effects when it is used for a couple of times for example before any long duration dental procedure.there are many studies wherein centrally acting skeletal muscle relaxants are administered after dental procedures . Many studies have been done which suggest administration of corticosteroids and skeletal muscle relaxants postoperatively in order to relive the spasm and discomfort. (Rood, Yates and Buchanan, 1979; Ata-Ali et al., 2011). There are no studies that suggest administration of centrally acting skeletal muscle relaxants preoperatively in cases of tooth preparation. Based on the results obtained from the statistical data there was a significant difference in relation to pain, discomfort, and mouth opening of the patient when a centrally acting muscle relaxant was administered.

CHARTS AND FIGURES

Table 1. This table shows the association between the administration of skeletal muscle relaxant and post operative pain, discomfort and mouth opening. The association between the administration of skeletal muscle relaxant and post operative pain experienced by the patient was statistically significant [unpaired t test association value – 0.001] [p-value>0.05]. The association between the administration of skeletal muscle relaxant and post operative discomfort experienced by the patient was statistically significant [unpaired t test association value – 0.001] [p-value>0.05]. The association between the administration of skeletal muscle relaxant and improvement in postoperative mouth opening of the patient was statistically significant [unpaired t test association value – 0.009] [p-value>0.05].

VARIABLES	Group A– Patients without administration of the drug n=20	Group B – Patients with drug administration n=20 (Chlorzoxazone)	P value
Postoperative pain	5.50 ± 1.14	3.50 ± 0.889	0.001
Postoperative discomfort	5.25 ± 1.11	3.40 ± 1.09	0.001
Post operative mouth opening	38 ± 2.65	39 ± 1.53	0.009

Figure 1: This figure shows the difference between the means of post operative pain experienced by the population lying in the 2 groups. Group A represents the population not administered with chlorzoxazone and Group B represents the group administered with chlorzoxazone. It can be seen in the figure that the postoperative pain experienced by patients of Group A was higher as compared to that of Group B suggesting that administration of chlorzoxazone was effective in reducing post operative pain after tooth preparation procedure
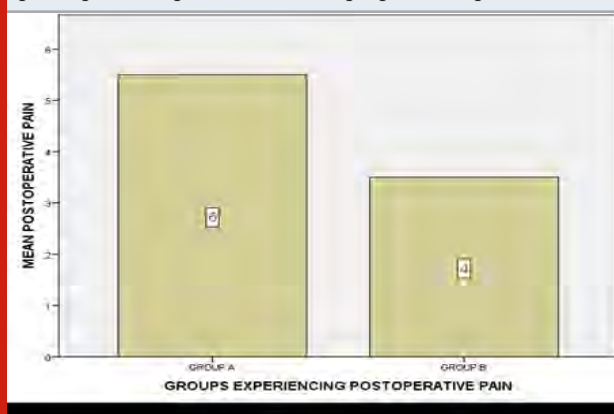
CONCLUSION

There have not been many studies describing pre operative administration with skeletal muscle relaxants during tooth preparation procedure.Based on the results obtained from the study it can be concluded that centrally acting skeletal muscle relaxants when used wisely keeping in mind the side effects can be used to significantly to reduce the patient discomfort, improve post operative mouth opening and reduce pain. This helps in improving overall operator efficiency.

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Awareness on Narcotic Substance Abuse Among Adolescents

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ABSTRACT

Substance abuse is a common phenomenon in the world and has invaded human society as the most important social damage. Adolescent age is the transition period where people tend to begin many unhealthy behaviours that represent major public health problems. Adolescents take up various habits like smoking, alcohol, drug abuse, etc that has a major impact on individuals, families as well as the community. It contributes to the social, mental and physical health problems of an individual at an early age. It also leads to consequences like unemployment, aggressive behaviour, violence in adulthood.In the present study, an online questionnaire was prepared and circulated through an online portal among adolescents. A total of 100 adolescents were included in the study among which 65 were male and 35 were female.The participants in the study were categorized in the age group of below 15 years, 15 - 18 years and above 18 years. The results retrieved from the survey were tabulated and analysed using SPSS software (Version 23). From this study, it was observed that the majority of adolescents were aware of narcotic substance abuse and its ill effects. An early intervention and awareness on the ill effects of narcotic substance abuse to adults plays an important role in prevention.

KEY WORDS: SUBSTANCE ABUSE, ADOLESCENCE, DRUGS, HEALTH, AWARENESS.

INTRODUCTION

Substance abuse is a global threat for public health and social concern. With the evolving globalisation and various lifestyle changes, an increase in the acceptance of ill habits is clearly seen in low and middle income countries specifically in adolescents and adults(Shelton, Harvin and White, 2006). Adolescence is a crucial period where people tend to begin with various unhealthy behaviours and substance use is one among them(Sarangi, Acharya and Panigrahi, 2008). Adolescents are more vulnerable and are at high risk of problems related to substance abuse.(So and Wong, 2006). It has a major impact on individuals, families, society, etc. It contributes to the social, physical and mental health problems. Unhealthy behaviours like smoking, alcohol, and drug use tend to begin at the adolescent age. It has positive association with increased morbidity and mortality and represents as one of the major public health challenges(Henkel, 2011). Social threats like poor health, unemployment, accidents, mental illness, suicide, etc have drug misuse as one of the contributing factors(World Health Organization, 2015).

Factors like socioeconomic status, peer group influence, genetic predisposition towards drug addiction, poor quality of parenting enhances the risk of initiation of

substance abuse(Abuse and US Department of Health & Human Services; National Institute on Drug Abuse, 2001). An early intervention, awareness and knowledge on the harmful effects of narcotic substances greatly reduces the risk factor of drug abuse among adolescents ('Programs for the Prevention of Suicide Among Adolescents and Young Adults', 1994; Gould et al., 2003; Busby et al., 2020). Various reasons like lack of love and safety feeling in families, being in conflict with peer group or influence of peer groups and the need for acting opposite to the social rules, etc. tend to be the causes of substance use among adolescents(Nieradko et al., 2002). Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about awareness on narcotic substance abuse among adolescents.

MATERIAL AND METHODS

The present study was a questionnaire based study. A questionnaire was prepared and circulated through an online portal among adolescents aged between 12 - 20 years. The data collection was done by a simple random sampling method. A total of 100 adolescents attended the survey among which 65 were male and 35 were female. The questionnaire included demographic details like age, gender, etc, and questions on awareness and knowledge on various ill effects on narcotic substance abuse and addiction among adolescents. The results obtained from the survey were tabulated and analysed by descriptive statistics with chi square test using SPSS software (version 23). The results were analysed and represented graphically.

RESULTS AND DISCUSSION

The responses retrieved from the questionnaire were tabulated, analysed and graphical representation was done using the SPSS software. A total of 100 respondents submitted the completed survey among which 65 were male respondents and 35 were female respondents. Among the 100 respondents, 13% were below 15 years of age, 55% were in the 15 - 18 age group and 32% were above 18 years of age. [Figure 1] When enquired about the awareness on narcotic substances, 76% of the adolescents were aware of narcotic substances while 24% of the adolescents were not aware. When enquired about the causes of use of narcotic substances, the respondents below 15 years of age were not aware. In the age group of 15 - 18 years, 3% responded that it is because of not being content in life, 13% responded that it is for fun and amusement, 16% responded that it is due to peer pressure, 17% agreed with the statement that there is no harm in trying drugs once and 6% of them were not

aware. In the age group of above 18 years, 2% felt that it is because of not being content in life, 7% responded that it is for fun and amusement, 15% responded that it is due to peer pressure, 8% felt that it is because of the attitude of there is no harm in trying drugs once. When the chi square test was done and the association between age and awareness on causes of narcotic substance use was analysed, p value was 0.00 (<0.05) showing statistical significance. [Figure 2] When the awareness of ill effects of the narcotic substance use on health was analysed, the majority of the respondents below 15 years were not aware(9%) while 4% were aware. Among the respondents in the age group of 15 - 18 years, 44% were aware and 11% were not aware. In the age group of above 15 years, 18% were aware of the ill effects and 14% were not aware.

Figure 1: Bar graph representing the different age group of the participants in the study. X- axis represents the different age groups and y-axis represents the number of participants. In this study, 13% of the participants were below 15 years of age, 55% were in the age group of 15 - 18 years and 32% were above 18 years
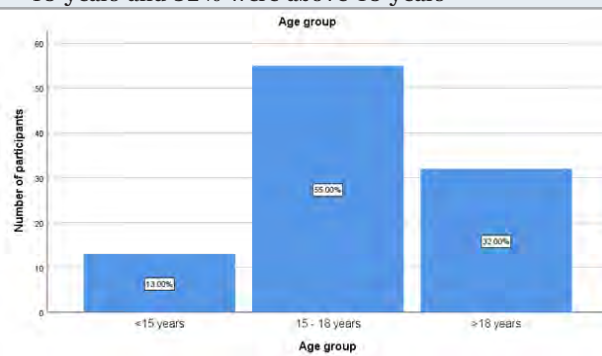
Figure 2: Bar graph representing the association between age groups and the causes of narcotic substance use among adolescents. X axis represents the different age groups and y-axis represents the number of participants. The participants in the age group of above 15 years were more aware of the causes of narcotic substance use. There was a significant statistical difference between age and awareness on causes of narcotic substance use. (Pearson's chi square test, p > 0.05)
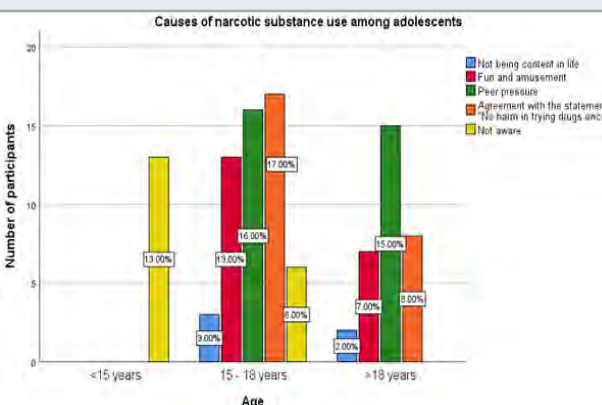
When the chi square test was done and the association between age and awareness on ill effects of narcotic substance use on health was analysed, p value was found to be 0.00 (<0.05) showing statistical significance. [Figure 3] When the awareness on psychological and social effects due to narcotic substance use was analysed, the respondents below 15 years of age were not aware, among the respondents in the age group of 18 - 15 years, 39% were aware and 16% were not aware. Among the respondents in the age group of above 18 years, 28% were aware and 6% were not aware. When the chi square test was done and the association between age and awareness on psychological and social effects due to narcotic substance use was analysed, p value was found to be 0.00 (<0.05) showing statistical significance. [Figure 4] When the awareness on law against narcotic substances use "Narcotic drugs and psychotropic substances act" was analysed, the respondents below 15 years were not aware of it , in the age group of 15 - 18, 13% were aware and 42% were not aware of the law.

Figure 3: Bar graph representing the association between age groups and the awareness on ill effects of narcotic substance abuse on health among adolescents. X axis represents the different age groups and y-axis represents the number of participants. The participants in the age group of above 15 years were more aware of the ill effects of narcotic substance use. There was significant statistical difference between age and awareness on ill effects of narcotic substance use. (Pearson's chi square test, p value > 0.05)
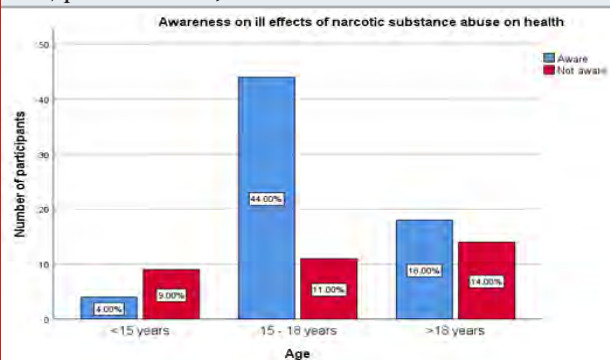
In the age group of above 18 years, 11% were aware of the law and 21% were not aware of it. When the chi square test was done and the association between age and awareness on law against narcotic substance use was analysed, p value was found to be 0.00(<0.05) showing statistical significance. [Figure 5] When the awareness on addiction due to narcotic substance abuse was analysed, among the respondents below 15 years of age, 2% were aware of it and 11% were not aware of it. In the age group of 15 - 18 years, 38% were aware and 17% were not aware. In the age group of above18 years, 28% were aware and 4% were not aware. When the chi square test was done and the association between age and awareness on addiction due to narcotic substance use was analysed, p value was found to be 0.00(<0.05) showing statistical significance. [Figure 6]

Figure 4: Bar graph representing the association between age groups and the awareness of psychological and social effects due to narcotic substance abuse among adolescents. X-axis represents the different age groups and y-axis represents the number of participants. The participants in the age group of above 15 years were more aware of psychological and social effects due to narcotic substance use. There was a significant statistical difference between age and awareness on psychological and social effects due to narcotic substance use. (Pearson's chi square test, p value > 0.05)
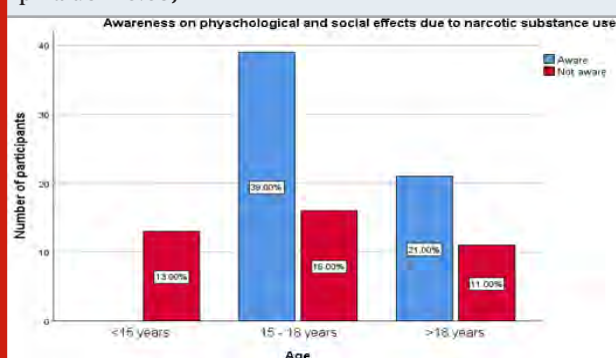
Figure 5: Bar graph representing the association between age groups and the awareness on Narcotic Drugs and Psychotropic Substance abuse Act among adolescents. X-axis represents the different age groups and y-axis represents the number of participants. Majority of the participants in different age groups were not aware of the law against narcotic substance abuse. There was significant statistical difference between age and awareness on Narcotic Drugs and Psychotropic Substance abuse Act among adolescents. (Pearson's chi square test, p value > 0.05)
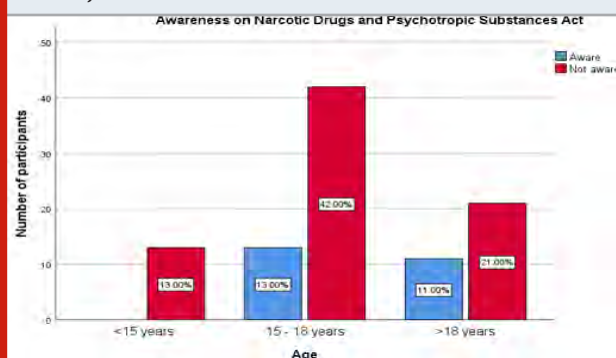
Adolescence is recognized as the period during which onset of change in behaviours occur. Unhealthy behaviours like drinking, smoking and illicit drug use begin during adolescence.(Das et al., 2016) The abuse of alcohol and illicit drugs are a major health problem worldwide.(Adolescent Drug Use Prevention: Common Features of Promising Community Programs, 1994) Prevention of substance abuse among adolescents requires awareness that focuses on the youngsters who are more prone to substance use and addiction. This

helps in greatly reducing the risk factors associated with drug use in adolescence. (Bukoski and US Department of Health and Human Services; National Institute on Drug Abuse, 1991) Preventive science states that negative health and psychological outcomes can be prevented by reducing the risk factors. Early intervention and awareness plays a key role in preventing substance abuse. (Hawkins and David Hawkins, 2002) The risk factors include poor parenting habits, poor communication, adverse childhood, loneliness, depression, peer influence, history of aggressiveness, violence, etc.

Figure 6: Bar graph representing the association between age groups and the awareness on addiction due to narcotic substance abuse. X axis represents the different age groups and y-axis represents the number of participants. The participants in the age group of above 15 years were more aware of addiction due to narcotic substance use. There was a significant statistical difference between age and awareness on addiction due to narcotic substance use. (Pearson's chi square test, p value > 0.05)
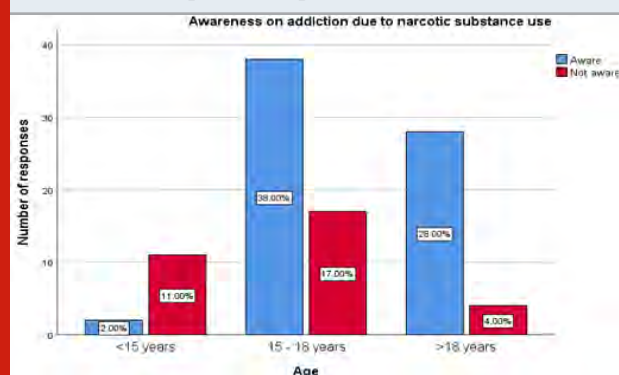
The prevention programs includes various aspects like family programs which includes parental monitoring and supervision that aims on enhancing the behaviour and reinforcing the harmful effects of drugs. (Kosterman et al., 2001) School programs help in working on self control, emotional awareness, communication, academic support, etc. Community programs which included clubs, schools, faith based organisations have beneficial effects on high risk families. (Epstein et al., 1995; Dishion et al., 2002) Survey based awareness programs play an essential role in prevention and they are cost effective too.(Chou et al., 1998; Spoth and Redmond, 2002; Hawkins, Ghiani and Baum, 2019) Previous studies state that adolescents have less knowledge on drug abuse, its effect on health, etc. (Wei et al., 1999; Epstein, Botvin and Diaz, 2001; Medrela-Kuder, 2007).

Some studies state that there is a positive relationship between knowledge and year of study, family income and drug abuse. Association between substance abuse and aggressive behaviour and violence were observed in previous studies. (Jindal and Gupta, 2004; Avila et al., 2005; Gilliland et al., 2006) In the present study, the majority of the adolescents were aware of the narcotic substance abuse and its ill effects. However, many were not aware of the laws and regulations

against narcotic substance abuse. There was significant association between age and awareness on the physical, psychological and overall health effects due to narcotic substance abuse.

CONCLUSION

From this study we can conclude that adolescents are aware of the harmful effects of use of narcotic substances. However, more awareness must be created among adolescents in a larger population about narcotic substance abuse. An early intervention and awareness on the ill effects of narcotic substance abuse at an early age helps in avoidance of such illicit habits and addiction.

Conflict of Interest: Nil

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Awareness of Anti-Sialogogues Among Dental Students

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ABSTRACT

The aim of this research is to assess the awareness of anti-sialogogues among dental students. Antisialogogues are substances that decrease the production of saliva, and their effect is opposite to that of sialogogues. Sialogogues are agents or drugs which increase the salivation during xerostomia. Anti-Sialogogues may be natural or synthetic. The most common adverse effect of root canal treatments, extractions and jaw surgeries. Antisialogogues are contraindicated in cases of Sjogren's syndrome, and in patients undergoing radiation therapy. This was an epidemiological survey conducted on 100 CRI students. The questionnaire was distributed via an online survey tool. The questionnaire contained 10 open ended questions regarding the knowledge and awareness of anti-sialogogues. The responses were collected and tabulated in the excel sheets, following which they were exported to SPSS software for statistical analysis. The CRIs possessed a moderate amount of awareness on antisialogogues. 73% of the students were aware of the function of the antisialogogues. 85% preferred the use of antisialogogues in cases of patients with hypersalivation. 37% of the students agreed that nausea is one of the side effects of antisialogogues, 79% of the students were aware that antisialogogues are contraindicated in patients with sjogren's syndrome and in patients undergoing radiation therapy.

KEY WORDS: ANTI-SIALOGOGUES; ATROPINE; HYPERSALIVATION; SALIVA.

INTRODUCTION

Saliva plays an important role in maintaining the homeostasis in the oral cavity. Saliva is predominantly secreted by the major and minor salivary glands. At rest without exogenous or pharmacological simulation there is a small continuous salivary flow and an unstimulated secretion of salivary flow present in tissues. (Christensen, 1986) This flow of saliva at rest is about 0.4-0.5 ml/min in healthy subjects. Stimulated saliva is produced in response to a mechanical, gustatory, olfactory, or pharmacological stimulus, contributing to around 40-50% of daily salivary production. The Salivary Flow (SF) index is a parameter allowing stimulated and unstimulated saliva flow to be classified as normal, low or very low (hyposalivation). In adults, normal total stimulated SF ranges 1–3 mL/minute, low ranges 0.7–1.0 mL/minute, while hypo salivation is characterised by a stimulated SF <0.7mL/minute. (Chainani-Wu et al., 2006).

In hypersalivation, the salivary glands produce more saliva than usual.Hypersalivation may be temporary or chronic depending on the cause. Constant hypersalivation

(sialorrhea) often relates back to an underlying condition that affects muscle control. Temporary hypersalivation is usually caused by: Cavities, infection, gastroesophageal reflux, pregnancy, certain tranquilizers and anticonvulsant drugs, exposure to toxins, such as mercury. (Mccubbin et al., 1979). In these cases, hypersalivation typically goes away after treating the underlying condition.Women who are pregnant typically see a decrease in symptoms after childbirth. Constant hypersalivation is usually caused by chronic health conditions that affect muscle control, when there is an impaired muscle control, it can affect the ability to swallow, leading to saliva buildup. This can result from:malocclusion, enlarged tongue, intellectual disability, cerebral palsy, facial nerve palsy, Parkinson's diseases, amyotrophic lateral sclerosis (ALS), stroke. When the cause is chronic, symptom management is key. ('Hypersalivation (Ptyalism)', 2012).

Commonly used Anti-sialogogues are Glycopyrrolate (Cuvposa), Atropine, Scopalmine, Botulinum Toxin The medications block the nerve impulses to the salivary glands so that they produce less saliva. (Murai et al., 1996). However, Anti-sialogogues can have some severe side effects, including: dry mouth, constipation, trouble urinating, blurred vision, hyperactivity, irritability. Scopolamine (Hyoscine) is given as a skin patch that's placed behind the ear. It works by blocking nerve impulses to the salivary glands. Its side effects include dizziness, rapid heartbeat, blurred vision, drowsiness.

Injections such as Botulinum toxin (Botox) injections if your hypersalivation is constant. The drug into one or more of the major salivary glands. (Kuijpers et al., 2010). The toxin paralyzes the nerves and muscles in the area, preventing the glands from producing salivaIn severe cases, this condition can be treated with surgery on the major salivary glands. The glands are removed completely or relocated so that the saliva is released in the back of the mouth where it can be easily swallowed. Excess salivation can hinder in delivering proper dental treatment by the dentist to their patients. (Saleh and Elazzazi, 2014). Moreover hypersalivation can cause improper bonding of dental cements to the tooth structure.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the awareness of anti sialogogues.

MATERIALS AND METHODS

This was an epidemiological questionnaire based study that assessed the awareness of anti sialogogues among undergraduate students. The ethical board clearance was obtained from the IERB of Saveetha dental college and hospitals.

Sampling: The entire population of 100 CRIs were involved. There were no chances of sampling bias as the entire sample was involved. Good external validity for the present study, as the full population cluster was involved and the results obtained can be generalisable within the state and country in which the students have obtained similar training.

Data collection: The data collection was done via Google forms. The questionnaire contained questions about the awareness, practice and knowledge of antisialogogues. The content validity was assessed by average congruency percentage and cronbach's alpha was used to assess the reliability of the questionnaire. Google forms were used to circulate the questionnaire among the students. The data obtained was collected and tabulated using excel sheets the data was transferred to SPSS software by IBM for statistical analysis.

Statistics: The data was transferred to SPSS software by IBM, version 25 for windows OS. In which the output variables were defined.

RESULTS AND DISCUSSION

A total of 100 CRI students participated in this questionnaire study.

Figure 1: Awareness of anti sialogogues
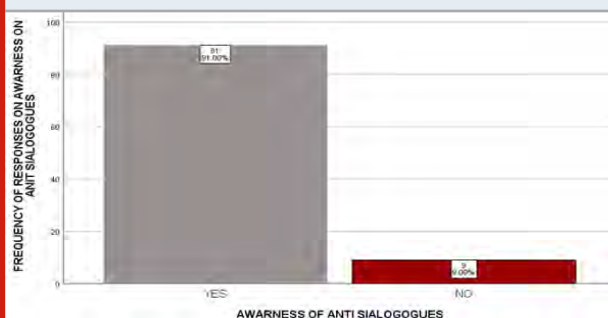
91% of the students were aware of antisialogogues (grey colour) while 9% were not aware of it. (Red colour)

In a similar survey conducted by Revathy et al, 87% of the students were aware of antisialogogues. 83% were aware that antisialogogues reduced salivary flow the 20% said it as some oral medication drug and the remaining 7% were not sure about the function of the anti sialogogues. 98% do not use anti sialogogues in their daily practice. 31% of the participants agreed that the usage of anti sialogogues decreased chair side time. 27% of the participants reported that they would prefer the use of anti sialogogues in patients with hypersalivation. (Revathy, 2017). These results were similar to the results obtained by the present study. Excess salivation can hinder successful jaw surgeries to bonding of light

cured composite restorations to tooth structure. Anti sialogogues are substances which can reduce the salivary flow, and their action is opposite to that of sialogogues which are used in patients with xerostomia. (Singh et al., 2020).

all medicines have their own set of side effects which are mostly nausea, constipation, tachycardia with an initial bradycardia, dry eyes, hyperthermia, headache, irritation, pupillary dilation. An initial bradycardia is more pronounced in the usage of IM propantheline.

Figure 2: Function of anti sialogogues
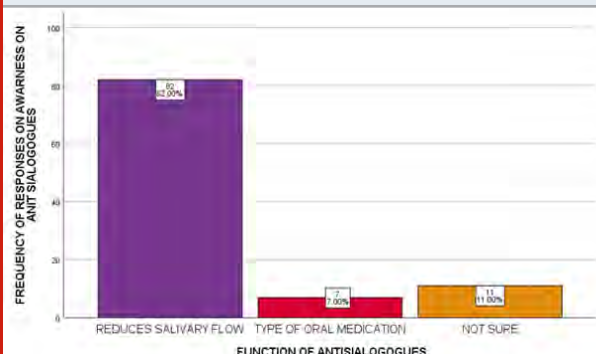
82% of the study population were aware that the antisialogogues reduce salivary flow (violet colour), while 7% of the study population thought it was a type of oral medication (red colour) and the rest 11% of the study population was not sure of the role of anti sialogogues (yellow colour)

Figure 3: Clinical usage of anti sialogogues
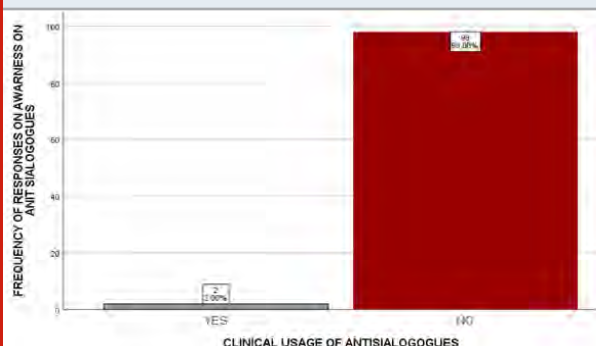
98% of the students did not or have not used antisialogogues in their daily dental practice (red colour), only 2% of the study population have used antisialogogues in their daily practice (grey colour).

Other methods of isolation of the oral cavity include Rubber dam, introduced by SC Barnum, suction tips, svedopters, which are more commonly used to anti sialogogues. (Edwards, 1998) Commonly used anti sialogogue drugs are Atropine, Scopolamine, and hyoscyamine. Normally 0.6 mg of atropine is given. Other lesser known anti sialogogues are Glycopyrrolate, Methantheline, Propantheline. (Leone, Georgievski and Koklanis, 2010). These anti sialogogues function from 20- 300 minutes after the injection which is dose dependent. Anti sialogogues are administered either via an intramuscular injection or as an oral tablet an hour prior to the dental procedure in patients with hypersalivation. (Gurney, 1967). Anti sialogogues like

Figure 4: Effectiveness of antisialogogues
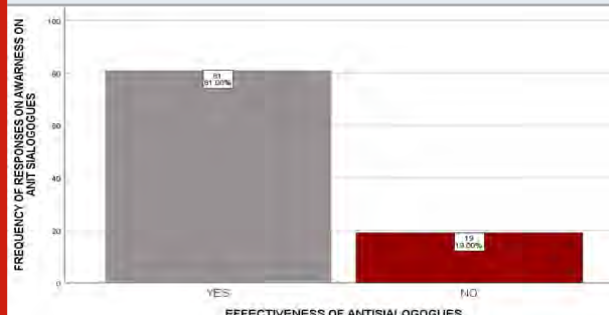
81% of the study population felt that anti sialogogues are effective in clinical practice (grey colour) while the rest 19% felt that anti sialogogues are not effective in daily practice.

Figure 5: Reduction of chair side time
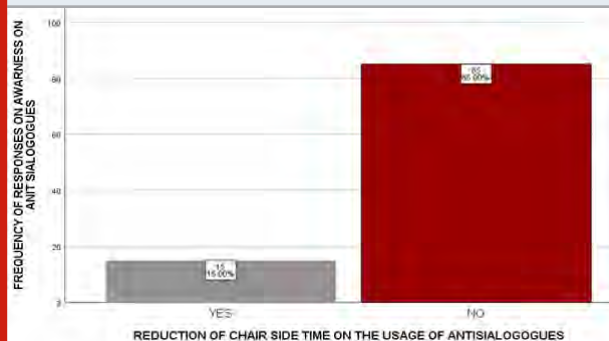
15% of the study population answered that usage of anti sialogogues reduce dental chair side time, (grey colour), while a majority of 85% disagreed that the usage of antisialogogues doesn't decrease chair side time. (Red colour)

Figure 6: Usage of anti sialogogues during hypersalivation
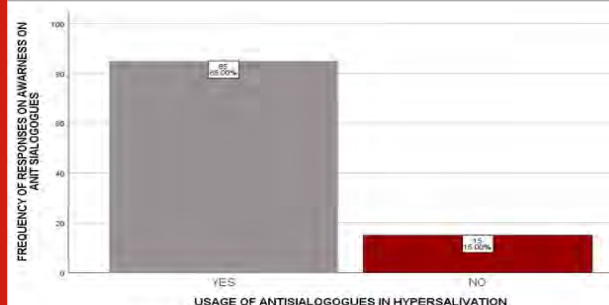
85% of the study population agreed that they would prefer the usage of anti sialogogues in patients with hypersalivation (grey colour), while 15% of the study population did not prefer the usage of antisialogogues in patients with hypersalivation (red colour).

Figure 7: Adverse effects of anti sialogogues
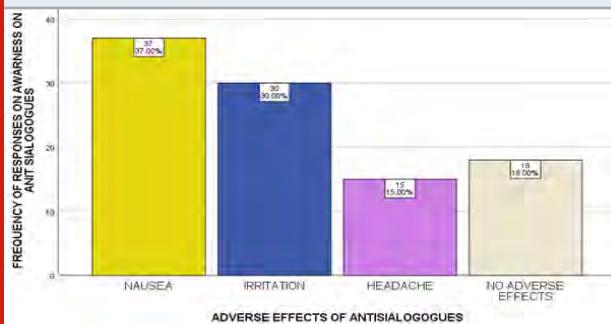
37% of the students felt that nausea is an adverse effect of antisialogogue usage (yellow colour), 30% felt that headache was an adverse effect (blue colour), while 15% felt that headache was a side effect of antisialogogue usage (purple colour), while 18% felt that there are no adverse effects of anti sialogogues (cream colour).

Figure 8: Nature of Anti sialogogues
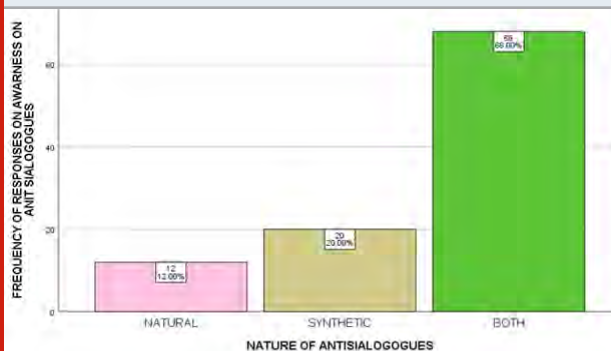
12% of the study population thought antisialogogues were natural, (pink colour), while 20% thought it was synthetic (mustard colour), 68% of the study population answered correctly that anti sialogogues were both natural and synthetic (green colour).

Figure 9: Excess usage of anti sialogogues causes xerostomia
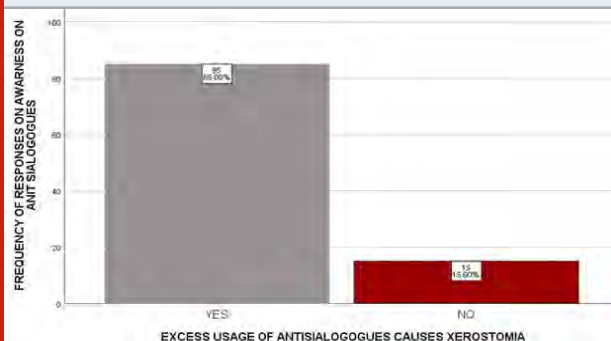
85% of the study population were aware that the excess usage of antisialogogues can cause xerostomia (grey colour), while 15% of the study population were not aware that the excess usage of nati sialogogues causes xerostomia. (Red colour).

Figure 10: Contraindications of anti sialogogues
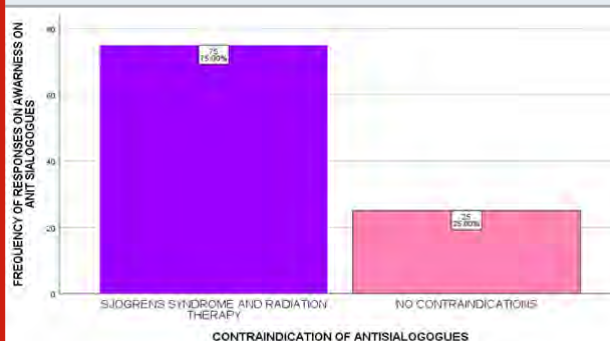
75% of the study population answered correctly that anti sialogogues are contraindicated in patients with Sjögren's syndrome and radiation therapy (violet colour). 25% of the study population thought there were no contradictions for the usage of anti sialogogues. (Pink colour).

The main limitations of the study is its limited sample size. Though all the students of the college when included in the study the sample size was limited. The study was confined to a single university and was restricted geographically. In the future, further studies CME and CDE programs can be conducted on antisialogogues, to increase the awareness and knowledge on antisialogogues. In doing so the quality and the efficiency of the treatment provided in the clinical setup can be improved upon. Furthermore, in the future randomised control trials can be conducted on patients with hypersalivation undergoing treatment with anti sialogogues and without anti sialogogues.

CONCLUSION

Anti- sialogogues are less commonly used in the day today dental practices as there are more non invasive, and topical methods of controlling hypersalivation in dental practice. But they are still used in severe cases of hypersalivation during surgeries. According to the study done the students had adequate knowledge about anti sialogogue drugs. The study says that it doesn't decrease the chair time, but it can be used in cases with hypersalivation. Further research must be done to find the efficacy of anti sialogogue and the knowledge, usage of anti sialogogues usage among the dental students can be improved by conducting various conferences and CME (continuing medical education) programmes.

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Awareness on the Management of Jaw Fractures in Osteoporotic patients among Dental Students – A Survey

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ABSTRACT

Osteoporosis is one of the common health problems affecting 5% of the population globally. It is often described as a metabolic bone disease with bone fragility and high risk of fracture resulting from reduced bone mass, microarchitectural weakening of the bone. It affects all bones in the human body including the facial skeleton which often results in jaw fracture. Management of mandibular fracture in osteoporotic wounds is similar to that of other fractures which may be in the form of closed reduction or open reduction, in addition to other forms of treatments such as antibiotic therapy. The aim of this study is to evaluate the awareness of dental students on the various management of jaw fractures in osteoportic patients. A questionnaire-based study was done involving 100 participants. The inclusion criteria of this study were dental students ranging from third years to post-graduates with personal experiences of working in a dental setting. Questions related to the awareness on the management of jaw fractures in osteoporotic wounds were provided. Data was collected and analyzed using the SPSS version 23.0.

Change in occlusion is the most common physical finding of jaw fracture (23%) and angle fracture is considered to have the highest rate of complications (37%) that can be treated with extraoral ORIF with a large reconstruction plate (39%). Complications of fracture treatment are usually associated with infections (71%). Comminuted fracture of mandible can be best treated with reconstruction plates (74%), while open reduction with internal fixation is often done for edentulous mandible (68%). Locking reconstruction plates provide no intimate contact with the underlying bone (42%). Transoral approach is usually preferred for jaw fracture (39%) and open reduction of condyle fracture is often performed with preauricular incision (77%). Lateral extracapsular displacement is selected as the absolute indication for open reduction of condyle fracture (39%). Within the limits of this study, it can be concluded that awareness about different management of jaw fractures among dental students is moderate and this may affect the healing period of osteoporotic wounds. It is important for every dentist to have a basic understanding of jaw fractures resulting from osteoporotic patients and its management to provide a proper diagnosis and treatment plan for patients with such conditions

KEY WORDS: FRACTURE; JAW; MANDIBLE; OSTEOPOROTIC.

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INTRODUCTION

Osteoporosis is one of the common metabolic bone diseases with approximately 5% rate of occurrence globally (Kyrgidis et al., 2011; Cooper, Campion and Melton, 1992; Reginster and Burlet, 2006). It is often characterized by reduced bone mass, bone fragility due to microarchitectural weakening and high risk of fracture (Gulsahi, 2015; Yamada et al., 2015) It is considered as a major public health concern seen in both genders, particularly females affecting one in three women and one in five men over the age of 50 (Kyrgidis et al., 2011; Reginster and Burlet, 2006; Gulsahi, 2015; Toumba and Skordis, 2010). Women usually show significant estrogen-related bone loss following menopause which can be seen mainly in the trabecular bone resulting in loss of both trabecular and cortical bone in the later stages (Gulsahi, 2015; Hassani-Nejad et al., 2013). Previous studies have reported that a considerable number of osteoporotic patients will sustain one or more fragility fractures in their lifetime (Reginster and Burlet, 2006; Cooper, Campion and Melton, 1992; Melton et al., 2005).

In osteoporotic patients, resorptive activity often takes place in the mandibular cortical bone which results in reduced thickness of the bone with a highly porous inferior border (Gulsahi, 2015). Various studies have reported on the relationship between osteoporosis and bone loss in the jaw. In most cases of osteoporosis, patients are usually asymptomatic until a fracture takes place making it difficult for treatment which explains the low number of patients being diagnosed with such condition (Kyrgidis et al., 2011; Gulsahi, 2015; Edwards and Migliorati, 2008; Cosman et al., 2014). Osteoporosis is usually managed by treatment of osteoporotic-associated fractures, universal preventative methods and medical treatment of the underlying condition (Kyrgidis et al., 2011).

Management of jaw fractures may differ depending on the anatomical sites of the jaw due to the difference in biomechanics, treatment requirements and complications. Recent advancements in the management of jaw fractures have resulted in reduced risk of infection and biological stable fixation of bone segments, which allows for rapid bony union, proper restoration of occlusion and reduces the requirement for wire maxillomandibular fixation. Intermaxillary fixation is often done before fracture reduction which utilizes occlusion to help in anatomical reduction of the fracture (Bhagol, Singh and Singhal, 2013). Management of fracture is usually paired with antibiotic therapy to prevent the 50% chance of infection (Zallen and Curry, 1975).

Various risk factors need to be considered prior to making the treatment decision which includes age, weight, history of fracture, bone density, underlying diseases and habits(Edwards et al., 2008). Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research the association of mandibular fracture with osteoporosis and its management.

Table 1. Table showing the percentage results of responses for the questions related to the awareness of the management of jaw fractures in osteoporotic wounds among dental students.

No.	Question	Response	Percentage (%)
1.	Which of the following is the most common physical finding of jaw fracture?	Change in occlusion	23
		Abnormal mandibular range of motion and deviation	20
			17
		Sublingual ecchymosis	
		Bony deformity	19
		Neurosensory disturbance	21
2.	Which of the following is recommended for the management of comminuted fracture in the mandible?	Compression plates	10
		Reconstruction plates	74
		Miniplates	16
3.	What is the most significant advantage of locking reconstruction plates?	No intimate contact with the underlying bones in all areas	42
			36
		Good stability by functioning as internal fixators	36
		No expansion	22

No.	Question	Options	
4.	In a surgical technique, which of the following is the most common approach for jaw fracture?	Transoral	39
		Vestibular	27
		Transfacial	34
5.	Which of the following is the absolute indication for open reduction of condylar fractures?	Bilateral condyle fractures in an edentulous patient	33
		Lateral extracapsular displacement of the condyle	39
		Bilateral condylar fractures associated with comminuted midface fractures	28
6.	Which of the following is the most common incision for open reduction of condyle fracture?	Preauricular incision	77
		Submandibular incision	10
		Intraoral incision	13
7.	In the management of edentulous mandible, which of the following techniques has lower risk of complications?	Closed reduction with the use of prosthesis	32
		Open reduction with internal fixation	68
8.	Which of the following is the most common complication of mandibular fractures?	Malocclusion and malunion	12
		Infection	71
		Nerve injury	17
9.	Which of the following is associated with the least complications in the treatment of angle fractures?	Extraoral ORIF with a large reconstruction plate	39
		Intraoral ORIF using a single lag screw	33
		Intraoral ORIF using two 2-4mm mandibular compression plate	28
10.	Which of the following is associated with the highest rate of complications?	Mandibular body fractures	34
		Angle fractures	37
		Condylar fractures	29

MATERIAL AND METHODS

A questionnaire-based study was conducted involving students of Saveetha Dental College and Hospital, Chennai, India for a period of January 2020 to March 2020. Two examiners were involved in this study. A total of 100 participants took part in the survey. The inclusion criteria of this study were dental students ranging from third years to post-graduates with personal experiences of working in a dental setting. First and second year dental students and non-dental students were excluded from this study. All the participants were provided with a list of 10 questions related to the management of jaw fractures in osteoporotic patients. Data was collected and statistical analysis was done. Tabulation and analysis of the collected data were done using Statistical Package for Social Sciences for Windows version 23.0 (SPSS Inc., Chicago, IL, USA). Descriptive analysis was done to assess the awareness of dental students on the management of jaw fractures in osteoporotic wounds based on their responses for each question provided.

RESULTS AND DISCUSSION

Our present study reveals that most of participants have chosen the change in occlusion (23%) as the most common physical finding of jaw fracture, followed by neurosensory disturbance (21%), abnormal mandibular motion and deviation (20%), bony deformity (19%) and sublingual ecchymosis (17%) respectively. [Figure 1] A report by Bhagol et al., states that the change in occlusion is undoubtedly the most common clinical feature seen in patients with jaw fracture. The report also confirms other findings such as neurosensory disturbances that occurs when the fracture crosses an area of the mandible close to the inferior alveolar nerve, abnormal mandibular range of motion or deviation normally expressed by the incapability of patients to close the mouth completely and sublingual ecchymosis as highly indicative of mandibular fracture (Bhagol, Singh and Singhal, 2013).

It can be seen that most of the participants agreed that the comminuted fracture of the mandible can be best treated using reconstruction plates which accounts for 74% of them, followed by miniplates (16%) and

compression plates (10%) respectively. [Figure 2] It was reported that reconstruction plates are often preferred in the treatment of comminuted fracture and may act as a bridge for continuity gaps due to its rigidity and ability to adapt properly to the underlying bones. Reconstruction plates are placed along with their corresponding screws (2.3-3.0mm) (Bhagol, Singh and Singhal, 2013). Another study also describes the use of larger and highly rigid plates for the treatment of comminuted fracture and continuity gaps (Herford and Ellis, 1998; Edwards and David, 1996).

Figure 1: Bar chart showing the responses to Question 1, "Which of the following is the most common physical finding in patients with jaw fracture?". X axis represents the multiple answers provided. Y axis represents the number of individuals with each answer (Blue). Most of the participants have chosen the change in occlusion (23%) as the most common physical finding of jaw fracture, followed by neurosensory disturbance (21%), abnormal mandibular motion and deviation (20%), bony deformity (19%) and sublingual ecchymosis (17%) respectively.
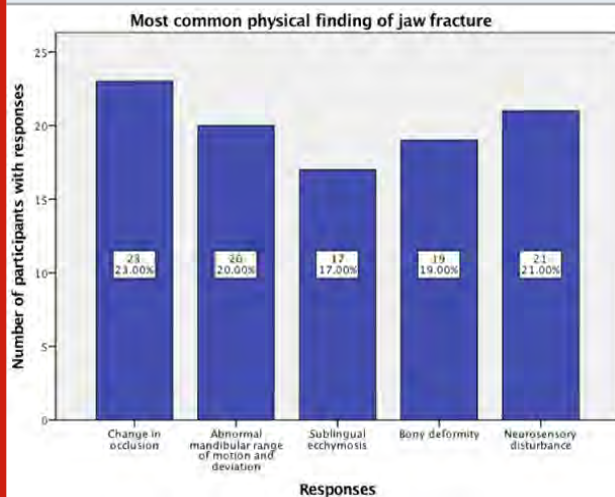
Most of the participants believe that the absence of intimate contact with the underlying bone in all areas is the best feature of the plate (42%), while 36% of them have chosen the ability of locking reconstruction plate to function as internal fixators providing good stability and the remaining 22% suggested the absence of expansion screw as the main advantage of the plate. [Figure 3] This result is further supported by another study by Bhagol et al., which confirms that locking reconstruction plates do not require close contact with the underlying bones in all areas (Bhagol, Singh and Singhal, 2013).

Transoral approach is commonly done for the treatment of jaw fracture according to 39% of the participants, 34% have chosen transfacial approach and vestibular approach are selected by the other 27% of the participants. [Figure 4] Most fractures can be easily managed by transoral incision except for condyle fracture as described in a previous study because it provides good access and

visibility for fracture reduction and fixation in a surgical technique (Bhagol, Singh and Singhal, 2013).

Figure 2: Bar chart showing the responses to Question 2, "Which of the following is recommended for the management of comminuted fracture in the mandible?". X axis represents the multiple answers provided. Y axis represents the number of individuals with each answer (Purple). Most of the participants agreed that the comminuted fracture of the mandible can be best treated using reconstruction plates (74%), followed by miniplates (16%) and compression plates (10%) respectively.
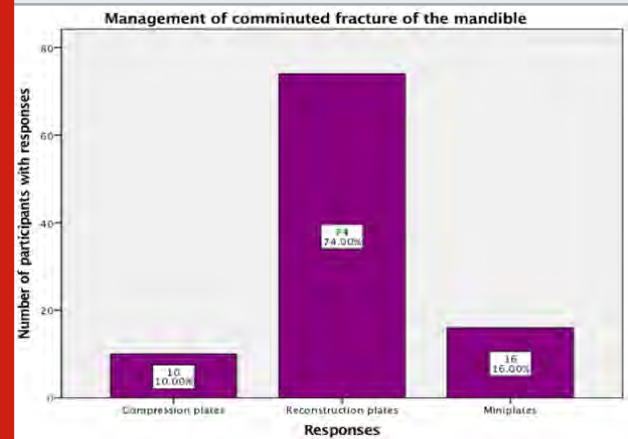
Figure 3: Bar chart showing the responses to Question 3, "What is the most significant advantage of locking reconstruction plates?". X axis represents the multiple answers provided. Y axis represents the number of individuals with each answer (Green). Majority of the participants believe that the absence of intimate contact with the underlying bone in all areas is the best feature of the plate (42%), while some of them have chosen the ability of locking reconstruction plate to function as internal fixators providing good stability (36%) and the remaining participants suggested the absence of expansion screw as the main advantage of the plate (22%).
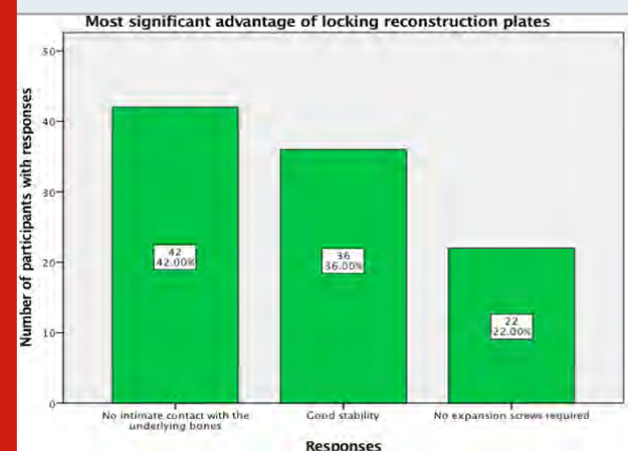
Figure 4: Bar chart showing the responses to Question 4, "In a surgical technique, which of the following is the most common approach for jaw fracture?". X axis represents the multiple answers provided. Y axis represents the number of individuals with each answer (Gold). Transoral approach is considered as the most common approach for surgical technique in the treatment of jaw fracture (39%), followed by transfacial approach (34%) and vestibular approach (27%) respectively.
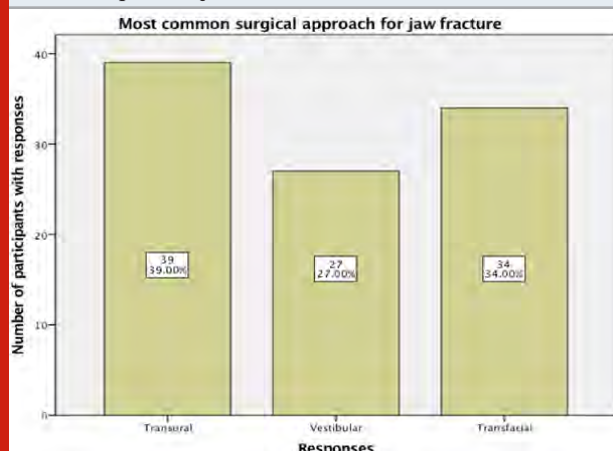
Figure 5: Bar chart showing the responses to Question 5, "Which of the following is the absolute indication for open reduction of condylar fractures?". X axis represents the multiple answers provided. Y axis represents the number of individuals with each answer (Orange). Lateral extracapsular displacement of the condyle is selected as the absolute indication for open reduction in the treatment of condyle fracture (39%), followed by bilateral condyle fractures in edentulous patients (33%) and bilateral condylar fracture with comminuted midface fracture (28%) respectively.
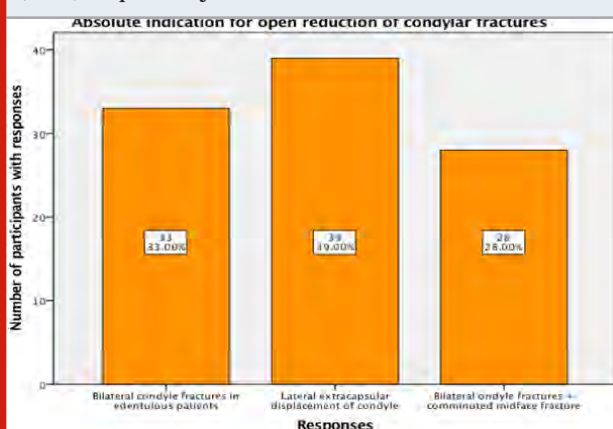
Our study shows that the lateral extracapsular displacement of the condyle is selected as the absolute indication for open reduction in the treatment of condyle fracture according to 39% of the participants, followed by bilateral condyle fractures in edentulous patients (33%) and bilateral condyle fracture with comminuted midface fracture (28%). [Figure 5] A previous study reported

that lateral extracapsular displacement of condyle is considered as one of the absolute indications for open reduction of condyle fracture while bilateral condyle fractures in edentulous patients and bilateral condyle fracture with comminuted midface fracture are grouped as relative indications for open reduction of condyle fractures (Hazrati, Zide and Kent, 1984; Bhagol, Singh and Singhal, 2013).

Figure 6: Bar chart showing the responses to Question 6, "Which of the following is the most common incision for open reduction of condyle fracture?". X axis represents the multiple answers provided. Y axis represents the number of individuals with each answer (Red). Most of the participants agreed that preauricular incision is the best option for open reduction of condyle fracture (77%), followed by intraoral incision (13%) and submandibular incision (10%) respectively.
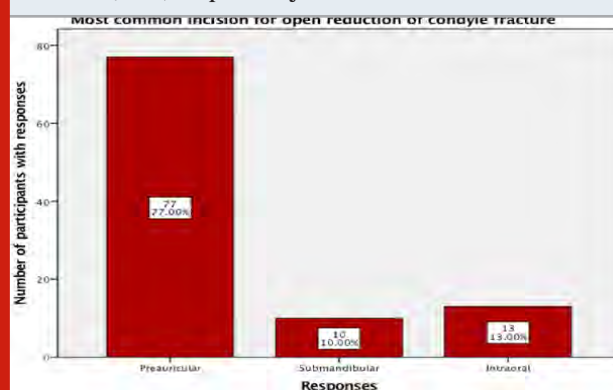
Most of the participants agreed that preauricular incision is the best option for open reduction of condyle fracture as chosen by 77% of them, followed by intraoral incision (13%) and submandibular incision (10%). [Figure 6] Most common surgical approaches in the treatment of mandibular fracture are reported to be retromandibular, submandibular and preauricular approaches (Bhagol, Singh and Singhal, 2013). In the treatment of condyle fracture, preauricular incision is the most common approach providing direct access to the temporomandibular joint (TMJ) (Dergin, Emes and Aybar, 2019; Ellis and Dean, 1993). Submandibular approach can be done to access the TMJ indirectly while intraoral incision is usually done at the sigmoid notch (Zachariades et al., 2006; Khelemsky, Moubayed and Buchbinder, 2016).

It can be seen that 68% of the participants believe that open reduction with internal fixation can be done with lesser complications in the management of edentulous mandible compared to closed reduction with the use of prosthesis chosen by 32% of them. [Figure 7] A previous study reveals lesser complications seen in patients treated by transfacial open reduction and internal fixation than those who underwent closed reduction technique showing complications such as delayed fibrous union (15%) and union defect (26%) in the management of

edentulous fracture (Bhagol, Singh and Singhal, 2013; Bruce and Ellis, 1993).

Figure 7: Bar chart showing the responses to Question 7, "In the management of edentulous mandible, which of the following techniques has lower risk of complications?". X axis represents the multiple answers provided. Y axis represents the number of individuals with each answer (Yellow). Most of the participants believe that open reduction with internal fixation can be done with lesser complications (68%) in the management of edentulous mandible compared to closed reduction with the use of prosthesis (32%).
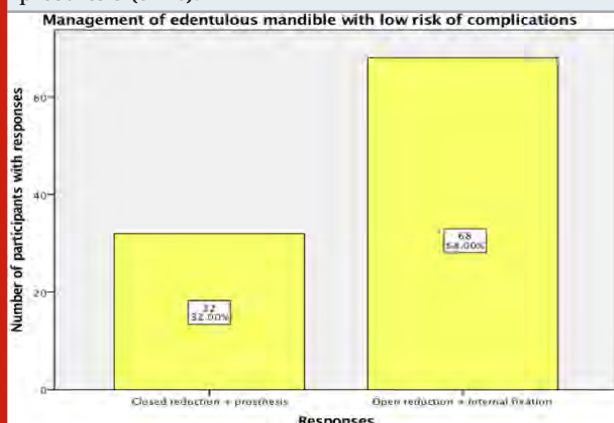
Figure 8: Bar chart showing the responses to Question 8, "Which of the following is the most common complication of mandibular fractures?". X axis represents the multiple answers provided. Y axis represents the number of individuals with each answer (Pink). A significant number of participants agreed on infections being the most common complication of mandibular fractures (71%). The remaining participants have chosen nerve injury (17%) and malocclusion or malunion (12%) as the main complications of jaw fracture.
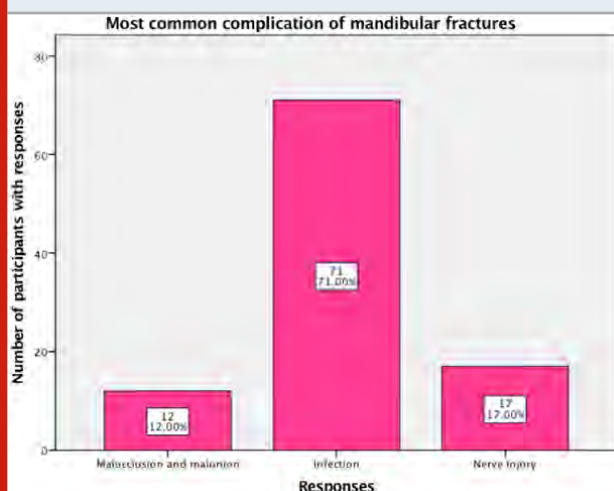
A significant number of participants agreed on infections being the most common complication of mandibular fractures as chosen by 71% of them. The

remaining participants have chosen nerve injury (17%) and malocclusion or malunion (12%) as the main complications of jaw fracture. [Figure 8] It was reported that infections are the most commonly reported complication of mandibular fracture seen in about 0.4% - 32% of patients. According to Zallen and Curry et al., patients who do not receive antibiotic therapy following fracture treatment are often associated with 50% risk of infection compared to the 6% risk of infection seen in patients receiving antibiotic therapy (Zallen and Curry, 1975). Problems with malunion or malocclusion was reported in approximately 0% - 4.2% of cases (Moulton-Barrett et al., 1998). Nerve injury is often reported in 11% - 59% cases of displaced mandibular fractures, mainly involving inferior alveolar nerve and mental nerve (Thaller, 1994; Iizuka and Lindqvist, 1991; Marchena, Padwa and Kaban, 1998).

Figure 9: Bar chart showing the responses to Question 9, "Which of the following is associated with the least complications in the treatment of angle fractures?". X axis represents the multiple answers provided. Y axis represents the number of individuals with each answer (Turquoise). Majority of the participants have chosen extraoral ORIF with a large reconstruction plate (39%) as the treatment of angle fractures with lesser complications compared to intraoral ORIF using a single lag screw (33%) and intraoral ORIF using two 2-4mm mandibular compression plate (28%).
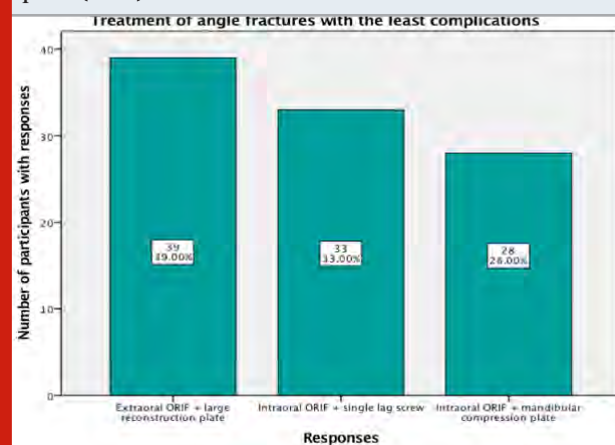
It can be seen that 39% of the participants have chosen extraoral ORIF with a large reconstruction plate as the treatment of angle fractures with lesser complications compared to intraoral ORIF using a single lag screw (33%) and intraoral ORIF using two 2-4mm mandibular compression plate (28%) as selected by the other participants. [Figure 9] It has been reported previously that extraoral ORIF with a reconstruction plate is associated with the least complications (7.5%) compared to the other two methods in the treatment of angle fractures (Ellis, 1999).

Most of the participants mentioned angle fracture having the highest rate of complications selected by 37% of them as compared to mandibular body fracture (34%)

and condyle fracture (29%). [Figure 10] A previous report describes the angle of mandible as a fragile area compared to the mandibular body and ramus seen anterior and posterior to the angle respectively (Schubert, Kobienia and Pollock, 1997). It is further complicated by the movement of the elevator muscles and depressor muscles with opposing forces leading to highest risk of complications in angle fractures (Juniper and Awty, 1973).

Figure 10: Bar chart showing the responses to Question 10, "Which of the following is associated with the highest rate of complications?". X axis represents the multiple answers provided. Y axis represents the number of individuals with each answer (Brown). Most of the participants have selected angle fracture (37%) with the highest rate of complications when compared to mandibular body fracture (34%) and condyle fracture (29%).
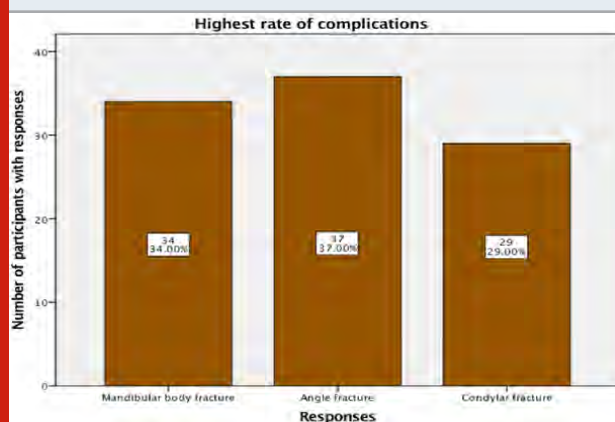
Facial skeleton is often the focus of interest in patients with osteoporosis. Mandible is one of the principal skeleton components of the face in which fracture of this essential bone may affect both esthetic and function of an individual. Proper diagnosis and early prevention can be achieved by the cooperation from both dentists and physicians. Early recognition and rapid intervention in the management of jaw fractures in osteoporotic patients are important for a multidisciplinary approach.

CONCLUSION

Within the limits of this study, it can be concluded that awareness about different management of jaw fractures among dental students is moderate and this may affect the healing period of osteoporotic wounds. It is important for every dentist to have a basic understanding of jaw fractures resulting from osteoporotic wounds and its management to provide a proper diagnosis and treatment plan for patients with such conditions.

ACKNOWLEDGEMENTS

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Knowledge, Attitude and Practice on Various Local Anesthesia Techniques for Maxillary Teeth Extractions Among Dental Students

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ABSTRACT

Local anesthetic agents block the peripheral nerves and prevent the conduction of pain perception, making the treatment procedure easy and comfortable. Lidocaine is the most commonly used drug for induction of local anesthesia. Maxillary teeth extractions usually require up to five injections to obtain anesthesia of the hard and soft tissues. The Posterior superior alveolar, middle superior alveolar and anterior superior alveolar, greater palatine and nasopalatine blocks are used for anesthetizing the maxillary teeth. The study aims at assessing the knowledge and awareness of various local anesthetic techniques for maxillary teeth extractions. A questionnaire based survey was conducted in January 2020 among dental students. 150 dental students working in a private dental college and hospital participated in this study. The questionnaire consisted of 16 questions related to various local anesthetic techniques. The collected data was added in MS Excel and subjected to statistical analysis using SPSS software and Chi-square test was done. The results depicted that 28.67% of interns, 12% final years and 2 % of third years were aware of the various local anesthesia techniques for maxillary teeth extractions. 27.33% of interns, 16.67% of final years and 22% of third years preferred infiltration for maxillary teeth extractions whereas 11.33% of third years, 16.67% of final years and 12.67% of interns preferred nerve block techniques. 30% of interns and 26.67% of third years felt that nerve block is technique sensitive for maxillary teeth extractions. Within the limitation of the study it was seen that Interns had a good knowledge, attitude and practice on various local anesthesia techniques for maxillary teeth extractions when compared to the final and third years.

KEY WORDS: ANAESTHESIA; INFILTRATION; MAXILLARY TEETH; NERVE BLOCK.

INTRODUCTION

The most important skill required of all dental practitioners is the ability to provide safe and effective local anesthesia (Saxena et al., 2013). Local anesthetic agents block the peripheral nerves and prevent the conduction of pain perception, making the patient and the dentist more comfortable (Parirokh and Abbott, 2014). The injection of local anesthetic is perhaps the greatest source of patient fear (Milgrom, Weinstein and Getz, 1995) (AL-Omari and AL-Omiri, 2009) and inability to obtain adequate pain control with minimal discomfort remains a significant concern of dental practitioners (Kaufman, Weinstein and Milgrom, 1984). Pain and anxiety related to dentistry have historically been the main reason for poor attendance at the dentist (Hochman et al., 1997). The achievement of good local anesthesia requires the following: knowledge

of the agents being used, the neuroanatomy involved, and the best techniques and devices available.

The advancements in various agents and anesthetic delivery equipment available provide the practitioner with an array of options to effectively manage the pain caused during dental procedures. Lidocaine is the most commonly used drug for induction of local anesthesia. It is an amide anesthetic agent with a shorter duration and rapid action ;the effect of Lidocaine increases when used with association with adrenaline (Becker and Reed, 2012). Articaine is an anesthetic agent belonging to the amide family and is said to be more soluble in lipids when compared to Lidocaine which is due to the presence of a thiophene ring in its chemical structure which helps easy penetration into the lipid membrane of nerves (Leith, Lynch and O'Connell, 2012). Articaine has strong affinity for proteins, hence penetrates into bone (Gusi, Raimundo and Leal, 2006)

Maxillary teeth are anesthetized by administering a local anesthetic injection in the mucobuccal supraperiosteal fold in the proximity to the apices of teeth to be anesthetized. Maxillary teeth extractions usually require up to five injections to obtain anesthesia of the hard and soft tissues. The Posterior superior alveolar, middle superior alveolar and anterior superior alveolar nerve block injections, greater palatine and nasopalatine blocks are used to anesthetize the maxillary teeth. A bilateral Anterior middle superior alveolar injection anesthetizes 10 maxillary teeth extending from the second premolar of one side to the second premolar on the opposite side (Friedman and Hochman, 1999). The AMSA injection derives its name from the injection's ability to supposedly anesthetize both the anterior and middle superior alveolar nerves (Sf., 1997). The anterior superior alveolar and middle superior alveolar nerves branch from the infraorbital nerve before they exit from the infraorbital foramen.

Currently there are many advancements in delivering local anasthesia to maxillary teeth for various dental procedures. The maxillary teeth can also be anesthetized with troncular techniques or intraligamentary and intraosseous injection. Recent studies prove that only the buccal infiltration with articaine can be used which has the potential to anaesthetise all dental tissues for various dental procedures.

With a rich case bank established over 3 decades we have been able to publish extensively in our domain (Abdul Wahab et al., 2017; Eapen, Baig and Avinash, 2017; Patil et al., 2017; Jain and Nazar, 2018; J et al., 2018; Marimuthu et al., 2018; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019; Senthil Kumar et al., 2019; Sweta, Abhinav and Ramesh, 2019). Based on this inspiration we aim to assess the Knowledge, attitude and practice on various local anesthesia techniques for maxillary teeth extractions among dental students.

MATERIAL AND METHODS

Study design: Awareness based survey

Data collection: A survey was conducted in January 2020 among dental students (Third years, Final years, Interns). It was an online questionnaire based study, conducted to assess the Knowledge, attitude and practice on various local anesthesia techniques for maxillary teeth extractions. 150 dental students (Third years, Final years, Interns) participated in this study. The data collection was done via google forms.

Survey instrument: A pretested, self administered, closed ended questionnaire comprising the following sections formed the survey instrument. A structured questionnaire containing 10 questions which was adopted from a validated questionnaire developed by the World Health Organisation. The questionnaire was equally distributed among Third years, Final years, Interns. The goal of developing this questionnaire was to know about the Knowledge, attitude and practice on various local anesthesia techniques for maxillary teeth extractions. The questions had to be answered with a Yes or No response.

Ethical approval: Ethical approval was attained from the Institutional Ethical Committee.

Data analysis: The data collected was entered in an Excel sheet and subjected to statistical analysis using SPSS version 20. Chi square test was done. The independent variables are age and gender while dependent variables are knowledge, attitude and practice on various local anesthesia techniques for maxillary teeth extractions. The level of significance was set at $p<0.05$.

Questionnaire given is as follows:

1. Are you aware of various local anesthesia techniques for maxillary teeth extraction?
2. Do you always prefer infiltration for maxillary teeth extraction?
3. Do you always prefer nerve block for maxillary teeth extraction?
4. Do you think that nerve block is technique sensitive for maxillary arch?
5. Are you aware of the complications of nerve block?
6. Have you faced any complications after giving nerve block?
7. Do you feel that infiltration is better than nerve block?
8. Do you feel that nerve block has a better anesthetic effect than infiltration?
9. Do you think that local anesthesia produces post extraction discomfort?
10. Do you think that more programs should be conducted on local anesthesia techniques for maxillary teeth extraction?
11. Are you aware of the evolutionary painless injection?

12. Do you know about the cartridge type of injections?
13. Do you know the each nerve supply of each root of the maxillary molars?
14. Do you know the methods to make palatal infiltrations painless?
15. Do you know how a hematoma is caused?
16. Do you prefer longer acting anesthetic agents like articaine

Figure 1: Bar graph denotes association between year of study of the participants and number of participants who were aware of various local anesthesia techniques for maxillary teeth extraction. X axis denotes the year of study of the participants and Y axis denotes the number of responses. The response of yes (green) was mostly given by the interns and the majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who were aware of various local anesthesia techniques for maxillary teeth extraction.
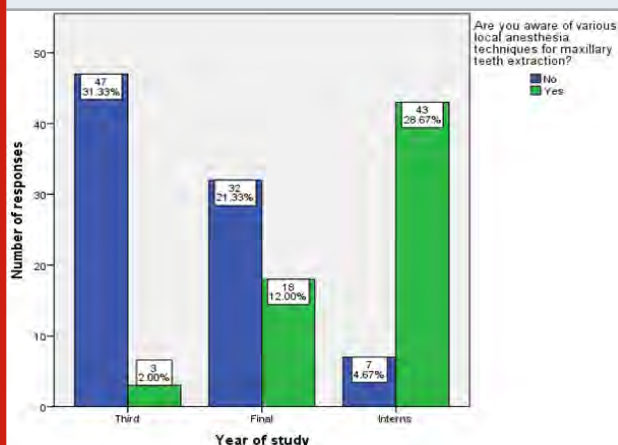
RESULTS AND DISCUSSION

From the results of the study, it was seen that 28.67% of interns, 12% final years and 2 % of third years were aware of the various local anesthesia techniques for maxillary teeth extractions Chi square test shows p value =0.00 (Figure1). 27.33% of interns, 16.67% of final years and 22% of third years preferred infiltration for maxillary teeth extractions Chi square test shows p value =0.00 (Figure 2) whereas 11.33% of third years, 16.67% of final years and 12.67% of interns preferred nerve block techniques Chi square test shows p value =0.00 (Figure 3). 30% of interns and 26.67% of third years felt that nerve block is technique sensitive for maxillary teeth extractions Chi square test shows p value =0.00 (Figure 4). 31.33% of interns, 14% of final years and 8% of third years were aware of complications of nerve block Chi square test shows p value =0.00 (Figure 5). 30.67% of third years, 30.67% of final years and 21.33% of interns have never faced any complications after

delivering nerve block Chi square test shows p value =0.00 (Figure 6). 30% of third years, 25.33% of final years and 28% of interns felt that infiltration is better than nerve block Chi square test shows p value =0.00 (Figure 7). 22% of third years,

Figure 2: Bar graph denotes association between year of study of the participants and number of participants who always prefer infiltration for maxillary teeth extraction. X axis denotes the year of study of the participants and Y axis denotes the number of responses. The response of yes (green) was mostly given by the interns and the majority of the final years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who always prefer infiltration for maxillary teeth extraction.

Figure 3: Bar graph denotes association between year of study of the participants and number of participants who always prefer nerve blocks for maxillary teeth extraction. X axis denotes the year of study of the participants and Y axis denotes the number of responses. The response of yes (green) was mostly given by the final years and the majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who always prefer nerve blocks for maxillary teeth extraction.
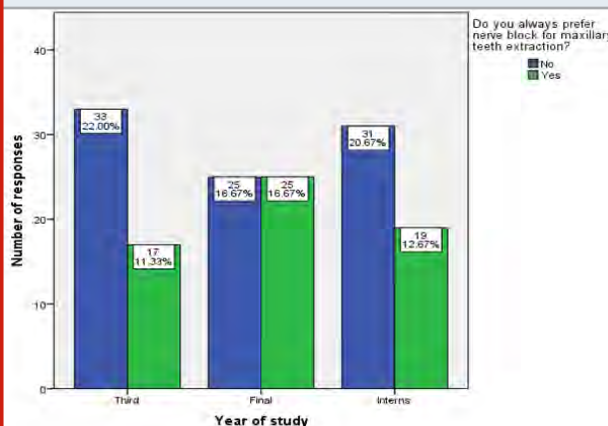
Figure 4: Bar graph denotes association between year of study of the participants and number of participants who thought that nerve block is technique sensitive for maxillary arch. X axis denotes the year of study of the participants and Y axis denotes the number of responses. The response of yes (green) was mostly given by the interns and the majority of the final years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who thought that nerve block is technique sensitive for maxillary arch.

Figure 5: Bar graph denotes association between year of study of the participants and number of participants who were aware of complications of nerve block. X axis denotes the year of study of the participants and Y axis denotes the number of responses. The response of yes (green) was mostly given by the interns and the majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who were aware of complications of nerve block.
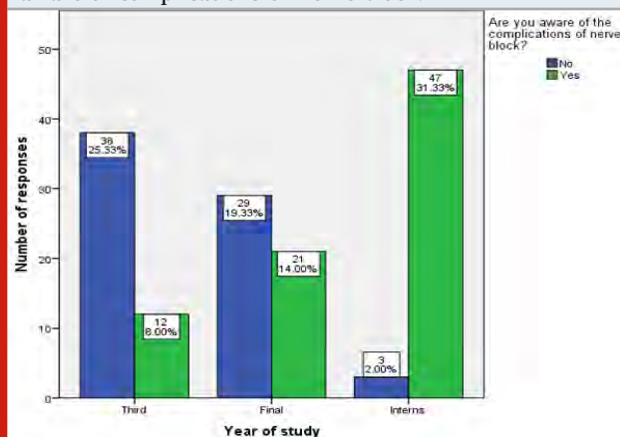
27.33% of final years and 27.33% of interns felt that nerve block had better anesthetic effect Chi square test shows p value =0.00 (Figure 8). 24.67% of third years, 26% of final years and 31.33% of interns felt that anesthesia produces post extraction discomfort

Chi square test shows p value =0.00 (Figure 9). 32% of third years, 28.67% of final years and 20.67% of interns felt that more programs should be conducted on local anesthesia techniques Chi square test shows p value =0.00 (Figure 10). 28% of third years, 29.33% of final years and 20 % of interns were not aware of painless injections Chi square test shows p value =0.00 (Figure 11). 32% of third years, 18.67 of final years and 3.33% of interns did not know about the cartridge type of injections Chi square test shows p value =0.00 (Figure 12).

Figure 6: Bar graph denotes association between year of study of the participants and number of participants who faced complications after a nerve block. X axis denotes the year of study of the participants and Y axis denotes the number of responses. The response of yes (green) was mostly given by the interns and the majority of the third years and interns have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who were aware of complications of nerve block.
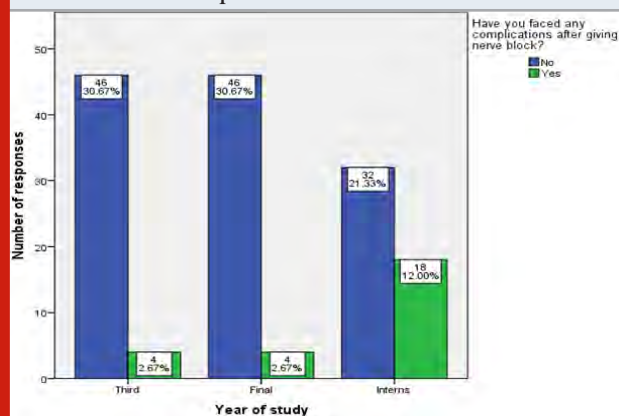
Figure 7: Bar graph denotes association between year of study of the participants and number of participants who felt infiltration was better than a nerve block. X axis denotes the year of study of the participants and Y axis denotes the number of responses. The response of yes (green) was mostly given by the third years and the response of no (blue) was mostly given by final years. Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who felt infiltration was better than a nerve block.
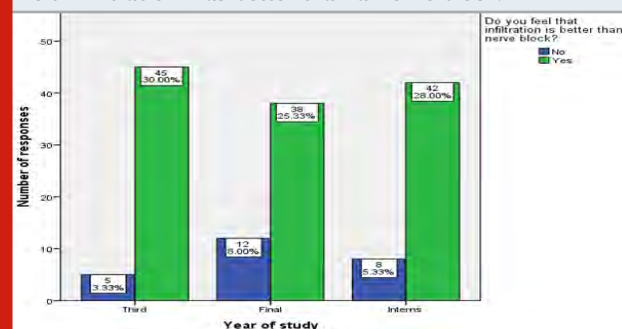
Figure 8: Bar graph denotes association between year of study of the participants and number of participants who thought that nerve block has better anesthetic effect than infiltration. X axis denotes the year of study of the participants and Y axis denotes the number of responses. The response of yes (green) was mostly given by the interns and final years and the response of no (blue) was mostly given by the third years. Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who thought that nerve block has better anesthetic effect than infiltration.
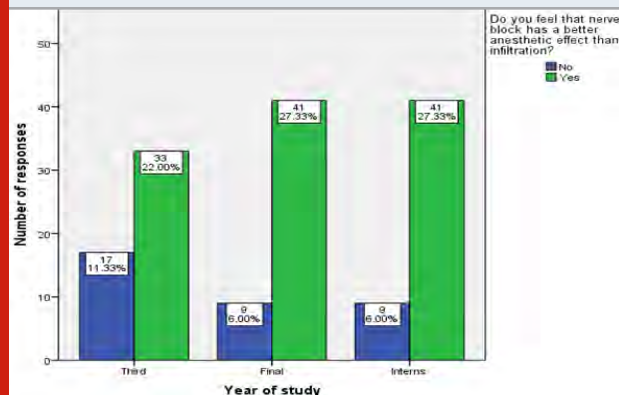
Figure 9: Bar graph denotes association between year of study of the participants and number of participants who thought that local anaesthesia produces post extraction discomfort. X axis denotes the year of study of the participants and Y axis denotes the number of responses. Majority of interns gave a response of yes (green) and the response of no (blue) was mostly given by the third years. Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who thought that local anaesthesia produces post extraction discomfort.
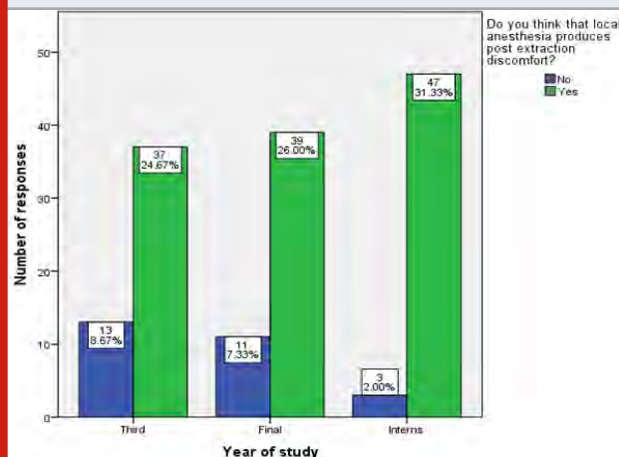
24.67% of third years, 24.67% of final years and 30% of interns knew the nerve supply of each root of maxillary molars Chi square test shows p value =0.00 (Figure 13).

32% of third years, 27.33% of final years and 16.67% of interns did not know the methods to make palatal infiltration painless Chi square test shows p value =0.00 (Figure 14). 8% of third years, 29.33% of final years and 31.33% of interns knew how hematoma was caused. Chi square test shows p value =0.00 (Figure 15). 30.67% of third years, 28.67% of final years and 26.67% of interns did not prefer longer acting anesthetic agents Chi square test shows p value =0.00 (Figure 16).

Figure 10:Bar graph denotes association between year of study of the participants and number of participants who thought that more programs should be conducted on local anesthesia techniques for maxillary teeth extraction. X axis denotes the year of study of the participants and Y axis denotes the number of responses. Majority of third years gave a response of yes (green) and the response of no (blue) was mostly given by the interns. Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who thought that more programs should be conducted on local anesthesia techniques for maxillary teeth extraction.

Figure 11: Bar graph denotes association between year of study of the participants and number of participants who were aware of the painless injection techniques. X axis denotes the year of study of the participants and Y axis denotes the number of responses. Majority of third years gave a response of no (blue) and the response of yes (green) was mostly given by the interns. Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who were aware of the painless injection techniques.
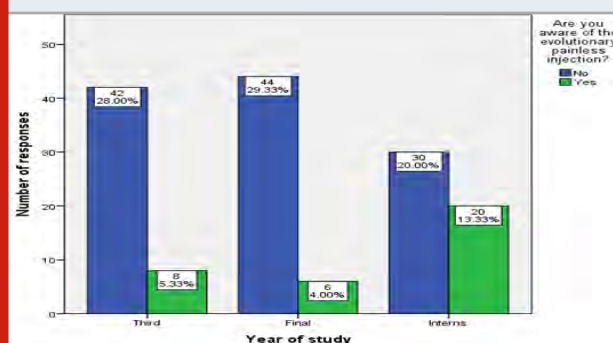
Figure 12: Bar graph denotes association between year of study of the participants and number of participants who had known about cartridge type of injections. X axis denotes the year of study of the participants and Y axis denotes the number of responses. The response of yes (green) was mostly given by the interns and the majority of the third and final years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who know about cartridge type of injection.
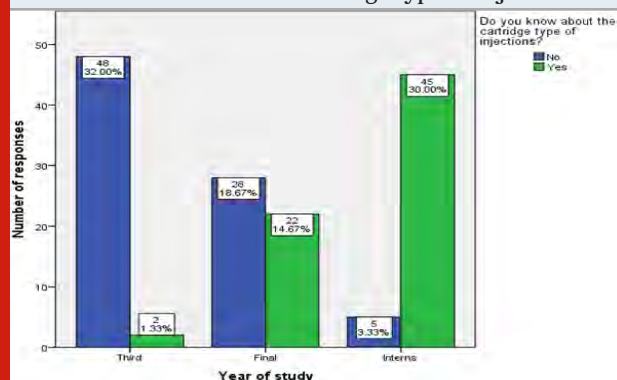
Figure 13: Bar graph denotes association between year of study of the participants and number of participants who had known about the each nerve supply of each root of maxillary molars. X axis denotes the year of study of the participants and Y axis denotes the number of participants. The response of yes (green) was mostly given by the third years, final years and interns when compared to No (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who had known about each nerve supply of each root of maxillary molars.
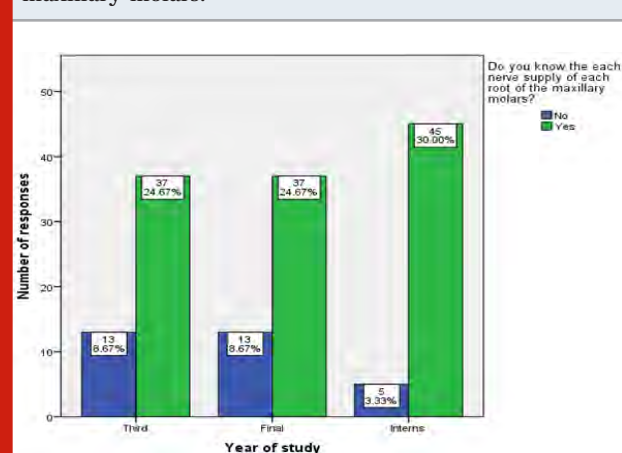
In our study, it was found that maximum number of participants preferred infiltration when compared to nerve block. Most of them felt that the nerve block in the maxillary arch was technique sensitive. Majority of the participants were aware of complications of nerve but most of them have not faced any complications till

now. Most of the participants felt that infiltration than nerve block but felt that nerve block had better anesthetic effect and they felt that local anesthesia often felt that local anesthesia produces post extraction discomfort. Most of the participants wanted more programs to be conducted on techniques of local anesthesia. Most of the participants had a good knowledge on nerve supply of maxillary molars but majority of them did not know how to make palatal infiltration painless. Most of them knew how a hematoma was caused.

Figure 14: Bar graph denotes association between year of study of the participants and number of participants who had known the methods to make palatal infiltrations painless. X axis denotes the year of study of the participants and Y axis denotes the number of participants. The response of no(blue) was mostly given by the third years and final years, Interns have given a equal response of no (blue) and yes (green). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who had known the methods to make palatal infiltrations painless.
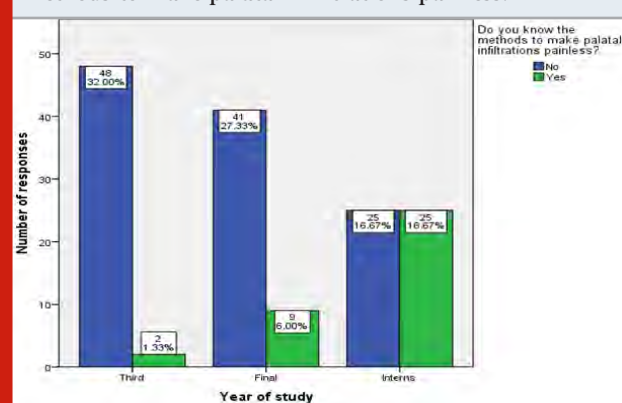
Figure 15: Bar graph denotes association between year of study of the participants and number of participants who had known how a hematoma was caused. X axis denotes the year of study of the participants and Y axis denotes the number of participants. The response of yes (green) was mostly given by the final years and interns, the majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who had known how a hematoma was caused.
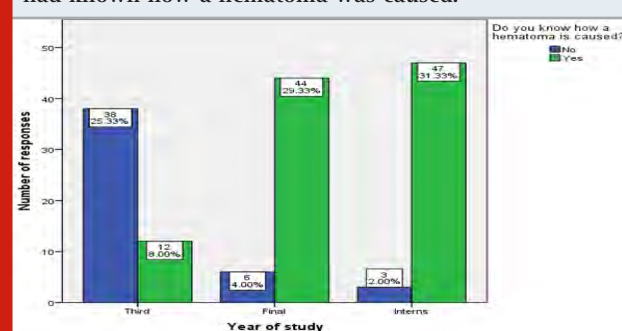
Figure 16: Bar graph denotes association between year of study of the participants and number of participants who preferred longer acting anesthetic agents. X axis denotes the year of study of the participants and Y axis denotes the number of responses. The response of yes (green) was mostly given by the interns and the majority of the third years have given a response of no (blue). Chi square test shows p=0.000, significant. Hence proving that there is significant association between the year of study of the participants and the number of dental students who preferred longer acting anesthetic agents.
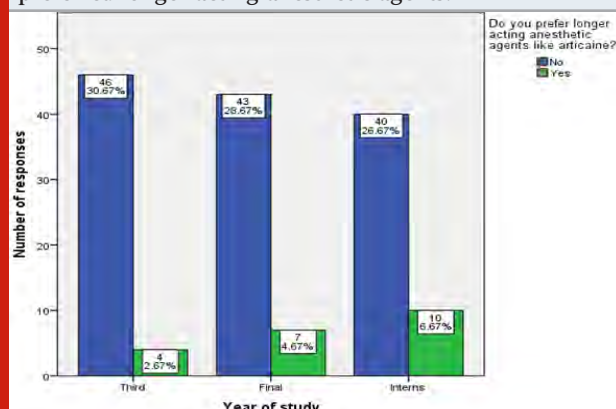
In our study, it was reported that most of them did not prefer longer acting local anesthetic agents like articaine. In contrast to our study, Ensiyeh et al. reported that infiltration of Articaine resulted in more effective anesthesia compared to Lidocaine in the PSA technique (Maljaei et al., 2017). Katya et al. reported that Articaine had higher post-injection pain compared to Lidocaine, but pain scores were negligible clinically (Katyal, 2010). Bartlett et al. reported that the success of infiltration of Articaine was almost similar to that of IANB technique with Lidocaine. Our study shows that many of the participants did not know how to make palatal injections painless (Bartlett and Mansoor, 2016). Mittal et al. reported that buccal infiltration with articaine failed to provide adequate palatal anesthesia, it can still be considered a good alternative to lidocaine for local anesthesia (Mittal et al., 2015).

The results depict that the majority of them were not aware of the various techniques of local anesthesia in maxillary teeth extractions. Amit et al. reported that most of the patients reacted well to the anterior middle superior alveolar technique. Adequate anaesthesia for an accepted duration was achieved and it reduced cumulative reduction of the number of injections reducing patient discomfort (Sangle, Tambuwala and Agrawal, 2012).

In our study, it was reported that the majority of the participants were not aware of various advanced techniques for delivering local anesthesia like cartridge type of injections. Kandiah et al. reported that there was no difference in the onset of local anaesthesia or pain difference when using the Wand and conventional technique when administering buccal infiltration (Kandiah and Tahmassebi, 2012).

CONCLUSION

Within the limitation of the study it was seen that Interns had a good Knowledge, attitude and practice on various local anesthesia techniques for maxillary teeth extractions when compared to the final and third years. This is because of the clinical expertise that the interns have acquired through clinical experience and clinical practice.

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Comparative Evaluation of Root Canal Configuration and Root Canal Curvatures of Mandibular Premolars in South Indian Population – A CBCT Based Analysis

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ABSTRACT

Several studies have stated the root canal morphology of premolars to be unique. The purpose of this article is to evaluate the root canal configuration and curvatures of mandibular premolars using Cone beam computed tomography amongst genders. This would enable us to understand the morphology and reduce the chances of failure of root canal treatments. 25 CBCT images (100 teeth) including those of mandibular premolars of 12 male (48 teeth) and 13 female (52 teeth) patients were selected. The images were observed with Galileos Viewer Sirona 3D. The images were used to evaluate the number of roots and root canals, root canal morphology according to Vertucci's classification and the direction of root apex curvature. According to this study, Type I Vertucci canal configuration was most prevalent in both mandibular premolars. Distal canal curvature was more in males and distal and lingual curvatures were found to be more in females in mandibular first premolars. Distal canal curvature was found to be more across both the genders while labial canal curvature was absent in both genders in mandibular second premolars. There was no significant association between men and women in root canal configurations or root canal curvatures (p>0.05).Identification of root canal morphology of complex mandibular premolars would reduce the chances of root canal failures by making sure all canals are obturated. Identification of direction of root canal curvature is essential to pre-curve the files prior to negotiation of canals to prevent perforation. The most prevalent root canal type in both premolars was Type I Vertucci and the most prevalent root canal curvature was distal

KEY WORDS: CBCT, PREMOLARS, ROOT CANAL MORPHOLOGY, ROOT CANAL CURVATURE, VERTUCCI'S CLASSIFICATION.

INTRODUCTION

Mandibular premolars are known as an Enigma of Endodontics. They have one of the most complex anatomies. Treatment failures and post-treatment flare-ups have been majorly reported in these teeth, thus indicating the existence of too much variation in the root canal morphology. (Berman DDS and Hargreaves, 2015; Glassman, 1987) A thorough knowledge of root canal morphology is crucial for the success of root canal treatment (Vertucci, 2005). The internal root canal complexities are genetically categorized and they have a significant role in anthropology, hence emphasizing the identification of root canal morphologies of different ethnic populations (Neelakantan et al., 2010).

Weine, Vertucci, and Gulabivala (Gulabivala et al., 2001; Vertucci, 1984; Weine et al., 1969) classified and described the root canal system of human permanent teeth. Vertucci's classification is the most commonly used. The canal configurations were categorized into the following eight types based on Vertucci's classification (Vertucci, 1984).

Root canal configuration has been identified using different methods such as 2D radiography, root canal staining, hard tissue section and micro-CT but they miss the important third dimension which could lead to missing canals and buccolingual curves of root canals. (Alfawaz et al., 2019; Hajihassani et al., 2017) Cone-beam computed tomography scanning is a non-invasive 3D imaging technique which provides three-dimensional high-resolution images with the possibility of removing the superimposed structures.(Yu et al., 2012) Tachibana and Matsumoto (1990) introduced it in the field endodontics (Tachibana and Matsumoto, 1990). It provides images of root morphology with more details than those obtained by conventional periapical radiography and will help in improving the endodontic treatment outcomes (Patel et al., 2007). In addition, it has a significantly lowered radiation dose compared to medical computed tomography (CT) (Suomalainen et al., 2009; Tsiklakis et al., 2005) and majority of the CBCT equipment are ergonomically designed for safe use and optimal performance(Llena et al., 2014)

We have numerous highly cited publications on well designed clinical trials and lab studies (Azeem and Sureshbabu, 2018; Govindaraju et al., 2017; Janani and Sandhya, 2019; Jenarthanan and Subbarao, 2018; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Poorni et al., 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique, Nivedhitha, et al., 2019; Siddique, Sureshbabu, et al., 2019; Siddique and Nivedhitha, 2019; Teja et al., 2018). This has provided the right platforms for us to pursue the current study. The aim of the present study is to evaluate the root canal configuration and root curvatures of mandibular premolars using Cone beam computed tomography amongst genders.

MATERIAL AND METHODS

Study design: The present study was conducted in the Department of Conservative Dentistry and Endodontics at Saveetha Dental College, Chennai. This study was done with the use of 25 Cone Beam Computer Tomography images which contained 100 mandibular premolar teeth of patients attending the hospital for treatment. 12 were male (48 teeth) and 13 were female (52 teeth) patients. The study was initiated after approval from the institutional review board. The study was generalised to the South Indian population.

Inclusion and Exclusion criteria
CBCT images included in the study contained,

- teeth without periapical lesions
- non- endodontically treated teeth
- no open apex canals
- CBCT images of high quality

The exclusion criteria was missing or incomplete data. Cross verification of data for errors was done with the help of clinical photographs.

Data Collection: The CBCT images were observed with Galileo's Viewer Sirona 3D and were evaluated by 2 examiners. The images were used to evaluate:

- number of roots and root canals
- root canal morphology according to Vertucci's classification
- direction of root canal curvature

Figure 1: CBCT of 34 shows distally curved root canal

Radiographic technique and image analysis: The images for the study were selected from the radiographic database of the dental hospital. The images were acquired from a standard protocol for patient positioning, exposure parameter setting and image acquisition. The images were analysed on Galileo's Viewer Sirona 3D. The slice thickness of the CBCT is 150 micrometer.The variables evaluated were the number of roots and root canals, direction of root canal curvature and root canal morphology according to Vertucci's classification. The direction of root canal curvatures were divided into 4 categories:Mesial, Distal, Labial, Lingual. CBCT images

of the curvatures are represented in Figure 1,2. The root canal configurations were evaluated based on the 8 types in Vertucci's classification (Vertucci, 1984).

Figure 2: CBCT of 35 shows lingually curved root canal

Statistical Analysis: The collected data was validated, tabulated and analysed with Statistical Package for Social Sciences for Windows, version 20.0 (SPSS Inc., Chicago, IL, USA). Percentage distribution of Vertucci's root canal configurations and root apex curvatures of mandibular premolars were calculated. Pearson's chi-square association was used to test associations between the gender of patients with root canal configuration and gender of patients with root apex curvatures of mandibular first and second premolars; p value < 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Since mandibular premolars have complex anatomies, studies regarding their anatomical variations could lead to better knowledge prior to root canal treatment. The aim of the present study is to evaluate the root canal configuration and root apex curvatures of first and second mandibular premolars using Cone beam computed tomography amongst genders.

On comparison of Vertucci's root canal configuration among genders, in mandibular first premolars, Type 1 configuration was seen in 40% of males and 36% of females, Type 2 configuration was seen in 6% of males and 8% of females and Type 5 configuration of root canals was seen in 2% and 8% of males and females respectively. Type I root canal configuration was found to be more across both the genders. Chi square test was performed to test the association of the root canal configuration of mandibular first premolars with gender. The association was found to be not significant. Pearson Chi-Square Value - 1.97; p = 0.373 (p value >0.05); not statistically significant, proving gender of patients is not associated with the root canal configuration of the mandibular first premolars (Fig 3).

Figure 3: Bar graph depicting the association of gender of patients with Vertucci's root canal configurations of mandibular first premolar. X axis represents the gender of patients and Y axis represents the number of mandibular first premolars. Type I root canal configuration (Blue) was found to be more across both the genders. However, Chi square test was performed and the association was not significant. Pearson Chi-Square Value - 1.97; p = 0.373 (p value >0.05); not statistically significant.
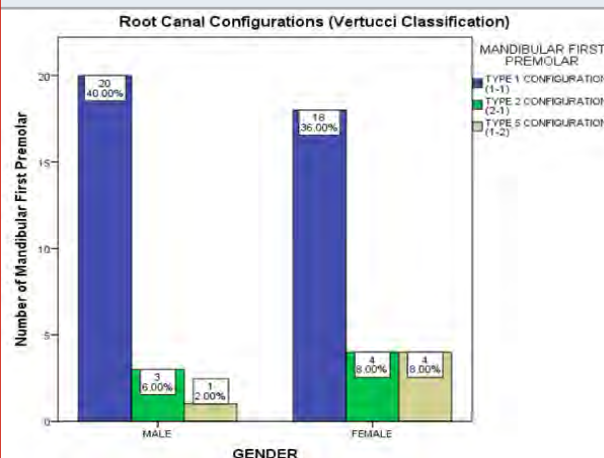
This statement was supported by a study conducted in the Iranian population (Kazemipoor et al., 2015), where the majority of mandibular first premolars (63.9%) had Type 1 configuration ie. one canal and in which the association between the number of root canals in the mandibular first premolars in the two genders was statistically non significant (P = 0.081). However regarding the Vertucci classification in the mandibular first premolar in the Portugese subpopulation (Martins et al., 2018), the statement was opposed as a significant association was found in Type I (1-1) configuration with 72.7% [68.4–77.0 CI 95%] in males and 80.7% [77.7–83.7 CI 95%] in females. Huang et al (Huang et al., 2015) performed an analysis of the mandibular first premolar in Taiwan patients and concluded that females had a significantly higher number of single-rooted first premolars with one root canal, while males had a significantly higher prevalence of two-rooted first premolars with two root canals.

In mandibular second premolars, Type 1 configuration was seen in 36% of males and 34% of females, Type 2 configuration was seen in 10% of males and 12% of females and Type 5 configuration of root canals was seen in 2% and 6% of males and females respectively. Type I root canal configuration was found to be more across both the genders. Chi square test was performed to test the association of the root canal configuration of mandibular second premolars with gender. The association was found to be not significant. Pearson Chi-Square Value - 1.04; p = 0.594 (p value >0.05); not statistically significant, proving gender of patients is not associated with the root canal configuration of the mandibular second premolars (Fig 4).

Figure 4: Bar graph depicting the association of gender of patients with Vertucci's root canal configurations of mandibular second premolar. X axis represents the gender of patients and Y axis represents the number of mandibular second premolars. Type I root canal configuration (Blue) was found to be more across both the genders. However, Chi square test was performed and the association was not significant. Pearson Chi-Square Value - 1.04; p = 0.594 (p value >0.05); not statistically significant.
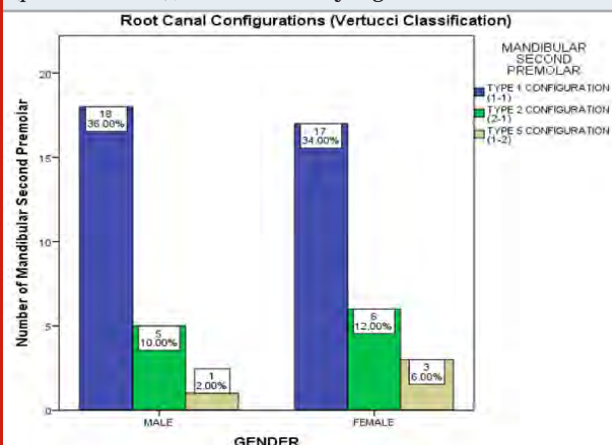
This statement was also supported by the study conducted in the Iranian population(Kazemipoor et al., 2015), where the majority of mandibular second premolars (78.3%) had Type 1 configuration and there was no significant association between the two genders in the number of root canals (P = 0.498) in the mandibular second premolars. Of the reported studies, females have a higher likelihood of two or more roots or canals in mandibular first premolars, whereas men exhibit multiple canals much more frequently than females in mandibular second premolars (Iyer et al., 2006; Serman and Hasselgren, 1992; Sert and Bayirli, 2004). Others have reported no significant difference in root configuration between females and males (Miyoshi et al., 1974).

Specific types of canal morphology are visible in different racial groups. A higher incidence of two canals in mandibular first premolars was reported in several populations, upto 50% in Indian populations (Velmurugan et al., 2010) and approximately 40% in Middle Eastern populations from Kuwait(Zaatar et al., 1997), Jordan (Awawdeh and Al-Qudah, 2008), and Turkey (Çaliskan et al., 1995). In the Malaysian population ((Kacharaju et al., 2019) 71% of the single-canal premolars (Type 1) were observed in all three cross-sectional views. A study conducted by Lei Dou (Dou et al., 2017), in the Chinese population in mandibular first premolars, Type I canal system was found in 114 teeth (64.04%), Types II, III, IV, V and VIII in 2 teeth (1.12%), 19 teeth (10.67%), 1 tooth (0.56%), 39 teeth (21.91%), and 2 teeth (1.12%) respectively and only one tooth (0.56%) belonged to an additional type (1-3-1).

In the Jordanian population (Awawdeh and Al-Qudah, 2008) however, two separate apical foramina (Type IV)

were found in 33% of the teeth with two canals, compared to 6.2% with one apical foramen (Type I). Teeth with three separate apical foramina (Type VIII) were scarce (2.2%), this statement supported the current study which found no three separately distinct root canals extending to the apex. Majority of the mandibular second premolars were found to have a single canal; 72% of the teeth possessed type I canal systems, whilst 22.8% of the roots had two canals with two separate apical foramina in the Jordanain population (Awawdeh and Al-Qudah, 2008).

In a systematic review conducted by Kottoor et al, mandibular first premolars were found to have one root (97.21%) in most instances. However, only 73.55% of these single rooted teeth contained a single canal.The mandibular first premolar was more prone to bifurcation of canals (23–30%) terminating in multiple apical foramina (15–20%), as compared to second premolars. Type I canal configuration was most prevalent in both first (72.6%) and second premolars (83.65%) (Kottoor et al., 2013). In a study conducted by FJ Vertucci (Vertucci, 1978), the mandibular first premolar had one canal in 74% of the teeth, two canals in 25.5%, and three canals in 0.5% of the teeth. The mandibular second premolar had 97.5% one canal at the apex and 2.5% two canals at the apex respectively.

Figure 5: Bar graph depicting the association of gender of patients with the root canal curvature of mandibular first premolar. X axis represents the gender of patients and Y axis represents the number of mandibular first premolars. Distal curvature (blue) was more in males, Distal (blue) and lingual (purple) curvatures were found to be more in females. However, Chi square test was performed and the association was not significant. Pearson Chi-Square Value - 0.72; p = 0.868 (p value >0.05); not statistically significant.
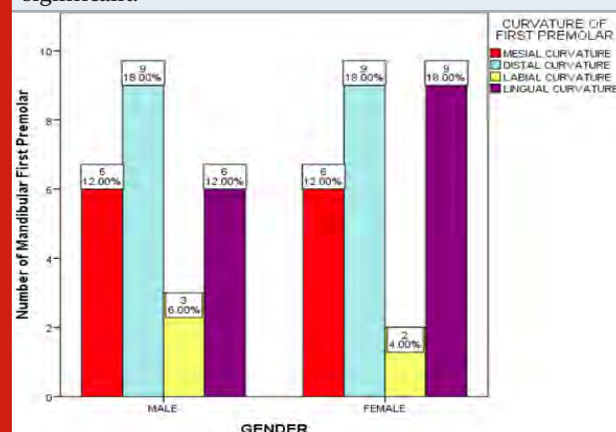
On comparison of the root canal curvatures among genders, in mandibular first premolars, mesial curvature was seen in 12% of males and females, distal curvature was seen in 18% of males and females, labial curvature was seen in 6% of males and 4% of females and lingual curvature was seen in 12% and 18% of males and females respectively. Distal curvature was more in males and distal and lingual curvatures were found

to be more in females in mandibular first premolars. Chi square test was performed to test the association of the curvatures of root canals of mandibular first premolars with gender. The association was found to be not significant. Pearson Chi-Square Value - 0.72; p = 0.868 (p value >0.05); not statistically significant, proving gender of patients is not associated with the root canal curvatures of the mandibular first premolars (Fig 5). No significant difference was also found between men and women (p>0.05) in a study conducted by Hajihassani N(Hajihassani et al., 2017), thus supporting our statement.

In mandibular second premolars, mesial curvature was seen in 8% of males and 10% of females, distal curvature was seen in 22% of males and 24% of females and lingual curvature was seen in 18% of males and females. Distal canal curvature was found to be more across both the genders while labial canal curvature was absent in both genders in mandibular second premolars. Chi square test was performed to test the association of the curvatures of root canals of mandibular second premolars with gender. The association was found to be not significant. Pearson Chi-Square Value - 0.075; p = 0.963 (p value >0.05); not statistically significant, proving gender of patients is not associated with the root canal curvatures of the mandibular second premolars (Fig 6). This was supported by Hajihassani N(Hajihassani et al., 2017) who also found no significant difference between men and women in his study (p>0.05).

Figure 6: Bar graph depicting the association of gender of patients with the root canal curvature of mandibular second premolar. X axis represents the gender of patients and Y axis represents the number of mandibular second premolars. Distal curvature (blue) was found to be more across both the genders while Labial curvature (yellow) was absent in both genders. However, Chi square test was performed and the association was not significant. Pearson Chi-Square Value - 0.075; p = 0.963 (p value >0.05); not statistically significant.
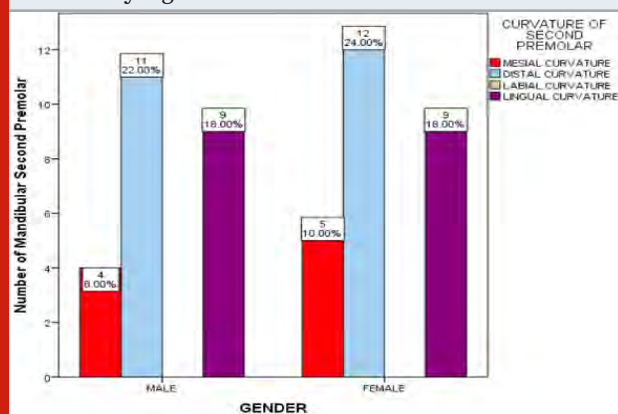
In mandibular first premolars, distal and lingual canal curvatures were most prevalent in females with 18% of occurrence while in males, distal curvatures were more prevalent (18%). In mandibular second premolars as well distal curvatures were most prevalent in females (24%)

and males (22%). This statement was supported by a study conducted in the Iranian population (Hajihassani et al., 2017) which stated the most prevalent canal curvature to be lingual for the first premolars (7.6%) and distal for the second premolars (11%). No significant difference was found between men and women (p>0.05). They also found that the most prevalent root curvature was the distal curvature in both premolars; with 71.4% and 74% of first and second premolars, respectively.

CONCLUSION

Identification of root canal morphology of complex mandibular premolars would reduce the chances of root canal failures by making sure all canals are obturated. Identification of direction of root canal curvature is essential to pre-curve the files prior to negotiation of canals to prevent perforation. The most prevalent root canal type in both premolars was Type I Vertucci and the most prevalent root canal curvature was distal.

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Awareness About Hyperbaric Prilocaine Among Dental Students

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ABSTRACT

Hyperbaric formulation of local anesthetic solutions have some advantages over plain solutions. The hyperbaric solutions are used in various fields of medicine due to their properties. The aim of this study was to assess the awareness about hyperbaric prilocaine among dental students.This study included 150 dental students in a dental hospital during the month of December 2019. Pre tested questionnaire was distributed among the students through an online link. Data was tabulated and results were obtained.Descriptive and chi square statistics were performed.Out of 150 patients, 6 students (44%) were under 18-20 years and 84 students (56%) were under 21-25 years age groups. Out of 150 students ,87 students (58%) were males and 63 students (42%) were females. On analysing the awareness of hyperbaric prilocaine among students, 88% had known about hyperbaric oxygen and 12% were not aware about hyperbaric prilocaine. There was a significant association between age groups and awareness among dental students (p<0.05) while no statistically significant was found between gender and awareness among dental students (p>0.05). Within the limitations of the present study, the awareness about the uses and properties of hyperbaric prilocaine was moderate.

KEY WORDS: HYPERBARIC PRILOCAINE;RAPID;AWARENESS;LIDOCAINE;DENTAL STUDENTS.

INTRODUCTION

Prilocaine is a local anesthetic agent characterized by intermediary potency and duration and rapid onset of action. As a hyperbaric formulation of 5% solution, it was introduced and has been successfully used for spinal anesthesia since 1960.(Manassero and Fanelli, 2017)A new formulation of 2% plain and hyperbaric solution is currently available in Europe. Because of its decreased incidence of transient neurological symptoms, prilocaine is suggested as a substitute to lidocaine and mepivacaine in spinal anesthesia for ambulatory surgery, as well as a potential alternative to low doses of long-acting local anesthetics. (Kreutziger et al., 2010)

Prilocaine with its 2% hyperbaric formulation (HP), developed in recent times, showed fast onset of action and rapid regression of motor block compared to other local anesthetics without noteworthy side-effects when used intrathecally.(Ambrosoli et al., 2016) Literature suggests a dose ranging between 40 and 60 mg of prilocaine for lower extremities and lower abdominal procedures lasting up to 90 min, whereas a dose ranges

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from 10 to 30 mg is appropriate for perineal surgical procedures. Readiness for discharge occurs in 4 h from spinal administration.(Lacroix et al., 2019)With the use of large doses of long-acting local anesthetics, delay of discharge emerged as a growing problem, although small doses demonstrated a wide variability in block duration and failure rate.Due to its intermediate duration of action and the lower incidence of TNS, prilocaine has been proposed as a valuable alternative to lidocaine as well as to small doses of long-acting local anesthetics for short procedures performed under spinal anesthesia. (St George et al., 2018)

Since prilocaine has the disadvantage of methemoglobinemia, hyperbaric prilocaine has been introduced and is in use with various fields of medicine. They are constantly used in spinal anesthesia for their rapid onset and offset actions and their short acting nature. They have been used in perianal surgeries, arthroplasty knee surgeries and various other surgeries due to their less toxic effect and also their rapid onset of action and regression of the motor block (Kaban et al., 2014; St George et al., 2018; Palumbo et al., 2019). There are more advantages of using hyperbaric prilocaine as a local anesthetic agent in the field of dentistry too but there are no studies highlighting the use of hyperbaric prilocaine in dentistry.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the awareness on hyperbaric prilocaine among dental students.

MATERIAL AND METHODS

The study was done in an online setting among the dental students in the month of December 2019 in a private dental college in Chennai. Institutional review board approval was obtained for this survey based analysis. 2 reviewers [Primary investigator & guide] were involved in this study.

The sample size of 150 participants of age group 18-25 years including dental students from first year to interns both males and females were selected by a simple random sampling method studying in a private dental college. The students who were not willing to take part in the survey were excluded from the study. Randomisation [for all variables] was followed to minimise the bias. Pre tested questionnaires where the internal validity was the homogenisation and replication of experiment. Cross verification with existing studies was the external validity of this study.

The set of questionnaires which includes gender, questions on awareness were circulated among the participants through an online link. The results were collected and tabulated . Then the results were exported for statistical analysis to SPSS statistical software. Both descriptive (frequency of the responses) and inferential statistics (Chi - square tests) were done and the results were presented in the forms of graphs.

RESULTS AND DISCUSSION

In the present study, out of 150 patients, 66 students (44%) were under 18-20 years and 84 students (56%) were under 21-25 years age groups. [FIgure 1] Out of 150 students ,87 students (58%) were males and 63 students (42%) were females. [FIgure 2]

Figure 1: Pie chart showing the age distribution among dental students. The higher participation was seen among 21-25 years age groups (green).
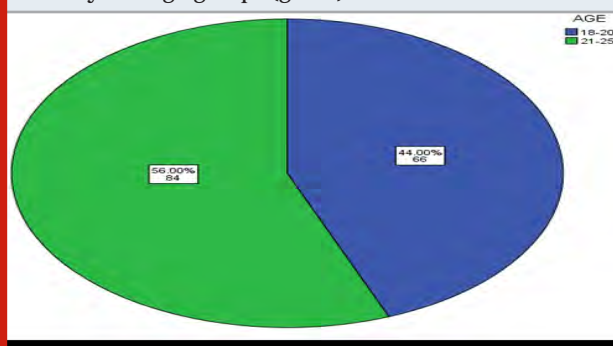
Figure 2: Pie chart showing the gender distribution among dental students. Males (58%) (blue) have participated more than females (42%) (green).
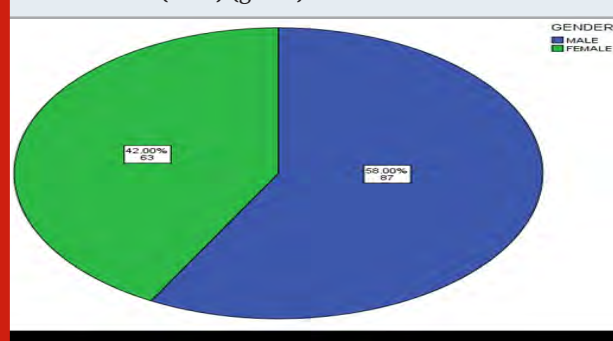
Figure 3: Pie chart showing the percentage of students awareness about hyperbaric prilocaine. 88%(blue) were aware about hyperbaric prilocaine.
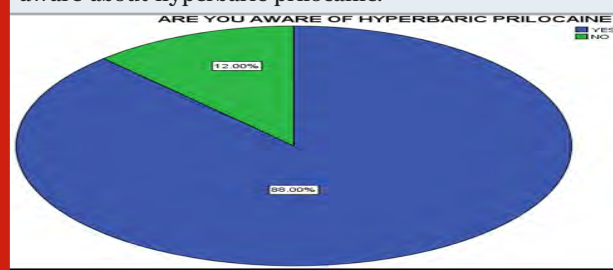
On analysing the awareness of hyperbaric prilocaine among students, 88% had known about hyperbaric oxygen and 12% were not aware about hyperbaric prilocaine. [FIgure 3] On assessing the awareness of the type of prilocaine, 99.3% of students have correctly answered as amide and 8.67% of students have answered as ester. [FIgure 4]

31.33% were not aware about it. [FIgure 5] Previous studies have shown that hyperbaric bupivacaine used in the spinal block lasted longer in patients with a restricted block. Hence several local anesthetics have been formulated as hyperbaric solutions for intrathecal administration. (Infante and Van Gessel, 2000).

Figure 4: Pie chart showing the percentage of dental students awareness about the type of anesthetic agent. 91.3%(blue) were aware that prilocaine is a type of amide.

WHAT TYPE OF ANAESTHETIC AGENT IS PRILOCAINE

AMIDE
ESTER

8.67%

91.33%
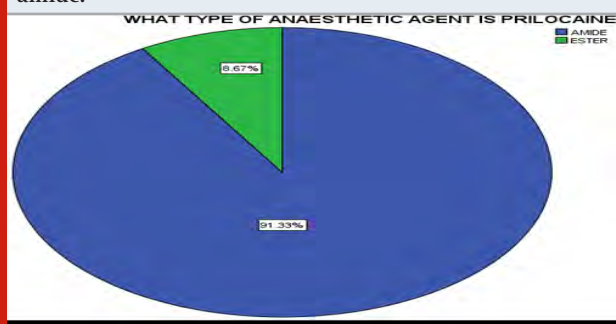
Figure 5: Pie chart showing the percentage of dental students awareness about hyperbaricity and onset of action. 68.67% (blue) were aware about the hyperbaricity.

DOES HYPERBARICITY REMARKABLY ACCELERATES THE ONSET AND OFFSET TIMES OF INTRATHECAL ANAESTHESIA

YES
NO

31.33%

68.67%
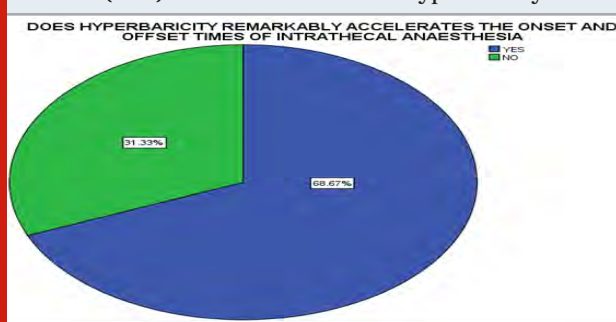
Figure 6: Pie chart showing the percentage of dental students awareness about the faster patient recovery and the type of anesthetic used. 76.67% (blue) were aware that there was faster recovery after use of hyperbaric prilocaine.

PATIENT RECOVERY IS FASTER IN WHICH TYPE OF PRILOCAINE

HYPERBARIC PRILOCAINE
PLAIN PRILOCAINE

23.33%

76.67%
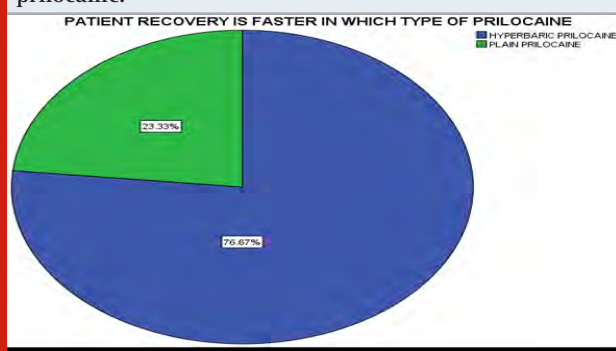
On analysing the response of students on hyperbaricity of prilocaine 68.67% have reported that they accelerate the onset and offset times of intrathecal anaesthesia while

Figure 7: Pie chart showing the percentage of dental students aware about the lower incidence of urinary retention post surgery after use of different types of anesthetic agents. 40.67% (blue) were aware that hyperbaric prilocaine had a lower incidence of urinary retention post surgery when compared with other agents.

LOWER INCIDENCE OF ACUTE POSTOPERATIVE URINARY RETENTION POST SURGERY IS SEEN IN

HYPERBARIC PRILOCAINE
HYPERBARIC MEPIVACAINE
HYPERBARIC BUPIVACAINE
LIDOCAINE

22.00%

13.33%

24.00%

40.67%
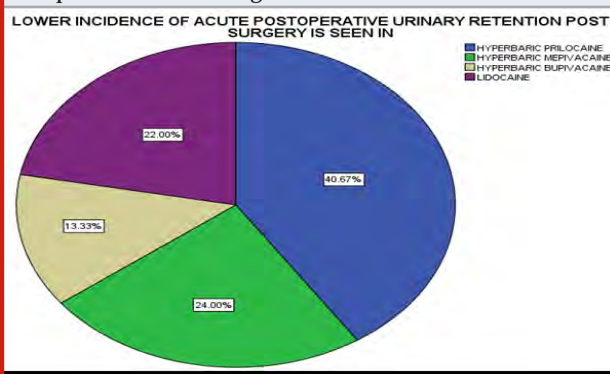
Figure 8: Pie chart showing the percentage of dental students' awareness about the safe and effectiveness of hyperbaric prilocaine. 55.33% (blue) were aware that hyperbaric prilocaine was safer and effective in use.

HYPERBARIC PRILOCAINE IS SAFE AND EFFECTIVE IN ITS USE FOR AMBULATORY AND SHORT TIME SURGERIES

YES
NO

44.67%

55.33%
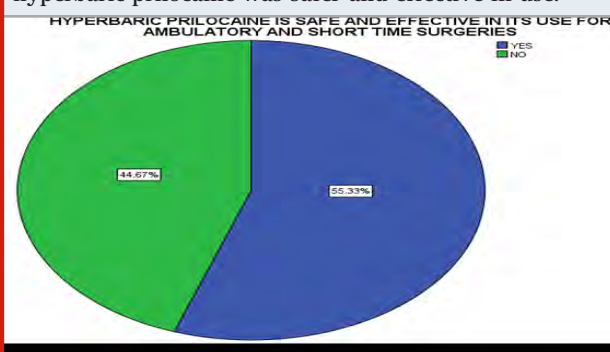
Figure 9: Pie chart showing the percentage of students aware of using hyperbaric prilocaine as an alternative to lidocaine. 63.33% were unaware about the use of hyperbaric prilocaine as an alternative to lidocaine.

DO YOU THINK 2% HYPERBARIC PRILOCAINE IS AN ALTERNATIVE DRUG TO LIDOCAINE AND MEPIVACAINE FOR SPINAL ANAETHESIA OF INTERMEDIATE OR SHORT DURATION

YES
NO

63.33%

36.67%
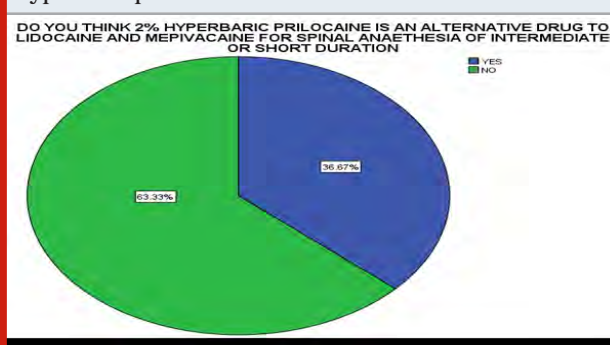
On asking about the patient recovery after using plain and hyperbaric prilocaine, 76.67% of students have said that hyperbaric prilocaine has faster recovery while 23.33% have said that plain prilocaine has faster recovery. [FIgure 6] Studies done by Camponovo et al have shown that motor and sensory blocks are established faster; the anesthetic is fixed earlier, and patients recover faster after hyperbaric than after spinal plain prilocaine. (Camponovo et al., 2010).

On assessing the awareness of lower incidence of acute postoperative urinary retention post surgery, 40.67% have responded as hyperbaric prilocaine, 24% as hyperbaric mepivacaine, 13.33% as hyperbaric bupivacaine, 22% as lidocaine. [FIgure 7] The study confirmed prilocaine as an effective spinal anesthetic for day-case surgery showed no postoperative urinary retention post surgery. (Manassero et al., 2014)

When asked whether hyperbaric prilocaine is safe and effective in its use for ambulatory and shot time surgeries, 55.33% have answered yes and 44.67% have answered no. [FIgure 8] When asked about the hyperbaric prilocaine and whether it can be used as an alternative drug to lidocaine and mepivacaine for spinal anaesthesia of intermediate or short duration, 36.67% have responded yes and 63.33% have answered no. [FIgure 9] Previous study done by Aguirre et al compared 60 mg of 2% hyperbaric prilocaine with 12 mg of 0.4% plain ropivacaine. The offset of the motor block was faster after intrathecal administration of prilocaine. (Aguirre et al., 2015)

Figure 10: Bar graph depicting the association between the awareness of patient recovery after use of different types of prilocaine and age groups. X axis - age in years; Y axis- number of students with their responses. 77% (blue) of students under 21-25 years were aware that there was faster recovery after use of hyperbaric prilocaine. There was a statistically significant association found (Pearson chi square =24.012a , p value=0.000)(p<0.05). Hence it is statistically significant.
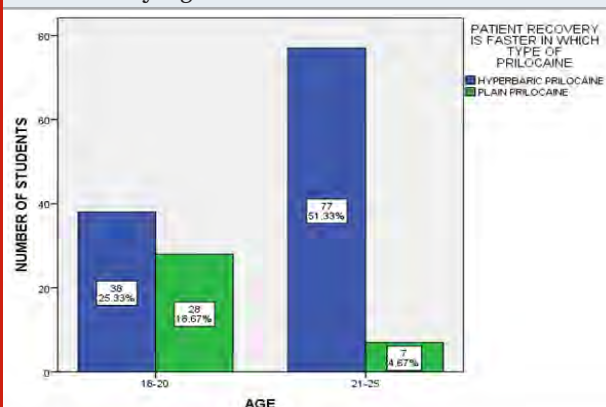
On statistically analysing the association between the awareness of patient recovery and age groups. 38 students (25.33%) under 18-20 years and 77 students (51.33%) under 21-25 years have said hyperbaric

prilocaine had faster recovery. There was statistically significant association between the awareness of patient recovery and the age groups , p value=0.000. [FIgure 10] . Previous study done by Gebhardt et al suggested that hyperbaric prilocaine had faster recovery from spinal anaesthesia when compared with mepivacaine.(Gebhardt et al., 2014)

Figure 11: Bar graph depicting the association between the awareness of effective use of hyperbaric prilocaine and age groups. X axis - age in years; Y axis- number of students with their responses. 56% (blue) of students under 21-25 years were aware of the safety and effective use of hyperbaric prilocaine. There was statistically significant association found (Pearson chi square=9.921a, p value=0.002)(p<0.05). Hence it is statistically significant.
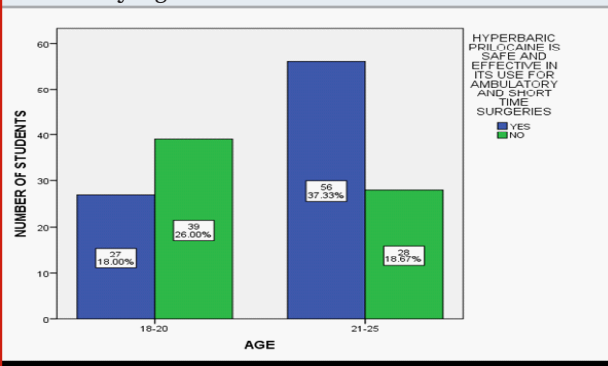
Figure 12: Bar graph depicting the association between the awareness of patient safety after use of hyperbaric prilocaine and age groups. X axis - age in years; Y axis- number of students with their responses. 76% (blue) of students under 21-25 years were aware that there was patient safety after use of hyperbaric prilocaine. There was a statistically significant association found (Pearson chi square =30.486a ,p value=0.000)(p<0.05). Hence it is statistically significant.
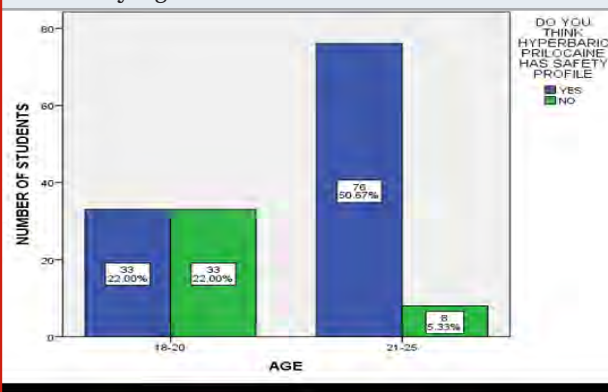
On statistically analysing the association between the awareness of safety and the effective use of hyperbaric prilocaine, 27 students(18%) under 18-20 years have answered yes and 56 students (37.33%) under 21-25 years have answered yes. There was a significant

association between awareness of safety and effective use of hyperbaric prilocaine and age groups, p value=0.002. [FIgure 11] Previous studies have shown that hyperbaric prilocaine is safer and effective in use in short time surgeries.(Manassero and Fanelli, 2017)

On statistically analysing the association between the safety profile of hyperbaric prilocaine and age groups, 76 students (50.67%) under 21-25 years age groups and 33 students (22%) under 18-20 years have answered yes for hyperbaric prilocaine. There was statistically significant association between awareness on safety profile and age groups, p value=0.000. [FIgure 12]

Figure 13: Bar graph depicting the association between the awareness about hyperbaric prilocaine and gender. X axis - gender (males/females); Y axis- number of students with their responses. There was no statistically significant association found (Pearson chi square =1.698a , p value=0.192) (p>0.05). However, males (blue) had more awareness about hyperbaric prilocaine under both 18-20 years (49.33%) and 21-25 years (38.67%).
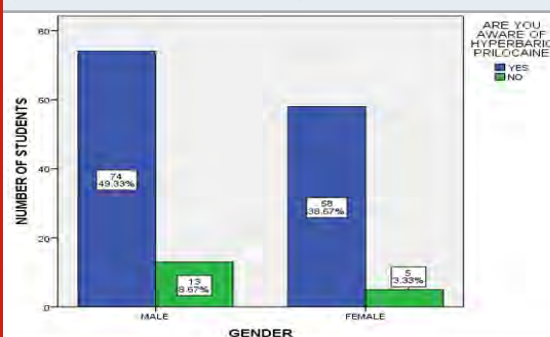
Figure 14: Bar graph depicting the association between the awareness about hyperbaric prilocaine use in short time surgeries and gender. X axis - gender (males/females); Y axis- number of students with their responses. Males (blue) had awareness among 18-20 years (37.33%).There was statistically significant association found (Pearson chi square =6.484a , p value=0.009)(p<0.05). Hence it is statistically significant.
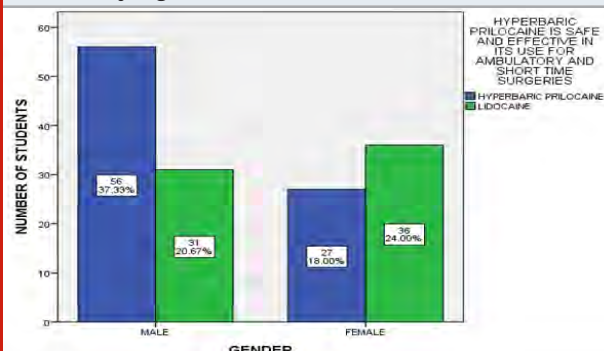
On statistically analysing the association between awareness about hyperbaric prilocaine among gender,74 male students (49.33%) and 58 females students (38.67%)

have said that they were aware about hyperbaric prilocaine. There was no statistically significant association between the awareness about hyperbaric prilocaine and gender, p value=0.192. [FIgure 13]

On statistically analysing the association of awareness of safety and effective use of hyperbaric prilocaine among gender, 56 male students (37.33%) and 27 female students (18%) have responded that hyperbaric prilocaine is safe and effective. There was a statistically significant association between awareness of safety and effective use of hyperbaric prilocaine among gender, p value=0.009. [FIgure 14] Previous studies have shown that hyperbaric prilocaine is safer and effective in use in short time surgeries.(Manassero and Fanelli, 2017)

On statistically analysing the association of using hyperbaric prilocaine as an alternative to lidocaine among gender, 33 male students (22%) and 22 female students (14.67%) have responded that hyperbaric prilocaine can be used as an alternative. There was no statistically significant association between the awareness of using hyperbaric prilocaine as an alternative among gender, p value=0.710. [FIgure 15] Previous studies have shown prilocaine as a same duration of action than an equal dose of lidocaine resulting an alternative drug for spinal anesthesia of intermediate or short duration.(Østgaard, Hallaråker and Ulveseth, 2000; Weert et al., 2000)

Figure 15: Bar graph depicting the association between the awareness about hyperbaric prilocaine as an alternative to lidocaine and gender. X axis - gender (males/females); Y axis- number of students with their responses. There was no statistically significant association found (Pearson chi square =3.865a , p value=0.710) (p>0.05). However, Males (blue) had awareness about hyperbaric prilocaine under both 18-20 years (22%) and 21-25 years (14.67%).
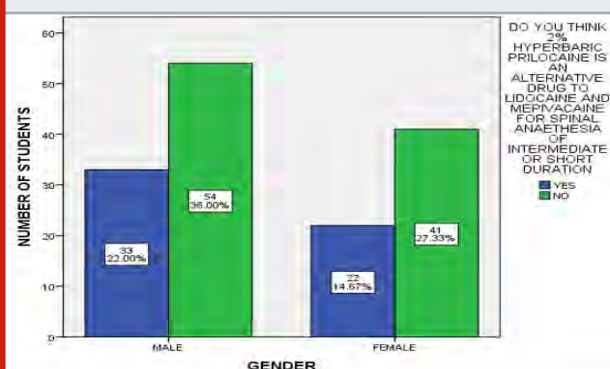
The limitation of the present study was that it was an online survey and the response from students may not feel encouraged to provide accurate, honest answers. There are chances for the students of not feeling comfortable providing answers that present themselves unknown. The sample size of the study was smaller which could define the generalised population. And so multicentric surveys can be conducted on a larger population.

CONCLUSION

Within the limitations of the present study, the awareness about the uses and properties of hyperbaric prilocaine was moderate. There was higher awareness among 21-25 years age group students which showed a statistically significant association. Though there was higher awareness among male students yet no significant association was found among gender. Research on the use of hyperbaric prilocaine in dentistry can be done in future.

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Awareness on Complications Induced by Corticosteroid Therapy Among Dental Students

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ABSTRACT

Corticosteroids are one of the widely used drugs in dentistry. These are immunosuppressive agents. The reason for its use is its anti-inflammatory as well as immunosuppressive properties. Corticosteroids have revolutionized the management of several disabling conditions, but its use in terms of dosage is inappropriate. Therefore, the aim of the present study was to analyse the awareness of complications induced by corticosteroid therapy among dental students. An online survey of 15-20 questions based on the awareness of corticosteroid complications has been prepared and uploaded online and circulated among 100 dental students. And the mean values were evaluated from the following responses. From the observed results of the survey among the 100 dental students 80% were almost aware of the complication induced by corticosteroid complications. And the remaining 20% of the individuals had very less knowledge comparatively. Corticosteroids are regarded as double-edged swords to the patients. Despite its various advantages, they also have severe side-effects. These drugs are one of the most misused drugs in the form of dosage. This present study concludes awareness levels were adequate and created awareness on the complications induced by corticosteroid among the dental students.

KEY WORDS: CORTICOSTEROID, COMPLICATIONS, ANTI-INFLAMMATORY, IMMUNOSUPPRESSANTS.

INTRODUCTION

Over the past 60 years, Glucocorticoids (GC) continue to be widely used in treating inflammatory diseases since their discovery (Hench, 1950). Oral GCs, most commonly have been prescribed in the context of respiratory disease. (van Staa, 2000). Corticosteroids have many side effects, including potentially life-threatening such as cardiovascular events and infections to less serious effects such as bruising, skin thinning and fat redistribution (Davis et al., 2007). Previous research has focused more on the serious side effects than the 'less serious' side effects which may be important to the patient and have the potential to markedly impair quality of life in patients. Moreover, patients may prefer not to take glucocorticoid therapy because of concerns regarding the possible side

effects. Till date, only a few studies have investigated which side effects which are important to patients. (Davis et al., 2007; Forss et al., 2012). Osteoporosis was in the top three most important side effects, however these findings have not been consistent. One study stated 'diabetes/glucose intolerance' was ranked third most important, while in another 'trouble with blood glucose levels/diabetes' was 12th of side effects that bothered patients a lot.(van Staa et al., 2000).

Figure 1: Pie chart representing the awareness on usage of corticosteroids in the field of dentistry. Blue colour denotes the percentage of participants who agreed that corticosteroids were used as immunosuppressant (23.0%), red denotes the participants who agreed to corticosteroids were used as anti-inflammatory drug (43.0%) and green denotes the participants who agreed to corticosteroids were used as both immunosuppressant and anti-inflammatory agent (34.0%) in the field of dentistry
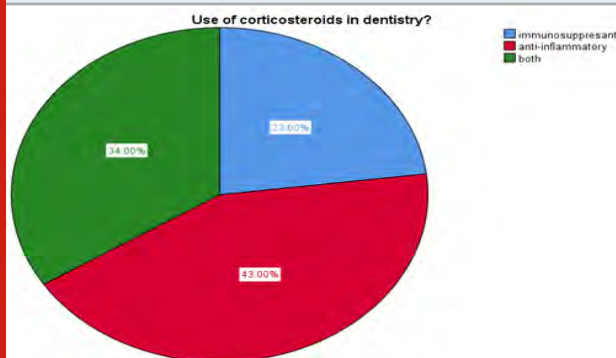
Figure 2: Pie chart depicting the awareness on corticosteroid altering the sugar levels. Blue denotes the participants who agreed that corticosteroids alters the sugar levels in the body (75.0%) and red denotes the participants who agreed that steroid does not alter the sugar levels in the body (25.0%)
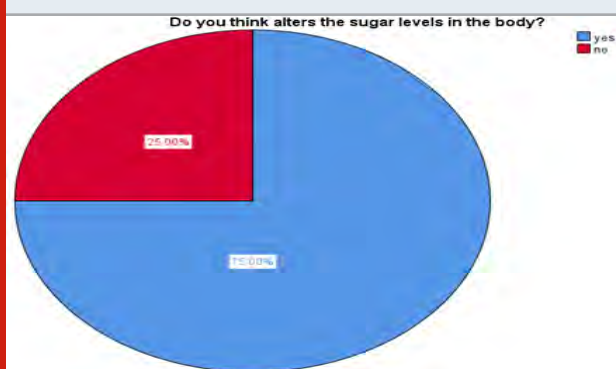
Steroids are substances that are naturally produced in the human body. These are one of among the widely prescribed drugs in both medical and dental fields. The most commonly used steroids are hydrocortisone, dexamethasone, methylprednisolone, prednisolone, etc. Patients presenting with a history of corticosteroid usage may require special consideration before receiving any

dental treatment. Currently, the misuse of steroids is due to its overdosage as it is been prescribed even before minor dental procedures. The risks that are associated with excess glucocorticoid administration are relatively small which includes impaired electrolyte balance and hypertension.

Figure 3: Pie chart depicting the awareness of individuals on corticosteroids and diabetes. Blue denotes the participants who agreed to corticosteroids causes diabetes (24.0%), red denotes the participants who disagreed that corticosteroids causes diabetes (21.0%) and green denotes the number of participants who were doubtful whether steroid administration would lead to diabetes or no (55.0%)
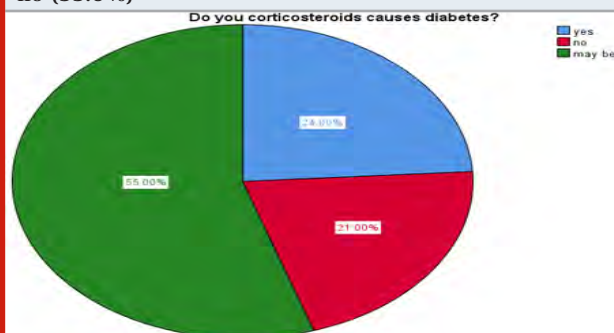
Figure 4: Pie chart depicting the awareness on factors associated with steroid therapy such as weight loss and wound healing. Blue denotes the participants who agreed to weight loss and slow wound healing are factors of steroid therapy (83.0%) and red denotes the participants who disagreed to weight loss and slow wound healing are factors of steroid therapy (17.0%)

Steroids have shown adequate effects on root resorption ((Sambandam and Neelakantan, 2014). In intracanal medications such as ledermix paste, it reduces pulpal inflammation as well as root resorption. Zinc oxide eugenol along with steroids is also used as root canal sealer. In cavity liners, when steroid is mixed with chloramphenicol and gum camphor to reduce mainly postoperative thermal sensitivity. In orthodontic treatment, it has been reviewed to show a lower amount of tooth movement. Therefore, it is essential that the patients are being consulted on their prior history of corticosteroids usage. (Dr.horiyah et al., 2020). Steroids are used after oral surgical procedures to limit the

postoperative inflammation. Topical use of steroid helps to prevent ulceration and excoriation which results during retraction during surgery over the lips and corners of the mouth (Hooley and Hohl, 1974). The anti-inflammatory property of steroids shows a direct healing action (Borle and Borle, 1991). Due to anti-inflammatory action of steroids, it is used to reduce swelling and persistent edema (Rogers, 1996).

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the awareness of complications induced by corticosteroid therapy among dental students.

Figure 5: Pie chart depicting the awareness about corticosteroids and infections. Blue denotes the participants who agreed that patients under steroid therapy are at higher risk of developing infections (69.0%) and red denotes the participants who disagreed that patients under steroid therapy are at high risk of developing infections (31.0%)
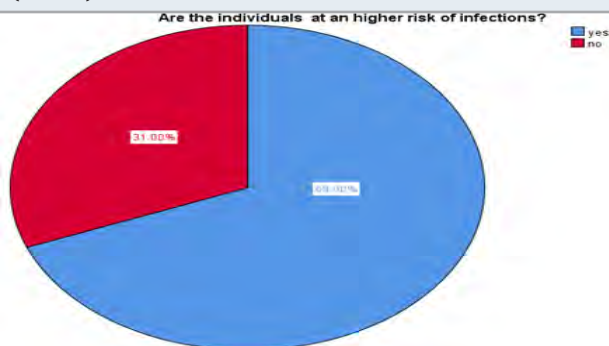
Figure 6: Pie chart depicting the awareness on corticosteroid complication (cataract). Blue denotes the participants who agreed that long term usage of steroid results in cataract (66.0%) and red denotes the participants who disagreed that long term usage of steroids resulted in cataract (34.0%).
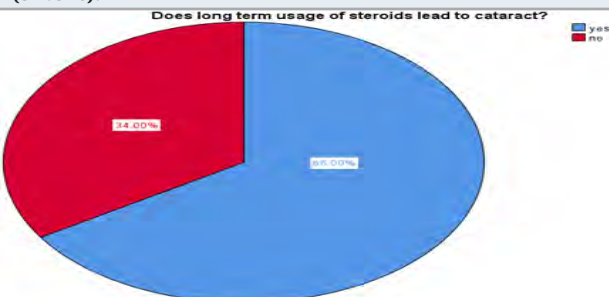
MATERIAL AND METHODS

A cross-sectional questionnaire survey was carried out among to assess the awareness on complications induced by corticosteroid therapy . A simple random sample was drawn to reach the required sample size of 100. A online survey of 15-20 questions based on the awareness of corticosteroid complications was been prepared and uploaded online and circulated among 100 dental students. Questionnaire based on the complications of oral corticosteroids, adverse effects of corticosteroids and the use of corticosteroid in the field of dentistry was carried out. And the mean values were evaluated from the following responses. The responses was therefore estimated by personally collecting the completely filled questionnaire from the 100 participants.

Figure 7: Pie chart depicting the awareness on the alterations in blood pressure associated with steroid therapy. Blue denotes the participants who agreed that steroids alter the range of blood pressure (64.0%) and red denotes the participants who disagreed that steroids alter the blood pressure (26.6%)
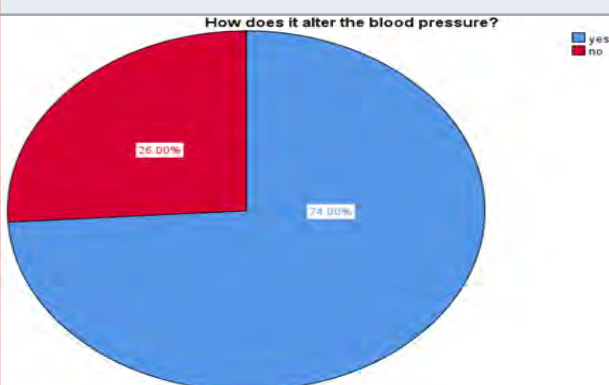
Figure 8: Pie chart depicting the awareness on prognosis of wound healing under steroid therapy. Blue denotes the participants who agreed that the prognosis of wound healing is delayed (46.0%), green denotes the participants who agreed that the prognosis is at a faster rate (16.0%) and red denotes the participants who agreed that the prognosis of wound healing is at an intermediate rate (38.0%)
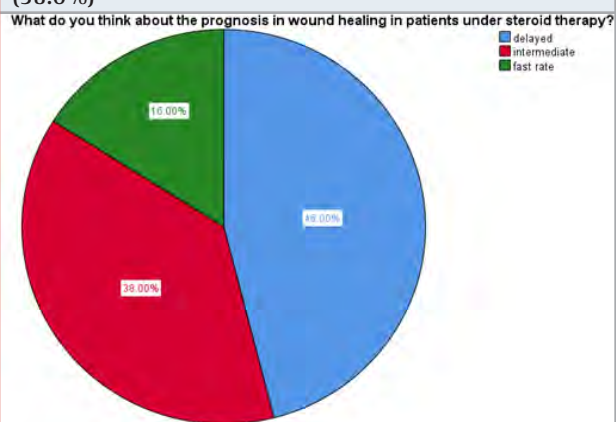
RESULTS AND DISCUSSION

From the observed results of the survey among the 100 dental students 80% were almost aware of the complication induced by corticosteroid complications. And the remaining 20% of the individuals had very less knowledge comparatively.

It is known that oral glucocorticoids have many side effects, but only few studies have investigated which matters most to the patients. Weight gain, insomnia and moon face were the side effects ranked highest, despite them being less clinically serious. This contrasted to all other communities where weight gain was the most important side effect overall taken in the previous studies. Most clinicians and patients make treatment decisions after weighing the benefits against the possible harmful effects, considering its probability, its nature, and a value judgement of how important it is to the individual. (Herxheimer, 2005) Patients with prevalent hypertension may have considered high BP or CVD to be particularly important to them as a corticosteroid associated side effect. While previous studies have estimated the frequency of side effects, few have considered how important they are to the patients. (Herxheimer, 2005) Patients value judgements about a given side effect which will further influence their decisions about treatment and adherence.

Figure 9: Pie chart depicting the awareness of complication induced by steroids (osteoporosis). Blue denotes the participants who agreed that corticosteroids cause osteoporosis (70.0%) and red denotes the participants who disagreed that corticosteroids cause osteoporosis (30.0%)
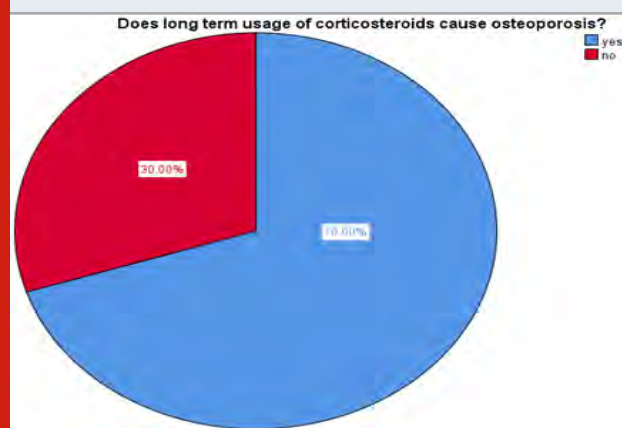
(Morrison, 2003) Osteoporosis was 'the most worrisome' side effect, followed by CVD, diabetes, weight gain and renal dysfunction.(van der Goes et al., 2010) The most bothersome side effects of those experienced in line with were moon face, weight gain and insomnia. (Guidry et al., 2009) Weight gain was one of the top five most worrisome side effects of corticosteroids. Weight gain is known to affect body image and self-esteem. A few studies have reported on weight gain following glucocorticoid therapy. (Curtis et al., 2006)However,

studies have failed to address the sort of questions, such as the extent of weight gain with specific doses, or the likelihood of weight loss following discontinuation of steroid therapy. Few other studies have investigated insomnia in patients taking corticosteroid therapy. Further research should be informed by patients, and targeted to provide patients with better information about the side effects of higher importance.

Current evidences reveals that majority of patients with adrenal insufficiency can undergo routine, nonsurgical dental treatment without the need for supplemental glucocorticoids.(Bromberg et al., 1994) Dental procedures do not stimulate the level of cortisol production and local anesthetic blocks neural stress pathways required for adrenocorticotropic hormone secretion. (Bromberg et al., 1994; Miller, Little and Falace, 2001) Major controversy resides for patients who are undergoing any oral surgical procedures and had discontinued steroids recently. A conservative approach remains to wait 2 weeks for normal adrenal functioning to return before performing elective oral surgical procedures.(Streck and Lockwood, 1979).

Figure 10: Pie chart depicting the awareness of steroid therapy related to muscle damage. Blue devotes the participants who agreed that steroids lead to muscle damage (70.0%) and red denotes the participants who disagreed that steroids lead to muscle damage (30.0%)
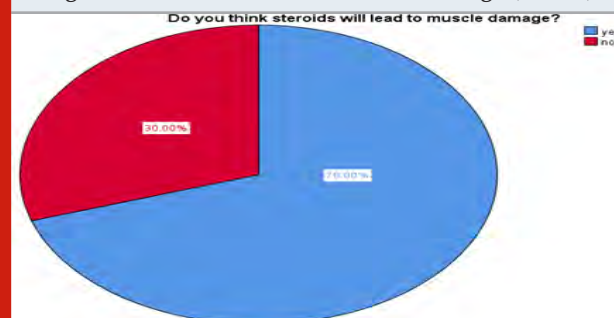
Figure 11: Pie chart depicting the awareness of cholesterol and triglyceride levels and steroid therapy. Blue denotes the participants who agreed that steroids increases the levels of triglyceride and cholesterol (68.0%) and red denotes the participants who disagreed that steroids increases the levels of cholesterol and triglycerides (32.0%)
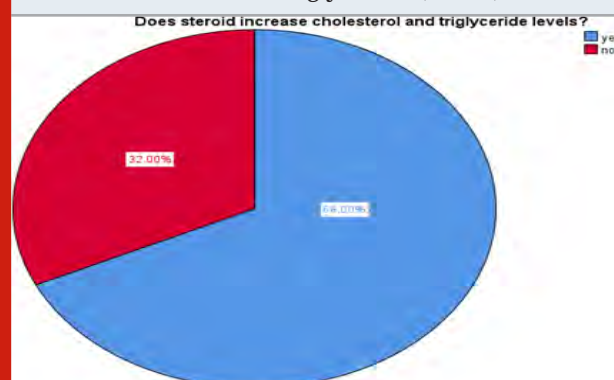
Steroids may exacerbate the response in the following conditions. subh as in primary bacterial infection, hypersensitivity, diabetes mellitus, hypertension, osteoporosis, etc.(Bernard and Charneux, 2011) Side effects depend on duration for which steroids are given, dosage of drug as well as the route of drug administration. Other side effects of steroids include skin atrophy, precipitation of diabetic myopathy, susceptibility to infection, delayed healing of wounds, osteoporosis, osteonecrosis, ophthalmic complications, growth retardation, CNS complications, malignancy, etc. (Dahl, 2006)

Figure 12: Pie chart depicting the steroid therapy associated with complications particularly in the bone. Blue denotes the participants who agreed that steroids make the bones more fragile and prone to fracture (38.0%), red denotes the participants who disagreed that steroids causes complications in the bones and green denotes the participants who agreed that it may or may not cause changes to the bones (53.0%).
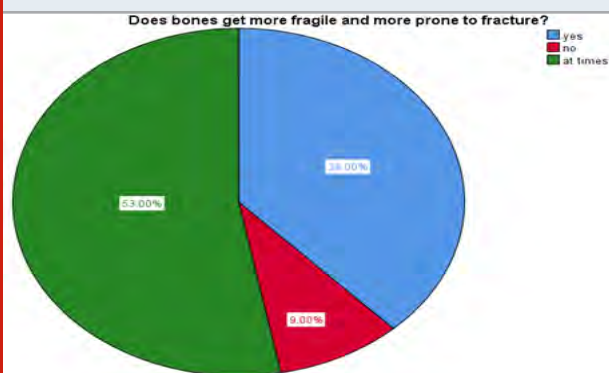
Figure 13: Pie chart depicting the awareness of participants on higher levels of corticosteroids. Blue denotes the participants who agreed that higher levels of corticosteroid administration would lead to Cushing's syndrome (64.0%) and red denotes the participants who disagreed that higher levels of steroids would lead to Cushing's syndrome (36.0%)
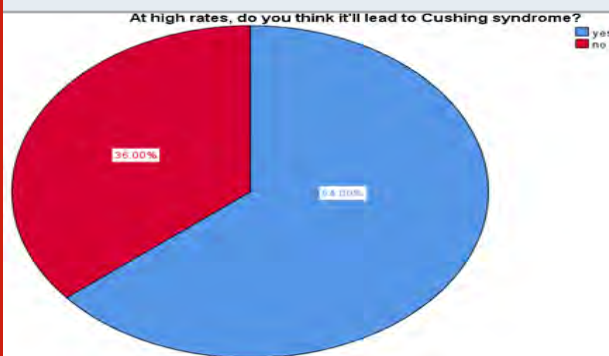
The usage of probiotics play a crucial role in minimizing the effects of candidiasis when any patient is under steroid therapy. Probiotics inhibits pathogenic enteric bacteria, improves epithelial and mucosal barrier function by enhancing mucus production, increasing barrier integrity

and by producing short chain fatty acids and finally it alters immune regulation by stimulating secretory immunoglobulin a production, decreasing tumor necrosis factor expression, by inducing interleukin-10. (Sartor and Balfour Sartor, 2004)

Figure 14: Pie chart depicting the awareness of steroid therapy associated with ulcers and developmental of gastritis. Blue denotes the participants who agreed that the patients under steroid therapy are more prone to develop ulcers and gastritis and red denotes the participants who disagreed that the patients under steroid therapy are more prone to develop ulcers and gastritis (31.0%)
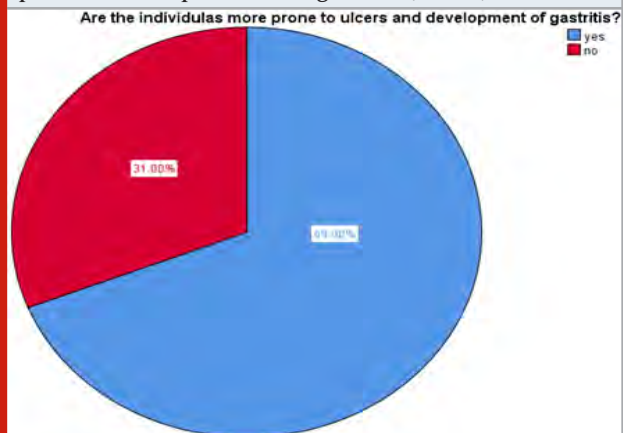
Figure 15: Pie chart depicting the awareness of the immune system of patients undergoing steroid therapy. Blue denotes the participants who agreed that the immune system of patients under steroid therapy would be poor (36.0%), green denotes the participants who agreed that the immune system would be good (24.0%) and red denotes the participants who agreed that the immune system in patients undergoing steroid therapy would be intermediate (40.0%).
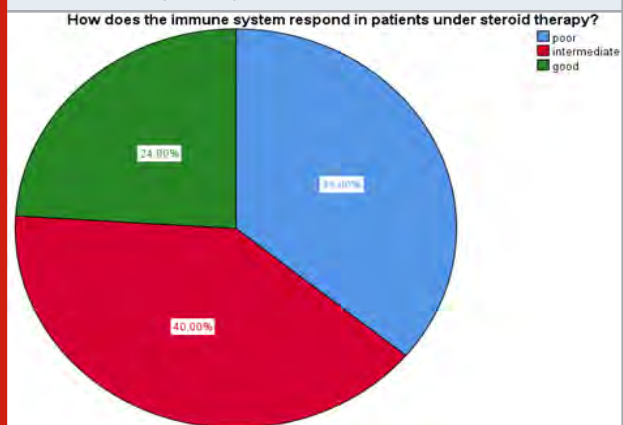
CONCLUSION

Corticosteroids are regarded as double-edged swords to the patients. Despite its advantages, they also have numerous side-effects. Corticosteroids are one of the most misused drugs in the form of dosage. The present

study highlights its complications and awareness among the dental students.

Conflict of Interest: The authors declare that there were no conflicts of interest in the present study.

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BBRC
Bioscience Biotechnology Research Communications

Comparison of Effects of Triple Antibiotic Paste , Double Antibiotic Paste and Proton Pump Inhibitor on E. faecalis– An Invitro Study

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ABSTRACT

Endodontic therapy is mainly done for complete elimination of the root canal pathogens within the root canal system. Triple antibiotic paste and double antibiotic paste are one of the intracanal medicaments that are used for root canal disinfection. They are known for complete microbial suppression of root canal pathogens. Endodontic instrumentation with irrigants alone cannot achieve a sterile condition. Therefore, the aim of this study is to compare the effects of triple antibiotic paste, double antibiotic paste and a proton pump inhibitor on E.faecalis. In this study, we used 50µl of triple antibiotic paste, 50µl of double antibiotic paste and a proton pump inhibitor (pantoprazole). These antibiotics were then incubated at 37°C and were tested against the bacterial strains of E.faecalis. The percentage of microbial inhibition was found and the results were then expressed as the mean percentage of microbial inhibition at 12h and 24h respectively. The results were statistically significant as compared with TAP group and the DAP group (p<0.001). Therefore, TAP and DAP were found to be equally effective against E.faecalis, but TAP+PPi was found to have a higher percentage of inhibition than TAP and DAP.

KEY WORDS: TRIPLE ANTIBIOTIC PASTE, DOUBLE ANTIBIOTIC PASTE, INHIBITION, E.FAECALIS.

INTRODUCTION

Root canal treatment is a procedure for elimination of bacteria from the infected root canal (Pinky, Subbareddy and Shashibhushan, 2011). The infection of the root canal system is a multifactorial bacterial infection, consisting of aerobic and anaerobic bacteria, most of them being the obligate anaerobes. Bacteria in the infected root canals and periradicular tissues can invade through the cementum and dentin to the periapical region leading to infection of the periapex. A wide range of intra canal medicaments have been used such as the Calcium hydroxide paste, Chlorhexidine gel, Triple antibiotic paste, and Double antibiotic paste. Calcium hydroxide plays an important role as it has the ability to induce hard tissue formation, antibacterial property and tissue dissolving capability (Nerwich, Figdor and Messer, 1993).

A single antibiotic may produce ineffective sterilisation of the root canal system. Therefore, a combination of one or more antibiotics can result in the elimination of the bacteria (Windleyiii et al., 2005). Metronidazole

was the first antibiotic drug used, but since it cannot kill all the bacteria, a combination of drugs were used. There are numerous ways to eliminate the microbial colonies from the root canal system such as various instrumentation techniques (Mohammadi et al., 2013), irrigation techniques (Mohammadi, Shalavi, et al., 2015; Mohammadi et al., 2017) and intracanal medicaments (Mohammadi, Giardino, et al., 2015).

One of the widely used intracanal medicaments combination is the triple antibiotic paste consisting of metronidazole, ciprofloxacin, and minocycline, due to its antimicrobial properties in endodontic regenerative procedures (Sato et al., 1996; Windleyiii et al., 2005)). Double antibiotic paste is another antibiotic consisting of ciprofloxacin and metronidazole, which is mainly known for its treatment in external resorption. Traditionally used intracanal medicament was the calcium hydroxide to induce apexification at the root apex. Tetracycline belongs to a group of broad-spectrum antibiotics which are effective against a wide range of microorganisms that are bacteriostatic in nature.

Metronidazole is also a broad spectrum antibiotic that is effective against protozoa, anaerobic cocci and gram-negative and gram-positive bacilli. Studies show that 2% metronidazole gel was used for disinfection of dentinal tubules and this metronidazole gel was more efficient than bioactive glass and calcium hydroxide for disinfection (Krithikadatta, Indira and Dorothykalyani, 2007). Ciprofloxacin is a second-generation fluoroquinolone antibiotic that is effective against most strains including Escherichia coli, Legionella pneumophila, Haemophilus influenzae, Klebsiella pneumoniae, etc (Drusano et al., 1986). Proton pump inhibitors are drugs that inhibit the production of acid by the stomach and are commonly used in the treatment of gastroesophageal reflux disease (GERD), peptic ulcer disease, and infection in the stomach with Helicobacter pylori.

Endodontic regeneration can occur from various sources like the vital pulp cells in the root canal, the stem cells in the dental pulp , periodontal ligament from apical papilla (Saad and Yousef Saad, 1988; Gronthos et al., 2002; Cotti, Mereu and Lusso, 2008). Radiographic evaluation reveals the successfulness of endodontic treatment performed (Antony, Thomas and Nivedhitha, 2020). We have numerous highly cited publications on well designed clinical trials and lab studies (Govindaraju, Neelakantan and Gutmann, 2017; Azeem and Sureshbabu, 2018; Jenarthanan and Subbarao, 2018; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Teja, Ramesh and Priya, 2018; Janani and Sandhya, 2019; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Poorni, Srinivasan and Nivedhitha, 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique and Nivedhitha, 2019;

Siddique et al., 2019; Siddique, Nivedhitha and Jacob, 2019). This has provided the right platforms for us to pursue the current study. Our aim was to compare the effects of triple antibiotic paste, double antibiotic paste and a proton pump inhibitor on E.faecalis.

MATERIAL AND METHODS

Chemicals:
1. Pantoprazole (PPIs)- pantoprazole was mixed with deionised water at a concentration of 1 mg/ml and dilutions made at 12.5 µg/ml.
2. Double antibiotic paste (DAP) - Equal amounts (250 mg tablets) of metronidazole and ciprofloxacin were mixed with distilled water (1 g/mL).
3. Triple antibiotic paste (TAP) - Equal amounts (167 mg tablets) of metronidazole, ciprofloxacin and minocycline were mixed with distilled water (1 g/mL).

TAP and DAP were used as the positive control.

Figure 1: This figure shows the inoculation of the E.faecalis from the master broth

Microbial strains: Bacterial strains of gram positive Enterococcus Faecalis were obtained from ATCC 29212 that were cultured on Mueller Hinton broth. Bacterial growth of this master broth was confirmed by the presence of turbidity. Two millilitres of the sterilised Muller Hinton broth was inoculated with 50 µl of E. faecalis from the master broth and incubated at 37°C for 5 h. The growth of bacteria was confirmed by the turbidity of the broth (Figure 1 and 3).

Figure 2: This figure demonstrates the incubation of the tubes for 12hrs and 24hrs at 37°C

Experiment protocol: The tubes containing broth were divided into two time parameters for evaluation after 12h and 24h. E.faecalis in the media without treatment served as controls for optical density (OD) evaluation. Tubes were divided into four groups each for evaluation at 12 and 24h (Figure 2).

Figure 3: This figure shows measuring the turbidity for confirmation of bacterial growth using a spectrophotometer
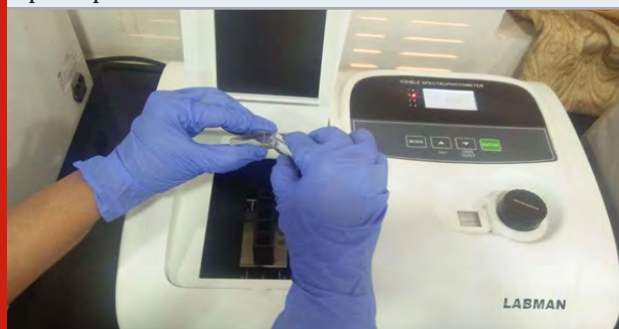
Group 1- Triple antibiotic paste (50 µl)
Group 2- Double antibiotic paste (50 µl)
Group 3- TAP (25 µl) + pantoprazole (25 µl)
Group 4- DAP (25 µl) + pantoprazole (25 µl)

As described above, the test solutions were added to the test tubes and incubated at 37°C. The tubes were then evaluated for OD at 630 nm at 12 and 24 h after addition of test solutions, and the mean of five readings of each dilution was taken.

RESULTS AND DISCUSSION

In this study, the Mean microbial inhibition rates were expressed at 12h and 24h at three intervals and represented as Mean ± SD. Statistical significance was determined by one-way analysis of variance (ANOVA) and post hoc least-significant difference test using SPSS software (version 22.0). P values less than 0.05 were considered significant. The results were statistically significant as compared with TAP group and the DAP group (*p<0.001). Therefore, the results suggest that the TAP or its combination with PPIs can even be used at a lower concentration as it is statistically significant than DAP at p<0.001, in order to avoid the deleterious effects associated with higher concentrations.

Therefore, It can be seen that, in TAP there is a higher amount of antibiotic sensitivity at 24h concentration at the third interval with a mean inhibition rate of 0.294± 0.03 (Figure 4). In DAP, there is a higher amount of the antibiotic sensitivity at 24h concentration at the first interval with a mean inhibition rate of 0.215± 0.20 (Figure 5). In TAP+PPi, there is an increase in the antibiotic sensitivity at 24h concentration at the second interval with a mean inhibition rate of 0.195±

0.003 (Figure 6). In DAP+PPi, there is an increase in the antibiotic sensitivity at 24h concentration at the second with a mean inhibition rate of 0.172± 0.003 (Figure 7). On association between mean antibiotic sensitivity (Abs) at 12h and 24h concentration of four types of antibiotic combinations at three different intervals, TAP+PPi showed a highly significant inhibition at both the 12h and 24h concentration with a mean inhibition rate of 0.157 and 0.191 respectively with a p value of 0.001 (<0.05), statistically significant association (Figure 8).

Figure 4: Bar graphs represent the antibiotic sensitivity (Abs) at 12h and 24h of Triple antibiotic paste (TAP) at three different intervals. X- axis represents the three different intervals of Triple antibiotic paste (TAP) and Y-axis represents the mean inhibition rates. It can be seen that there is an increased amount of antibiotic sensitivity at 24h concentration (red) at the third interval with a mean inhibition rate of 0.294
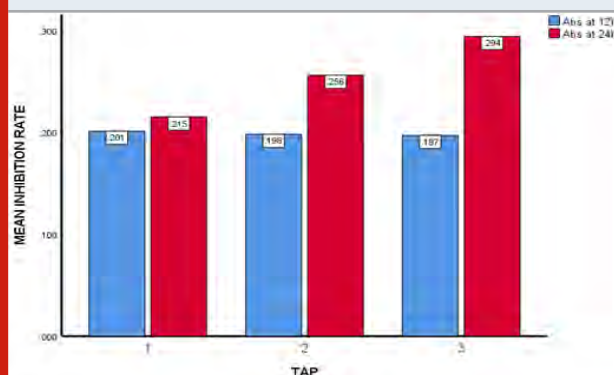
Figure 5: Bar graphs represent the antibiotic sensitivity (Abs) at 12h and 24h of Double antibiotic paste (DAP) at three different intervals. X-axis represents the three different intervals of Double antibiotic paste (DAP) and Y-axis represents the mean inhibition rates. It can be seen that there is an increased amount of antibiotic sensitivity at 24h concentration (red) at the first interval with a mean inhibition rate of 0.215
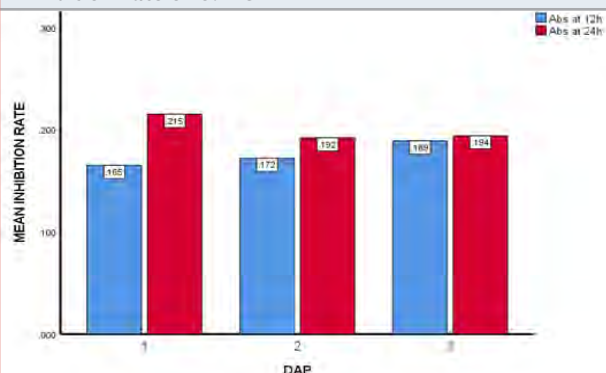
Generally, reinfection and failure of root canal treatment is due to the microorganisms in the periapical region. Studies prove TAP to be biocompatible (Gomes-Filho et al., 2012). Tetracycline group of drugs inhibits collagenases and

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matrix metalloproteinases and is not cytotoxic (Yao et al., 2007; Soory, 2008). They are known to increase the level of interleukin-10 which is an anti-inflammatory cytokine (Ramamurthy et al., 2002). Antibiotics such as metronidazole and ciprofloxacin have been proven to generate fibroblasts (Ferreira et al., 2010). TAP consists of metronidazole, minocycline, and ciprofloxacin and when used as an antimicrobial dressing, induces bleeding and creates a matrix for the growth of new vital tissue within the pulp canal (Hoshino et al., 1996).

Figure 6: Bar graphs represent the antibiotic sensitivity (Abs) at 12h and 24h of Triple antibiotic paste with a proton pump inhibitor (TAP+PPi) at three different intervals. X- axis represents the three different intervals of Triple antibiotic paste with a proton pump inhibitor (TAP+PPi) and Y-axis represents the mean inhibition rates. It can be seen that there is an increase in the antibiotic sensitivity at 24h concentration (red) at the second interval with a mean inhibition rate of 0.195.
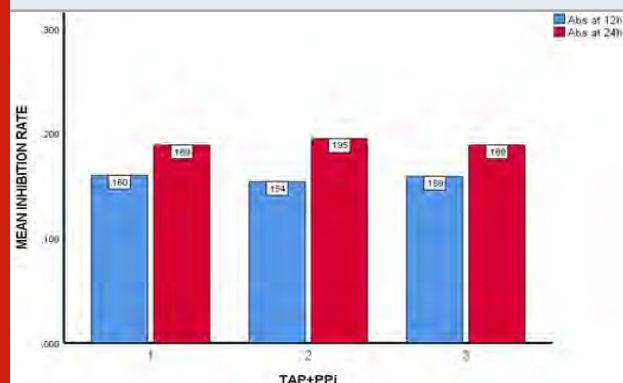
Figure 7: Bar graphs represent the antibiotic sensitivity (Abs) at 12h and 24h of Double antibiotic paste with a proton pump inhibitor (DAP+PPi) at three different intervals. X-axis represents the three different intervals of Double antibiotic paste with a proton pump inhibitor (DAP+PPi) and Y-axis represents the mean inhibition rates. It can be seen that there is an increase in the antibiotic sensitivity at 24h concentration (red) at the second interval with a mean inhibition rate of 0.172.
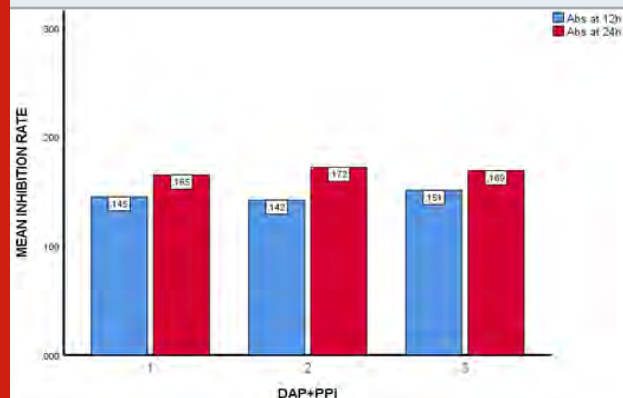
E.faecalis is known to express a proton pump in its plasma membrane for its energy metabolism and maintenance of constant cytoplasmic pH, which enables the bacteria to maintain homeostasis of the cytoplasm (Booth, 1985; Kakinuma, 1987). PPIs exert both antibacterial and anti-inflammatory properties along with the pro-reparative effects that enhance the healing of the periapical region (Kedika, Souza and Spechler, 2009). Studies show that removal of TAP from the canal using irrigation is much more difficult when compared to calcium hydroxide (Berkhoff et al., 2014). Therefore, as the success of the endodontic treatment lies upon the elimination of bacteria from the root canal, the future scope of this study was to evaluate the antibacterial efficacy of these drugs against other bacteria and fungi and evaluate its efficiency as an intracanal medicament.

Figure 8: Bar graph represents the association between the mean antibiotic sensitivity (Abs) at 12h and 24h concentration of four types of antibiotic combinations at three different intervals. X- axis represents the three different intervals of Triple antibiotic paste (TAP), Double antibiotic paste (DAP), Triple antibiotic paste with a proton pump inhibitor (TAP+PPi) and Double antibiotic paste with a proton pump inhibitor (DAP+PPi) whereas Y-axis represents the mean inhibition rates. It can be seen that the mean inhibition rate of TAP is significant only at the 24h concentration (0.255), whereas TAP+PPi showed a highly significant inhibition at both the 12h and 24h concentration (0.157 and 0.191 respectively). DAP+PPi was found to be significant only at the 24h concentration (0.160). Therefore, TAP or its combination with PPIs can be used at a lower concentration as it is statistically significant than DAP. [*p value- 0.001 (<0.05), statistically significant association]
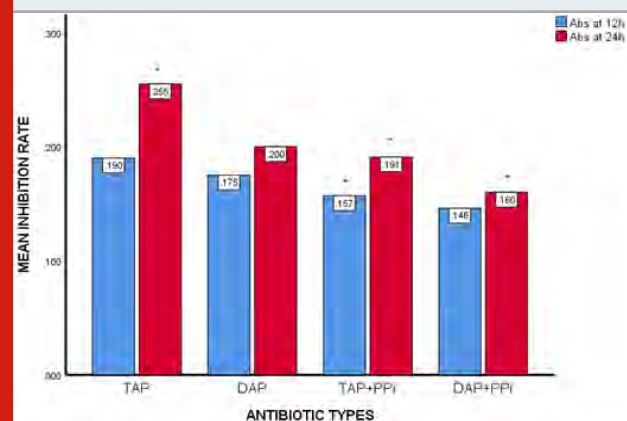
CONCLUSION

Therefore, within the limitations of this study, Triple antibiotic paste in combination with a proton pump inhibitor (TAP+PPi) showed significant and effective inhibition against bacterial strains of E.faecalis at both 12h and 24h concentration than TAP and DAP alone.

Further studies have to be conducted for evaluation of other different combinations of antibiotics against E.faecalis.

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Conflicts of Interest: There are no conflicts of interest.

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Knowledge and Awareness on Cementation Protocols for Fixed Partial Dentures Among Dental Students

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ABSTRACT

Continuous development of technology in dental medicine and the high esthetic demands of the patients determined an increased awareness regarding the success of treatment among the clinical practice of dental students. The longevity of prosthesis depends on the type of luting cement, isolation techniques and the protocols used with tooth preparation. So it is important to educate students regarding this to achieve successful bonding of FPD. The aim of this study was to evaluate the knowledge and awareness of cementation protocols for Fixed Partial Dentures (FPDs) among undergraduate and postgraduate dental students in achieving success of Fixed dental prosthesis. It is a university setting study. Total of 150 students both undergraduate and postgraduates who are practicing in dental clinics in saveetha dental college were included in this study. A questionnaire containing 15 questions focused on the perceptions and experiences on protocols followed by dental students for cementation of prosthesis were given to them.The data obtained was entered in excel and imported to SPSS. Chi square association was done to compare the responses between undergraduates and postgraduates and were represented in the form of bar graphs. Out of 150 students, 70% were undergraduate and 30 % were postgraduate students. 19.33% of the postgraduates were aware about all of the protocols followed during cementation, whereas majority of the undergraduates chose isolation as the protocols to be followed 13.33% of the postgraduates and 49.33% of the undergraduates, both were equally aware that inadequate isolation majorly as led to the failure of FPD post cementation, which was statistically significant (p <0.05).20% of the postgraduates were aware about all the steps to be followed during re-cementation of FPD, whereas majority of the undergraduates chose better isolation to be followed, which shows that post graduates were more aware about re-cementation protocols than undergraduates and was statistically significant (p<0.05). This survey shows that both undergraduate and postgraduate dental students have fairly good knowledge about the cementation protocols for FPD.Through increased awareness of dental students expectations and experiences, restorations can be planned, made and placed in harmony with the hard and soft oral tissues, and in harmony with the patient's expectation as well

KEY WORDS: CEMENTATION, FIXED PARTIAL DENTURES, ISOLATION, POSTGRADUATES, UNDERGRADUATES.

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INTRODUCTION

Edentulism and dental disease have a profound effect on the quality of life of patients. Tooth loss is a common finding among individuals (Fiske et al., 1998) . Despite the ongoing progress in oral health services offered world wide, had caused a reduced number of partially dentate patients, demanding care in fact as it really widened (Loera, no date). Loss of tooth or tooth form often occurs due to caries, periodontal pathology or trauma (Rosenstiel and Land, 2001).

Fixed prosthetic replacement and restoration of teeth restores form, function and aesthetic of the damaged or lost dentition. Fixed prosthodontics treatment modality provides exceptional satisfaction for both patients and the dental practitioner (Kannan et al., 2018). It can transform an displeasing, unhealthy dentition with poor function into a more comfortable, healthy occlusion capable of years of further oral activity while greatly improving aesthetics. The quality of construction of fixed prostheses directly affects its long-term survival (Prath, Ashwatha Prath and Jain, 2017). It is essential that the dental practitioner follows all the fundamental clinical guidelines for longevity of the treatment.

Continuous development of technology in dental medicine and the high esthetic demands of the patients determined an increased awareness regarding the success of treatment among the clinical practice of dental students (Rosenstiel, Land and Crispin, 1998). The longevity of prosthesis depends on the type of luting cement, isolation techniques and the protocols used with tooth preparation (Hill, 2007). The clinician's understanding of various cements, their advantages and disadvantages is of utmost importance. In recent years, isolation techniques, protocol measures, luting agents cements have been introduced claiming clinically better performance than existing materials due to improved characteristics (Macorra, de la Macorra and Pradíes, 2002).

The foremost goal of any clinician is providing the patient with a restoration which preserves the longevity and pulpal vitality of natural abutments of fixed partial dentures and regaining the lost function (Chen et al., 2006). A luting agent is defined as the application of a dental cement connecting the underlying prepared tooth structure to a fixed dental prosthesis. A luting agent's primary and most vital function is to fill the voids present at the restoration-tooth interface so as to prevent any marginal leakage which may lead to secondary caries and mechanically interlock the prosthesis in place to prevent its dislodgement during masticatory activities (Diaz-Arnold, Vargas and Haselton, 1999). Depending on the expected longevity of the dental cement, a luting agent may be classified into definitive (long term) or provisional (short term) restoration. In recent years, many luting agents and dental cements have been introduced with better clinical performance than existing materials due to improved characteristics.

Post cementation sensitivity is one of the most significant complications in fixed Prosthodontics, especially when the prosthesis is cemented on teeth with vital pulps (Hill and Rubel, 2009). However, the incidence of this post cementation complication is underestimated by most clinicians. The selection of permanent luting cement for fixed partial dentures is critical as it has an important role to play in controlling the post cementation sensitivity and success of the final prosthesis.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about knowledge and awareness of cementation protocols for Fixed Partial Dentures (FPDs) among undergraduate and postgraduate dental students in achieving success of Fixed dental prosthesis.

Figure 1: Questionnaire regarding cementation protocol for Fixed Partial Denture

MATERIAL AND METHODS

Study setting: It is a university setting study, conducted in Saveetha Dental College from November 2019 to January 2020. The pros of the study are flexibility, low cost. The cons of the study are that it is limited to a certain population. Total of 150 students who were pursuing their undergraduate and postgraduate studies in Saveetha dental college were randomly selected. Approval was obtained from the Institutional Ethical Committee (IEC), Saveetha Dental College. Two examiners were included in the study.

Sampling: Simple random sampling was done to minimise sampling bias. It was generalised to South Indian population.

Figure 2: Bar graph shows distribution of level of study of the study population. X axis shows the level of study and Y axis shows the percentage of students in each category. Out of 150 students, **70**% were undergraduate and 30 % were postgraduate students.
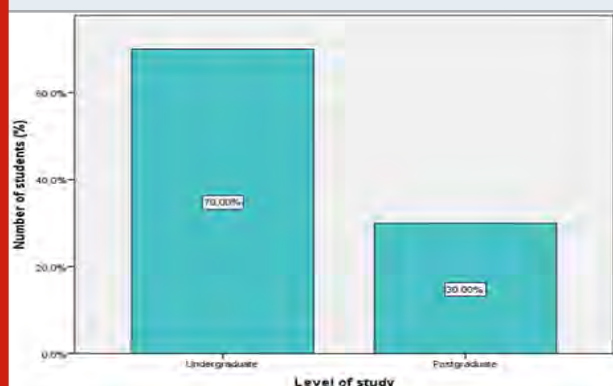
Data collection: Questionnaire based study. Questionnaires [Figure 1] consisting of fifteen questions focused on the perceptions and experiences on protocols followed by dental students for cementation of prosthesis were distributed through Survey planet link and were asked to fill by both the undergraduate and postgraduate students.

Analysis: Data was entered in excel in a methodical manner and was imported to SPSS software 2.0. Descriptive statistics were used to evaluate the distribution of undergraduate and postgraduate students. Chi square association was done to compare the responses between undergraduates and postgraduates and were represented in the form of bar graphs.

RESULTS AND DISCUSSION

In relation to the distribution of level of study of the study population, it was found that out of 150 students, 70% were undergraduate and 30 % were postgraduate students [Figure 2]. In relation to association between protocols followed and level of study, it was seen that 19.33% of the postgraduates were aware about all of the

protocols followed during cementation, whereas majority of the undergraduates chose isolation as the protocols to be followed, which shows that post graduates were aware mostly when compared to undergraduates regarding protocols to be followed during cementation, and was statistically significant .(Pearson Chi square =36.588 , p value =0.001(<0.05), hence statistically significant) [Figure 3 and Table 1] .

Figure 3: Bar graph shows association between protocols followed and level of study. X axis shows protocols followed during cementation of FPD and Y axis shows the percentage of students in both undergraduate and postgraduate categories.(Pearson Chi square =36.588 , p value =0.001 (<0.05), hence statistically significant) 19.33% of the postgraduates were aware about all of the protocols followed during cementation, whereas majority of the undergraduates were not aware of all the protocols followed and was statistically significant.
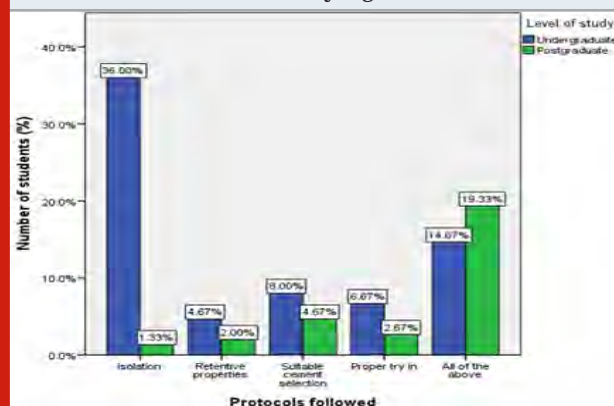
Figure 4: Bar graph shows association between isolation methods followed and level of study. X axis shows isolation methods followed during cementation of FPD and Y axis shows the percentage of students in both undergraduate and postgraduate categories.(Pearson Chi square =7.465 , p value =0.024 (<0.05), hence statistically significant) 18% of the postgraduates and 56% of the undergraduates were equally aware that cotton rolls were majorly used as an isolation method followed during cementation, which was statistically significant.
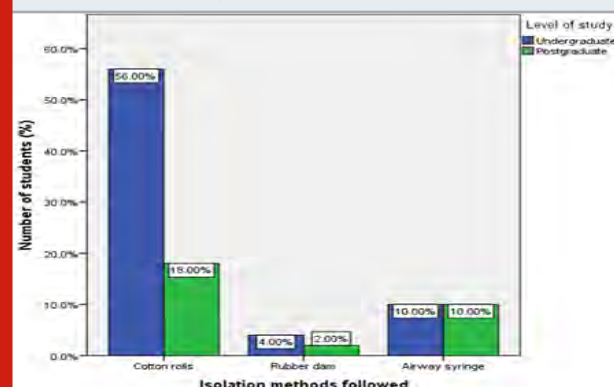
In relation to association between isolation methods followed and level of study, it was seen that 18% of the postgraduates and 56% of the undergraduates were equally aware that cotton rolls were majorly used as an isolation method followed during cementation, which was statistically significant.(Pearson Chi square =7.465 , p value =0.024 (<0.05), hence statistically significant) [Figure 4 and Table 1]. In relation to association between reason for replacement of FPD and level of study it was seen thatv10.67% of the postgraduates and 40% of the undergraduates ,both were equally aware that fracture of crown majorly as led to the replacement of FPD, which was not statistically significant. (Pearson Chi square =6.473, p value =0.91(>0.05), hence not statistically significant)[Figure 5 and Table 1].

Figure 5: Bar graph shows association between reason for replacement of FPD and level of study. X axis shows for replacement of FPD and Y axis shows the percentage of students in both undergraduate and postgraduate categories. (Pearson Chi square =6.473, p value =0.91(>0.05), hence not statistically significant) 10.67% of the postgraduates and 40% of the undergraduates ,both were equally aware that fracture of crown majorly as led to the replacement of FPD, which was not statistically significant.
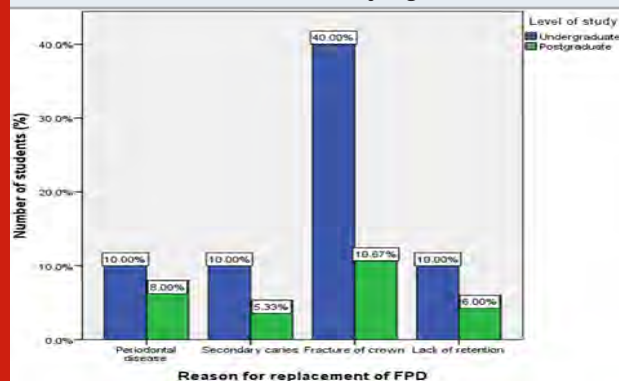
In relation to association between reason for failure of FPD and level of study, it was seen that 13.33% of the postgraduates and 49.33% of the undergraduates ,both were equally aware that inadequate isolation majorly as led to the failure of FPD post cementation, which was statistically significant. (Pearson Chi square =11.307, p value =0.010 (<0.05), hence statistically significant) [Figure 6 and Table 1]. In relation to association between steps followed during re-cementation of FPD and level of study, it was seen that 20% of the postgraduates were aware about all the steps to be followed during re-cementation of FPD, whereas majority of the undergraduates chose better isolation to be followed, which shows that post graduates were more aware about re-cementation protocols than undergraduates and was statistically significant. (Pearson Chi square =20.015, p value =0.001 (<0.05), hence statistically significant)[Figure 7 and Table 1].

Dentistry is an art and science that should go hand in hand for a successful dental treatment. The clinical success of a dental restoration is determined by its

resistance to fracture, marginal fit, esthetic outcome, and survival (Goodacre et al., 2003). A reliable marginal seal is among the factors that are vital to the clinical success of a dental restoration . This requires proper cementation protocols to be followed which results in ultimate prosthodontic success (Tan et al., 2004). This study discusses the knowledge and awareness of cementation protocols among both undergraduate and postgraduate dental students. Postoperative sensitivity after cementation of fixed prosthesis is a common complaint especially in cases where the abutments have vital pulp (Rosenstiel and Rashid, 2003)

Figure 6: Bar graph shows association between reason for failure of FPD and level of study. X axis shows reason for failure of FPD and Y axis shows the percentage of students in both undergraduae and postgraduate categories.(Pearson Chi square =11.307, p value =0.010 (<0.05), hence statistically significant) 13.33% of the postgraduates and 49.33% of the undergraduates ,both were equally aware that inadequate isolation majorly as led to the failure of FPD post cementation, which was statistically significant.
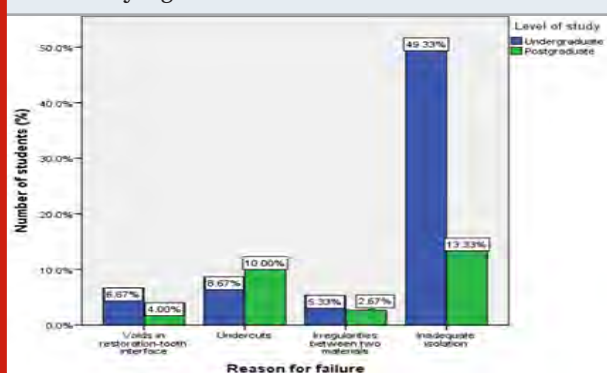
Figure 7: Bar graph shows association between steps followed during re-cementation of FPD and level of study. X axis shows steps followed during re-cementation of FPD and Y axis shows the percentage of students in both undergraduate and postgraduate categories.(Pearson Chi square =20.015, p value =0.001 (<0.05), hence statistically significant) 20% of the postgraduates were aware about all the steps to be followed during re-cementation of FPD, whereas majority of the undergraduates chose better isolation to be followed, which shows that post graduates were more aware about re-cementation protocols than undergraduates and was statistically significant.
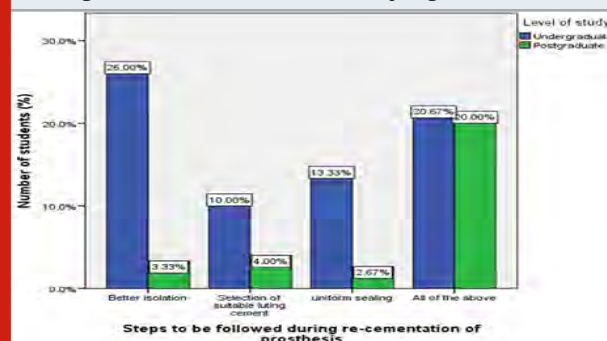
In relation to the protocols followed during cementation of Fixed partial dentures, post graduates were aware of all the protocols like isolation, retentive properties, suitable luting cement, proper try in etc, whereas undergraduates were not aware of all the protocols. This was in line with the study by Keerthana et al (Keerthna, Dhanraj and Jain, 2018), where majority of the dental students were aware about the protocols followed during cementation of fixed partial dentures. The selection of the luting agent for fixed dental prosthesis with vital abutments is considered critical as it has an important role to play in controlling post cementation sensitivity and success of the final prosthesis.So it is important that students should be aware of all the factors necessary for proper cementation of Fixed dental prosthesis.

Table 1. Shows questions of the survey, options, responses from undergraduates and postgraduates along with cumulative response, chi square value and p value have been reported.

Questions	Responses	Response by undergraduates (%)	Response by postgraduates (%)	Cumulative Response (%)	Chi square test	p value
Are you aware of the protocols to be followed for cementation of FPD?	Yes	52	26.67	78.67	9.138	0.003*
	No	18	1.33	19.33		
What protocols do you follow?	Isolation	36	1.33	37.33		
	Retentive properties	4.67	2	6.67		
	Suitable luting cement	8	4.67	12.67	36.588	0.001*
	Proper try in	6.67	2.67	9.34		
	All of the above	14.67	19.33	34		
What are the isolation methods do you follow?	Cotton rolls	56	18	74		
	Rubber dam	4	2	6	7.465	0.024*
	Air way syringe	10	10	20		
What do you think is the reason for failure of cementation of FPD?	Voids present in the restoration-tooth interface	6.67	4	10.67		0.701
	Undercuts	8.67	10	18.67	11.30	
	Irregularities between 2 materials	5.33	2.67	8		
Which step is crucial for prevention of failure?	Inadequate isolation	49.33	13.33	62.66		
	Proper isolation	42	16	58	4.848	0.183
	Retentive factor	14	3.33	17.33		
	Suitable luting cement	4.67	4	8.67		
What do you think is the common reason for replacement of FPD?	Proper try in	19.33	6.67	26		
	Periodontal disease	10	8	18		
	Secondary caries	10	5.33	15.33	6.473	0.91
	Fracture of crown	40	10.67	50.67		
	Lack of retention	10	6	16		

How long do you think the lifespan of FPD after cementation is?	Greater than 5 years	41.33	28.67	70	7.539	0.006*
	Lesser than 5 years	34.67	5.33	30		
What are the difficulties you used to face after cementation?	Excess cement	41.33	16	57.33		
					0,905	0.824
	Deficient cement	13.33	6.67	20		
	Debonding	6	2	8		
	Unaesthetic	9.33	5.33	14.66		
	Lack of retention	22	14	36		
What are the conditions you recommend for new prosthesis?	Deficient crown	19.33	4	23	5.918	0.116
	Discomfort	8.67	5.33	14		
	unaesthetic	20	6.67	26.67		
	Better isolation	26	3.33	29.33		
What are the steps you follow during re-cementation of prosthesis?	Selection of suitable luting	10	4	21	20.015	0.001*
	cement	13.33	2.67	16		
	Uniform sealing					
	All of the above	20.67	20	40.67		

*p<0.05 statistically significant

In relation to isolation methods followed during cementation of prosthesis, it was seen that both the undergraduates and postgraduates equally selected cotton rolls for isolation during cementation of FPD. It was in line with the study by Raigrodski et al (Raigrodski et al., 2012), where he stated that proper isolation using cotton rolls, suction tip and air way syringe during cementation of Fixed dental prosthesis will lead to increased longevity of the fixed dental prosthesis when compared to those prosthesis which was not cemented with proper isolation protocols. But this was contradictory to the study by Mitchell et al (Mitchell et al., 2009) where undergraduates were not aware of isolation as an important factor in determining the longevity of a fixed dental prosthesis. The probable reason for this could be differing sample size, less knowledge regarding protocols to be followed/ So these students have to be educated regarding the isolation protocols.

In relation to the replacement of fixed partial dentures, both undergraduates and postgraduates were equally aware about the reasons for replacement of FPD like periodontal disease, secondary caries, fracture of crown and lack of retention. Secondary caries usually occur when there is deficiency of luting cement during cementation of the prosthesis which results in marginal leakage, predisposing to secondary caries. This was stated in the study by (Song et al., 2013). Also, fractures and dislodged crowns are common when they are not properly cemented which causes premature contacts resulting in fractures and dislodgement. So it is important to follow proper cementation protocols while cementation and

students should be aware of this in order to achieve prosthodontic success at the final.

In relation to the failure of Fixed partial dentures, both undergraduates and postgraduates were aware of the reasons for failure of FPD, like inadequate isolation, voids between restoration-teeth interface, undercuts. This was in line with the study by Scurria et al (Scurria, Bader and Shugars, 1998), where he stated that inadequate isolation leads to contamination of the prosthesis with saliva during cementation which results in weak bonding between the tooth and the prosthesis. Also, deficient cement and voids between restoration-tooth interfaces leads to poor bonding of the prosthesis with the tooth which reduces the lifespan of the prosthesis.In relation to the steps followed during recementation of fixed dental prosthesis, post graduates were more aware about the steps when compared to undergraduates. The reason for this may be postgraduates are the ones who will experience recementation of prosthesis when compared to undergraduates. This was in line with the study by Miettinen et al (Miettinen and Millar, 2013) It is important to follow better isolation techniques, proper selection of luting cement and uniform sealing in order to achieve successful treatment outcome. The limitations of the study include small sample size , single-centered study and examiner's subjectivity. The future scope of study is to extensive research and to educate dental students regarding the cementation protocols for fixed partial dentures which would result in successful treatment outcome and increased longevity of the fixed dental prosthesis.

CONCLUSION

Within the limits of this study it is seen that both undergraduate and postgraduate dental students have fairly good knowledge about the cementation protocols for FPD. Postgraduates were more aware about all the cementation protocols as well as recementation of FPD. Undergraduates and postgraduates were equally aware about the reason for failure of FPD and replacement of FPD. Multiple educational webinars, conferences, scientific and panel discussions can be conducted to improve the knowledge of the students.Through increased awareness of dental students' expectations and experiences, restorations can be planned, made and placed in harmony with the hard and soft oral tissues, and in harmony with the patient's expectation as well.

ACKNOWLEDGEMENTS

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Comparison of the Efficiency of Piezoelectric Surgery, Er:Yag Laser and Rotary Surgical Burs in Harvesting Mandibular Block Grafts- an Ex-Vivo Study

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ABSTRACT

Newer tools for bone surgery are available such as LASER's and piezoelectric units,which produce less thermal insult to bone and improved healing properties when compared to the conventional rotary burs. The aim of this study is to evaluate the most efficient method to harvest a mandibular block graft by using rotary bur, LASER and piezoelectric unit on cadaveric mandibles.This experimental ex-vivo study consisted of five cadaveric mandibles in which 15 sites were identified for block graft harvest.A block of size 5*5 mm was marked with an intended depth of osteotomy to be 3 mm and the osteotomy was performed.The harvested block graft and the resultant defect site were measured.Data was analysed using SPSS software.Mean value for volume of block graft was found to be comparatively less in rotary surgical bur group (49.62±7.07 mm3) and higher in the Piezoelectric group (63.50±1.69 mm3)(p=0.005).Within the limitations of the current study , we conclude that piezo surgery is the best suited method to harvest a good viable bone graft when compared to LASER and Rotary burs.

KEY WORDS: AUTOGRAFT, BLOCK GRAFT, CADAVERIC MANDIBLE, PIEZOELECTRIC.

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INTRODUCTION

Bone augmentation procedures are carried out in cases where there is a deficiency of the alveolar ridge, making it impossible to place implants for prosthetic restoration. Various techniques of bone augmentation have been employed to get the desired alveolar ridge dimensions. Various bone graft materials available are autografts, allografts, xenografts and alloplasts. The autografts are considered to be the gold standard in bone grafting materials as it has properties of osteoinduction as well as osteoconduction making it also highly osteogenic.

The commonest site of autograft harvest for block grafting is the mandibular symphysis region. The obvious reasons for an intra-oral site of graft harvest is the minimal scarring, absence of a skin incision, reduced operating time, procedure done on an outpatient basis (Nesappan and Ariga, 2014).The symphyseal region is considered a safe zone for surgical procedures and is easily accessible for graft harvest. Various methods are employed to harvest graft from this region. The earliest method used was using chisel and mallet, which has slowly lost its favour to more advanced methods using more modern equipment. Micromotors with rotary cutting burs, piezosurgery and use of LASER has been advocated in autograft harvest.(Gupta, Dhanraj and Sivagami, 2010) (Gupta, Dhanraj and Sivagami, 2010; Ashok et al., 2014) (Anbu et al., 2019)

Piezosurgery involves the use of piezoelectric burs, it is being used in Dental implant Surgery due to numerous advantages as they are precise and have selective cuttings, minimal or No thermal damage, and the preservation of soft-tissue structures.(Vidhya and Nesappan, 2016) It is not only used due to the advantage of very precise customized cutting but also due to factors associated with the healing process. The reduced blood loss improves healing conditions(Stübinger et al., 2008). Moreover, piezoelectric bone cutting does not influence bone remodeling or cell viability(Esteves et al., 2013).Rotary cutting burs are driven by micromotors which cause a mere mechanical ablation by crushing and shearing bone with serrated or diamond coated rotational hard metal bodies (Möhlhenrich et al., 2016). The action depends on size of the serrated surface, speed of the handpiece and pressure exerted onto the bone, thus causing frictional heat, which might cause bone necrosis. The major and unavoidable medical drawback of drills, burs and slow-oscillating saws is the enormous procedural bone loss due to the minimum necessary diameter of the instrument of at least 1,5 – 2 mm and the imprecision of the cut due to the high torque-moment.(Rood, 1992)

Erbium-Yttrium-Aluminium-Garnet (Er:YAG) laser has emerged as a possible alternative to conventional methods of bone reduction. They have a high absorbability in water so it is highly safe to use it around implant during the treatment of bone reduction and peri-implantitis. (Romanos et al., 2009) (van As, 2004).It has many advantages such as noncontact, blood-reduced and vibration-reduced surgery techniques, free choice of cut geometry, a small operation field, and the prevention of massive bone flour and metal abrasion.(Pearson and Schuckert, 2003).

Previously our department has published extensive research on various aspects of dentistry including clinical trials (Anbu et al., 2019) (Venugopalan et al., 2014) (Abhinav et al., 2019) (Sweta, Abhinav and Ramesh, 2019) (Wahab et al., 2017) (Balaji and Gajendran, 2018) (Madhavan and Gajnedran, 2018) (Janani, Janani and Gajendran, 2018) ,in vitro studies (Ganapathy, Kannan and Venugopalan, 2017) (Ganapathy, Kannan and Venugopalan, 2017; Pandurangan, Veeraiyan and Nesappan, 2020) and systematic reviews (Kannan and Venugopalan, 2018). This vast experience has inspired us to research about the most efficient method to harvest symphysis block graft by comparing piezoelectric, LASER, Rotary cutting bur in cadaveric mandible.

MATERIAL AND METHODS

This was an experimental in-vitro study conducted at the Department of Implantology,Saveetha Dental College,Chennai ,India. Five cadaveric mandibles in which 15 sites were identified for block graft harvest were used for the study. The bone graft of size 5 mm length*5 mm width were marked on the mandibles using a graphite marker and markings were verified with Vernier caliper(Figure 1). The osteotomy was made using three cutting instruments- Rotary surgical burs(SS White Dental,USA), Piezoelectric unit (Piezotome Solo Acteon, France)and an Er:YAG LASER unit (Waterlase Iplus,USA) (Figure 2).

The osteotomy was done to a depth of 5 mm and was checked periodically to confirm the depth by using a graduated probe .Once the osteotomy was completed, the graft was taken with the use of a periosteal elevator (Figure 3). If the graft did not come out easily, a chisel and mallet was used to free the graft until the graft was free from the donor site.A stop watch was used to record the time taken from start of the osteotomy to the end of graft harvesting. After the graft harvest, the resultant defect was filled with gutta percha and a CBCT was taken for evaluation. The resultant defect site was measured using the CBCT software (GALAXIS-Galileos viewer 1.9) (Figure 4).All manual measurements were done using two methods-A graduated probe and by using a vernier caliper to prevent measurement bias.

Volume calculation
Volume of the graft was calculated using the following formula-
Volume of graft harvested = Height of graft*Width of the graft* Length of the graft
The loss of bone volume was calculated using the following formula:
Loss of bone volume = Total volume of defect after graft harvest - Total volume of the harvested graft

Statistical Analysis: Data was analysed using SPSS software (IBM SPSS Statistics, Version 24.0, Amonk,

NY: IBM Corp). Descriptive statistics were used for data summarization.Non-parametric Kruskal Wallis test was used to test for equality of the sample medians among the groups.p<0.05 was considered to be statistically significant.

RESULTS AND DISCUSSION

The mean values of Rotary surgical bur, Piezoelectric and Er.YAG LASER was calculated and tabulated (Table1). Mean value for volume of block graft was found to be comparatively less in Rotary surgical bur (49.62±7.07 mm3) and higher Piezoelectric (63.50±1.69 mm3).This was found to be statistically significant(p=0.005). Mean value for volume of defect was found to be lowest in Er;YAG LASER (71.90±6.61 mm3) and highest in Rotary surgical bur (126.93±6.58 mm3).This was also statistically significant (p=.002).The mean value for time taken for graft harvest was lowest in rotary bur (77.60±10.41 secs) and highest in Er;YAG LASER (503±49.17 secs). This was statistically significant(p=0.002). Mean value for loss of bone volume compared to graft size was found to be lower in Er;YAG LASER (16.14±6.40 mm3)and higher in Rotary surgical bur (77.30±8.30 mm3)(p=.002).

Table 1. Outcome variables of the study				
	VOLUME OF GRAFT HARVESTED (Mean±SD mm3)	VOLUME OF DEFECT (Mean±SD mm3)	TIME TAKEN FOR HARVEST (Mean±SD secs)	VOLUME OF BONE LOSS (Mean±SD mm3)
PIEZOELECTRIC (N=5)	63.50±1.69	107.68±1.61	273.6±25.32	44.18±2.20
ROTARY (N=5)	49.62±7.07	126.93±6.58	77.60± 10.41	77.30±8.30
LASER (N=5)	55.76±1.93	71.90±6.61	503.00±49.17	16.14±6.40
p value	.005	.002	.002	.002

Mean value for volume of block graft was found to be comparatively less in Rotary surgical bur (49.62±7.07 mm3) and higher Piezoelectric (63.50±1.69 mm3).This was found to be statistically significant(p=0.005).It was maximum in piezoelectric unit as it was more precise and well controlled with proper irrigation whereas it is the least in rotary surgical bur as it has less control over the osteotomy. Based on the volume of defect, it is higher in Rotary surgical bur as it cuts excess bone due to its unpredicted control and stability whereas it is lesser in Er:YAG LASER.

Piezosurgery bone surgery has become famous off late due to its precise cutting, preservation of the soft tissues and lesser thermal heat when compared to rotary cutting drills (Birkholz, 1995).This results in enhanced operator sensitivity and control, indicating that the clinician can develop a far better 'feel' and precision for the cutting action thanks to micro vibration of cutting tip. The cutting action is smaller and less invasive, producing less collateral tissue damage, which ends up in better healing (Aro et al., 1981) (Crovace et al., 2020). The main disadvantage is its slowness. Cutting very dense bone with ultrasound can take up to 4 times longer than with a rotary bur. Tip breakage can be frequent which makes it necessary to maintain a stock of tips.The cost of ultrasonic osteotomy equipment is also elevated (González-García et al., 2009).

The use of piezosurgery in the field of implant dentistry is varied. It can be used to prepare implant osteotomies, harvest bone grafts, perform direct or indirect sinus lifts, perform ridge splits and very useful in nerve lateralizations.Otake et al. in their experimental study have shown that there is very minimal to no soft tissue injury when the piezoelectric saw is used on soft tissues. Similarly, when piezosurgery is performed on bones,it has been shown to have an increased viability of osteocytes and decreased cell death.A histomorphometric analysis study by Berengo et al. demonstrated that the amount of non vital bone was intermediate when compared with slow speed and high speed rotary burs (Berengo et al., 2006).Piezosurgery is also said to aid in faster healing of the surgical site decreased post-operative discomfort.

Figure 1: Graphite marking done on cadaveric mandible

LASER surgery is fast becoming the new surgical aid for bone surgery due to its effects such as reduced pain and edema formation and rapid wound healing.The 2.94 µm radiation emitted by the Er:YAG laser is ideal for absorption by water and hydroxyapatite, making it a very ideal candidate to perform hard and soft tissue LASER surgery (Hale and Querry, 1973) (Robertson and Williams, 1971) . The advantages of cutting vital bone by Erbium lasers are a non-contact, reduced bleeding and non-vibrating form of surgery technique, free

choice of cut geometry, a small operating field, and the prevention of massive bone necrosis and metal abrasion (Zolotarev et al., 1970).

However minimal knowledge, inadequate training, lesser experience of surgeons, and the overall cost often limit the use of LASER in everyday practice (Hale and Querry, 1973). Martins et al. compared bone healing between rotary burs and Er:YAG LASER osteotomies and concluded that bone healing was faster when surgical burs were used, with (Martins et al., 2011)similar results after 90 days of healing (Martins et al., 2011). We felt that though we had control over the LASER while performing the osteotomy, the perception of depth of the osteotomy was not possible. There was a need to stop and use an instrument to check for the depth throughout the procedure.

Figure 2: Osteotomy is done for Graft harvest using A) Piezoelectric B)LASER C)Rotary bur
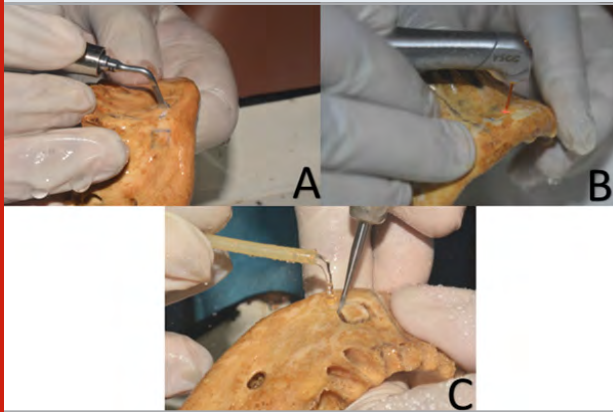
The rotary bur has been used far and wide and has a few advantages such as faster bone osteotomy, less pressure, greater ease of operation, economically feasible hardware to obtain. But its disadvantages are also a cause for concern.It produces excessive thermal damage thereby reducing the viability of the bone,increased vibrations and mechanical abrasions, soft tissue injury if not used cautiously and increased post-operative discomfort such as edema and pain.(Romeo et al., 2009). Schmidt in his study, showed that temperature rise was mainly related to formation of bone chips during cutting and their retention in the area thus clogging the bur. In our study our results showed that the highest volume of graft was harvested using a piezoelectric unit and highest volume of defect and mean bone loss was created while using a rotary bur to perform the graft harvest.

LASER surgery for graft harvest took a longer time to complete when compared to piezo surgery and use of rotary burs.From this we can conclude that piezo surgery is better compared to the other two modalities of bone surgery due to its least possibility of thermal necrosis, improved bone healing, high precision of the osteotomy design ,reduced mean bone loss, improved soft tissue preservation and reduced postoperative discomfort to the patient. The limitations of the study are that it is an ex-

vivo study which cannot replicate the actual environment where these instruments would be potentially used in and the small sample size. Future studies should be aimed at designing long term clinical prospective studies which compare the intra-oral surgical time,post-operative complications and graft uptake in patients.

Figure 3: A) Block graft is elevated from the harvest site B) Defect region after removal of block graft
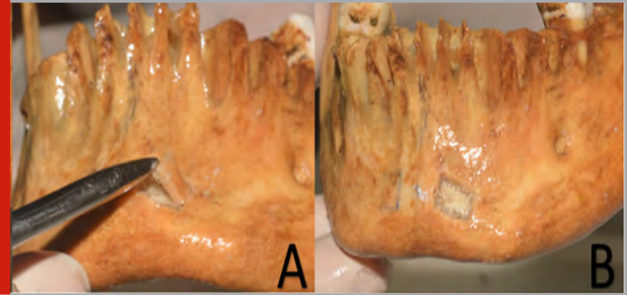
Figure 4: CBCT cross-section of the defect filled with gutta percha
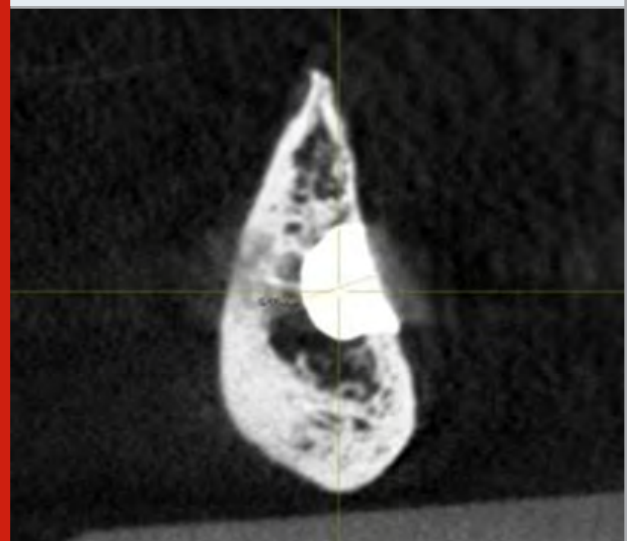
CONCLUSION

Within the limitations of the current study , we conclude that piezo surgery is the best suited method to harvest a good viable bone graft when compared to LASER and Rotary burs. Piezo surgery seems to define a possible new gold-standard in bone osteotomies due to their improved bone healing, reduced bone loss and precise osteotomy design and depth control, soft tissue protection as well as reduced intra surgical and post surgical morbidity

Conflict of Interest: Nil

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Antimicrobial Efficacy of Diclofenac Sodium Against Candida Albicans by Determining Minimal Inhibitory Concentration (Mic) and Minimal Fungicidal Concentration (Mfc) – An in Vitro Study

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ABSTRACT

According to some recent studies, Non steroidal anti inflammatory drugs(NSAIDs) have shown some antimicrobial activity. The aim of this study is to evaluate the antimicrobial activity of Diclofenac sodium against Candida albicans in comparison with Calcium hydroxide. The test samples consisting of diclofenac sodium (DS) 20mM/ml was prepared as a stock solution at various concentrations (0.5, 2.5, 5.0, 7.5 and 10.0 mM/ml) of the working solution was prepared for Minimal Inhibitory Concentration (MIC) and Minimal Fungicidal Concentration (MFC) assay. Ca(OH)2 1.75mg/ml was used as positive control. Fungal strains (*Candida albicans*) (ATCC 10231) were chosen based on their clinical and pharmacological importance. The fungal stock cultures were incubated for 24 hours at 37°C on potato dextrose agar (PDA) medium, following low temperature storage at 4°C. The fungal strains were grown in Sabouraud dextrose agar and PDA media, respectively, at 28°C. The stock cultures were maintained at 4°C. On analysing the MIC, all the test groups showed significant differences when compared to the negative control group ($p<0.01$), no significant difference seen between Diclofenac sodium (10 mM/ml) and calcium hydroxide group ($p>0.05$). On analysing the MFC,no significant difference is seen between Diclofenac sodium (7.5 mM/ml) to Diclofenac sodium (10 mM/ml) ($p>0.05$). Within the limitations of the study, it has been noticed that diclofenac sodium has some fungicidal activity but less when compared to calcium hydroxide.

KEY WORDS: CANDIDA ALBICANS; CALCIUM HYDROXIDE; DICLOFENAC SODIUM; MINIMAL INHIBITORY CONCENTRATION (MIC); MINIMAL FUNGICIDAL CONCENTRATION (MFC).

INTRODUCTION

Micro organisms play a key role in the development of pulpal and periapical diseases. Hence it is important to eliminate these bacteria by using certain local or systemic antimicrobial agents along with root canal therapy. The main aim of root canal therapy is to remove the necrosed pulp tissue, deceased bacteria, disinfect the canal and placement of intracanal medicament (Narayanan and Vaishnavi, 2010). The cleaning and shaping of the canal makes sure that most of the bacteria are eliminated. But the complex anatomy of the pulpo-dental system will allow either multiplication or recolonization of microorganisms (Young et al., 2007) Hence the placement of intracanal medicament will minimize the colonization of microorganisms. As it has a fluid consistency, it can penetrate into the inaccessible areas of canals where usual filing is not possible (Blanscet et al., 2008).

The rationale behind placing intracanal medicament is to eliminate the microorganisms and make the canal inert. This ensures that the canal is free of any possible bacteria or any other microorganisms, no weeping canals and no drainage. This makes the canal ready for obturation (Blanscet et al., 2008).The most commonly used intracanal medicament is calcium hydroxide based. This is most commonly used because of its ability to dissolve the necrotic tissue, viability in weeping canals and biocompatibility (Kim and Kim, 2014). But there are also certain potential limitations of calcium hydroxide as an intracanal medicament. These include the following:It might inhibit or delay the setting of zinc oxide eugenol sealer.Calcium hydroxide is not totally very effective against E.faecalis and Candida albicans (Kim and Kim, 2015).The precise concentration of calcium hydroxide at which it is effective against microbes is clearly not known (Blanscet et al., 2008).

Antibiotics have also been used for this purpose. However, extensive use of antibiotics led to antibiotic resistance. Hence keeping these limitations in mind, there have been studies going on for newer intracanal medicaments. NSAIDs are usually anti-inflammatory and analgesic in nature. NSAIDs act by different mechanisms one of which is antibacterial effect. The conventional use of NSAIDs is analgesic action. It may possess additional properties therapeutically such as antimicrobial efficacy mediated by inhibition of bacterial DNA synthesis or impairment of membranous activity or inhibition of biofilm formation by intervening with quorum sensing (Chockattu et al., 2018) Kristiansen and Amaral coined the term 'non antibiotic.' These drugs have been used to treat non infectious diseases but they have also been known to exhibit antimicrobial efficacy (Kristiansen, 1997).

The commonly prescribed NSAIDs are Diclofenac sodium or ibuprofen. If such compounds are incorporated as intracanal medicaments the beneficial effects such as anti inflammatory action, analgesic action and potent antimicrobial efficacy (Zimmermann and Curtis, 2017) In this study, the antimicrobial efficacy of Diclofenac

sodium is being tested. Diclofenac sodium is a potent non steroidal anti inflammatory drug, analgesic with very few side effects (Chockattu et al., 2018) There are several studies which proved its efficacy in reducing postoperative complications especially after the extraction of third molars. It has also been advocated after endodontic therapy to alleviate post endodontic pain (Negm, 1994; Saatchi et al., 2009) It has also shown its antibacterial efficacy against certain gram positive and gram negative bacteria and also synergistic action with other antibiotics. However its antibacterial efficacy against all endodontic pathogens by placing it within the canal has not been studied so far (Chockattu et al., 2018; Salem-Milani et al., 2013).

We have numerous highly cited publications on well designed clinical trials and lab studies (Azeem and Sureshbabu, 2018; Govindaraju et al., 2017; Janani and Sandhya, 2019; Jenarthanan and Subbarao, 2018; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Poorni et al., 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique, Nivedhitha, et al., 2019; Siddique, Sureshbabu, et al., 2019; Siddique and Nivedhitha, 2019; Teja et al., 2018). This has provided the right platforms for us to pursue the current study. The aim of this study is to determine the antimicrobial efficacy of Diclofenac sodium against the endodontic pathogen Candida albicans by using it as an intracanal medicament.

MATERIAL AND METHODS

Test samples: The diclofenac sodium (DS) 20 mM/ml was prepared as a stock solution and various concentrations (0.5, 2.5, 5.0, 7.5 and 10.0 mM/ml) of the working solution was prepared for MIC and MFC assay. Ca(OH)2 1.75 mg/ml was used as positive control (Figure 1).

Figure 1: Test drugs

Fungal strains: Fungal strains (Candida albicans) (ATCC 10231) were chosen based on their clinical and pharmacological importance. The fungal stock cultures were incubated for 24 hours at 37°C on potato dextrose agar (PDA) medium, following low temperature storage at 4°C. The fungal strains were grown in Sabouraud dextrose agar and PDA media, respectively at 28°C. The stock cultures were maintained at 4°C.

Determination of MIC:

Tube dilution assay: For determining MIC, further dilutions of DS were prepared and tested at the various concentrations (μg/ml) on the C.albicans. The stock solutions were diluted and studied on the microorganism. Antimicrobial activity of DS was determined using the tube dilution method. MIC, is defined as the lowest concentration of a compound that has the ability to completely inhibit the microbial growth. It was determined by a standard broth dilution technique (Figure 2). The cultures were then incubated and subsequently, serially diluted to reach the density of 2×10^4 cells per ml. Two milliliters of MHB broth was dispensed in tubes, and 100 μL of cell culture was inoculated in it followed by 100 μL of different concentrations of DS was added to each tube. Growth control was parallelly assessed with every experimental group, for 48 hours, in an anaerobic jar all the experimental tubes were incubated. After completion of the incubation period, the optical density was measured at 600 nm. MIC was defined as the minimum concentration of DS that caused 20% inhibition in growth of test microorganism. Each experiment was carried out in a triplicate set. The Minimum Inhibitory Concentration (MIC) was then determined which was nothing but the lowest concentration prior to colour change.

Figure 2: Broth dilution with various conc of DS and Ca(OH)2

The percentage of bacterial inhibition by the test product was computed using the following equation: Percentage Inhibition = OD in control - OD in test x100 / OD in control

Determination of MFC

Agar well diffusion assay: Agar well diffusion assay method was applied to find out the zone of inhibition for the diclofenac sodium. C. albicans were incubated in yeast mold agar plates at 37°C for 24 h and the cultures were used to determine the zone of inhibition. The Sabouraud dextrose agar medium was poured into the petri plates and about 1 ml of 24 h incubated old culture was inoculated; then the plates were set at room temperature for 10 minutes. Using a microtip the wells were made and the wells were filled with 100 μl of test samples (7.5 and 10 mM). Ca(OH)2 was used as a positive control and distilled water used as negative control. All the plates were incubated at 37°C for 24 hours. The zone of inhibition was measured and expressed in millimetres(Figure 3). All the tests were repeated thrice.

Figure 3: Agar well diffusion assay
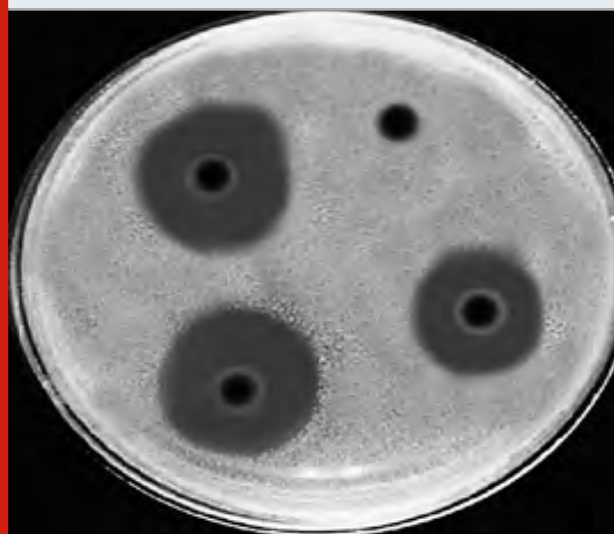
1-Negative control; 2-DS(7.5mM);3- DS(10.0mM); 4-Ca(OH)2

Statistical analysis: Results were expressed as mean ± SD. Statistical significance was determined by one-way analysis of variance (ANOVA) using SPSS software (version22.0) and post hoc least significant difference test. P values less than 0.05 were considered significant.

RESULT AND DISCUSSION

Table 1: The table shows the mean minimum inhibitory concentration (C. albicans) of the negative control group, various concentrations of Diclofenac Sodium and Calcium hydroxide.

Table 1

GROUPS	Mean	N	Std. Deviation
NEGATIVE CONTROL	.512	3	.04
DICLOFENAC SODIUM [1 mM/ML]	.494	3	.04
DICLOFENAC SODIUM [2.5 mM/ML]	.399	3	.03
DICLOFENAC SODIUM [5 mM/ML]	.301	3	.02
DICLOFENAC SODIUM [7.5 mM/ML]	.215	3	.01
DICLOFENAC SODIUM [10 mM/ML]	.104	3	.01
CALCIUM HYDROXIDE	.098	3	.02
Total	.303	21	.16

The mean values of different concentrations of diclofenac sodium, calcium hydroxide and negative control are taken and minimum inhibitory concentration and minimum fungicidal concentrations values are obtained (Table 1 & Table 2). The results indicate that at a minimum inhibitory concentration of diclofenac sodium at 2.5mM/ml, the percentage of microbial growth inhibition of diclofenac sodium is lesser than calcium hydroxide (Figure 4) and the minimum fungicidal concentration was 7.5mM/ml (Figure 5). Kristiansen and Amaral (1997) were paramount in bringing research into antibacterial activity of "nonantibiotics," Non antibiotics are those that not only treat noninfectious diseases but also exhibit antimicrobial activity. The application of diclofenac sodium either intracanal or systemic application has shown to alleviate postoperative endodontic pain (Blanscet et al., 2008; Young et al., 2007) Diclofenac sodium has exhibited antimicrobial effect against both gram-positive and gram-negative bacteria (Dastidar et al., 2000) and also exhibited synergism with other antibiotics (Mazumdar et al., 2009) These studies have proven that diclofenac is a potent non-antibiotic antibacterial agent. But the doubt arises if diclofenac sodium is compatible as an antimicrobial agent in systemic or intracanal usage in endodontics with simultaneous anti-inflammatory and pain management effects. In an in vitro study conducted by Salem Malini et al, antibacterial effect of Diclofenac sodium was tested against an endodontic pathogenic E. faecalis (Salem-Milani et al., 2013)

as follows: anti-inflammatory action, local analgesic action and possible antimicrobial action. Domenico et al was probably the first to conduct a research into the antimicrobial efficacy of NSAIDs (Domenico et al., 1989) In the in vitro and in vivo animal studies conducted by Annadurai et al, Dastidar et al, Dutta et al, they revealed that Diclofenac sodium exhibited antibacterial efficacy against Salmonella typhimurium, Mycobacterium tuberculosis and Listeria monocytogenes (Dutta et al., 2008; Dutta, Mazumdar, et al., 2007)

Table 2. The table shows the mean values of minimum fungicidal concentrations of the control group, various concentrations of Diclofenac Sodium and Calcium hydroxide.NI means no inhibition zone. Each value is expressed as mean ± SD (n = 3)

Samples	Conc (mM)	C. albicans Zone of Inhibition(mm) (Mean ± SD)
Negative control	-	NI
DS	7.5	8.1 ± 0.75
DS	10.0	9.4 ± 0.92
Ca (OH)$_2$		13.5 ± 1.1

Figure 4: Bar chart depicts the Minimal Inhibitory Concentration of all groups. *denotes all test groups resulted better than the negative control group (p<0.05), "a" denotes Calcium hydroxide and Diclofenac Sodium (10mM/ml) were better when compared to other groups (p<0.05). No significant difference seen between calcium hydroxide and Diclofenac Sodium (10mM/ml). The minimum inhibitory concentration of Diclofenac sodium was found to be 2.5mM/ml

Error Bars: +/- 1 SD

Figure 5: The graph depicts the minimum fungicidal concentration of the negative control group,Diclofenac Sodium at two different concentrations (7.5 mM/ml, 10 mM/ml) and the calcium hydroxide group. *denotes all the test groups performed better than the negative control group (p<0.01). "a" denotes p<0.001 as compared with Ca.(OH)2.The minimum fungicidal concentration is found to be 7.5mM/ml

Error Bars: +/- 1 SD

Diclofenac sodium has been used in the management of post endodontic pain over a period of time. It is known to alleviate the pain post endodontic treatment when it is administered preoperatively(Negm, 1994; Saatchi et al., 2009) There are certain potential advantages of using NSAIDs as intracanal medicament which are stated
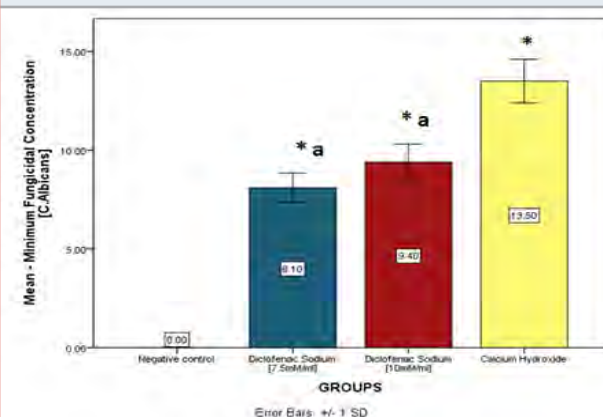
The exact mechanism of antimicrobial activity of diclofenac remains unclarified. Few studies have proposed following mechanisms:Inhibition of bacterial DNA synthesis (Silva et al., 2018), Impairment of cell membrane activity, Anti Plasmid activity, Reduced quorum sensing leading to decreased biofilm formation (Chockattu et al., 2018; Dutta, Annadurai, et al., 2007) In this study, the antimicrobial activity of Diclofenac

sodium as an intracanal medicament was tested against Candida albicans strain. Its efficacy was compared with the standard and most commonly used intracanal medicament Calcium hydroxide. The reason to select Candida albicans is based on the studies that showed the presence of these microorganisms in refractory infections after endodontic treatment. The minimum inhibitory concentration at which the fungal growth was suppressed at 2.5mM/ml. It is less compared to calcium hydroxide's efficacy but not in significant amounts. The minimum fungicidal concentration determined on agar well diffusion assay also showed that calcium hydroxide has a little higher fungicidal activity compared to Diclofenac sodium.

Some studies have shown that inclusion of diclofenac sodium in the intra canal dressings managed to alleviate the inter appointment pain (Dutta et al., 2004)However, few studies have shown the antibacterial efficacy of diclofenac sodium mainly against bacteria such as E.faecalis (Salem-Milani et al., 2013) The results of those studies have proposed that theoretically diclofenac sodium can act as a substitute for calcium hydroxide. But however, the results of those studies should be interpreted with caution and further studies should be conducted to evaluate the exact efficacy of diclofenac sodium (Padma and Yalavarthy, 2015) The exact mechanism of action of diclofenac sodium is unclear. Few studies have mentioned it may be due to the inhibition of microbial DNA synthesis or impairment of membrane activity or impairment of plasmid activity (Chockattu et al., 2018)

Agar well diffusion assay is a simple, rapid and well standardized traditional method for testing of antimicrobial efficacy. It is most commonly used by all the clinical laboratories because of its minimal equipment, cost effectiveness and readily accessible supplies (Balouiri et al., 2016) Umpteen variety of materials can be tested quickly by using this method. However, the accuracy of the results should be contemplated as there are chances of false results (Chen et al., 2019) For example, the inhibition zone does not always have regular boundaries because it can be influenced by factors such as diffusion rates of materials through agar, concentration and solubility of various antimicrobials (Besra and Kumar, 2018) Besides, the determination of MIC by tube dilution method in vitro may not reflect the ideal conditions in vivo as in in vivo there will be a complex biofilm instead of a single strain (Hiremath et al., 2015) Hence, further studies should be conducted to precisely determine the antimicrobial efficiency of diclofenac sodium.

CONCLUSION

Minimal inhibitory concentration is used to evaluate the antimicrobial efficacy of various compounds by measuring the effect of decreasing concentrations of the compound over a defined time period in terms of inhibition of microbial growth. These evaluations can be useful to determine the final concentration of the antimicrobial compound. MFC is complementary to MIC where it identifies the lowest concentration

of antimicrobial agent that reduces the viability of fungal inoculum and denoting the microbial death. These testings are good and relatively inexpensive to simultaneously evaluate multiple antimicrobial agents for efficacy.Within the limitations of the study, it has been noticed that diclofenac sodium has some fungicidal activity but less when compared to calcium hydroxide.

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Sleep Disorder and Sleep Behavior Pattern in Children– A Survey

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ABSTRACT

Children spend one-third to one-half of their life sleeping. Although sleep occupies such a significant portion of a child's day, sleep disturbances are often overlooked by healthcare practitioners. Studies indicate that sleep problems in children and adolescents are highly prevalent, with prevalence rates ranging from 25% to 40%, and they are often persistent. The questionnaire-based study was carried out among 140. Parents with children between the ages of 6-10. The questionnaire comprised 20 questions which were used to detect the sleep behavior pattern and sleep disorders. The questionnaire was prepared and uploaded on to an online survey platform (surveyplanet) and the link was shared to the parents.The responses from the questionnaire included 68 males and 72 females. The most common age group was found to be between the ages of 6-10 years. Bed wetting occurred in about 17.9% of the cases. 15% of the cases snored regularly. In addition, other sleep related disorders, such as sleep walking, sleep terror, bruxism were also frequent, occurring in 6.4, 7.9%, 19.3%, respectively. When finding the relationship between snoring and children talking in their sleep, we obtained a p-value of 0.013 which was statistically significant. The most common sleep disorder that was observed in this population was sleep talking which was about 25.7 % of the people. There was no significant correlation between children with medical issues and children who woke up during their sleep at night. When finding the relationship between bedwetting and sleepwalking we obtained a p value of 0.030 which was statistically significant. When finding the relationship between the use of security objects and that of night terrors we obtained a p value of 0.00 which was highly significant. Sleeping disorders are highly prevalent in children and adolescents especially those who have undergone a psychological trauma. Early diagnosis and prompt treatment are necessary for the wellbeing of the child affected.

KEY WORDS: SLEEP DISORDER, CHILDREN, ADOLESCENTS, NIGHT, SLEEP WALKING.

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INTRODUCTION

Sleep is the time period during which the body conserves energy, restore its normal processes, promote physical growth, and support mental development. These processes are very important during the growth of a child and hence children spend one-third to one-half of their life sleeping. Although sleep occupies such a significant portion of a child's day, sleep disturbances are often overlooked by healthcare practitioners. Studies, however, indicate that sleep problems in children and adolescents are highly prevalent, with prevalence rates ranging from 25%to 40%, and they are often persistent (Owens, 2005) (Mindell and Owens, 2015).

Sleep disorders are mainly divided into dyssomnias, parasomnias and circadian rhythm sleep disorders. Dysomnias are the broad classification characterized by difficulty in getting sleep, remain sleep or excessive sleepiness. Parasomnias involve abnormal movements, behaviors, emotions, perceptions, and dreams that occur while falling asleep, sleeping, between sleep stages, or during arousal from sleep and Circadian rhythm sleep disorders (CRSD), is a family of sleep disorders, which affects (among other bodily processes) the timing of sleep and people affected by CRSD are unable to go to sleep and wake up at the times commonly required such as social needs(i.e waking up to school or going to work) Inadequate sleep quantity and quality have been associated with poor school performance, mental health problems, poor sociability, behavioral problems, the development of obesity and its accompanying comorbidities .(Gokul, 2016) ((Kim and Kim, 1998)

There are short- and long-term effects on life in sleep deprivation. The short-term effects include poor attention and concentration, reduced quality of life, low productivity and an increased absence in class or work, while long-term effects include higher morbidity and mortality due to car accidents, coronary artery disease, heart failure, hypertension, obesity, type-2 diabetes, stroke, depression, memory loss, and decreased immune function (Seo et al., 2008).According to a recent study conducted the prevalence of sleep-related diseases in children and adolescents was determined to be approximately 43%, the rate of insomnia was determined to be 5%–20%, the rate of obstructive sleep apnea was determined to be 1%–3%, the frequency of snoring was determined to be 5%–27%, and the rate of parasomnias was determined to be 14%–37% (Cho et al., 2002) (Chokroverty, 2010) (Jochebed and Priya, 2015).

Our department is passionate about child care, we have published numerous high quality articles in this domain over the past 3 years (Govindaraju, Jeevanandan and Subramanian, 2017a, 2017b; Panchal, Gurunathan and Shanmugaavel, 2017; Ravikumar, Jeevanandan and Subramanian, 2017; Jeevanandan and Govindaraju, 2018; Nair et al., 2018; Ravikumar et al., 2018, 2019; Ravindra et al., 2018, 2019; Subramanyam et al., 2018; Vishnu Prasad et al., 2018; Jeevanandan, Ganesh and Arthilakshmi, 2019; Ramadurai et al., 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Veerale Panchal, Jeevanandan and Subramanian, 2019; Vignesh et al., 2019; V. Panchal, Jeevanandan and Subramanian, 2019; Samuel, Acharya and Rao, 2020). With this inspiration we planned to pursue research on the sleep behavior pattern and   sleep disorder in children .

MATERIAL AND METHODS

The questionnaire-based study was carried out among Parents with children between the ages of 6-10. The questionnaire comprised 20 questions which were used to detect the sleep behavior pattern and sleep disorders. The questionnaire was prepared and approved by the scientific review board of the institution. The questionnaire was uploaded on to an online survey platform (survey planet) and the link was shared to the parents. The questionnaire was just a screening questionnaire and cannot be used for diagnostic purposes.

Part 1 of the questionnaire was developed to include questions about the child's age and sex and if the child suffers from any medical problems.

Part 2 of the questionnaire was developed to include questions about how long the child takes to fall asleep, if the child experiences any trouble going to bed or falling asleep and does the child have any bedtime rituals. These questions were asked to assess the sleep behavior pattern of the child.

Part 3 of the questionnaire was concerned with the previously mentioned sleep disorder which were explicitly expressed in lay language.

Based on the responses from the subjects, the statistics was done and the results was obtained in a systematic manner. The statistics was carried out using the IMB SPSS software.

Figure 1: Pie chart shows the distribution of children that were considered for the survey, where blue represents female and green represents male . The most common gender noticed in the survey conducted were females
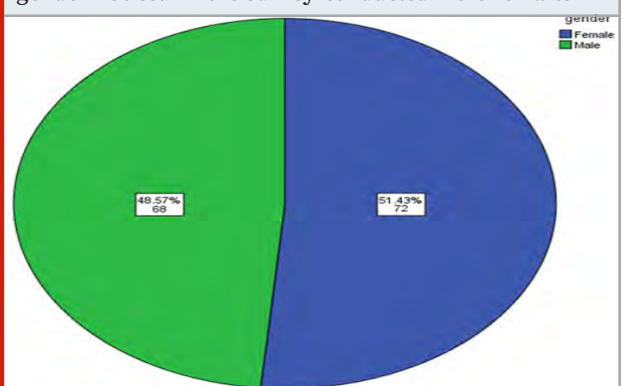
RESULTS AND DISCUSSION

Demographic Characteristics 140 responses were

obtained which included 48.57% males and 51.43% females participants (Figure 1). Analysis of sleep behavior pattern shows that the most common response to the question how long does it takes for the child to fall asleep was between 5- 10 minutes (33.57%) (Figure 2). Most children did not have any trouble going to bed or any trouble falling asleep. When asked if the children had any bedtime rituals the most common response was no and even if they did the most common among them was saying a prayer before going to bed.

Figure 2 : Bar graph shows the distribution of time take by children to fall asleep (X-axis represents the time take for the children to fall asleep , Y-axis represents the number of children) where blue represents the time range between 0-2 min (5.71%), green represents time range between 2-5 min (15%), blue represents time range between 5-10 min (33.57%) , purple represents time range between 10-15 min (10%) , yellow represents time range between 15-20 min (10.71%), red represents time range between time range between 20-30min (14.29%) and orange represents time range between 30-60 min (10.71%). The most common time range for children to fall asleep was between 5-10 min
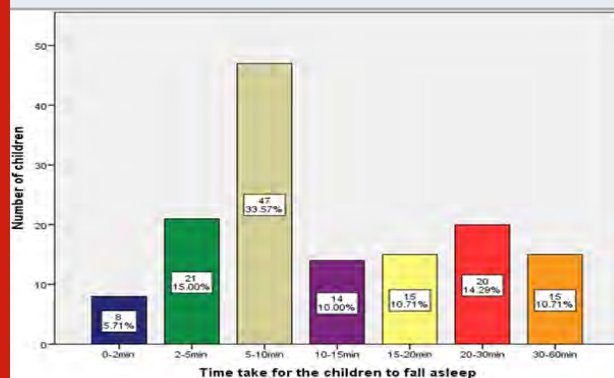
Figure 3: Pie chart shows the distribution of the response to the question , Does your child have the tendency to talk during their sleep. Blue represents the children who did not have the tendency to snore and green represents the children who had the tendency to snore . It was noted that about 25.72% of the children had the tendency of talking during their sleep
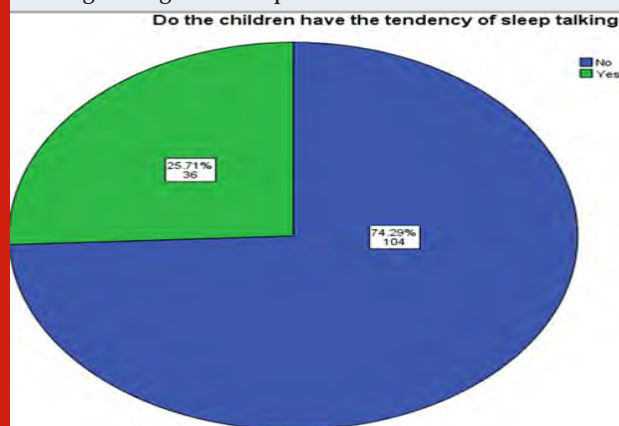
Analysis of sleep disorder: The most common sleeping disorder that was observed was sleep talking which included about 25.7% responding yes to the question, does your child have the tendency to talk during their sleep (Figure 3). Bedwetting occurred in about 17.9% of the cases (Figure 4) 15% of the cases snored regularly. (Figure 5).

Figure 4: Pie chart shows the distribution of the response to the question, Does your child have the tendency of bed wetting. Blue represents the children who did not have the tendency of bedwetting during their sleep and green represents the children who had the tendency of bedwetting during their sleep . It was noted that about 17.86% of the children had the tendency of bedwetting during their sleep
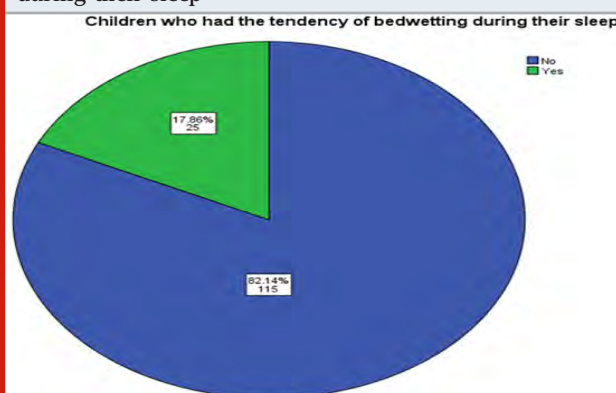
Figure 5: Pie chart shows the distribution of the response to the question , Does your child snore. Blue represents the children who did not have the tendency of snoring during their sleep and green represents the children who had the tendency of snoring during their sleep . It was noted that about 15% of the children had the tendency of snoring during their sleep
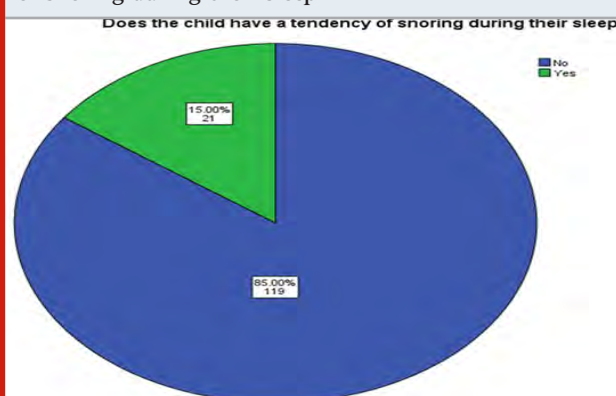
In addition, other sleep related disorders, such as sleep walking, night terror, teeth grinding occurring in 6.4(Figure 6), 7.9% (Figure 7) , 19.3%(Figure 8), people respectively. When finding the relationship between snoring and children talking in their sleep, we obtained a p-value of 0.013 which was statistically significant (Figure 9). There was no significant correlation between children with medical issues and children who woke up

during their sleep at night with a p-value of 0.114 (Figure 10). When finding the relationship between bedwetting and sleepwalking we obtained a p- value of 0.724which was not statistically significant (Figure 11). When finding the relationship between the use of security object and that of night terrors we obtained a p- value of 0.00 which was highly significant (Figure 12).

Figure 6: Pie chart shows the distribution of the response to the question , Does your child have the tendency of sleepwalking . Blue represents the children who did not have the tendency of sleepwalking and green represents the children who had the tendency of sleepwalking . It was noted that about 6.4% of the children had the tendency of sleepwalking.
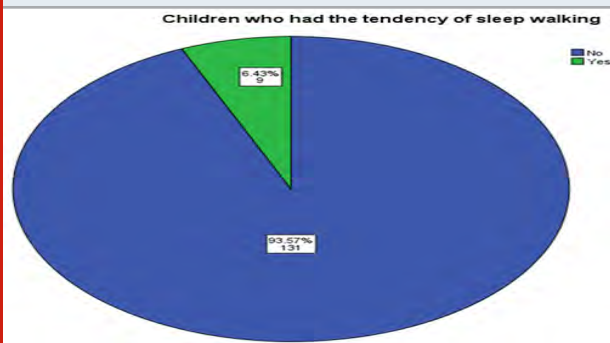
Figure 7: Pie chart shows the distribution of the response to the question, Is your child prone to night terrors (Episodes of screaming, intense fear and flailing while still asleep). Blue represents the children who did not have night terrors during their sleep and green represents the children who had night terrors during their sleep. It was noted that about 7.9% of the children had night terrors during their sleep.
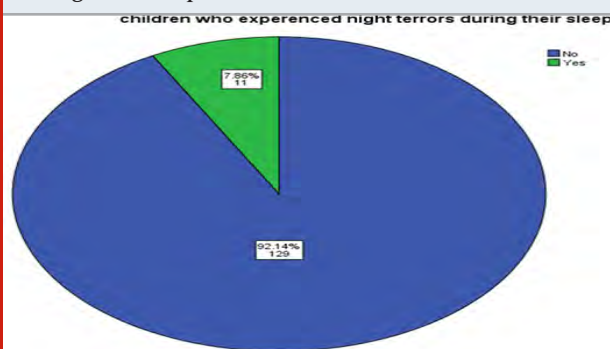
Although there are around 90 distinct sleep disorders, according to the International Classification of Sleep Disorders (Bhate and Williams, 2013) most are marked by one of these symptoms: excessive daytime sleepiness, difficulty initiating or maintaining sleep, or abnormal movements, behaviors, and sensations occurring during sleep. The cumulative effects of sleep loss and sleep disorders have been associated with a wide range of deleterious health consequences including an increased risk of hypertension, diabetes, obesity, depression,

heart attack, and stroke. Lack of sleep can contribute to acne and other skin problem (Krakowski, Eichenfield and Dohil, 2008) (Kamphuis et al., 2012). Low sleeping hours can also lead to aggressive behavior resulting in harsh behavior with friends and family (Durmer and Dinges, 2005) The main symptom of sleep loss is excessive daytime sleepiness, but other symptoms include depressed mood and poor memory or concentration (Owens et al., 2000).

Figure 8: Pie chart shows the distribution of the response to the question , Does your child have the habit of grinding their teeth during their sleep ?. Blue represents the children who did not have the tendency of grinding their teeth during their sleep and green represents the children who had the tendency of grinding their teeth during their sleep. It was noted that about 19.29% of the children had the tendency of grinding their teeth during their sleep.
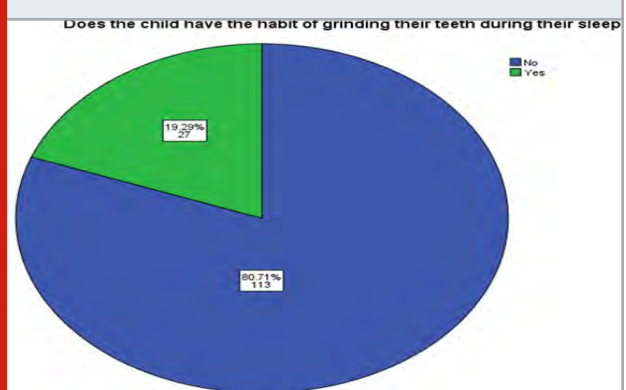
Figure 9: Bar graph shows the correlation between the response to children to snore and the children who talk during their sleep(X-axis shows the distribution of response to children to snore, Y-axis shows the distribution of response to children who talk during their sleep). Chi-square test was done and the association was not found to be statistically significant. Peason's value:6.206, DF:1, P value: 0.013(<0.05) hence statistically significant , proving that children who snore did have the tendency of talking during their sleep.
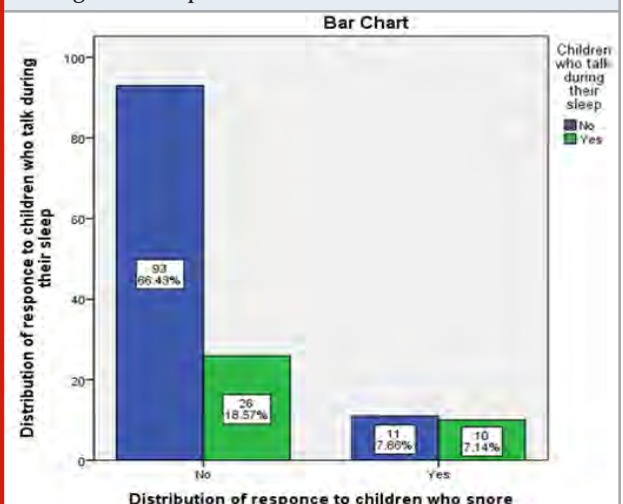
Figure 10: Bar graph shows the correlation between the response to whether children had any medical issue and the whether children woke up during the nigh (X-axis shows the distribution of response whether children had any medical issue, Y-axis shows the distribution of response whether children woke up during the night). Chi-square test was done and the association was not found to be statistically significant. Peason's value:2.493, DF:1, P value: 0.114(>0.05) hence statistically not significant, proving that there is no association present between children who have medical issues and children who wake up during the night.
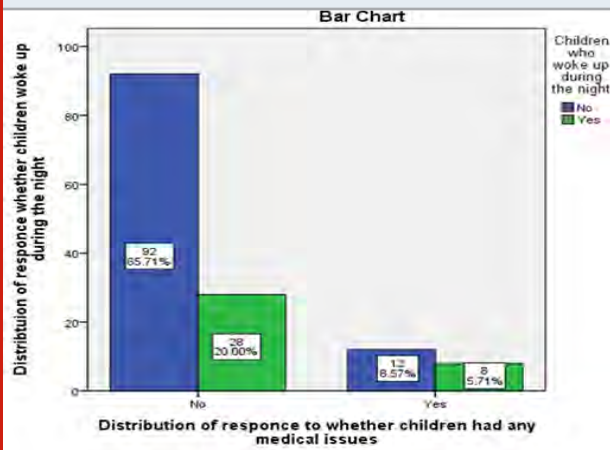
Figure 11: Bar graph shows the correlation between the response to whether children who had the tendency of bedwetting and the whether children who had the tendency of sleepwalking (X-axis shows the distribution of response whether children had the tendency of bedwetting, Y-axis shows the distribution of response whether to whether children had the tendency of sleepwalking). Chi-square test was done and the association was not found to be statistically significant. Peason's value:0.125, DF:1, P value: 0.724(>0.05) hence statistically not significant, proving that there is no association present between children who have had the tendency of bedwetting and children who had the tendency of sleepwalking.
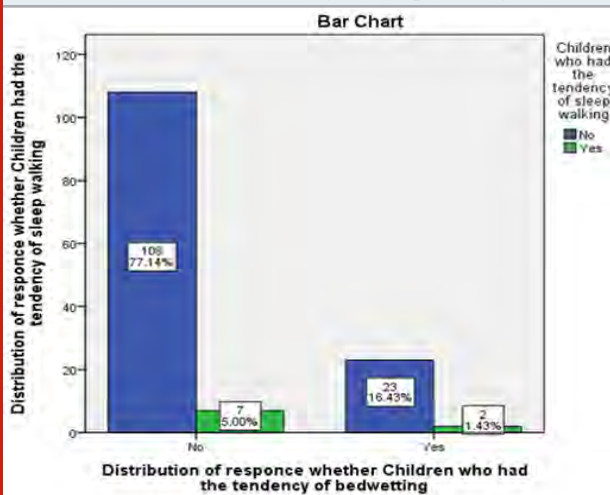
Figure 12: Bar graph shows the correlation between the response to whether children who had the tendency of using security object during their sleep and the whether children who experienced night terrors during their sleep (X-axis shows the distribution of response to whether children used security object while sleeping, Y-axis shows the distribution of response whether to whether experienced night terrors during their sleep). Chi-square test was done and the association was found to be statistically significant. Peason's value: 35.616, DF:1, P value: 0.00(>0.05) hence statistically significant , proving that there children who experienced night terrors went to sleep with a security object
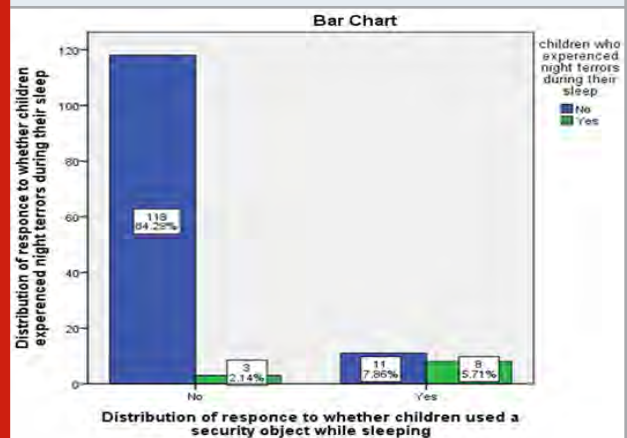
The frequency of behavioral insomnia in children, including insomnia and night walking, was 15% in school-age children (Morgenthaler et al., 2006) (Johnson et al., 2006)and the prevalence of insomnia in adolescents between 16 and 18 years old was approximately 11% (Kim, Lee and Ahn, 2017). These values are somewhat similar to the values obtained in this study.Sleep-related breathing disorders are conditions that present problems in breathing during sleep and are caused by increased resistance in the upper respiratory tract. This includes snoring, upper airway resistance syndrome and obstructive sleep apnea (Li et al., 2010). The risk factors of habitual snoring are similar to those of SDB. In a study targeting elementary school children in China30), risk factors , such as low family income, lack of higher education in the father, breastfeeding for less than 6 months, smoking during pregnancy, obesity, overweight, respiratory problems (rhinitis, asthma, adenoids hypertrophy, chronic otitis media), and a family history of habitual snoring were investigated. In this study, however, such risks were not examined (Meltzer et al., 2010). Meltzer et al reported that the prevalence of sleep problems according to the ICD-9 (International Classification of Diseases,9th revision) is 3.7%, which was lower than the results of previous studies.

Low prevalence is thought to be a result of the study having been conducted retrospectively based on medical records.The lack of interest in addressing sleep problems has been studied in previous research that indicated that while 24.6% of patients suffer from sleep problems, only

4.1% of parents discussed the problems and only 7.9% of parents consulted a doctor. A systematic review found that traumatic childhood experiences (such as family conflict or sexual trauma) significantly increases the risk for a number of sleep disorders in adulthood, including sleep apnea, narcolepsy, and insomnia ((Kajeepeta et al., 2015) . The National Sleep Foundation found that high school students who reported insufficient sleep or daytime sleepiness also reported depressed mood and lower grades, whereas 80% of students who reported getting enough sleep made As and Bs in school.

CONCLUSION

Within the limitations of the present study , it was noted that the most common sleep disorder was sleep talking. It wad also noted that children who had the tendency of snoring also had the tendency of sleep talking and children who experienced night terrors had the habit of going to sleep with a security object.

Conflict of Interest: The author would like to declare there was no conflict of interest

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Conscious Sedation by Midazolam and Ketamine in Pediatric Dentistry – A Review

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ABSTRACT

Management of an uncooperative behaviour is important in treating a child in a dental office. Young, uncooperative children needing extensive dental treatment are difficult to manage, for these children, conscious sedation or general anesthesia are the primary treatment options that allow comprehensive restorative dental care. To control the pain and anxiety in pedodontic patients, pharmacologic sedation like anesthesia and analgesia are commonly used. Safe sedation of a pediatric patient requires a thorough knowledge of the pharmacokinetics and pharmacodynamics of the drugs used to sedate the patient and the skills necessary to deal effectively with potential adverse events as a result of the sedation. conscious sedation can be very supportive in allying anxiety, uneasiness, fear and minimizing an uncooperative child's attempt to resist treatment procedures. There are a variety of drugs available that can be used for conscious sedation for dental office procedures. Pediatric sedation technique should ideally be customized for the patient and the procedure to be performed. The present review discusses the various aspects of conscious sedation and its application in pediatric dentistry

INTRODUCTION

Management of children for various dental procedures in dental offices is very challenging. The behavioral problems are commonly seen in children under the age of 6 years due to various elements such as immature reasoning, restricted coping skills and anxiety(Henry and Jerrell, 1990; Swetah and Ramakrishnan, 2019). Conscious sedation is defined as a controlled state

of low consciousness that conserves protective and unconditioned reflexes, permits continuance of a patient's airway impartially and allows the patient to communicate appropriately to physical and verbal stimuli(Kauffman et al., 1992).

Procedural conscious sedation includes providing an adequate level/degree of sedation whereas decreasing pain and anxiety, maximizing amnesia, curtailing the potential for adverse drug-related events, monitoring and governing behavior, and sustaining a stable cardiovascular and respiratory status. Sedation drugs can be administered through various routes such as oral, inhalational, nasal, intramuscular, subcutaneous, and intravenous routes(Mistry and Nahata, 2005).

The primary use of pharmacological sedation is to modify or eliminate negative behavior and allow the child to

cooperate(McComb et al., 2002),improve the patient's behavior, reduce apprehension, minimize the negative psychological response toward treatment by reducing anxiety, and maximize amnesia potential so as to control behavior during dental procedure.(Coté, 2001) Sedative drugs may be administered by oral, inhalation, rectal, submucosal, intramuscular, or intravenous routes. The selection of techniques is often made as a matter of clinical judgment. Oral sedation is regarded by many dentists to be the simplest and most convenient sedation method for managing uncooperative children, since it is easy to administer and there is no need for nasal hood or injection.(Wright and McAulay, 1973).

Our department is passionate about child care, we have published numerous high quality articles in this domain over the past 3 years (Govindaraju et al., 2017a, 2017b; Jeevanandan et al., 2019; Jeevanandan and Govindaraju, 2018; Nair et al., 2018; Panchal et al., 2017; Veerale Panchal et al., 2019; V. Panchal et al., 2019; Ramadurai et al., 2019; Ramakrishnan et al., 2019; Ravikumar et al., 2017, 2018, 2019; Ravindra et al., 2018, 2019; Samuel et al., 2020; Subramanyam et al., 2018; Vignesh et al., 2019; Vishnu Prasad et al., 2018). With this inspiration the present review was conducted to discuss the advantages of conscious sedation by midazolam and ketamine in pediatric dentistry.

Sedative Drugs: The use of sedative drugs alongside local anesthesia is often appropriate to reduce anxiety and fear among patients. There are a number of sedative drugs that can be used for dental procedures, midazolam belongs to benzodiazepine groups that is used as a short and fast acting drug prior to general anesthesia or several other medical diagnostic approaches(Golpayegani et al., 2012). On the other hand, several other studies(Chudnofsky et al., 2000; Karapinar et al., 2006; Sener et al., 2011; Shende et al., 2003; Warner et al., 1995), have looked at the sedative effects of similar drugs used along with midazolam with a synergic effect to reduce the required dose of midazolam. Ketamine and midazolam combination has already been used successfully for the surgical treatment of young fearful and anxious children (Chudnofsky et al., 2000; Golpayegani et al., 2012; Sener et al., 2011).

Midazolam: The resultant effects of midazolam in children under sedation for dental procedures have been studied in a number of projects, and midazolam is now the standard agent for conscious sedation during pedodontic treatments (Erlandsson et al., 2001; Jensen, 2002; Jensen and Matsson, 2002; Lindh-Strömberg, 2001; Yanase et al., 2009). Midazolam is a short-acting benzodiazepine with quick onset, shorter term of activity and negligible symptoms. The intramuscular prescribed amount (used for premedication) is 0.07–0.08 mg/kg; the intravenous measured quantity for tranquility is 0.07–0.1 mg/kg, titrated according to response; the oral amount for tranquility/drowsiness is 0.2 mg/kg. The end point for sedation is drowsiness and slurring of speech – response to commands is maintained (Butler, 2006; Sasada and Smith, 1997). Diazepam and midazolam

exhibit similar sedative effects, but the latter provides a better anxiolytic effect as well as a minimally higher level of sedation; therefore, diazepam does not offer any sedative advantage over midazolam(Tyagi et al., 2013).

Midazolam–mode of action: The mode of action of benzodiazepines (midazolam) is thought to act through specific benzodiazepine receptors found all around the central nervous system (CNS) and focal sensory system. Benzodiazepine receptors are completely joined with gamma amino butyric acid (GABA) receptors. GABA receptors open chloride particle channels, which hyperpolarize and produce hypnosis and sedation (Butler, 2006; Sasada and Smith, 1997).

Ketamine: Ketamine is an N-methyl d-aspartate (NMDA) opponent which prompts a daze like sedation with few considerable impacts (Karapinar et al., 2006; Shende et al., 2003; Warner et al., 1995). Ketamine is a dissociative agent that gives sedation, control of pain and amnesia(Rodriguez and Jordan, 2002). Ketamine is used for the induction of anesthesia, especially in high risk patients with hypotension or asthma, for short procedures it is the fundamental technique, for instance; intra-visual examinations, burns dressings and radiological and radiotherapy procedures in children, as an agent for mass casualties in the field, for analgesia both post-operatively and in patients receiving intensive care, for pain relief from chronic pain for patients and for the reversal of severe unresponsive asthma(Sasada and Smith, 1997).

Ketamine–mode of action: Ketamine is a non-competitive antagonist of the N-methyl-d-aspartate (NMDA) receptors Ca^{2+} channel pore and also inhibits NMDA receptor activity by interaction with phencyclidine binding sites. It may also modulate opioid and muscarinic activity. Ketamine causes tachycardia, an increase in the blood pressure, central venous pressure and cardiac output secondary to enhance sympathetic tone. It causes mild stimulation of respiration with relative reservation of airway reflexes. Bronchodilation is a feature of the action of the drug. The state of dissociative anesthesia is produced by ketamine. The cerebral blood flow, cerebral metabolic rate, intraocular pressure increased; amnesia is a marked feature. At high doses, ketamine exhibits local anesthetic properties(Nagdeve et al., 2006; Sasada and Smith, 1997).

Ketamine and Midazolam combination: Ketamine and Midazolam have been utilized independently to encourage the sedation of painful techniques for pediatric patients(Sievers et al., 1991; Tobias et al., 1992). However, benzodiazepine sedation does not give a pain relieving impact and is deficient to anticipate pain emulated by additional combative techniques for example central venous catheter insertion or bone marrow biopsy. It was demonstrated that the combination of ketamine with midazolam gave faster onset of absence of pain and much proficient amnesia, diminishing the obliged dosage of ketamine and the occurrence of illusions(Beebe et al., 1992; Okamoto et al., 1992). when comparing

oral midazolam and oral ketamine, while they exhibit similar sedative effects, midazolam is more conducive to anxiolysis, and orally administered ketamine results in a slower recovery period post-sedation(Damle et al., 2008).

Routes of Drug Administration

Intravenous and intramuscular route: Diazepam's absorption after IM injection is slow and erratic and it is often associated with severe pain(Bergman et al., 1988), whereas midazolam is well-absorbed and is less painful via the IM route. When administered intravenously, diazepam may cause phlebitis and local pain, whereas midazolam does not, due to its increased water solubility. The recommended dose for IV administration of midazolam is between 0.05-0.1 mg/kg, depending on the nature of the procedure and whether other drugs are being used(Diament and Stanley, 1988; Tolia et al., 1990, 1991). Intravenous ketamine has been shown to have a powerful sedative effect; some researchers actually preferred ketamine to midazolam due to increased patient cooperativeness and because it carried less side effects. (Rai et al., 2007)

Oral route: Numerous studies of oral midazolam in children have given conflicting results.(Feld et al., 1990; Payne et al., 1991) A single oral dose of 0.2 mg/kg was found to be effective during laceration repair in the emergency room(Hennes et al., 1990). However, most studies indicated that a higher oral dose is needed (Silver, 1992). Only 15-30% of an orally administered dose reaches the systemic circulation in its non metabolized form due to an extensive first pass hepatic effect, Thus, the oral dose should be approximately double or triple the intravenous dose to achieve similar clinical effects(Payne et al., 1989). oral administration of ketamine has also been studied using a lollipop to deliver the drug, and its effectiveness was then compared with oral midazolam without evidence of any greater sedative effects(Horiuchi et al., 2005).

Rectal route: Oral administration requires patient cooperation, whereas the rectal route does not. Children could be told that their temperature is being taken and frequently they will cooperate for the procedure. Most drugs, however, are not as well-absorbed rectally as from the upper intestine(Holroyd et al., 1988). Rectal midazolam has been studied as a preanesthetic medication for children and the optimal sedative dose was determined to be 1.0 mg/kg(Spear et al., 1991).

Nasal Route: Ketamine can be delivered safely and effectively via an intranasal route of administration (Bhatnagar et al., 2008). Ketamine also proves very useful when administered intranasally, inducing a high level of sedation. Children sedated with intranasal midazolam are passive and moderately drowsy but usually do not fall completely asleep. The average time to peak plasma concentrations and maximal effect is 10 min (Latson et al., 1991; Rose et al., 1990) and recovery time is approximately 30 min, with the degree of the sedative effect similar to that obtained with IM administration

(de Santos et al., 1991). Intranasal midazolam may be used in combination with other drugs in diagnostic and short surgical procedures in children. One technique involved 0.2 mg/kg intranasal midazolam followed by 9.0 mg/kg ketamine administered rectally(Saint-Maurice et al., 1990).

Adverse Effects: Side effects of midazolam confined to occasional discomfort at the site of injection. Withdrawal phenomena may occur in children after prolonged infusion(Kain et al., 2000). In case of any unwanted event, antidote for midazolam (Flumazenil) can be administered intravenously (0.01 mg/kg/dose).The dose can be repeated for up to four times with an interval of one minute each(Adams and Dervay, 2012; Khalid et al., 2011). Emergence delirium, unpleasant dreams and hallucinations are much notable complications of the use of ketamine(Sasada and Smith, 1997; Webster and Walker, 2006). Transitory depression of breath and apnea can be seen after administration of ketamine either intramuscularly or intravenous(S. M. Green et al., 1998; Steven M. Green et al., 1998; Zsigmond et al., 1976). The benzodiazepine group of drugs is one of the safest presently in use. Midazolam is virtually free of any side effects.

The major risk associated with high doses of midazolam is hypoventilation and associated hypoxemia(Sievers et al., 1991). Respiratory depression has been reported in adults(Lewis and Benjamin, 1990), however, there have been few reports of depression in children. Children receiving midazolam should be monitored for early signs of hypoventilation or apnea. Respiratory depression appears to be dose related(Reves et al., 1985), and dosage regimens should be strictly followed (Sievers et al., 1991).

The increase in muscle tone produced by ketamine makes it unsuitable for operations where muscle relaxation is needed(Kolawole, 2001). The increase in salivation produced by ketamine can be troublesome during dental procedures and premedication with an antisialogogue may be needed (Dundee and Wyant, 1974). Patients have reported disturbing sensations when awakening from ketamine anesthesia. Ketamine can cause an increase in blood pressure and intracranial pressure, or pressure in the brain. Ulcerative cystitis, secondary renal damage and hepatic failure can occur with high doses of oral ketamine (Bell, 2009).

CONCLUSION

Midazolam offers many advantages when compared with diazepam, which are, it is more water soluble, rapid onset, short acting, anticonvulsant, muscle relaxant, relatively high margin of safety, reversal agent available and can be administered intranasally and when given intravenously, it is less irritating and causes fewer adverse local vascular reactions and pain. Its distribution and elimination half-lives are much shorter than with diazepam. Evidences provided strong, positive evidence for the use of ketamine

alone or in combination with midazolam to reduce dental anxiety and behavioral non-compliance

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A Survey on Increasing Spelling Errors Due to Increase Use of Digital Technology Among Students

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ABSTRACT

In this digital era, technology has been accused of causing declining language standards. Interaction with digital technologies for work, play, and communication altered the intellectual pattern for development. Written communication through messaging, chat, and other forms of electronic communication developed a taxonomy of new knowledge. The problem in the digital age is that good language and strong spelling have become way more optional. Spell checking tools play a major role in hindering any room for creativity, style, and improvement of cognitive skills. The study aimed to check the concerns of spelling errors among the students in the digital era. A questionnaire was created, and a survey was taken among 100 students consistently who were using gadgets for their educational purposes. The questionnaire consists of 5 valid questions. The data was compiled and analyzed statistically. Descriptive and Chi square analysis was done.the results showed that the students are very much caring about their spellings when they type and giving more importance to avoiding spelling errors. Also we found that second year dental students and postgraduates are more concerned with spelling errors than the other students in the study population.The increasing use of technology has had an impact on increasing spelling errors. There is a considerable impact on spelling errors due to digital technology.

KEY WORDS: DIGITAL TECHNOLOGY, SPELLING ERRORS, SPELL CHECKERS, STUDENTS.

INTRODUCTION

In this digital era, technology has been accused of causing declining language standards (Andersson, 2015). Interaction with digital technologies for work, play, and communication altered the intellectual pattern for

development (Adams, 2004). Written communication through messaging, chat, and other forms of electronic communication developed a taxonomy of new knowledge (Varnhagen et al., 2010). Digital technology is an extensive source of information and entertainment. It is everybody's arena. The problem in the digital age is that good language and strong spelling have become way more optional (The Importance of Spelling and Handwriting in a Digital Age - Edublox Online Tutor | Development, Reading, Writing, and Math Solutions, 2017). This revolution has profoundly affected daily living (Schindler et al., 2017). Computer-mediated communication (CMC) a term used for communication produced with help from electronic devices. It plays a major role in the impact of standard

spelling. There are both positive and negative aspects. Computer-based technology has infiltrated many aspects of life and industry.

Spelling is the learner's ability to write or spell out a word correctly (Othman, 2018). Accurate spellings help to enhance the quality of the writing texts. Spelling errors are when a learner consistently makes the same misspellings repeatedly because they do not know what is correct (Kusuran, 2017). It usually occurs because the students cannot distinguish between letters and sound of the words when they write (Siti and Muhammad, Zainal Muttaqien S.S.,M.Hum, 2017). There are 2 types of errors that people make: Topographic and cognitive errors. The former includes errors such as letter insertions, letter omissions, letter substitutions, and transpositions, whereas the latter from phonetic similarities (Kusuran, 2017). Exposure to incorrect versions can lead to greater difficulty discriminating correctly from incorrect versions. This increases the subsequent likelihood of misidentifying or generating an incorrect version as correct (Brown, 1990).

The increase of digital technology led to an increase in newer advancements where the spell checker tools are becoming practical for maintaining or enhancing database quality (Gardner, 1992). It is a function that automatically highlights a spelling mistake or error and suggests possible spelling correction by flagging out the errors. Spell-checkers also help them to revise and edit their written work, thus fewer surface errors will occur. It is also evident that learners displayed more vocabulary when using spell-checkers (Rimbar, 2017). Spell checking tools play a major role in hindering any room for creativity, style, and improvement of cognitive skills. This study aimed at the concerns of spelling errors made by the students due to increased use of digital technology.

MATERIAL AND METHODS

Sample collection: A survey was conducted among 100 students of Saveetha Dental College and Hospital in the month of November 2019. Nearly 5 valid questions had been prepared and circulated among the students and answers were recorded.

Inclusion Criteria: Selection criteria include all the dental students of Saveetha dental college who are willing to participate in the study. First, second, third and final year Undergraduate dental students and Interns all were included in the study. This study also included the postgraduate students of Saveetha Dental College. The age limit included in this study was 18-23 years.

Exclusion Criteria: Students who were not willing to participate were excluded from this study. The age less than 18 years and more than 23 years were not included in this study.

Sampling method: In the present study,the sampling method used is a random sampling method.

Data Collection and Tabulation: The responses were entered into the excel sheets and then tabulation of the data finally and the question comparison was done. The representation of the data is through the bar graph.

Statistical Analysis: The statistical software used IBM SPSS V22.The statistical tests used were descriptive analysis and Chi Square analysis. Significant p value was set at <0.05.

Figure 1: Pie Chart shows the year of study of the sample population, in which 40.74 % were 2nd year BDS(red), 15.74% were 1st year BDS (blue), 24.07% were post graduates dental students(light green), 7.41% were 3rd year BDS(green), 7.41% were interns (yellow)and 4.63% were 4th year BDS students(orange).
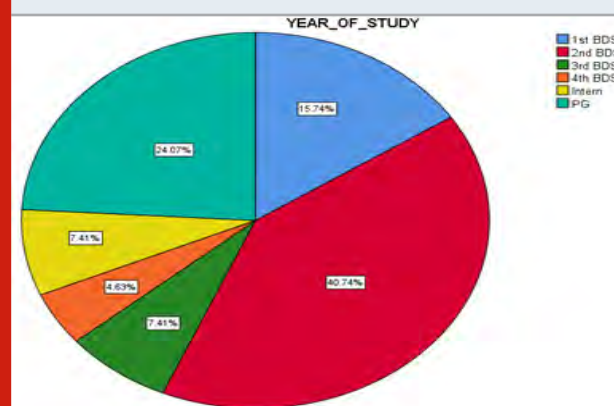
RESULTS AND DISCUSSION

The study included 40.74 % were 2nd year BDS, 15.74% were 1st year BDS, 24.07% were post graduates dental students, 7.41% were 3rd year BDS, 7.41% were interns and 4.63% were 4th year BDS students(Figure 1). Figure 2 represents the amount of care that students take for spelling of the words when they type. Around 53.7% responded that they always take care, 25.93% answered that they take care frequently, 17.59% for occasionally and 2.78% never concerned about their spelling when they type. As shown in Figure 3, 65.74% answered that they commit spelling errors always, 15.74% of the students agreed that they commit spelling errors occasionally, 14.81% of the students answered that they do spelling errors frequently and 3.7% answered that they never do spelling errors.

When we analysed the association between the year of study and concern about the spelling errors we found that the majority of the second year BDS students, followed by Postgraduate students who always take care about the spelling when they type than the other students. However, the difference was not significant statistically. Pearson Chi square value of 22.25 and P value of 0.101(>0.05) were obtained(figure 4), the majority of the second year BDS students, followed by Postgraduate students make spelling errors occasionally when they type than the other students. However, the difference was not significant statistically. Pearson Chi

square value of 17.07 and P value of 0.314(>0.05) were obtained (figure 5) and majority of the second year BDS students, followed by Postgraduate students, have given more importance to spellings than the other year students and the difference is also significant statistically. Pearson Chi square value of 25.76 and P value of 0.041(<0.05) were obtained.

Figure 2: Piechart represents the amount of care that students take for spelling of the words when they type. Around 53.7% responded that they always take care (blue), 25.93% answered that they take care frequently (red), 17.59% for occasionally and 2.78% never concerned about their spelling when they type.
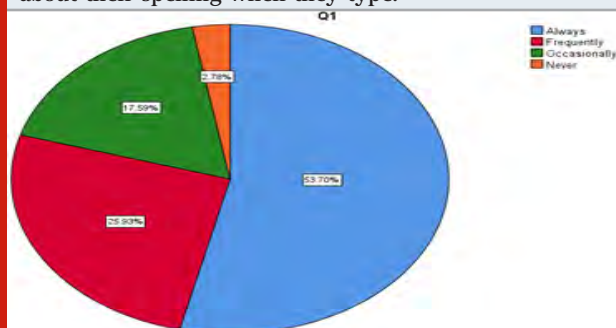
Figure 3: Pie Chart represents percentage response of the students who commit spelling errors. 65.74% answered that they commit spelling errors always(blue), 15.74% of the students agreed that they commit spelling errors occasionally (Dark green), 14.81% of the students answered that they do spelling errors frequently (red) and 3.7% answered that they never do spelling errors(orange).
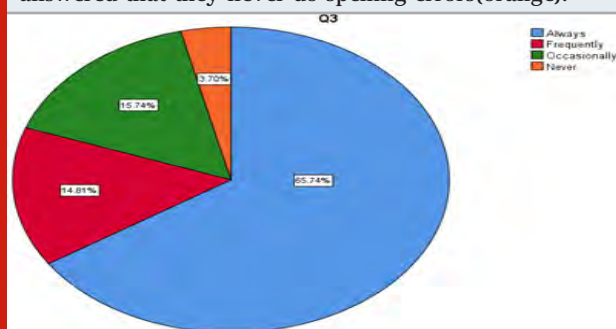
There is a lot of research and debate on the effectiveness of error correction and the contribution to improve and develop those error accuracy (Corpuz, 2011). The new emergence of word processors with spell checkers in this modern era has helped a lot in writing and spelling out wrong words (Lyster and Ranta, 1997). Spell checkers flag out the errors and provide an alternative or an apt word in replacement of that. The one thing about the spell checkers is that the learners must at least have a clue of how the word should be spelled. By knowing the spell checkers have a considerable influence on students' ability to generate repair of a spelling error, what language teachers in a Computer Assisted Language Learning (CALL) could do is to remain learners that spell checkers are not always correct.

They should also remind them to use spell checkers to check how the word is spelled and not just use them by clicking on the spelling suggestions and moving on. By doing this, the language learner can be more cautious while selecting suggested spelling and they will make sure to remember the corrections they have made. Limitations of the study is the biased distribution of the sample population. Future studies may be done with an unbiased sample distribution and with an analysis of spelling errors made by the students in text they type like research manuscripts, notes and assignments.

Figure 4: Bar graph shows the association between the year of study of sample population and their amount of care about spelling errors when they type (Chi square analysis). X axis represents year of study and Y axis represents the number of responses for the care about spelling errors. Majority of the second year BDS students, followed by Postgraduate students who always take care about the spelling when they type than the other students. However, the difference was not significant statistically. Pearson Chi square value of 22.25 and P value of 0.101(>0.05) were obtained.
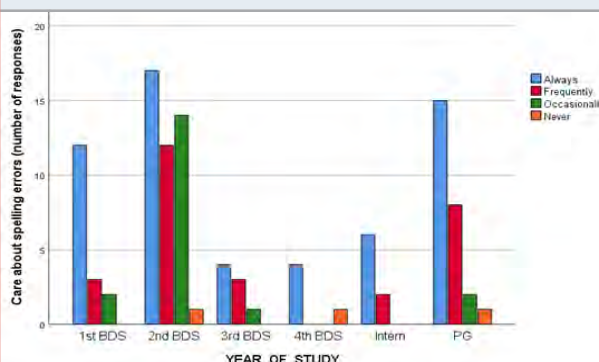
Figure 5: Bar graph shows the association between the year of study of sample population and frequency of spelling errors they make (Chi square analysis). X axis represents year of study and Y axis represents the number of responses for frequency of spelling errors. Majority of the second year BDS students, followed by Postgraduate students make spelling errors occasionally when they type than the other students. However, the difference was not significant statistically. Pearson Chi square value of 17.07 and P value of 0.314(>0.05) were obtained.
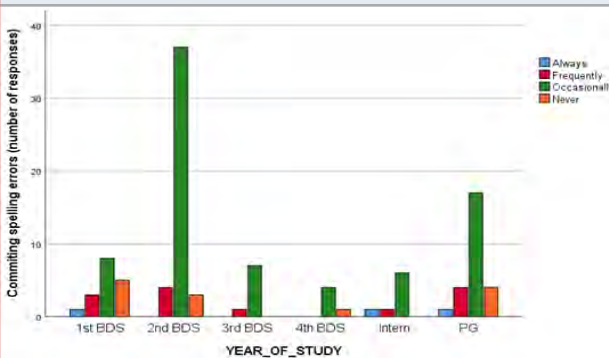
Figure 6: Bar graph shows the association between the year of study of sample population and the importance to learn the correct spelling given by the students(Chi square analysis). X axis represents year of study and Y axis represents the number of responses that students have given to spellings. Majority of the second year BDS students, followed by Postgraduate students, have given more importance to spellings than the other year students and the difference is also significant statistically. Pearson Chi square value of 25.76 and P value of 0.041(<0.05) were obtained.
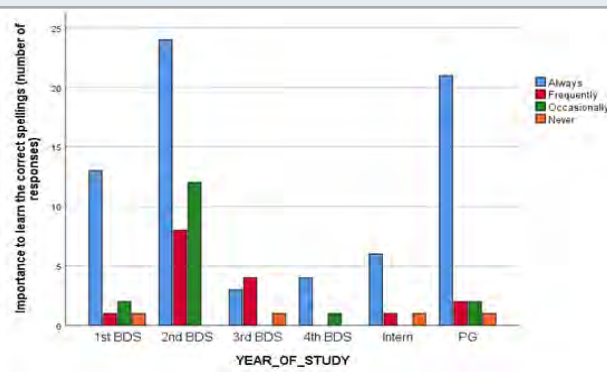
CONCLUSION

Within the limitations of the study, we conclude that the students are very much caring about their spellings when they type and giving more importance to avoiding spelling errors. Also we found that second year dental students and postgraduates are more concerned with spelling errors than the other students in the study population. The increasing use of technology has had an impact on increasing spelling errors. There is a considerable impact on spelling errors due to digital technology.

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Conflict of Interest: None to declare

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Evaluation of Cytotoxicity of A Nanoparticle Incorporated Root Canal Sealer – An In-Vitro Study

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ABSTRACT

The objective of a root canal therapy is to remove the infected pulpal tissue and fill the enlarged canal spaces in such a way that a 3-D hermetic seal is obtained. For the obturation of the root canal space, an obturating core and a sealer are used. The sealer must be as biocompatible as possible with low cytotoxicity and genotoxicity and additional antibacterial properties. The aim of the current study was to evaluate the cytotoxicity of a silver nanoparticle incorporated root canal sealer using MTT Assay against human periodontal ligament cells. MTT Assay is a colorimetric analysis for testing the cytotoxicity of drugs in-vitro. It was observed that the cytotoxicity of the nanoparticle incorporated sealer was concentration dependent with the maximum cytotoxicity at a concentration of 10% of silver nanoparticles within the original sealer. It can be concluded that the nanoparticle incorporated sealer has more cytotoxicity when compared to the original composition and this is directly proportional to the concentration of the nanoparticles. More studies need to be done to analyse the clinical use of this nanoparticle incorporated sealer as evaluation of cytotoxicity levels alone does not qualify for a material to be used as an endodontic sealer.

KEY WORDS: ANTIBACTERIAL; CYTOTOXICITY; MTA; NANOPARTICLES; SEALER; SILVER.

INTRODUCTION

The success or failure of a root canal therapy depends on the complete elimination and disinfection of the root canal system. It has been proven from time to time that inability to remove the microbial biofilms has caused root canal therapies to fail (Ramachandran Nair, 1987; Lin, Skribner and Gaengler, 1992). The role of cleaning and disinfection using irrigants and medicaments cannot

be overlooked. However, a three dimensional seal of the canal system that includes the root canal, its accessory canals and abnormal anatomy, if any is extremely important and forms a goal of the root canal therapy. Root canal sealers in conjunction with solid core filling materials aid in the sealing of the canal system three dimensionally (Kumaravadivel and Pradeep, 2016). Sealers help overcome the limitations of Gutta percha by filling minute microscopic space between the dentinal wall and gutta percha.

Sundqvist and Figdor (Orstavik, 2020) described three major functions of the root canal sealer as to seal canal systems against bacterial ingrowth from oral cavity, entombment of leftover viable microorganisms and complete obturation of the canal system at a submicroscopic level to prevent stagnant fluid from

accumulation and serving as bacterial nutrition. Root canal sealers that possess superior sealing ability and antimicrobial activity would hence be beneficial in clinical aspects (Branstetter and von Fraunhofer, 1982) as they can not only prevent bacteria from re-entering and re-infecting the canal system but also inactivate the remaining viable bacteria of the canal system post-obturation .

The ideal properties of sealers include establishment of hermetic seal, minimal cytotoxicity to periodontal ligament cells, tackiness when mixed to provide adhesion, radiopacity to be seen on a radiograph, lack of shrinkage and staining of tooth structure (ØRstavik, 2005). Traditional root canal sealers belong to the categories of zinc oxide eugenol (ZOE), epoxy resin (ER) and calcium hydroxide (CH). This categorization is based on the basic composition of the sealers (Shin, Lee and Lee, 2018). Calcium silicate based cement consisting of added metal oxides lead to the development of Mineral Trioxide Aggregate (MTA) that has bioactive properties (Torabinejad and Chivian, 1999). Apart from being extremely biocompatible, it is seen to stimulate tissue repair and induce mineralisation (Camilleri et al., 2005; Parirokh and Torabinejad, 2010). These reasons make MTA a suitable material to be used as a root canal sealer as it fulfils most of the criteria for a material to be called an ideal root canal sealer.

Silver has gained a fame of being an antimicrobial agent and is being incorporated to check for its antimicrobial efficiency against various species of microorganisms important as per the dental perspective (Noronha et al., 2017). We have numerous highly cited publications on well designed clinical trials and lab studies (Govindaraju, Neelakantan and Gutmann, 2017; Azeem and Sureshbabu, 2018; Jenarthanan and Subbarao, 2018; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Teja, Ramesh and Priya, 2018; Janani and Sandhya, 2019; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Poorni, Srinivasan and Nivedhitha, 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique and Nivedhitha, 2019; Siddique et al., 2019; Siddique, Nivedhitha and Jacob, 2019). This has provided the right platform for us to pursue the current study. Our aim was to evaluate the cytotoxicity of a MTA based sealer; MTA Fillapex, developed by Angelus (Londrina/Parana/Brazil) against the human periodontal cell lines by MTT Colorimetric Assay in vitro.

MATERIAL AND METHODS

Silver nanoparticles (10nm), MTT(1-(4,5-Dimethylthiazol-2-yl)-3,5-diphenylformazan) and DMSO purchased from Sigma Aldrich was used in this study. Silver nanoparticles 10 nm: AgNP 20 µg/mL solution (nanoparticles, 10 nm particle size), 0.02 mg/mL in aqueous buffer, contains sodium citrate as stabilizer. The endodontic sealer MTA-Fillapex, developed by Angelus (Londrina/Parana/ Brazil) and launched commercially in 2010 was mixed with 0.5%, 1.0%, 2.5%, 5%, and 10% of silver nanoparticles.

Samples were prepared by mixing the silver nanoparticles percentages (by weight), proportionally incorporated into the base paste of the endodontic sealer and weighed. The pH value of the product was measured as 7.4. The concentration of the stock solution was 0.2 mM. The solution was stored at 4°C. Serial dilutions from the (100%) were made to obtain dilutions of 0.5%, 1.0%, 2.5%, 5%, and 10% in supplemented DMEM medium.

Human periodontal ligament cell lines were purchased from NCCS Pune, India.The PDL Cells were cultured in a humidified atmosphere at 37 °C in the cell growth DMEM medium with 10% fetal bovine serum, L–glutamine,1% penicillin (100 U/ml), and streptomycin (100 µg/ml) at 37°C in a humidified CO_2 (5%) chamber and 95% air. The cells were detached using 0.25% EDTA Trypsin. Neutralization of the Trypsin was achieved using DMEM containing 10% FBS and PSGF, and cells were mechanically separated using a pipette. There were 96-well plastic culture plates filled with 200µl of medium containing in each well. The plates were then incubated at 37°C in a humidified atmosphere containing 5% CO_2 and 95% air for 24 h to permit attachment of the cells to the plates.

Testing groups: The testing groups include negative control- only the medium without any test compound; sealer control - only the sealer without nanoparticles; sealer+silver nanoparticles - (0.5, 1.0, 2.5, 5, 10%) of silver nanoparticles mixed with the sealer. The testing groups include negative control- only the medium without any test compound; sealer control - only the MTA without nanoparticles; MTA + silver nanoparticles - (0.5, 1.0, 2.5, 5, 10%) of silver nanoparticles mixed with the sealer.

Cell viability assay: The PDL cells were seeded at the density of (1×10^3 cells/ml) were plated on into well plates and the cells were permitted to adhere for 24 hours, and the growth medium (MEM) removed using micropipette and the monolayer of cells washed twice with MEM without FBS to remove dead cells and excess FBS. Then treated with 100µl of different concentrations of MTA + AgNps and MTA alone in respective wells for 24 h. Cell culture medium (DMEM) was used as a negative control for assessment of cell viability. 200 µl of MTT (5 mg/ml in PBS) were added to each well, and the cells incubated for a further 6-7 hrs in 5% CO_2 incubator. After removal of the medium, 1ml of DMSO was added to each well. The effect of the MTA + AgNps (0.5, 1.0, 2.5, 5, 10%) and sealer control on cell growth inhibition was assessed as percent cell viability, where vehicle-treated cells were taken as 100% viable.

The supernatant was removed and 50 µl of propanol was added and the plates were gently shaken to solubilize the formed formazan. The MTT enters the cells and passes into the mitochondria where it is reduced to an insoluble, coloured (dark purple) formazan product. Since reduction of MTT can only occur in metabolically active cells the level of activity is a measure of the viability of the cells. The plates were placed on a shaker for 15

min and the absorbance was read on an enzyme-linked immunosorbent assay (ELISA) reader at 570 nm. From the values obtained, the percentage cytotoxicity (IC50 value) was calculated. Each experiment was carried out in triplicate and the half maximal inhibitory concentration (IC50) of the test samples as the percentage survival of the cells was calculated according to the formula provided below:

Percentage of viable cell concentration was calculated thus:

Viability (%) = (Mean test OD/Control OD) ×100

Statistical analysis: Results were expressed as mean ± Standard error of Mean (SEM). Statistical significance was determined by one-way analysis of variance (ANOVA) and post hoc least-significant difference test. P values less than 0.05 were considered significant.

Table 1: Table showing % of cell viability after MTT Assay was performed. Values are expressed as Mean ± Standard error of Mean (SEM). (n=3); MTA + AgNPS treated PDL cells showed statistically significant difference *P<0.05; **P<0.01; ***P<0.001 as compared with Negative control. MTA alone treated PDL cells showed statistically significant difference #P<0.001 as compared with Negative control. The IC50 of the MTA + AgNPS is 4.52%.

S. No	Treatment	Conc (%)	Absorbance 570nm	% of cell viability
1.	PDL untreated cells		0.427 ± 0.11	100 ± 7.6
2.	MTA Control	1.0	0. 376 ± 0.25	88.3 ±2.7*
3.	MTA+AgNPs	0.5	0.315 ± 0.14	73.7 ± 3.8*
4.	MTA+AgNPs	1.0	0.295 ± 0.19	69.0 ± 1.9**
5.	MTA+AgNPs	2.5	0.236 ± 0.11	55.2± 2.4***
6.	MTA+AgNPs	5.0	0.195 ± 0.23	45.6 ± 1.5***
7.	MTA+AgNPs	10.0	0.107 ± 0.11	25.0 ± 1.2#

RESULTS AND DISCUSSION

In the current study cytotoxicity analysis was done using MTT Assay which is a colorimetric test. The MTT (3-[4,5-dimethylthiazol-2-yl]-2,5 diphenyl tetrazolium bromide) assay is based upon the conversion of MTT to formazan crystals that determine the mitochondrial activity of living cells (van Meerloo, Kaspers and Cloos, 2011). The formazan crystals presence in the cells can be evaluated by spectrophotometer. For most cell populations' total mitochondrial activity is related to the number of viable cells . MTT assay, hence broadly is used to measure the in vitro cytotoxic effects of drugs and dental materials on cell lines or primary cells lines. As seen in the results (Table 1 and Figure 1), the incorporation of nanosilver particles increases the cytotoxicity of the PDL cells and decreases the cell viability proportionally as the increase in the concentration of the silver nanoparticles is seen. Minimum cytotoxicity is seen in the original product while maximum is seen when 10% of silver nanoparticles

are added. The mechanism of cytotoxicity of the silver nanoparticles in vitro to PDL cells reportedly is due to the interaction of the nanoparticles with mitochondria and other cell organelles after they have phagocytized into the cells. This results in cells' apoptosis or necrosis. (Wei et al., 2010).

Figure 1: Bar graph depicting the % of viable cells. X-axis denotes the nature of the test product used and Y-axis denotes the % of periodontal cells viable after the performance of MTT Assay. It can be inferred that maximum % of the periodontal cell viability was seen when MTA with no silver nanoparticles were added. The % of cell viability is concentration of silver nanoparticles incorporation dependent.
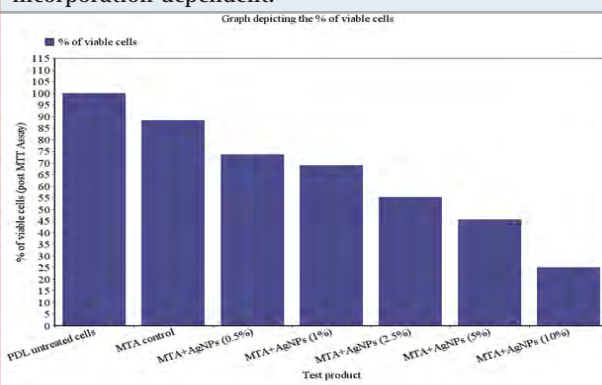
Since ancient times, the silver ion has been known to be effective against a broad range of microorganisms. Silver ions are used to control bacterial growth in a variety of medical applications, including dental work, catheters, and the healing of burn wounds. The mechanism of the antimicrobial action of silver ions is closely related to their interaction with thiol (sulfhydryl) groups and it has a deadly effect on bacterial enzymes, bacterial growth and cell division and result in damage of bacterial cell wall and contents (Jung et al., 2008). The addition of nanoparticles to the endodontic sealers help in an interaction at the molecular level. Silver particles are extremely efficient when delivered in particles of nano ranges. The nano range comprises particles with a size of 1 to 100 nm range. The silver nanoparticles are stored in a liquid medium to prevent agglomeration and entrapment of the particles within the matrix.

It has been implied that the particle shape, size, distribution and agglomeration are important characteristics of nanoparticles (Lara et al., 2011). These factors determine the distribution of the particles in vivo, their biological fate, toxic effects, and targeting ability. Silver nanoparticles are non-toxic at low concentrations and have a broad spectrum of antimicrobial activity that includes many gram positive, gram negative and antibiotic drug resistant species like MRSA (Morones et al., 2005). The antimicrobial mechanism of action of silver nanoparticles can be attributed to its greater ability of binding to the negatively charged part of the bacterial cell wall causing the rupture of the cell membrane and subsequent leak in the cytoplasmic

contents of the microorganisms. Furthermore, the nanoparticles infiltrate within the cytoplasm and interact with the nuclear content causing bacterial cell death (Ibrahim et al., 2017) . This was the idea behind inclusion of silver nanoparticles in a MTA based sealer.

MTA Fillapex, developed by Angelus (Londrina/Parana/ Brazil) and launched commercially in 2010, is seen to comprise natural resin, salicylate resin, diluting resin, bismuth trioxide, nanoparticulated silica, MTA and pigments (Bin et al., 2012). There have been claims that MTA Fillapex has a good antimicrobial efficiency (Rahman et al., 2017; Faria-Júnior et al., 2013; Kuga et al., 2013; Ustun et al., 2013; Hasheminia et al., 2017). The product claims to provide high alkalinity that favours hard tissue remineralisation and offers good antimicrobial activity (Kuga et al., 2011; Borges et al., 2014). Physical properties of MTA Fillapex when compared to commonly used epoxy resin based sealers are acceptable and MTA Fillapex has shown lowest values of flow, shorter working and setting times, lesser solubility and water absorption and good radiopacity, making it a clinically acceptable and desirable endodontic sealer (Vitti et al., 2013).

In the current scenario, epoxy resin based sealers are seen to possess very good physical properties, excellent apical sealing ability and biocompatibility (Singh et al., 2015). AH 26 releases formaldehyde hence its use has been questionable and this resin based sealer is being replaced with AH Plus which is a more biocompatible option (Spångberg, Barbosa and Lavigne, 1993; Huang et al., 2002). Zinc oxide eugenol based sealers have released potentially cytotoxic concentrations of eugenol that affect the viability of periodontal cells (Jung et al., 2018). Calcium hydroxide based sealers promote calcification but dissolution over a period of time remains a challenge (Khashaba, Chutkan and Borke, 2009).

Calcium silicate based sealer MTA Fillapex, developed by Angelus (Londrina/Parana/ Brazil), is reported to have a similar or greater cytotoxicity when compared to conventionally used sealers as reported by few authors when cytotoxicity studies on various cell lines like human periodontal cell lines, human gingival fibroblasts and primary human osteoblasts were performed (Bin et al., 2012; Scelza et al., 2012; Silva et al., 2013; Zhou et al., 2015; Collado-González et al., 2017; Poggio et al., 2017; Saygili et al., 2017) . A time- and dose-dependent response has been reported when MTA Fillapex was tested in-vitro for cytotoxicity analysis (Yoshino et al., 2013; Jafari et al., 2017). In our study, hence it is evident that with the addition of silver nanoparticles, though there may be an increase in the antibacterial activity of the sealer, there definitely is an increase in the cytotoxicity of the dental material which is dose dependent in nature. The decision of using this nanoparticle incorporated root canal sealer needs to be made after balancing all the desired properties and requirements. More tests need to be carried out for the cytotoxic and genotoxic analysis of this nanoparticle incorporated sealer. However, an endodontic sealer that is ideal for use appears as a myth even today.

CONCLUSION

Nanoparticulate dental materials are the future of dentistry. The in-vitro study gives us a perspective of nanosilver particle modified MTA based sealers to be cytotoxic to the human periodontal cells in a concentration dependent fashion. However, more clinical oriented studies need to be done to check for other aspects like toxicity, discoloration or microleakage in the canal of this nanosilver modified sealer.

Conflict of Interest: The authors deny any conflict of interests related to this study.

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Comparative Study Between Leishman's Stain and Giemsa Stain on Routine Peripheral Smear Examination

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ABSTRACT

Leishman stain, a type of Romanowsky stain, is a mixture of Methylene blue and Eosin dye. It is prepared in alcohol and is diluted using distilled water. It stains human cells purple in colour. It is one of the best methods preferred for peripheral blood smear examination. Giemsa stain has been named after a German chemist and bacteriologist Gustav Giemsa and used in histopathological diagnosis of malaria and various other parasites. Comparative study in between Leishman's stain and Giemsa stain was done. Randomly selected 20 peripheral blood samples were used for this study. Two Peripheral smears were prepared from each sample with a total of forty smears. The first group of twenty smears was selected from each sample and stained with routine Leishman's stain and the second group of twenty smears from each sample was stained with Giemsa stain. The morphology of the blood cells was analysed by a pathologist in an unbiased manner. The scores were analysed statistically. The smears were kept for storage after mounting with DPX mounting media. This study shows that Giemsa staining is a better alternative for Leishman's staining for a routine peripheral smear examination and this also has advantages of finding other abnormalities in blood such as other blood element abnormalities. Due to no significant difference seen in staining property in between Leishman's stain and Giemsa stain, we can very well use Giemsa stain as an alternative to Leishman stain.

KEY WORDS: GIEMSA STAIN; LEISHMAN STAIN; PERIPHERAL SMEAR; HISTOPATHOLOGY; PARASITES; INFECTION.

INTRODUCTION

Human blood is made up of both liquid and solid components in which the liquid part is called plasma, is made up of water, salt and protein (Fridman, 2008). The most important part to know is that the solid part of our blood contains red blood cells, white blood cells and platelets. Any abnormalities in blood are easily diagnosed by a blood film which is also known as peripheral blood smear which is defined as a thin layer of blood smeared on a glass slide and then stained in such a way that blood cells can be examined properly under microscope (Mohan, 2013). This peripheral smear gives us information about the number and shape of the cells in blood which will help the doctors in early diagnosis of blood disorders('Peripheral smear discloses histoplasmosis', 2010).

A complete blood smear examination begins with a visible scrutiny for acceptable quality of smear, stain and absence of macroscopic starches (Maslak, 2004). An

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appropriate smear is then examined under the microscope in 10X magnification, to recheck the stain quality and to make sure the smear is free of Clumps of platelets, white blood cells or red blood cells, any sort of living micro-organism, Rouleaux formation, Microfilaments and Protein strands(Renu and Pati, 2008).

Leishman stain, a type of Romanowsky stain, is a mixture of Methylene blue and Eosin dye (Bohatirchuk, 1957). It is prepared in alcohol and is diluted using distilled water. It stains human cells purple in colour. It is one of the best methods preferred for peripheral blood smear examination. The Leishman stain was first discovered by a British surgeon W. B (Korson, 1951). Leishman. It consists of an acidic stain eosin and a basic stain methylene blue. It is capable of fixing the smear to the slide there by prefixing steps can be avoided. The various methods in which Leishman's stain is used are, a) Differential Leucocyte Count, b) Determination of Type of Anemia, c) Platelet count. The stain must be diluted with a phosphate buffer in order to achieve very accurate results(Aspinall, 2014). The ideal pH would be 6.8 for morphological studies of blood cells, while a pH of 7.2 is required for parasitic studies (Villanueva, 1974).

Morphology of a normal red blood corpuscle is a biconcave disc shaped with a diameter measuring about 7-8μm, with a central pallor (Cox and Cunliffe, 1979). To perform it function to the fullest a mature red blood cell lacks a nucleus. Red blood cells are stained in pink with Romanowsky stain as the haemoglobin picks up eosin stain(Bessman, 1978). Development in the marrow, cells that belong to leukocytes of the granulocytic series, neutrophils, eosinophils, and basophils, synthesize proteins and store them as cytoplasmic granules. When specific granules start appearing that marks the progression of the promyelocyte to neutrophilic, eosinophilic, or basophilic myelocytes (Culp-Hill et al., 2018). Thereafter, the cell continues maturation into an amitotic cell with a segmented nucleus, capable of ameboid motility, phagocytosis, and microbial killing (Mathur, 2006). The mature granulocytes also develop cytoplasmic and surface structures that permit them to attach to and penetrate the wall of venules(Strange and Marnell, 1985; Mathur, 2006). The mature granulocytes enter the blood from the marrow, circulate briefly, and move to the tissues to carry out their major function of host defense(Sivakumaran, 2001).

Giemsa stain has been named after a German chemist and bacteriologist Gustav Giemsa and used in histopathological diagnosis of malaria and various other parasites (Ramalingam et al., 2018). This is also a differential stain, for example when Giemsa stain is combined with Wright stain it gives Wright-Giemsa stain (Mehlhorn, 2016). This stain is a classic blood film stain for peripheral blood smears and also in bone marrow specimens. Giemsa stain contains a mixture of Azure, Methylene blue and Eosin dye (Lisanti and Stockert, 1974). Methylene blue is a basic dye which stains the acidic component in the smear and Methanol acts as a

fixative and also for cellular staining (Frink, 1965). This is available in two forms one is stock solution and the other one is working solution. Working solution has to be done by the laboratory person where if we add 30 drops of stock solution of Giemsa stain to 30 ml of distilled water respectively (Frink, 1965; Tyler, 1980).

MATERIAL AND METHODS

Peripheral Blood Collection: Peripheral Blood samples were collected from randomly 20 patients who were taking their routine blood examination at the Clinical Laboratory in Saveetha Dental Hospital in Chennai, after obtaining the consent from the respective individuals. Approval was given by the ethical committee for working on research involving humans in Saveetha Institute of Medical and Technical Sciences (SIMATS). The criterion for selecting the sample was the clinical request for Haemoglobin and Complete blood count. No restriction was made for age, sex, or clinical history of each patient under clinic care. All the procedures were carried out in the clinical laboratory of Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences in the month of November 2019.

Peripheral Blood Smear Preparation: Forty slides were taken to prepare a set of two slides of smear for each blood sample to compare the different staining. The slides were labelled with a glass pencil by the name of the patient from whom the blood was taken. Just near the label a small drop of blood was placed for the smear preparation (Marwaha, 2010). A separate clean slide was taken and held at 45° angle from the slide containing the blood drop about 1mm above the blood drop. The slider was pulled back over the blood drop and waited until the blood spread over the full edge of the slide. After this the slide was pushed forward until the other end of the slide in order to achieve an evenly spread tongue shaped smear. Any excess blood on the sides was wiped off with clean tissue paper. One labelled slide was placed inside a coplin jar of Methanol, while the other was left to air dry (Mohan, 2017).

Staining:
Leishman's Staining: The air-dried labelled slide is taken and placed on the staining rack with the right side facing up. Commercially available Leishman's stain was filtered and taken in a dispensing bottle. Few drops of Leishman's stain were poured on the slide to cover the blood smear from the head to the tail end of the slide and left for 2 minutes. After 2 minutes, double the amount of distilled water was poured on the slide to cover the whole smear, and left for 10 minutes. After 10 minutes, the slide was taken and washed under running tap water by holding the palm over the head end and directing the water on the slide concerning to not lose the contents of the slide with the flow of the water. The slide is later air-dried. A drop of Cedar Wood Oil was placed on the slide and viewed under a microscope (Mohan, 2017).

Giemsa Staining: Working solution has to be prepared after preparing the smear in a coplin jar which contains methanol we will have to keep the glass slide for 3-5 minutes after this we will have to immediately keep inside the coupling jar of the working solution we prepared for 30 minutes after this we will have to wash the slide carefully and air dry it. Later a drop of Cedar wood oil was placed on the slide mainly in the tail region so that RBC's will be scattered all over and examined under the microscope (Emsweller and Stuart, 1944; Mohan, 2017).

Figure 1: A representative photomicrograph of Leishman stained smear of this study
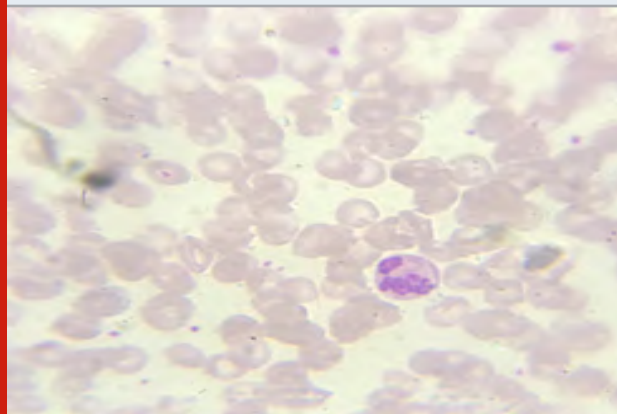
Figure 2: A representative photomicrograph of Giemsa stained smear of this study.
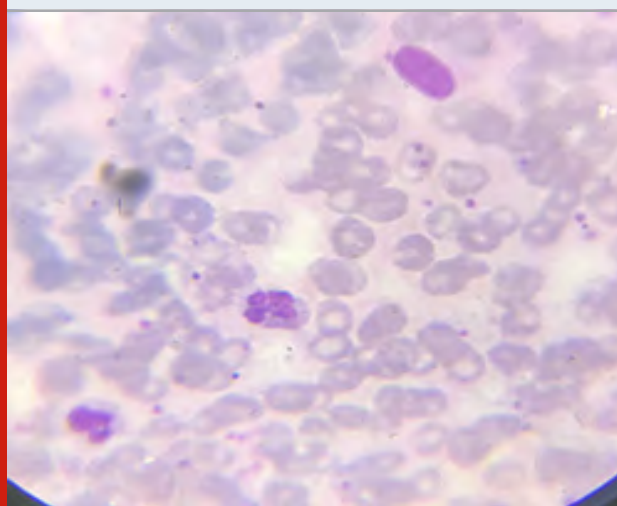
RESULTS AND DISCUSSION

The labelled slides were carefully analyzed under a microscope under various categories such as: Staining Technique, Morphology of RBCs, WBCs and Platelets. The analyzed slides were graded accordingly. In our study we used the Likert bipolar-scale grading method where 0 is not acceptable and 1 means acceptable [Table 1].

As the Table 2 and 3 and the figure 1 and 2, WBC's Nuclear detail were acceptable, the percentage in

Leishman's stain was 96% and in Giemsa was 95%, There was no significant difference in the WBC's nuclear detail when compared in our study. But the unacceptable percentage was 4% and 5% respectively. WBC's cytoplasmic acceptance percentage was 99% for Leishman's and 94% for Giemsa. Here also there was no significant difference and unacceptable percentage was 1% and 6% respectively. Platelet staining was 98% in both Leishman and Giemsa stain but the unacceptable percentage was very low and it is 2%. RBC's staining acceptable percentage was 98% in both Leishman and Giemsa staining. The background staining which obtained from both the staining was the same, as the acceptable percentage for Absence of background staining which was 90% in both Leishman and Giemsa staining and unacceptable percentage was 10% which can be avoided by proper cleaning procedures. The statistical analysis of the grades (results), were done and shown in Table 4.

Table 1. Likert bipolar scale of the acceptability, where 0 is not acceptable and 1 is acceptable.	
GRADES	
0	Not Acceptable
1	Acceptable

Table 2. The results of Leishman's stain.

FEATURES	TOTAL ACCEPTABLE SCORES (%)	TOTAL UNACCEPTABLE SCORE (%)
WBC's Nuclear detail	96	4
WBC's cytoplasmic details	99	1
platelets staining	98	2
RBC's	98	2
Absence of background staining	90	10

Table 3. The results of Giemsa Stain

FEATURES	TOTAL ACCEPTABLE SCORES (%)	TOTAL UNACCEPTABLE SCORE (%)
WBC's Nuclear detail	95	5
WBC's cytoplasmic details platelets staining	94 98	6 2
RBC's	98	2
Absence of background staining	90	10

In this study we used Mann Whitney Ranksum analysis. The one tailed P-value obtained was 0.600, which was >0.05. Hence, there is no significant difference

between the two staining methods. Both Leishman and Giemsa stains were comparatively the same and there was no significant difference in Morphology of RBCs, WBCs and platelets (Ramalingam et al., 2018).

Table 4: Statistical results of Leishman and Giemsa stain.

GROUP NAME	MEAN	STANDARD DEVIATION
Leishman's stain	96.2	3.633
Giemsa stain	95	3.137
Difference	1.2	

The background staining may be avoidable in both Giemsa and Leishman's stain. This study shows that Giemsa staining is an better alternative for Leishman's staining for routine blood smear and Leishman stain can be a better alternative for quantification of malarial parasites in case of unavailability of Giemsa stain and this also has advantages of finding other abnormalities in blood such as other blood elements abnormalities. Parasite count was compared between these two staining methods and they were highly correlated with each other and these methods showed a high level of agreement (Padma et al., 2018). As the study by Bower et al the effect of the Leishman's stain on the peripheral smear for the purpose of analysis was better and showed clearer results compared to the staining of Giemsa stain. The cells were more evident and recognizable in Leishman's stain. The Giemsa stain had also stained enough to make the cells visible while the proper anatomy was not appreciated(Isaiah et al., 2018).

The morphology of RBCs was maintained properly in the slide stained with Leishman's stain. Disc shaped round cells with centre pallor were appreciated. They were easily differentiable from other cells in the blood (Cunningham, 1969). On the other hand, the RBCs in the slides stained with Giemsa stain had mostly lysed and lost their morphological structure. The morphology of WBCs was maintained properly in the slide stained with Leishman's satin. The different types of leukocytes were effortlessly found out. There weren't any discrepancies that affected the analysis of the smear. The WBCs in the slide that was stained with Giemsa stain were appreciable. The different leukocytes were able to be located based on the shape and the number of lobes in the nucleus (Cunningham, 1969; Raju, 1982). Leishman-stained slides compared to Giemsa. Red cells stained with Giemsa result in a more bluish tinge than with Leishman stain (Sareen, Kapil and Gupta, 2018). This makes the contrast of the parasitic cytoplasm with Giemsa less appreciable.

In the thick smear preparation Giemsa stain was subjectively superior to Leishman. However, this did not translate into reduced sensitivity or reduced accuracy in quantitation in the series: only one case was missed with Leishman stain, and in general thick smear reading was not more difficult in preparations stained with Leishman

(Mathur, Tripathi and Kuse, 2013). In Leishman-stained slides, detection of these late-stage parasites was easier compared with Giemsa. Red cells stained with Giemsa have a more bluish tinge than Leishman stain does (Baird, 1936). The difference between stain on Leishman and stain on Giemsa found in our study is that the Leishman method of staining provides better representation of the cells ' nuclear chromatin patterns (Ramalingam et al., 2018).

Giemsa staining is most widely used to stain chromosomes directly in the DNA region in order to detect rearrangement and translocations (Baird, 1936; Meyer, 1945). Giemsa stain was subjectively superior to Leishman stain in the dense smear preparation. Red cells stained with Giemsa stain have a more bluish tinge than Leishman stain does (Leishman, 1901). For morphological evaluation of leukocytes Leishman stain was superior to Giemsa stain. Compared with Giemsa stain, the finer chromatin pattern and nucleus color was clearer with Leishman stain (Doddagowda, 2017). Limitations of this study were less sample size, availability of the pathologist for the scoring of the smears. Future studies may be done with increased sample size and inclusion of three to four expert pathologists for analysing the smears.

CONCLUSION

Within the limitations of the study we conclude that due to no significant difference seen in staining property in between Leishman's stain and Giemsa stain, we can very well use Giemsa stain as an alternative to Leishman stain in case of unavailability of stains and poor-quality stain lots.

ACKNOWLEDGEMENTS

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Knowledge, Awareness and Practice Among Dental Students on Colour Changes and Retention Qualities in Temporary Crowns

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ABSTRACT

Fabrication of provisional restoration is an important part in fixed partial denture.The provisional crowns must satisfy the requirements of pulpal protection, stability, marginal adaptability, wear resistance, occlusal functions, and esthetics.The aim of this study is to evaluate the awareness among dental students on colour changes and retention qualities of temporary crowns. A cross sectional study was conducted among dental students. The questionnaire consisted of 10 questions and were equally distributed among the students.The total sample size was 150 dental students. The data collected was entered in an Excel sheet and subjected to statistical analysis using SPSS version 23. it is observed that 15.33% of the third years felt that there was a change in shade of the temporary crowns after cementation, while only 7.33% of the interns felt a change in shade after cementation. 30% of the interns find their temporary crowns are of right thickness.17.33% of the interns have found their temporary crowns to be dislodged, rare, while 18% of the third years have responded to be often, for all of which the p value was statistically significant. Within the limits of the study, it is observed that most of the undergraduate students had difficulty in temporisation's shade selection and factors leading to change in retention qualities in temporary crowns.

KEY WORDS: PROVISIONAL CROWNS, CEMENTATION, RETENTION, SHADE MATCH.

INTRODUCTION

Provisional crowns in fixed prosthodontics is an important procedure, especially, if the restoration is expected to function for a longer duration or in cases of rehabilitation (Binkley and Irvin, 1987). Fabrication of provisional restoration is an important part in fixed partial denture.

The provisional crowns must satisfy the requirements of pulpal protection, stability, marginal adaptability, wear resistance, occlusal functions, and esthetics (Dumbrigue, 2003). A provisional crown must also provide a preview of the future prosthesis, while enhancing the abutment and periodontal health (Federick, 1975).

There are various ways by which a temporary crown can be made. It can either be made directly on a prepared tooth/teeth (Miller, 1983),(Fehling and Neitzke, 1994) or can be done indirectly with the impression of the prepared teeth (Boberick and Wyke, 1999), (Small, 1999) or by combination of both; direct-indirect method (Bennani, 2000). Provisional material selection should be based on how their mechanical, physical, and handling properties fulfill specific requirements for any clinical case.

Other factors to be considered are biocompatibility and complications from intraoral use, such as chemical injury from the presence of monomer residue and thermal injury from an exothermic polymerization reaction. The most common materials used for custom interim-fixed restorations are several types of acrylic resins such as poly(methyl methacrylate) resin, poly(ethyl methacrylate) resin and polyvinyl (Regish, Sharma and Prithviraj, 2011).

Provisional crowns are made available in different forms such as; preformed crowns, custom made crowns. Preformed provisional crowns commonly consist of tooth-shaped shells of cellulose acetate, or metal. They are usually relined with acrylic resin to provide a more custom fit before cementation, but the plastic and metal crown shells can also be cemented directly onto the prepared teeth. Polycarbonate resin is the material of choice, that is commonly used for preformed crowns (Shetty, Alva and Prasad, 2012).

Another factor to be considered with provisional crowns is, they must be easy to remove without damaging the existing tooth preparation (Strassler, 1998),(Gratton and Aquilino, 2004) Other key purposes for the temporary restoration include the maintenance of the tooth preparation position both occlusally and proximally. The provisional restoration should be adjusted to duplicate the desired final occlusion and must have proximal contact with adjacent teeth to avoid tooth movement and shifting that can have a negative impact on the placement of the final restoration (GEGAUFF and AG, 2006),(Zinner, Trachtenberg and Miller, 1989).

In esthetically visible areas, the provisional crowns must not only provide a shade match, but also must maintain its esthetic appearance over the period of usage (Doray, Li and Powers, 2001). Discolouration of the restoration can lead to patient dissatisfaction, and is particularly problematic when provisional restorations are subjected to prolonged exposure to colorants during the course of the treatment (Sham et al., 2004). Color stability of provisional restorations is an important quality of the resin used, particularly for extensive reconstruction over a long period of time (Koumjian, Firtell and Nimmo, 1991). Hence, color stability can be a significant criteria in the selection of a particular provisional material for use in an esthetical area of the oral cavity.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the knowledge, awareness and practice among dental students on colour changes and retention qualities in temporary crowns.

Thus, the present study focuses on the knowledge, awareness and perception among dental students on retention qualities of a provisional restoration and also its colour change in due course.

MATERIAL AND METHODS

Study design:
Cross sectional study:
Data collection: A cross sectional study was conducted in January 2020 among dental students (Third years, Final years, Interns). It was an online questionnaire based study, conducted to assess the knowledge, attitude and perception colour stability and retention qualities of temporary crowns. 150 dental students (Third years, Final years, Interns) participated in this study from dental colleges in Chennai. The data collection was done via google forms.

Survey instrument: A pretested, self administered, closed ended questionnaire comprising the following sections formed the survey instrument. A structured questionnaire containing 10 questions was adopted from a validated questionnaire. The questionnaire was distributed among Third years, Final years, Interns. The goal of developing this questionnaire was to know about the knowledge the dental undergraduates had on colour stability and retention qualities of temporary crowns.

Data analysis: The data collected was entered in an Excel sheet and subjected to statistical analysis using SPSS version 23. Chi square test was done. The level of significance was set at $p < 0.05$.

Questionnaire given is as follows:
- Year of study
- What type of temporary crowns do you use for temporization?
- Have you found any difficulties in shade matching the temporization of the material?
- What type of temporary cement do you use to lute for the temporary crowns?
- After cementation of temporary crowns, have you felt there was a change in shade with what you matched?
- Have you ever felt your temporary crown is of right thickness?
- Do you use the temporary luting cement according to the recommendations?
- How often have you found a temporary crown to be dislodged?
- How was the retention in your temporary crowns post cementation?
- How was the retention of your temporary crowns while retrieving?
- How many times the temporary crowns have been dislodged without you retrieving it?

RESULTS AND DISCUSSION

From the response obtained, it was observed that 33.33% of the third years, 32% of final years and 22% of the Interns use indirect methods for temporization. The direct method is mostly used by the Interns (11.33%) for which the p value was found to be statistically significant (p-0.000) (Figure 1). 28% of the third years have faced difficulties in shade matching. The P value was found to be statistically significant (p-0.001) (Figure 2). On type of temporary luting cements being used, 22% of the third years use IRM and 21.33% of the final years use ZOE-based cements for which the P value was 0.009 which is statistically significant (Figure 3). 15.33% of the third years felt that there was a change in shade of the temporary crowns after cementation, while only 7.33% of the interns felt a change in shade after cementation.

Figure 1: Bar graph showing association between year of study of the students and number of students using what type of temporization method. The X axis denotes year of study and the Y axis denotes number of dental students. It is observed that 33.33% of the third years use indirect methods (green) and 11.33% of the interns use direct methods (blue) for which the P value was found to be statistically significant (p-0.000).
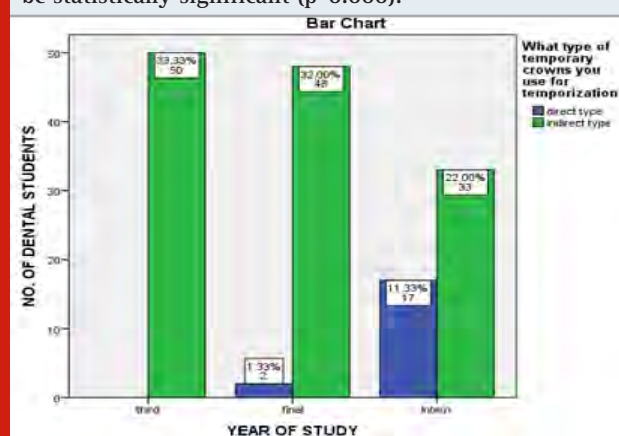
Figure 2: Bar graph showing association between year of study of the students and number of students who had difficulties in shade matching . The X axis denotes year of study and the Y axis denotes number of dental students. It is observed that 28% of the third years had difficulty (green) in shade matching and 14.6% of the interns did not have (blue) difficulty in shade matching for which the P value was found to be statistically significant (p-0.001).

Figure 3: Bar graph showing association between year of study of the students and number of students using what type of temporary cement for luting. The X axis denotes year of study and the Y axis denotes number of dental students. It is observed that 22% of the third years use IRM (blue) and 21.33% of the final years use ZOE based cements (green) for luting, for which the P value was found to be statistically significant (p-0.009).
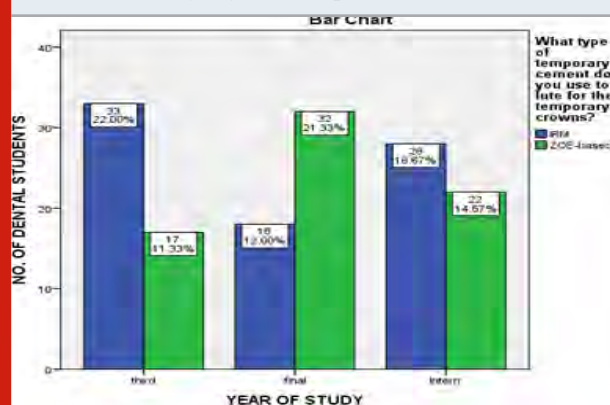
Figure 4: Bar graph showing association between year of study of the students and number of students who had an experience of shade change post cementation. The X axis denotes year of study and the Y axis denotes number of dental students. It is observed that 15.33% of the third years had experienced shade change (green) and 7.33% of the interns didn't experience shade change (blue) post cementation, for which the P value was found to be statistically significant (p-0.038).

The P value was 0.038(p<0.05) (Figure 4). 30% of the interns find their temporary crowns are of right thickness for which the p value was 0.001 (p<0.05) (Figure 5). 26.67% of the third years use the recommended P:L ratio for mixing while only 18% of the interns use it according to the recommended ratio. The P value was 0.013(p<0.05) (Figure 6). 17.33% of the interns have found their temporary crowns to be dislodged, rare, while 18% of the third years have responded to be often for which the P value was statistically significant (p-0.017) (Figure 7). 22.67% of the interns have found their temporary crowns to have a good retention, post cementation. The P value is 0.002 (p<0.05) (Figure 8).

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15.33% of interns felt the temporary crowns had good retention while retrieving it and 24.67% of the final years felt the retention was fair. The P value was 0.000 (Figure 9). 22.67% of the final years have responded that <50% of the times, the temporary crowns were dislodged, without them retrieving it, for which the P value was found to be significantly not significant (p-0.736) (Figure 10).

Figure 5: Bar graph showing association between year of study of the students and number of students who think their crowns are of right thickness. The X axis denotes year of study and the Y axis denotes number of dental students. It is observed that 20% of the third years have responded no (blue) and 30% of the interns have responded yes (green) for which the P value was found to be statistically significant (p-0.001).
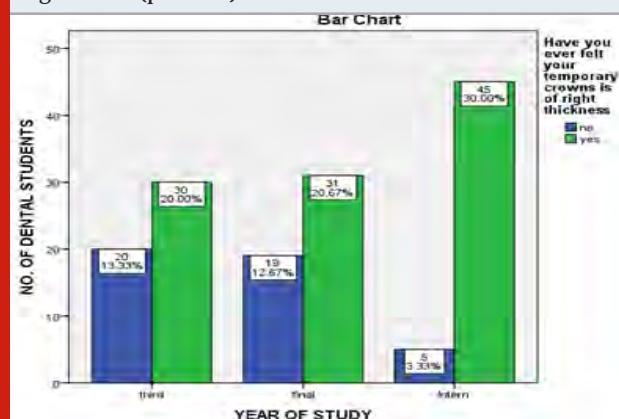
Figure 6: Bar graph showing association between year of study of the students and number of students using what type of P:L ratio. The X axis denotes year of study and the Y axis denotes number of dental students. It is observed that 26.67% of the third years use the recommended P:L ratio (green) and 15.33% of the interns use it with a change in the consistency (blue) for which the P value was found to be statistically significant (p-0.013).
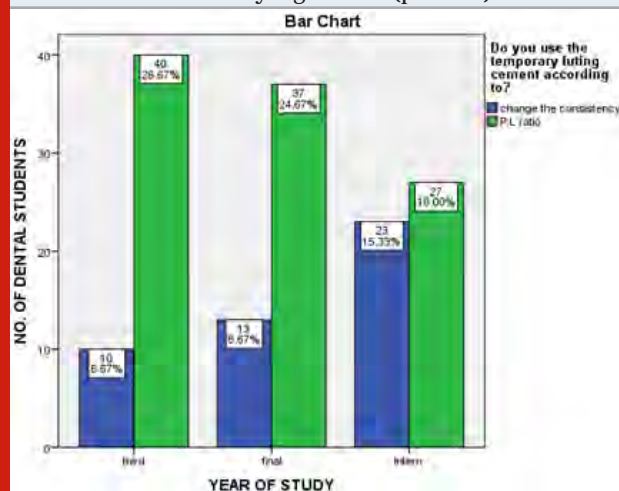
From the present study, it is observed that 15.33% of the third years felt that there was a change in shade of the temporary crowns after cementation, while only 7.33%

Figure 7: Bar graph showing association between year of study of the students and number of students who had experienced crown dislodgement. The X axis denotes year of study and the Y axis denotes number of dental students. It is observed that 18% of the third years responded often (blue), 17.33% of the interns responded rare (blue) and 9.33% of final years responded very often (mustard) for which the P value was found to be statistically significant (p-0.017).
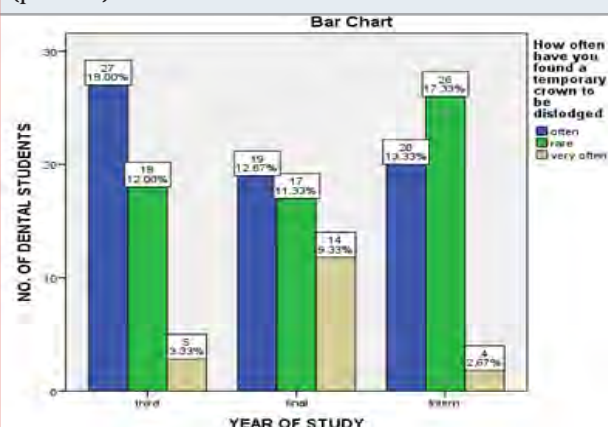
Figure 8: Bar graph showing association between year of study of the students and number of students on their experience of temporary crown retention post cementation. The X axis denotes year of study and the Y axis denotes number of dental students. It is observed that 14.67 % of the third years responded fair (blue), 22.67% of the interns responded good (green) and 10.67% of final years responded poor (mustard) for which the P value was found to be statistically significant (p-0.002).
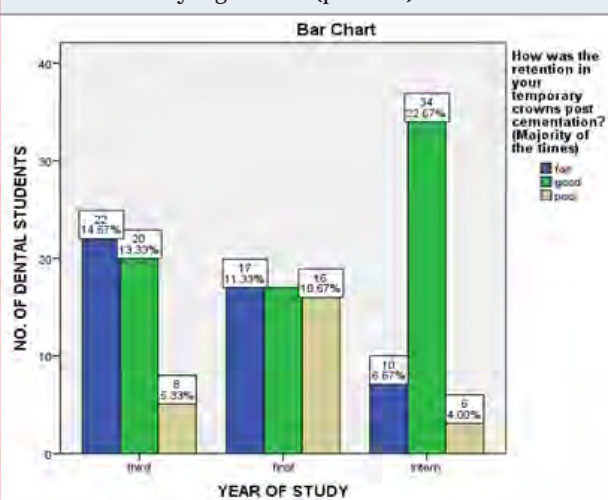
of the interns felt a change in shade after cementation. 30% of the interns find their temporary crowns are of right thickness.17.33% of the interns have found their temporary crowns to be dislodged, rare, while 18% of the third years have responded to be often, for all of which the p value was statistically significant.

Koumjian et al. in an in vivo-study, found that methyl methacrylate resin was lesser color stable than bis-acryl composite (Protemp II) (Koumjian, Firtell and Nimmo, 1991), whereas study by Gupta et al showed Revotek LC was the most color stable material (Gupta and Gupta, 2011). An awareness study done by Guru et al, showed that about 40% of the participants responded that methyl methacrylate is not directly used in the oral cavity, whereas 35% of the participants responded that methyl methacrylate is directly used in the oral cavity (Guru, Prasanna Guru and Sengottaiyan, 2019).

Figure 9: Bar graph showing association between year of study of the students and number of students on their experience of temporary crown retention while retrieving. The X axis denotes year of study and the Y axis denotes number of dental students. It is observed that 10% of the third years responded poor (mustard),15.33% of the interns responded good (green) and 24.67% of final years responded fair (blue) for which the P value was found to be statistically significant (p-0.000).
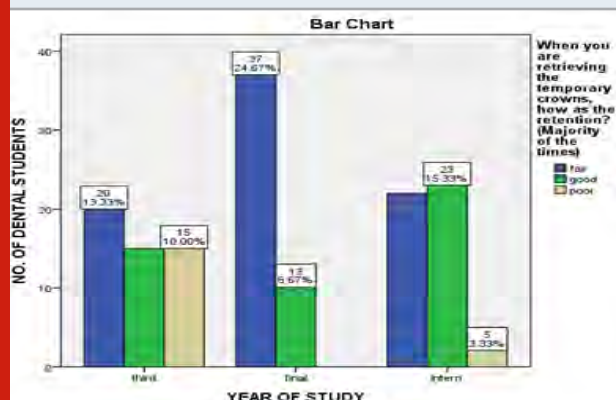
Figure 10: Bar graph showing association between year of study of the students and number of students on their experience of temporary crown dislodgement before retrieving them. The X axis denotes year of study and the Y axis denotes number of dental students. It is observed that 8.67% of the third years responded <25% of the times (blue),6.67% of the interns responded >50% of the times (mustard) and 22.67% of final years responded <50%of the times (blue) for which the P value was found to be statistically not significant (p-0.736).
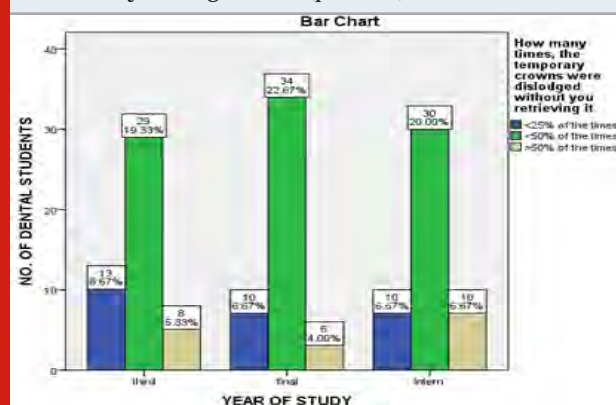
Few articles have compared the colour stability with various materials. Crispin and Caputo studied the color stability methyl methacrylate materials which exhibited the least darkening, followed by ethyl methacrylate and vinyl-ethyl methacrylate materials (Crispin and Caputo, 1979). Guler et al study showed that the color stability of four provisional restorative materials was evaluated after 48 hours of immersion in a staining solution, according to the different finishing procedure (Guler, Kurt and Kulunk, 2005).

According to the Hamid J et al, the methyl methacrylate-based provisional restorative material was found to be more color stable than the auto polymerized and light- polymerized composite provisional materials (Hoseinkhezri et al., 2012). According to Malek A et al, bulk filing of the temporary crowns with luting cement increased the adaptation discrepancies (Alabdulkader and Habib, 2018).

Though the present study was found to be statistically significant, there are no comparative studies since not much attention is given towards training the students at an undergraduate level to encounter and manage patients. Thus the curriculum should emphasise the need to know about the subjects which also helps in the management of patients and their needs.

CONCLUSION

Within the limits of the study it is observed that indirect technique of temporisation (88%) was more commonly employed in the construction of temporaries. The use of zinc oxide eugenol based temporary cement was more common and not much clinical colour change was noticed by the operators post cementation but found difficulty in colour matching of temporaries to natural teeth (62%). The temporary crowns or bridges were intact and retentive only in 63% of the survey opinion at the time of retrieval.

Conflicts of Interest: Nil

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Awareness of Different Forms of Denture Adhesives Among Dental Students

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ABSTRACT

Complete dentures constitute one of the most important treatment options in prosthodontics. Denture adhesives seem to improve oral health related quality of life of patients with edentulism. The aim of the study is to evaluate the knowledge, awareness and perception of denture adhesive among dental students. A cross-sectional study was conducted among 150 dental students belonging to third year, final year and internship selected by simple random sampling. The questionnaire was pre-fabricated , simple, close-ended. Data was gathered using an online survey application. It has been observed that all the interns and majority of third year students and final year students were aware of denture adhesives. Only 8% of third year students, 13.3% of final year students and 6.6% of interns do not use denture adhesives in the present study. Within the limitations of the study, it has been studied that most of the undergraduate dental students were aware of the denture adhesives that are being used although majority of the students were not aware of the different forms of available denture adhesives.

KEY WORDS: DENTURE; ADHESIVE; RETENTION; STABILITY.

INTRODUCTION

Complete dentures constitute one of the most important treatment options in prosthodontics, more so with an increase in average life expectancy of the individual. Newly made dentures could be a disappointment to a patient if deficient in retention and/or stability and could contribute to a sense of social anxiety and lack of confidence in them . However, retention of complete dentures has always posed to be a problem for the dentist

(Mantri et al., 2014). Denture adhesives (DA), also referred to as adherents or fixatives, have long been recognized by denture wearers as a useful adjunct to denture retention, stability, and function. (Grasso, 2004) Denture adhesives enhance the retention, stability, masticatory performance, occlusal force, sealing out of food particles, and overall function of dentures. In addition, Denture adhesives seem to improve oral health related quality of life of patients with edentulism. (Polyzois et al., 2017) Overall, the use of Denture adhesives has been an intriguing and controversial topic in both clinical practice and in academia.

The conflicting viewpoints among dental professionals can be described as the traditional historical and the advocate approaches. Denture adhesives have a profound place in prosthetic dental treatment but often dentists do not prescribe them for fear that it indicates their failure to provide a fitting prosthesis.(Shah et al., 2015) Many dentists also fear that DAs are causing increased residual

ridge resorption (RRR) and soft tissue hyperplasia (Neill and Roberts, 1973; Karlsson and Swartz, 1981) Studies show that denture adhesives when properly used provide and benefit denture patients with improved fit, comfort, chewing ability and confidence . (Figueiral et al., 2011; Ahlawat et al., 2012; Gonçalves et al., 2014) The use of denture adhesives in complete dentures can be justified when it is not possible to obtain sufficient retention and stability and when implants or surgical ridge augmentation procedures are not an option because of the patient's economic situation, systemic conditions, or age (Musani, Dugal and Kothavade, 2010; Shah, 2012).

The conflicting viewpoints among dental professionals have led to slow acceptance of Denture adhesives in their practice as a means to enhance denture retention, stability and function. Dentists need to be familiar with Denture adhesives to be able identify those patients who actually need them and to be able to educate them about the advantages, disadvantages and correct use of these products. This is an intriguing topic because it has received so little attention in the formal training of dentists, despite their widespread use among denture wearers. Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the knowledge,awareness and perceptions of different forms of denture adhesives among dental students.

MATERIAL AND METHODS

Data collection: A cross sectional study was conducted in January 2020 among dental undergraduates (Third years, Final years, Interns). It was an online questionnaire based study, conducted to assess the knowledge, attitude and awareness on the management of the maxillary antrum carcinomas. 150 dental undergraduates (Third years, Final years, Interns) participated in this study. The data collection was done via google forms.

Survey instrument: A pretested, self administered, closed ended questionnaire comprising the following sections formed the survey instrument. A structured questionnaire containing 10 questions which was adopted from a validated questionnaire developed by the World Health Organisation.The goal of developing this questionnaire was to know about the knowledge, awareness and perception the dental undergraduates had on denture adhesives.

Data analysis: The data collected was entered in an Excel sheet and subjected to statistical analysis using SPSS software. Chi square test was done. The independent variables are age and gender while dependent variables

are knowledge,attitude and awareness on the different forms of denture adhesive among dental students. The level of significance was set at p<0.05.

RESULTS AND DISCUSSION

In this study, it has been observed that all the interns and majority of third year students and final year students were aware of denture adhesives (Figure1). Only 8% of third year students, 13.3% of final year students and 6.6% of interns do not use denture adhesives in the present study (Figure 2). Most of the dental students responded that the denture adhesive enhances the stability and retention of the prosthesis (Figure 3). 26.6% of third year students, 26.6% of final year students and 24% of interns felt that DA provide psychological comfort to the patients (Figure 4). 4.6% of third year students, 12% of final year students and 9.3% of interns felt that the use of DA encourages improper practical use (Figure 5).

Figure 1: Bar graph depicts the association between the year of study of the participants and their awareness on denture adhesives. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a response of yes(blue). Chi square test was done and p value was found to be 0.000 hence statistically significant.
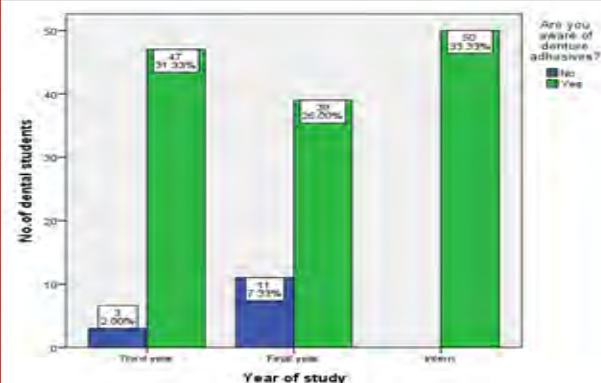
Figure 2: Bar graph depicts the association between year of study of the participants and if denture adhesives are used in the practise. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a response of yes(green). Chi square test was done and p value was found to be 0.062, hence statistically significant.
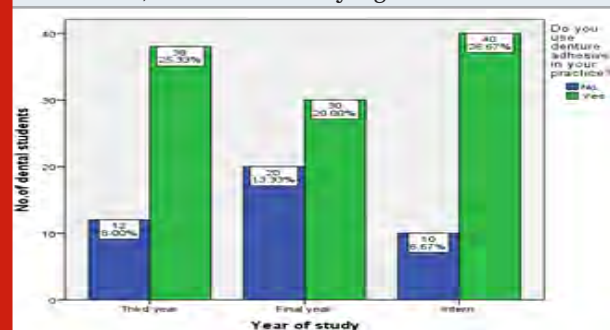
Figure 3: Bar graph depicts the association between the year of study of the participants and knowledge on stability and retention of the denture when DA is used. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a response of yes(green). Chi square test was done and p value was found to be 0.000 hence statistically significant.
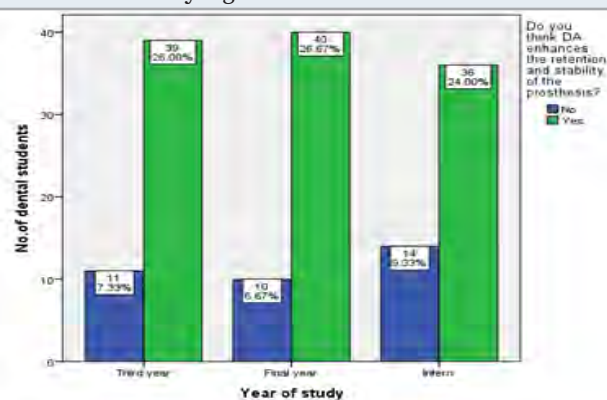
Figure 4: Bar graph depicts the association between years of study of the participants and if the DA provides psychological comfort to the patient. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a response of yes(green). Chi square test was done and p value was found to be 0.002 hence statistically significant.
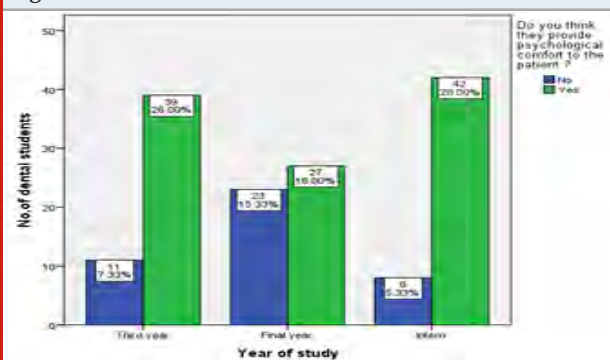
It has been observed that all the third year students were aware of only powder form of Denture Adhesive , 7.3% of final year students used paste form and 4% used strip form. Among interns, the majority used powder form while 12.6% used paste form and 2% used strip form (Figure 6). All the interns felt that the use of DA drastically improved the quality in upper arch while only 20.6% of final year students and 12.3% of third year students felt the same (Figure 7). Regarding the retention in lower arch, 20.6% of final year students and interns felt that the retention improves and 22% of third year students felt the same (Figure 8).

Only 7.3%% of interns, 6.7% of final year students and 13.3% of third year students had patients complaining

about loss of retention even after using DA (Figure 9). 2.6% of final year students and 3.3% of interns had patients who reported with a change in the type of DA being comfortable or uncomfortable (Figure 10). Majority of students did not know of patients using DA for a very long time (Figure 11). 5.3% of final year students and 10% of interns had checked for retention with different types of adhesives (Figure 12)

Figure 5: Bar graph depicts the association between year of study of the participants and perspective of DA encouraging improper clinical practice. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a response of no(blue). Chi square test was done and p value was found to be 0.040 hence statistically significant.
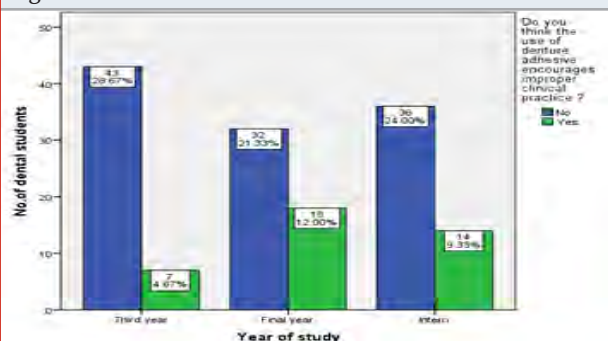
Figure 6: Bar graph depicts the association between year of study of the participants and perspective on type of denture adhesives. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have used powder form (purple), compared to paste(pink) and strips (brown). Chi square test was done and p value was found to be 0.000 hence statistically significant.
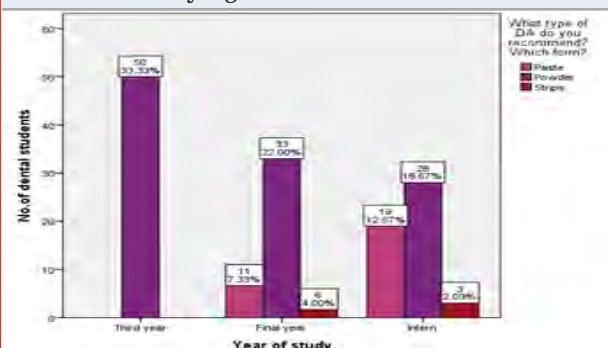
Studies showed that 40-60% of the patients were not aware of denture adhesives which was significantly higher compared to the present study (Fakhri et al., 2009; Muneer, Ahmed and Kamran, 2013; Polyzois et al., 2017). In a study conducted by Polyzois et al, it has been found that 60.3% of dental practitioners recommended the use of denture adhesives, while another study showed that 80.3% of dental practitioners recommended the same. (Mantri et al., 2014; Polyzois et al., 2017) These results are in accordance with the present study. In a study

conducted by Temel et al, it was reported that 81.2% of all respondents felt that the DAs may create problems with the oral mucosa. (Temel, 2007) In a study conducted by Polyzois et al, most (93.8%) of them recommended cream form whereas in the present study powder form was used most commonly (74%) (Polyzois et al., 2017).

Figure 7: Bar graph depicts the association between year of study of the participants and perspective on denture retention in upper arch using denture adhesives. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a response of yes(green), while many third years answered no (blue) . Chi square test was done and p value was found to be 0.000 hence statistically significant.
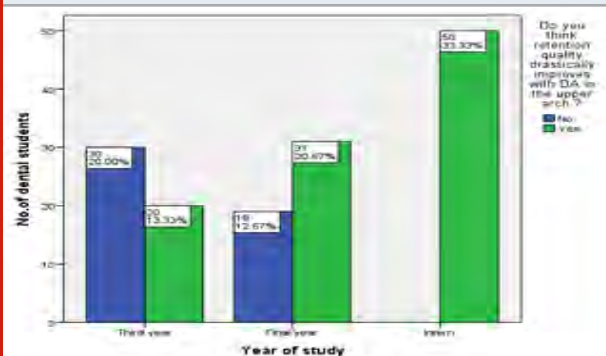
Figure 8: Bar graph depicts the association between year of study of the participants and perspective on denture retention in lower arch using denture adhesives. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a response of yes(green). Chi square test was done and p value was found to be 0.000 hence statistically significant.
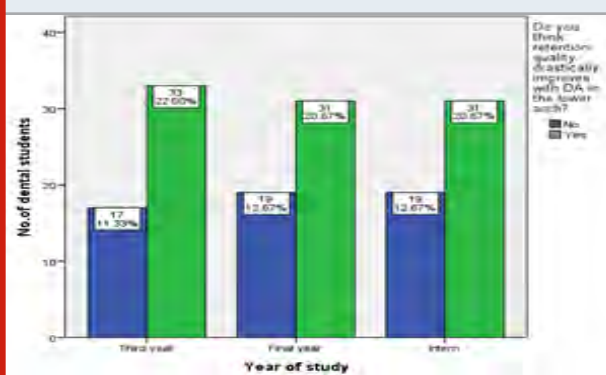
In a similar survey by Coates et al, 57.9% had tried powder adhesive and 42.1% had tried paste adhesive (Coates, 2000)In the current study , 72% of the students use denture adhesive which is well above the percentage recorded by Temel and mantri (Temel, 2007; Mantri et al., 2014). From the 318 denture adhesives users in a study conducted by Bo et al, 212(66.7%) used cream; 74(23.3%) used home liner; 25(7.9%) used powder; 4(1.3%) used sheet; 3(0.9%) used several types (Bo et al., no date) .

57.21% of dentists used DAs as they improved fitness and 77.83% felt it provided a psychological comfort to the patient in a study conducted by Shah et al.\ (Shah et al., 2015). Similar results were obtained in the present study.

Figure 9: Bar graph depicts the association between year of study of the participants and awareness on patients complaining of loss of retention. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a response of no (blue). Chi square test was done and p value was found to be 0.000 hence statistically significant.
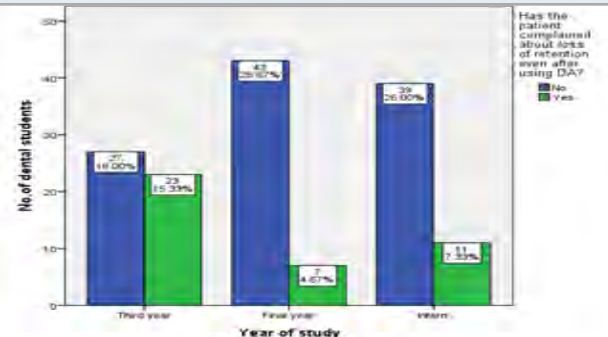
Figure 10: Bar graph depicts the association between the year of study of the participants and knowledge of patient reporting with change in comfortability with different types of DA. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a response of no (blue) . Chi square test was done and p value was found to be 0.001 hence statistically significant.
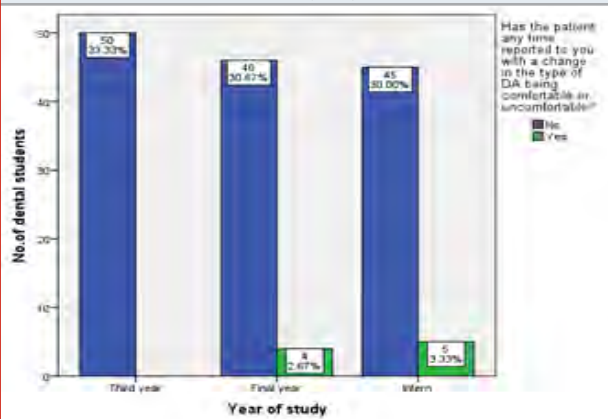
In our study it was found that the majority of the students felt that the retention of the prosthesis in the upper and lower was improved drastically when a denture adhesive was used. Very few students had complaints from patients for retention even after the use of DA in the present study similar results were obtained by (Coates, 2000). In our study, only 36.7% of students had patients who had been denture wearers for a very long time. While Coates stated that 54.9% of the patients wore denture for 10 years or more and 17.8% had prosthesis for more

than 20 years which is not in accordance with the present study. (Coates, 2000)

It is also important to note that patients should be educated about the importance of regular 'recall appointments' for the evaluation of the condition of denture and its foundation. These considerations are particularly important for patients employing DA because the use of products such as these can modify or eliminate customary cues for returning to the dental office.

Figure 11: Bar graph depicts the association between the year of study of the participants and knowledge of any patient using DA for a very long time. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a no (blue) . Chi square test was done and p value was found to be 0.084 hence statistically significant.
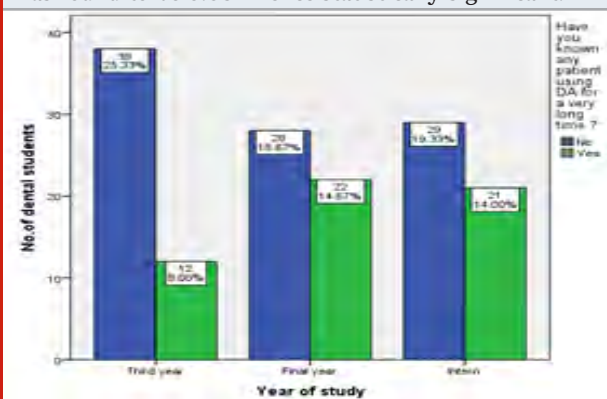
Figure 12: Bar graph depicts the association between the year of study of the participants and knowledge on retention with different types of DA. X axis denotes the year of study of participants and Y axis denotes the number of students. Majority of the participants have given a response of no (blue) . Chi square test was done and p value was found to be 0.001 hence statistically significant.
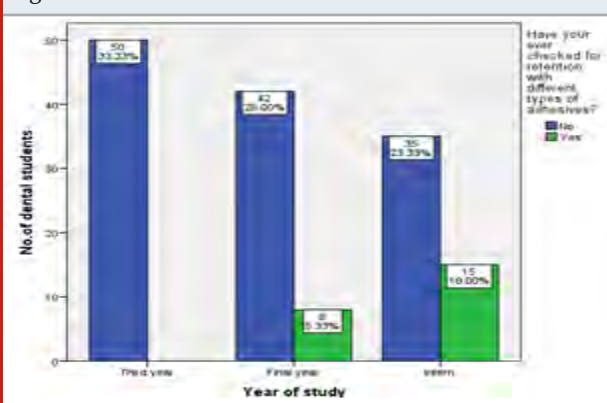
CONCLUSION

Within the limitations of the study, it has been studied that most of the undergraduate dental students were aware of the denture adhesives that are being used although majority of the students were not aware of the different types or application modes of denture adhesives. While denture adhesives are not intended to be an enhancer for ill-fitting dentures, its use largely impacts the comfort level of the patient. Denture adhesive in powder form was the most commonly used and operators felt in both arches use of denture adhesives increases denture retention qualities. Further clinical studies can be done to know the dentist or user experience with different forms of denture adhesives.

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Estimation of Salivary Flow Rate in Uncontrolled Diabetic Patients and Prediabetic Patients – A Hospital Based Study

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ABSTRACT

Diabetes Mellitus is a disease that occurs when the blood glucose is too high. Saliva is a most valuable oral fluid. It is essential for alimentation, remineralization. of teeth, and the pharyngeal disorders and requires early diagnosis protection and lubrication of oral mucosal tissues. An unstimulated whole saliva flow rate in a normal person is 0.3–0.5 ml per minute, and below 0.1 ml per minute is significantly abnormal. The aim of the study is to estimate the salivary flow rate between prediabetic and uncontrolled diabetic patients. The subjects are asked not to eat or drink 30 minutes prior to beginning the collection of the saliva sample after swallowing all saliva they are asked to accumulate new saliva and discharge into the tube for every 60 seconds for a period of 5minutes. The saliva sample was collected from 25 Pre diabetic patients ranging from (80 to 130mg/dl) and 25 uncontrolled diabetic patients ranging more than 250mg/dl. The samples were selected from saveetha dental college. The collected in the graduated disposable syringe of 3ml and the reading was noted and analysed statistically. The salivary flow rate for uncontrolled diabetic patients is less than pre-diabetic patients. Salivary flow is required for normal metabolism. It gives protection to the oral cavity.

KEY WORDS: SALIVARY FLOW, PREDIABETIC, UNCONTROLLED DIABETIC, SALIVARY RATE.

INTRODUCTION

Diabetes Mellitus is a disease that happens when the blood sugar is just too high. Blood sugar is the main source of energy and comes from the food you eat.

Insulin, a hormone made by the pancreas, helps glucose from food get into the cells to be used for energy (Asfandiyarova, 2015). It is a widespread metabolic disease-causing well-documented deleterious effects on the overall health of a private(Bikbov and Surkova, 2016). Multiple epidemiologic studies have suggested that diabetes may be a risk factor for the event of oral diseases in humans. Diabetes is perhaps the foremost frequent metabolic disease with the salivary implication(Keen, 2008). Type 2 diabetes currently affects 250 million people worldwide, and about 300 million people with

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borderline diabetes are at increased risk of type 2 diabetes(Molitvoslovova and Galstyan, 2013). Diabetes mellitus may be a complex multisystem disorder characterized by relative or absolute insufficiency of insulin secretion and/or concomitant resistance to the metabolic action of insulin on track tissues (Galloway, Potvin and Shuman, 1988).

The abundant oral manifestations seen in DM make it likely for dentists to return in touch with a big number of diabetic patients(LeRoith, Taylor and Olefsky, 2004). It's estimated that around the turn of the century, there have been 40 million diabetics in India. Oral fluid or whole saliva may be a complex chemical of teeth and oral soft tissues, consisting mainly of water, essential electrolytes, glycoproteins, antimicrobial enzymes, and various other important constituents like glucose and amylase(Lee, Jung and Choi, 2020).

DM has been consistently documented to be related to altered salivary composition and performance. This disrupts the homeostasis of the mouth, making it vulnerable to various oral alignments(Jongerius, van Limbeek and Rotteveel, 2004). Oral physicians hold the responsibility of recognizing significant associations between certain oral anomalies(Syrjälä et al., 2011). Saliva may be the most precious oral fluid that is always taken without any consideration. it's critical to the preservation and maintenance of oral health, yet it receives little attention until quantity or quality is diminished(Hegde, 2016). Consequently, it's necessary for clinicians to possess an honest knowledge domain concerning the tradition of salivary flow and performance. Medical complications related to diabetes include renal disease, retinopathy, neuropathy, peripheral vascular disease, and a coronary heart condition(Norasettkul, Gonlachanvit and Patcharatrakul, 2017). Several factors may account for the poor correlation between blood and saliva glucose concentrations prevailing in diabetic subjects.

They include oral retention of alimentary carbohydrates, glucose utilization by oral bacteria, the release of carbohydrates from salivary glycoproteins, and contamination of saliva by an outsized outflow of crevicular fluid in patients with a poor gingival status(Dawes and Watanabe, 1987). Type 1 diabetes results from the pancreas' failure to supply enough insulin thanks to the loss of beta cells. This type was previously mentioned as "insulin-dependent diabetes mellitus" (IDDM) or "juvenile diabetes". The loss of beta cells is caused by an autoimmune response(Shalal, no date). The explanation for this autoimmune response is unknown.Type 2 diabetes begins with insulin resistance, a condition during which cells fail to reply to insulin properly. because the disease progresses, a scarcity of insulin can also develop. This form was previously mentioned as "non-insulin-dependent diabetes mellitus" (NIDDM).

The foremost common cause may be a combination of excessive weight and insufficient exercise(Habibe et al., 2020).Hyperglycemia and a few disturbances in the antioxidant system cause free radicals production and oxidative stress. They reduce hyperglycemia by increasing urinary glucose excretion and exert favorable effects beyond glucose control with consistent weight, vital signs, and serum acid reductions(Garrett, Ekström and Anderson, 1998). DM may be a complex multisystem disorder characterized by relative or absolute insufficiency of insulin secretion and/or concomitant resistance to the metabolic action of insulin on track tissues(Babiker et al., 2020). The abundant oral manifestations seen in DM make it likely for dentists to return in touch with a big number of diabetic patients. It's estimated that around the turn of the century, there have been 40 million diabetics in India, and worldwide, the prevalence of diabetes is assumed to have doubled between 1994 and 2017, with about 240 million people now affected by the disease(Zerbe, Vinicor and Robertson, 1979).

Saliva is important for alimentation, remineralization of teeth, and the pharyngeal disorders and requires early diagnosis protection and lubrication of oral mucosal tissues, and intervention(Metz, Nice and LaPlaca, 1967). Large variability in salivary flow diminished output can have deleterious effects on oral and systemic health rates within and between individuals has been reported. Saliva consists of organic, inorganic, and macromolecules. Calcium and phosphate ions are both involved in calculus formation and in protecting against caries(Zarif and Norris, 2014). Salivary proteins have protective antimicrobial, lubricative and digestive functions, which give a barrier between toxins and oral soft tissues and modulate salivary calcium and phosphate chemistry. Amylase is related to digestive function and, to a particular extent, it's going to play a task in modulating the adhesion of bacterial species to the teeth(Erismis, 2016).

MATERIAL AND METHODS

Sample collection: The saliva sample was collected from 25 Pre diabetic patients whose blood glucose levels range from (80 to 130mg/dl) and 25 uncontrolled diabetic patients whose blood glucose levels range more than 250mg/dl. The subjects were selected from Saveetha Dental College and Hospital in the month of November 2019.The subjects are asked to wait for 30 minutes after eating, drinking, smoking before beginning the collection of the saliva sample. The participants were requested to rest for 5 minutes with eyes open without stimulating saliva. Before collection, they are asked to rinse their mouth with water. After swallowing all saliva they are asked to accumulate new saliva and discharge into the tube every 60 seconds for a period of 5 minutes (figure 1).

Inclusion Criteria: Selection criteria include the diabetic patients who visited Saveetha dental college and were willing to participate in the study. Patients' blood glucose level range from (80-130mg/dl) and more than 250mg/dl level were included in the study. The age limit included in this study was 20-60 years.

Exclusion Criteria: Diabetic patients who were not willing to participate were excluded from this study. Patients with normal blood glucose level and the blood glucose level from 130-240mg/dl were not included in this study. Age less than 20 years and more than 60 years were not included in this study.

Sampling method: Sampling method used in this study to select the study population is the Random sampling method.

Data Collection and Tabulation: The collected saliva is measured by collecting it in a graduated disposable syringe of 3ml and the reading was noted. The amount of saliva in ml divided by time in duration was recorded as mean salivary flow rate. This method is more specific than the traditional method. The salivary flow rate of the patient was entered into the excel sheets and then tabulation of the data was done finally and the question comparison was done. The representation of the data is through the bar graph.

Statistical Analysis: The statistical software used IBM SPSS V22.The statistical tests used were descriptive analysis and unpaired T -test . Significant p value was set at <0.05.

Figure 1: Represents the sample of saliva collection from the patient.

RESULT AND DISCUSSION

From table 1, it is seen that Prediabetic patients have a minimum range of salivary flow which is 1.2ml and the maximum range of salivary flow is 2ml. Their mean rate is 1.6 and the standard deviation is 0.5, whose blood glucose level ranges from 95mg/dl to134mg/dl their

mean is 113.68mg/dl and the standard deviation is 9.56. For uncontrolled diabetes the salivary flow rate ranges from 0.2 to 1.9 their mean value is 1.36 and the standard deviation is 0.49, whose blood glucose level ranges from 250mg/dl to 430mg/dl their mean value is 315 mg/dl and the standard deviation is 55.91. The salivary flow rate for uncontrolled diabetes is less than prediabetic patients. This may be due to the intake of medication.

Figure 2: Pie chart represents the age distribution of the diabetic patients. 34% participants were 20-40 years old , 30% participants were 30-40 years old, 24% participants were 40-50 years old.12% participants were 50-60 years old.
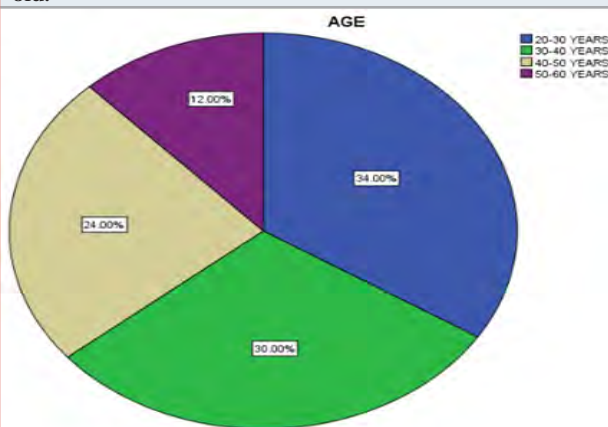
Table 1. Shows the statistical value for the salivary flow rate of prediabetic and uncontrolled diabetic patients.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
PREDIABETIC	25	1.60	.500	.100
UNCONTROLLEDDIABETIC	25	1.36	.490	.098

Table 2. Represents the unpaired T-test for salivary flow rate for prediabetic patient and uncontrolled diabetic patients. It was found that Prediabetic patients have greater value than uncontrolled diabetic patients and the difference was also significant statistically. (p-value <0.05).

One-Sample Test

					Test Value = 0	
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
PREDIABETIC	16.000	24	.000	1.600	1.39	1.81
UNCONTROLLEDDIABETIC	13.880	24	.000	1.360	1.16	1.56

Diabetes mellitus is a common chronic metabolic disease with numerous oral and systemic manifestations. The flow of saliva eliminates the carbohydrates which could be metabolized by the bacteria hence the acid produced by the bacteria is removed(Berra et al., 2020). This collaborative oral health study provides comprehensive data for an extremely large cohort of subjects with type 1 diabetes. Because accurate information with respect to medical status, glycemic control, and diagnoses of medical complications was available, analyses of multiple complications and confounding factors as possible(Gerstein and Brian Haynes, 2001). Findings from this cross-sectional oral health assessment are useful for generating hypotheses relating to the causes of xerostomia and hyposalivation, which have been reported for diabetes.

Figure 3: Bar graph shows the association between the salivary flow rate between prediabetic patients and uncontrolled diabetic patients. X axis denotes the diabetic patients and Y axis denotes the salivary flow rate. Majority of the uncontrolled diabetic patients have low salivary flow rate than the prediabetic patients. The difference was also significant statistically. [Unpaired t test P value 0.000(<0.05)]
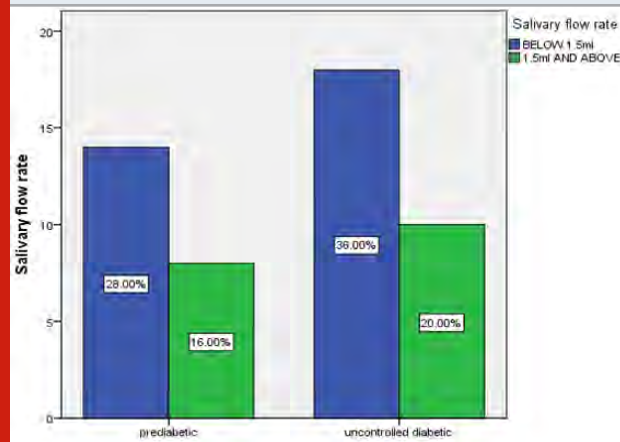
Conclusions made on the basis of this study may not apply to all diabetic populations and may be different if subjects with type 2 diabetes are studied(Rubin, 2009). Oral complications known to be associated with type 1 diabetes include tooth loss, periodontal disease, and a variety of candidal-related soft Significant to our study was that the self-report of salivary impairment and the measured hyposalivation were most related to the diabetic complication of neuropathy. The stimulation of salivary flow is controlled through both sympathetic and parasympathetic innervation(Wright, 2013).

EDC data were available for autonomic and peripheral neuropathy in this type 1 diabetes cohort. These 2 measures were found to be closely related, with 70% of the subjects with autonomic neuropathy also having a diagnosis of peripheral neuropathy.45 Although both measures of neuropathy were entered into the regression

analyses, peripheral neuropathy significantly reduced the flow of the whole saliva observed in the poorly controlled subjects in the present study confirmed the results of previous investigators (Marlow, 2012). Several factors may have caused a decreased flow of saliva in diabetics in poor control. Glucosuria caused by even mild hyperglycemia leads to elevated fluid loss and dehydration which may diminish salivary gland output(Cimperman, 2013).

A systematic review of previously published studies reflects the fact that salivary glucose concentration increases in type 2 DM and a positive correlation exists between blood glucose and salivary glucose; hence, it can be a useful biomarker to monitor type 2 DM.(Challem, 2011). Microvascular alterations in the blood vessels that are commonly seen in type 2 diabetics could also contribute to increased salivary glucose levels(Becker, 2004). Saliva samples collected in the study represented the whole mouth fluid, and therefore, reflect glucose levels due to leakage across the basement membrane of major and minor salivary glands and also from the gingival crevicular fluid. Furthermore, it has been proposed by Belazi that it leads to enhanced leakage of serum components including glucose into the gingival crevicular fluid rather than into saliva due to the basement membrane alterations.

The decrease in the unstimulated whole salivary flow rate in type 2 diabetics is in accordance with previous studies(Samuel 2017). Type 2 DM is known to affect the sympathetic and parasympathetic nervous system of the salivary glands, resulting in decreased salivary secretion, microangiopathy, dehydration, and hormonal changes, which may contribute to the decrease in the salivary flow rate. However, few authors were not ready to establish a significant difference in salivary flow rates between type 2 DM and healthy controls. We found a significant difference in the salivary pH between the type 2 DM patients and control (P < 0.01), which was similar to other studies. Salivary parameters are altered by metabolic, nutritional, and neurological abnormalities, the hydration status of a person and by drugs like anticholinergics, diuretics, antihistamines, antihypertensives, etc. Limitations of this study is not included the medication history, hydration level and other associated diseases which reduce the salivary flow rate like vitamin A deficiency. Future studies may be done with inclusion of the limitations of our study.

CONCLUSION

Within the limitations of the study, we conclude that the salivary flow rate for uncontrolled diabetic patients is less than pre-diabetic patients. Salivary flow is required for normal metabolism. It gives protection to the oral cavity. Saliva is an easily available fluid in the human body which plays a major role in our body. The less salivary flow may be due to medication taken by diabetes patients.

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Assessment of Apical Foramen Position and Morphology in Maxillary Incisors Among South Indian Population: an in Vitro Study

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ABSTRACT

The aim of the study was to assess the apical foramen position and morphology in maxillary incisors in the south Indian population. This was an in vitro, experimental study in which 100 human permanent maxillary anterior teeth extracted for periodontal reasons from various patients in Chennai, India were studied. The extracted teeth consisted of 50 central incisors and 50 lateral incisors. All the specimens were observed under 3X magnification to assess the position and morphology of apical foramen.In the maxillary central incisors, the apical foramen was present in the range between 0.00 to 0.20mm from the root apex in66%, 0.20 to 0.40mm in 12%, 0.40 to 0.60mm in 8%, 0.60 to 0.80mm from the root apex in 14% of the teeth. In the lateral incisors the apical foramen was present in the range between 0.00 to 0.20mm from the root apex in 60%, 0.20 to 0.40mm in 4%, 0.40 to 0.60mm in 20%, 0.60 to 0.80mm in 8%, 0.80 to 1.00mm from the root apex in 8% of the teeth. The shape of the apical foramen in maxillary central incisors was round (76%), oval (16%) and irregular (8%). In lateral incisors the apical foramen shape was round (78%), oval (14%), irregular (6%), and elliptical (2%). Chi-square test was performed to see the association between the distance of the apical foramen from the root apex and variation in the shape of the apical foramen from the root in maxillary central and lateral incisors. The results obtained were statistically significant with the p-value of 0.00 for both. In most cases in the maxillary incisor teeth the apical foramen coincided with the anatomic apex. The most common shape of the apical foramen was observed to be round shape. There is also a statistical significance present between the shape of the apical foramen and the distance of the apical foramen from the root apex in both maxillary central and lateral incisors.

KEY WORDS: APICAL FORAMEN POSITION, APICAL FORAMEN MORPHOLOGY, ROOT APEX, APICAL CONSTRICTION.

INTRODUCTION

For a successful endodontic treatment to be carried out a thorough knowledge about the root canal anatomy and the apical region of the root is necessary. The apical region of the tooth comprises significant landmarks which marks the extent for root canal instrumentation and filling. Earlier studies regarding the root canal anatomy are most commonly reported fromAmerican, Ugandan, Turkish, Sudanese, Caucasian, Srilankan, and Chinese population (Grove, 1926). Starting from the Caucasians to the Africans and Asians, the patterns of root canal system follow a racial characteristic making endodontic management extremely challenging to the clinical practitioners (Zaatar et al., 1997) Various

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methods to investigate the root canal anatomy have been identified.

The terminal portion of a tooth root exhibits four distinct landmarks; the apical constriction(AC), apical foramen (AF), roots apex (anatomic and radiographic), and cement junction (CDJ). AF is an important anatomical landmark which is the major apical opening of the root canal (Simon, 1994).The anatomic apex (AA) is the root end that is identified morphologically (Akers, 2010)Deviation of AF from the root apex is common, with a reported frequency of 17%–100% (Martos et al., 2009).

Review of literature showed that studies pertaining to root canal morphology of maxillary anterior teeth among Indian population is very limited. On the contrary, root canal anatomy of premolars and molars in Indian population has been extensively investigated. Further studies pertaining to root apical anatomy were even limited. Literature review reveals that the AF of maxillary and mandibular canines in Indian population exhibited variations in their locations and on average AC was 0.89 mm coronal to AA (Amardeep, Raghu and Natanasabapathy, 2014) (Dummer, McGinn and Rees, 1984).

We have numerous highly cited publications on well designed clinical trials and lab studies (Govindaraju, Neelakantan and Gutmann, 2017; Azeem and Sureshbabu, 2018; Jenarthanan and Subbarao, 2018; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Teja, Ramesh and Priya, 2018; Janani and Sandhya, 2019; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Poorni, Srinivasan and Nivedhitha, 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique and Nivedhitha, 2019; Siddique et al., 2019; Siddique, Nivedhitha and Jacob, 2019). This has provided the right platforms for us to pursue the current study. The aim of the study was to assess apical foramen position and morphology in maxillary incisors among south Indian population.

MATERIAL AND METHODS

This was an in vitro, experimental study in which 100 human permanent maxillary anterior teeth extracted for periodontal reasons from various patients in Chennai, India were studied. The extracted teeth consisted of 50 central incisors and 50 lateral incisors. Teeth with deep caries, cracks, fracture, incompletely formed root apices and those with root canal fillings were excluded from the study. All teeth were cleaned free of attached calculus and soft tissue using ultrasonic scalers and curette and were then preserved in 10% formalin until use.The storage and handling of the teeth were performed as per the centers for disease control and prevention guidelines and regulation. All the specimens were numbered from 1 to 50 for the central incisors and from 51 to 100 for the lateral incisors. All the specimens were then subjected to manual observation with the naked eye followed by observation under a SLR camera (model: Nikon D3500) at

3X magnification to assess the position and morphology of apical foramen. Photographs were taken of each specimen. A Vernier caliper was used to measure the distance of the AF from the AA. The values obtained were calculated. Descriptive statistical analysis was done.

Graph 1: Bar graph shows the distribution of distance of the apical foramen from the root apex in maxillary central incisors (X-axis represents distance in mm , Y-axis represents the number of teeth). It was noted that the most common distance present in maxillary central incisors was between 0.00-0.20 mm(66.66%).
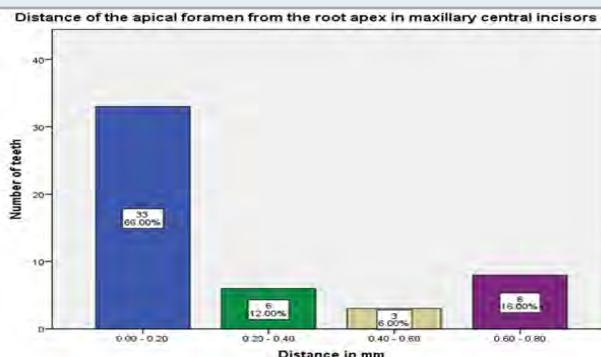
Graph 2: Bar graph shows the distribution of distance of the apical foramen from the root apex in maxillary lateral incisors (X-axis represents distance in mm , Y-axis represents the number of teeth). It was noted that the most common distance present in maxillary lateral incisors was between 0.00-0.20 mm(60.00%).
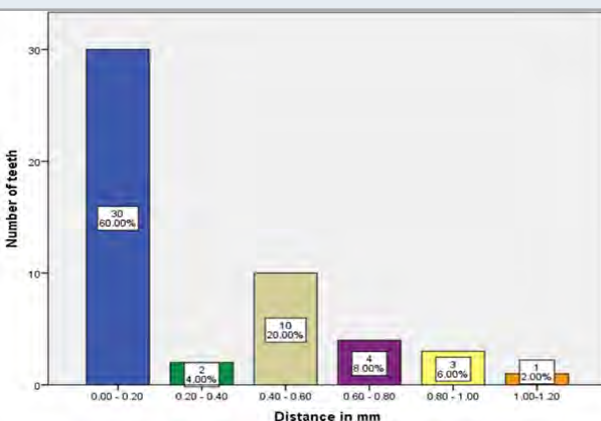
RESULTS AND DISCUSSION

In the maxillary central incisors, the apical foramen was present in the range between 0.00 to 0.20mm from the root apex in 66%, 0.20 to 0.40mm in 12%, 0.40 to 0.60mm in 8%, 0.60 to 0.80mm from the root apex in 14% of the teeth. In the lateral incisors the apical foramen was present in the range between 0.00 to 0.20mm from the root apex in 60%, 0.20 to 0.40mm in 4%, 0.40 to 0.60mm in 20%, 0.60 to 0.80mm in 8%, 0.80 to 1.00mm from the root apex in 8% of the teeth. The shape of the apical foramen in maxillary central incisors was round (76%), oval (16%) and irregular (8%). In lateral incisors

the apical foramen shape was round (78%), oval (14%), irregular (6%), and elliptical (2%). (Graph 1,2,3,4, Figure 1,2). Chi-square test was performed to see the association between the distance of the apical foramen from the root apex and variation in the shape of the apical foramen from the root in maxillary central and lateral incisors. The results obtained was statistically significant with the p-value of 0.00 for both (Graph 5,6)

Graph 3: Bar graph shows variation in the shape of the apical foramen from the root in maxillary central incisors (X-axis represents shape variation, Y-axis represents the number of teeth). It was noted that the most common shape variation in maxillary central incisors was round (76.00%).
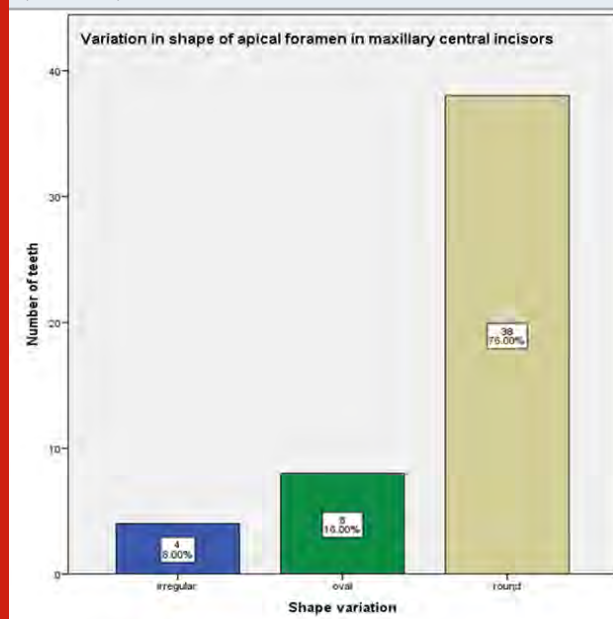
Graph 4: Bar graph shows variation in the shape of the apical foramen from the root in maxillary lateral incisors (X-axis represents shape variation, Y-axis represents the number of teeth). It was noted that the most common shape variation in maxillary lateral incisors was round (78.00%).
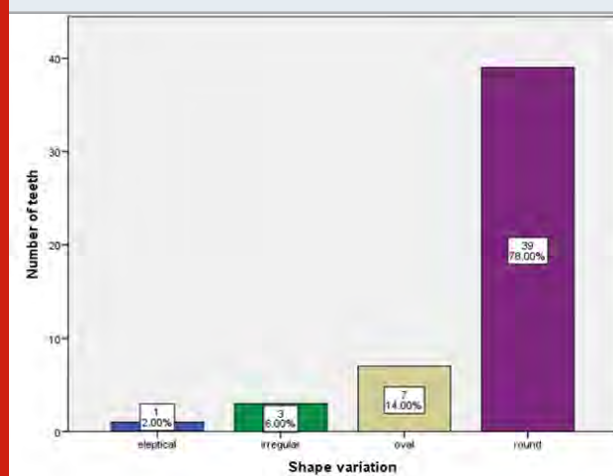
Graph 5: Bar graph shows the association between the distance of the apical foramen from the root apex and variation in the shape of the apical foramen from the root in maxillary central incisors (X-axis distance in mm, Y-axis represents variation of shape of social foramen). It was noted that the most common shape present between the distance of 0.00-0.20 was round, most common shape present between the distance of 0.20-0.40 was oval, most common shape present between the distance of 0.40-0.60 was round and most common shape present between the distance of 0.60-0.80 was irregular and oval. Chi-square test was done and p-value was 0.00(p=<0.05) hence statistically significant proving that there is an association present between shape of the apical foramen and distance of the apical foramen from the root apex in maxillary central incisors
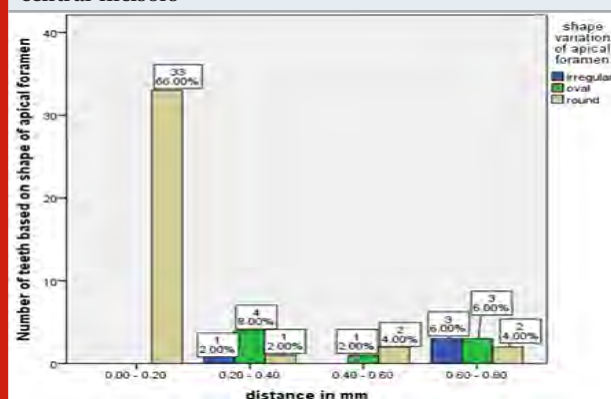
The morphology of root canal anatomy constituting apical exit of the canal, apical deltas, lateral canals, intercanal anastomosis, and canal designs with their complexities itself, provide conducive environments for microbial colonization resulting in periapical infections. Successful elimination of these microbes and debris from these complexities plays a major influence in the treatment outcome(Vertucci, 2005). It becomes the responsibility of the endodontist to disinfect the canal of these microbes. Hence, a proper knowledge of the root canal anatomy and apical root anatomy will only facilitate the clinicians to achieve this goal, thereby resulting in a drastic reduction in posttreatment failure rates.

As mentioned by a study conducted by Ghasemi et al., the complexity of the root canal system is influenced by genetics, and this factor should always be considered before interpreting and comparing the results of various other morphological studies(Ghasemi et al., 2017). Numerous techniques have been used for assessing the presence of apical and lateral foramina in extracted teeth such as sectioning of teeth, infiltration of the root canal system with dyes, radiographic techniques, scanning electron microscopy, and dental computerized tomography(Chapman, 1969) (Kartal and Yanıko lu, 1992; Gutierrez and Aguayo, 1995; Scarfe, Fana and Farman, 1995).

Graph 6: Bar graph shows the association between the distance of the apical foramen from the root apex in maxillary lateral incisors and variation in the shape of the apical foramen from the root in maxillary lateral incisors (X-axis distance in mm, Y-axis represents variation of shape of social foramen). It was noted that the most common shape present between the distance of 0.00-0.20 mm was round, most common shape present between the distance of 0.20-0.40 mm was round, most common shape present between the distance of 0.40-0.60 mm was round, most common shape present between the distance of 0.60-0.80 mm was irregular and oval, most common shape present between the distance of 0.80-1.00 mm was irregular and most common shape present between the distance of 0.60-1.00 mm was elliptical. Chi-square test was done and p-value was 0.00(p=<0.05) hence statistically significant proving that there is an association present between shape of the apical foramen and distance of the apical foramen from the root apex in maxillary lateral incisors
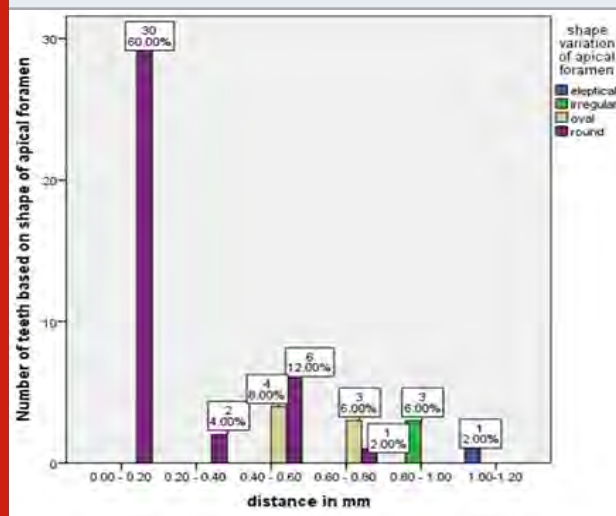
Figure 1: Maxillary central incisor apical foramen having (a) round shape, (b) oval shape, (c) irregular shape

Figure 1a   Figure 1b   Figure 1c

Figure 2: Maxillary lateral incisor apical foramen having (a) round shape, (b) oval shape, (c) irregular shape, (d) elliptical shape

Figure 2a   Figure 2b   Figure 2c   Figure 2d

Other methods employed for assessing the root canal anatomy in extracted teeth include contrast medium-enhanced radiographic techniques, modified canal staining and clearing technique and surgical operating microscopy (Altman et al., 1970; Fan et al., 2008; Weng et al., 2009)

In the present population studied, the position of AF in maxillary anterior teeth was determined with the aid of an SLR camera. SLR cameras emerge as a tool that offers many benefits such as, magnification and aids with proper documentation. The usage of documentation for medico-legal, insurance, patient communication, and lecturing purposes, as well as for communication with staff or colleagues, is also a major benefit. In the present study the position of the apical foramen coincided with the root apex in 66% of the cases in the maxillary central incisors. In case of the lateral incisors the apical foramen coincided with root apex in 60% of the cases.

This was in accordance with a study conducted by Martos et al in the Brazilian population, where the location of the major foramen was in the center of the root apex in 58.4% of specimens(Martos et al., 2010)The results of the study conducted by Teo et al.in a population in Singapore showed 54.3 percent with the foramen coincident with the root apex in maxillary anterior which was also consistent with the results obtained from this study. The deviation of the apical foramen from anatomical apex was 60.25% in the frontal teeth in a study conducted by Martic et al which was in contradiction with the result from this study. Studies have reported that only 1%–5% of maxillary central incisors had their AF at a distance of >1 mm from the apex of the root, whereas a higher frequency of AF deviation in posterior teeth has been observed which was consistent with our study as well (Marti et al., 1998)

The morphology of the apical foramen showed a predominance of the rounded shape followed by the oval shape in a study conducted by Martos et al. which was consistent with our study was well(Martos et al., 2009) Conducting this study will help with improving and modifying the endodontic procedure according to the population. Being aware of the variations in the apical foramen shape helps us to determine the type of obturating material that can generally be used for a good apical seal.

CONCLUSION

From the results obtained the apical foramen was found to be in the range between 0.00 to 0.20mm from the root apex in most of the cases of the maxillary central incisors and maxillary lateral incisor. Most common apical foramen shape was found to be round in maxillary central incisor and maxillary lateral incisor. There is also a statistical significance present between the shape of the apical foramen and the distance of the apical foramen from the root apex in both maxillary central and lateral incisors.

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Assessment of pH of Calcium Silicate Based Root Canal Sealers at Various Time Periods – an In Vitro Study

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ABSTRACT

Calcium silicate sealers otherwise known as the bioceramic sealers were introduced into dentistry as an alternative root canal sealer. This material originally came from the combination of calcium silicate and calcium phosphate. Calcium phosphate enhances the setting properties resulting in a chemical composition and crystalline structure similar to tooth and bone apatite materials, thereby improving the sealer to root-dentin bonding. Comparison of the physicochemical and biological properties of bio ceramic sealers with the conventional sealers reveals that the calcium silicate based sealers are similar or better. Therefore, the aim of this study is to assess the pH of calcium silicate based root canal sealer at various time periods. Commercial brand of calcium silicate sealer [Bioroot RCS, Septodont] was used for this study. To determine pH, 3 samples were prepared and introduced into polyethylene tubes. Each sample was placed in a tube containing 10ml of distilled water and stored at 37degree C. pH assessment was performed after 1hr, 3hr, 24hr, 48hr, 120hr, 168hr, 192hrs, 28 days after immersion. The samples were assessed for pH using the digital pH meter. The control for the method was based on the reading of pH values of distilled water in which no samples were immersed. Descriptive analysis of the values was performed. The pH of calcium silicate based root canal sealer at various time periods was 11.1 at 1hr, 11.5 at 3hrs, 11.9 at 24hrs, 11.9 at 48hrs, 12.3 at 120hrs, 12.2 at 168hrs, 12.0 at 192hrs, 11.9 at 28 days. The pH of the distilled water in which no samples were immersed was found to be 7.04. Bioroot RCS calcium silicate based sealer had alkaline pH. High alkaline pH of the sealer assumes particular importance because it enhances the deposition of hard tissue, improving the antibacterial properties by the release of calcium ions. Clinical trials and long term follow up studies would be highly valuable to evaluate the bio ceramic sealer's clinical performance.

KEY WORDS: BIO CERAMIC SEALERS, CALCIUM SILICATE, PH, TIME PERIODS, ALKALINITY.

INTRODUCTION

Endodontic sealers are used to attain a fluid-proof seal throughout the root canal system. An ideal root canal sealer should offer an excellent seal when set, dimensional stability, a sufficient setting time to ensure working time, insolubility against tissue fluids, proper adhesion with canal walls, and biocompatibility. (Lee et al., 2017) The commercially available sealers are categorized as zinc-oxide eugenol, calcium hydroxide containing, resin-based, glass-ionomer based, silicone-based, and bio ceramic-based sealers.

Calcium silicate-based sealers are usually known as bio ceramic sealers and introduced to dentistry as an alternative endodontic sealer. This material originally

came from a combination of calcium silicate and calcium phosphate. Calcium phosphate enhances the setting properties of bioceramic sealers resulting in a chemical composition and crystalline structure similar to the tooth and bone apatite materials, thereby improving sealer-to-root dentin bonding. (Mendes et al., 2018).

Root end filling materials should possess certain properties such as their own good sealing ability, improve the seal of existing root canal filling material, and should be biocompatible with the periradicular tissues. The root end filling material should also have the ability to increase the pH and release of calcium ions (Ca++) as it leads to mineralized tissue formation. (Kumari et al., 2018)

Calcium based sealers were used due to their antimicrobial activity owing to their Ca++ releasing potential. These sealers have been popularly used because of their potential for providing a high alkaline environment. The use of these materials highly aids in mineralization of hard tissue and provides good antimicrobial activity. (Shashank et al., 2019) Alka¬line pH could neutralize the lactic acid from osteoclasts and prevent dissolution of minera¬lized components of teeth. (Poggio et al., 2017)

We have numerous highly cited publications on well designed clinical trials and lab studies (Govindaraju, Neelakantan and Gutmann, 2017; Azeem and Sureshbabu, 2018; Jenarthanan and Subbarao, 2018; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Teja, Ramesh and Priya, 2018; Janani and Sandhya, 2019; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Poorni, Srinivasan and Nivedhitha, 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique and Nivedhitha, 2019; Siddique et al., 2019; Siddique, Nivedhitha and Jacob, 2019). This has provided the right platforms for us to pursue the current study. Therefore, this study aims at the assessment of pH of a calcium silicate based root canal sealers [Bioroot RCS Septodont] at various time periods.

MATERIAL AND METHODS

One commercial brand of bio ceramic sealer [Bioroot RCS Septodont] was tested. To determine the pH of calcium silicate based root canal sealer, 3 samples were prepared. The samples were prepared by mixing the powder and liquid in smooth consistency. The mixed sealer was introduced into the sample of dimensions 1 mm height and 1mm diameter. These samples were placed in a tube containing 10ml of distilled water. One tube containing 10ml of distilled water without any sealer was used as the control. All the samples are placed inside the incubator at 37degree C at the room temperature.

The pH measurements were done after 1hr, 3hr, 24hr, 48hrs, 120hrs, 168hrs and 192hrs, 28 days of immersion. The pH of each sample was measured in a digital pH meter. (Leonardo et al., 2013) The readings were noted and tabulated. [Table 1]

Table 1. This table shows the pH of calcium silicate sealer [Bioroot RCS Septodont] at various time periods.

SAMPLE	pH after 1 hr	pH after 3hr	pH after 24hr	pH after 48hr	pH after 120hr /5 days	pH after 168hr /7 days	pH after 192hr /8days	pH after 28 days
DISTILLED WATER	6.8	7	7	7	7.2	7.29	7	7
1ST SAMPLE	11.2	11.5	11.9	12	12.4	12.3	12	11.8
2nd SAMPLE	11.1	11.5	11.9	12	12.3	12.2	12	12
3rd SAMPLE	11.1	11.6	11.9	11.9	12.3	12.2	12	12

RESULTS AND DISCUSSION

The pH of the bioceramic root canal sealer used {Bioroot RCS Septodont] at different time periods of 1hr, 3hr, 24hr, 48hr, 120hrs, 168hr, 192hrs, 28 days were noted and tabulated as follows: [Table 1] [Figure 1]

The results revealed that the pH of the calcium silicate based root canal sealer [Bioroot RCS Septodont] was 11.1 at 1hr, 11.5 at 3hrs, 11.9 at 24hrs, 11.9 at 48hrs, 12.3 at 120hrs, 12.2 at 168hrs, 12.0 at 192hrs, 11.9 at 28 days. This shows that the pH constantly increases with the increasing time periods till 5 days. Remains above 12 until 168 hrs. Remains at pH 12 at 192 hrs and 28 days [Table 1, Figure 1].

Bio ceramics are specifically designed for medical and dental use with the prefix 'bio' referring to their biocompatibility. The active bio ceramics and re-absorbable ones are applied in the endodontic field. They are composed of alumina, zirconia, bioactive glass, glass ceramics, coatings, composites, hydroxyapatite, resorbable calcium phosphates and radiotherapy glasses. Calcium silicates and bio-aggregates (Mineral Trioxide Aggregate for example) are used for apical plug in apexification procedures but also for coronal/root repair in case of perforations.

Sterilizing and obtaining a root canal free of bacteria, following disinfection is impossible to obtain. Apart from disinfecting, the obturation plays an important role to trap residual bacteria, fill the pre-disinfected space and

ultimately seal it, in order to avoid any bacterial leakage into the periapical area. Modern techniques for filling the root canals are based on the association of gutta percha (the core of the filling) and a sealer. The latter acts as a sealing material and, because of its fluidity, it is able to spread into any free space, notably those which were not enlarged during the mechanical root canal preparation. (Marchi, Scheire and Simon, 2020).

Figure 1: Figure showing the simple scatter plot of the pH of distilled water and the calcium silicate sealer. Here, X axis shows the time at which pH was assessed and Y axis represents the pH of distilled water (blue line) and the calcium silicate sealer (red line). The pH of the calcium silicate sealer increased gradually with time and remained around 12 after a specified time. Similarly the pH of the distilled water remained around 7 over the time analysed. Chi square analysis showed that the variation in the pH of the distilled water and calcium silicate sealer was statistically not significant [Pearson's chi-square test; p >0.05 - statistically not significant]. Though statistically not significant, this minimal increase in the pH may be clinically significant.
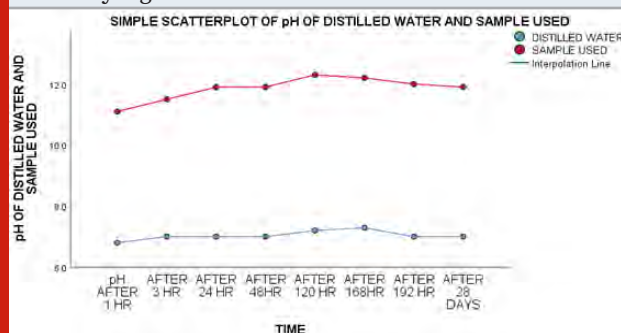
This study evaluated the pH of the calcium silicate sealers at various time periods. The calcium silicate based root canal sealers revealed that the pH increases with increasing time periods after the setting time and there is stable pH after 168hrs of immersion. This high alkaline pH promotes elimination of bacteria such as Enterococcus faecalis that might survive after chemo mechanical preparation and induce or maintain periapical inflammation. The mechanism of repair stimulation by deposition of mineralized tissue depends on pH and on the ability to release Ca2+ and water. (Candeiro et al., 2012).

MTA Fill Apex and AH Plus promoted an alkaline pH when immersed in distilled water, with values ranging from 7.30 to 11.35, which remained high until the end of the experiment. MTA-based cements are rich in calcium ions, which are converted to calcium hydroxide upon contact with the water, and dissociate into calcium and hydroxyl ions, increasing pH of the solution. Thus, the variation in the concentration of calcium hydroxide leads to different pH values. A high pH activates alkaline phosphatase, an enzyme strictly involved in the mineralization process and also neutralizes the acids secreted by osteoclasts,

avoiding the destruction of mineralized tissue. (Borges et al., 2014) (Silva et al., 2003) (Jafari and Jafari, 2017) (Schäfer and Zandbiglari, 2003).

Literature search reveals various reports on the antimicrobial activity of calcium hydroxide based sealers. (Muniti et al., 2019) It is quite familiar that the pH values above 12 inhibit the growth of many microorganisms, including E. faecalis. Limited antibacterial efficacy against E. faecalis for calcium hydroxide based sealers which have pH beyond 12, exhibits the inefficiency of calcium hydroxide based sealers. Extremely high pH value was not sufficient and that apart from it, some other factors also interfere with bacterial growth. (Geetha and Veeraraghavan, 2016) Previous reports showed that BC sealer exhibited an immediate, potent antibacterial effect up to 24 h after setting. However, its antibacterial effect considerably decreased within 3 days and was completely diminished at 7 days. This is in agreement to the result of an in vitro study that reported a short antibacterial action of BC sealer against E. faecalis. (Trisic et al., 2019) (Chotvorrarak et al., 2017)

In the study conducted for the fracture resistance of roots filled with various root canal sealers, the Bioceramic sealers showed the highest fracture resistance. Physicochemical properties of MTA Plus sealer such as calcium ion release, hydration reaction and pH did not change when powder was mixed either with water or gel. (Uzunoglu Ozyurek and Aktemur Turker, 2019) In the study conducted for assessing the biocompatibility, calcium silicate-based sealers showed decreased cell viability by time in fresh media, which might be a result of their high pH in the fresh state. Although the high pH of root canal sealers might have this negative effect on cell viability, it may provide several biological advantages. (Lim et al., 2015) (Lee et al., 2019) (Alsubait et al., 2018) pH of calcium silicate based root canal sealer [Bioroot RCS Septodont] were higher than the other root canal sealers evaluated in the previous studies. (Zhou et al., 2013) (Duarte et al., 2003) However, the high solubility of the calcium silicate sealers needs to be studied further.

CONCLUSION

Within the limitations of this study, pH of the calcium silicate sealer [Bioroot RCS Septodont] was found to be 11.1 at 1hr, 11.5 at 3hrs, 11.9 at 24hrs, 11.9 at 48hrs, 12.3 at 120hrs, 12.2 at 168hrs, 12.0 at 192hrs, 11.9 at 28 days.

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Evaluation of the Inhibitory Potential of Beta Lactam Derivatives Against Bile Salt Hydrolase from Enterococcus Faecalis by In-Silico Approach

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ABSTRACT

Bile Salt Hydrolase (BSH) is a vital protein in *E.faecalis* virulence and recent studies implicate that it can be an alternative target for the beta lactam derivatives to combat the menace of its complications in endodontic infections. The aim of the present study is thus undertaken to evaluate the inhibitory potential of four beta lactam derivatives against the BSH of *E.faecalis*. 3D structure of BSH was retrieved from the PDB data bank with further optimization of both the protein and ligands. In-silico inhibitory potential of the selected beta lactam derivatives against BSH was done by AutoDock 2.0 and was visualized with accelrys studio discoverer with the assessment of the molecular properties of the derivatives against BSH by molinspiration calculations for their drug likeness. Imipenem seems to be the potent inhibitory drug to target BSH with a promising binding energy of –5.54 with nine hydrogen bonds. Drug likeness parameters recorded imipenem as a promising protease and enzyme inhibitor followed by other beta lactam derivatives. The findings of the study emphasize that the beta lactam derivatives show promising interaction with bile salt hydrolase of *E.faecalis*. The findings of the study can thus have promising implications in combating the menace of drug resistance among *E.faecalis* associated with endodontic and other systemic infections with further in-vivo validation targeting the same.

KEY WORDS: BSH, E.FAECALIS, BETA-LACTAMS, AUTO-DOCK, IN-SILICO.

INTRODUCTION

Enterococcus faecalis, a gram positive diplococci, is an opportunistic pathogen commonly observed in oral and other systemic diseases. Pertained to endodontic infections, it has been listed as one among the 25 pathogens (Anderson et al., 2016) that can lead into further complications of the root canal. However, the frequency of the dental and oral manifestations varies with individuals based on oral hygiene, age, gender, comorbidities, geographical distribution and other associated risk factors (Sun et al., 2012). They are capable of causing a variety of infections including endocarditis, sepsis, surgical wound infections, and urinary tract infections (Van Tyne et al., 2013). In recent years, the pathogen has emerged as drug resistant forms due to its drug resistant properties against the routine antimicrobials (Sedgley et al., 2005). Amidst many

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intrinsic and acquired resistance mechanisms, the vital role of bile salt hydrolase (BSH) in inducing tolerance to bile salts, has an altering effect on the action of beta lactam group of drugs.

This is due to the fact that BSH has a unique allosteric catalytic property that can de-conjugate the bile salts and is considered to be evolutionary related to penicillin V acylase (PVA), which is responsible for hydrolysing penicillin V (Chand et al., 2018). It is industrially used in the hydrolysis of penicillin V to produce 6-aminopenicillanic acid (6-APA), which is the precursor molecule for semi-synthetic β-lactam antibiotics (Chandra et al., 2005).In addition, the non-substrate ligand of PVA has a marked modulating and hydrolysing ability on BSH (Chand et al., 2016).

The β-lactam family is the most important class of antibiotics for clinical use as antimicrobial agents and constitute a major part of the global antibiotic market (Rodríguez et al., 2011).Clavulanic acid, thienamycin, cefoxitin, imipenem have shown susceptibility against *E.faecalis* characterized from various clinical specimens, with varying efficacies. Clavulanate, being considered as a potent inhibitor of β-lactamase, shows 80% susceptibility against *E.faecalis* isolated from urinary tract infections (Venkatesan et al., n.d.). Theinamycin, having a broad spectrum activity to several resistant pathogens, shows synergistic activity with other aminoglycosides against *E.faecalis*but lacks in-vivo or in-vitro activity when administered as a single drug (Eliopoulos and Moellering, 1981). Cefoxitin, being active against most bacteria that have become refractory, was not effective against *E.faecalis* (Moellering et al., 1974). Imipenem are broad-spectrum parenteral antibacterial agents that are generally reserved for use as agents of last resort in the treatment of serious nosocomial infections (Karlowsky et al., 2018).Even the extremely broad spectrum drug imipenem shows resistance among vancomycin resistant *E.faecalis* (Ono et al., 2005).

BSH being evolutionarily related to penicillin V hydrolase, it would be a best target to combat the clinical complication of *E.faecalis* infections and its emerging resistance against the penicillin derivatives in an alternate way. The present investigation is thus aimed to assess the potent inhibitory role of four beta lactam derivatives viz., clavulanic acid, thienamycin, cefoxitin and imipenem against BSH by in-silico docking analysis. Thus will aid in the selection of the best beta lactam derivatives targeting BSH of Enterococcus faecalis to treat endodontic and other systemic infections.

METHODS

Retrieval And optimisation of BSH: From the RCSB protein data bank (http://www.rcsb.org/pdb) the crystal structure of Bile salt hydrolase was retrieved for this. For the target optimization the hydrogen atoms were added and using kollman united atoms force field, the electronic charges were assigned to the protein using AutoDock

Tool –1.5.6. RASMOL tool was applied to view the three dimensional structure of BSH.

Preparation and optimization of the ligand: Using Chemsketch Software the structures of the beta lactam derivatives viz., clavulanic acid, thienamycin, cefoxitin, and imipenem were drawn and generation of their 3-D structures and 3D optimization was also done. The selected ligands were further saved in .mol file followed subsequent conversion using open babel molecular converter program and were saved in PDB format.

Molinspiration assessments: Molecular descriptors such as logP for partition coefficient, molecular weight of the compounds, the counts of hydrogen bond acceptors and donors relates to the membrane permeability and bio-availability of the compounds were assessed using molinspiration (Rizvi et al., 2013). Characterization of the absorption, distribution, metabolism and elimination (ADME) properties of the selected compounds was checked to fit into the Lipinsky's rule of five (Morris et al., 1998).

Auto–docking for drug–ligand interactions: The docking analysis to interpret the affinity between clavulanic acid, thienamycin, cefoxitin, and imipenem against BSH of *E.faecalis* was achieved by an auto-dock tool. Briefly, the target protein is embedded in a grid in pre-calculated grid maps (Autodock 4.2) (Ertl et al., 2000). AutoDock requires pre–formed grid maps, one for each atom type present in the ligand being docked. Calculation of the maps was done using the Autogrid auxiliary program by allowing the flexible molecules to move in the six spatial degrees of freedom for orientation and torsion. For the modelling of H-bonds and vanderWaals interactions, we implemented Lennard–Jones parameters 12–10 and 12–6respectively.Evaluation of the force field was done in two steps, first by estimating the intra-molecular energetics between the transition from unbound states to the ligand-protein bound state. Secondly, evaluation of the intermolecular energetics was done by combining the ligand and protein in their bound conformation in the $\Delta G = \Delta Gvdw + \Delta Ghbond + \Delta Gelec + \Delta Gtor + \Delta Gdesolv$ format. First three terms are for van der Waal's, hydrogen bonding, electrostatics respectively (Lipinski et al., 1997).

Visualisation of the docked molecules: The hydrogen bond interactions clavulanic acid, thienamycin, cefoxitin, and imipenem against BSH of *E.faecalis* were visualized using Discovery Studio Visualizer. The relative stabilities were evaluated using their molecular dynamics, binding affinities, energy simulations with further docking score assessments.
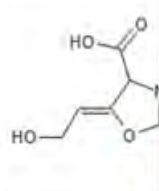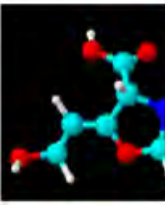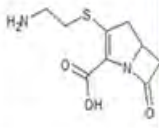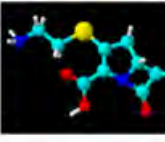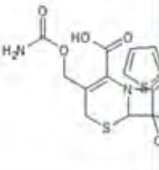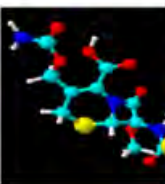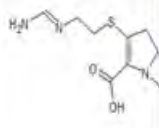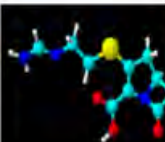
RESULTS AND DISCUSSION

Structure retrieval of the BSH protein from *E.faecalis*: The Crystal structure of a trimeric variant of the Bile Salt Hydrolase from *E.faecalis*(strain T2) is downloaded from PDB database and its structure is documented as 4WL3-A Chain. Optimization was successfully achieved

by the removal of the water molecules with merging of hydrogen atoms to the receptor molecule.RASMOL tool showed 3D structure of BSH with pink colour indicating the alpha-helix, yellow arrow indicating the beta sheets and white colour indicating the turns.

Beta lactam derivatives structure optimizations (the ligands): Optimization of the ligand was successful using ACD Chemsketch and the compatible format was retrieved using Open Babel molecular converter tool. The retrieved 2D and 3D structures of the ligands and its SMILES format are shown in table 1.

Drug likeness by molinspiration estimation: The bioactivity scores prediction of clavulanic acid, thienamycin, cefoxitin, and imipenem against BSH of *E.faecalis* based on the calculation of the GPCR ligand, ion channel modulation, kinase inhibitor, nuclear receptor ligand, protease inhibition and enzyme inhibition towards drug likeness is scored and tabulated in Table 2. Imipenem scores to be the best drug candidate followed by apigenin and cirsimaritin in targeting the bile salt hydrolase.

Table 1. 2D and 3D structures and SMILES format of the selected beta lactam derivatives under study			
Compounds	2D	3D	SMILES
Clavulanic acid			C1C2N(C1=O)C(C(=CCO)O2)C(=O)O
Thienamycin			CC(C1C2CC(=C(N2C1=O)C(=O)O)SCCN)O
Cefoxitin			COC1(C2N(C1=O)C(=C(CS2)COC(=O)N)C(=O)O)NC(=O)CC3=CC=CS3
Imipenem			CC(C1C2CC(=C(N2C1=O)C(=O)O)SCCN=CN)O

Docking analysis of the beta lactam derivatives against BSH of *E.faecalis*: Based on the lowest energy and minimal solvent accessibility, selection of the best conformers was made using LGA of the docked structure. Accelrys discovery studio visualization of the hydrogen bond interactions in the stick model between the Clavulanic acid, Thienamycin, Cefoxitin, and Imipenem against BSH of *E.faecalis* is given in Figure 1,2,3& 4. The number of hydrogen bonds formed, torsional energy and the docking scores between the drug and ligands are given in Table 3.

The present study involved an in-silico approach to target bile salt hydrolase of *E.faecalis*, to achieve a preliminary understanding of the drug interactions using computational tools prior experimental approaches. In-sights into such an approach reveals the potent

virulent based interactions which will further enhance the application of effective therapeutics in endodontic treatments (J et al., 2018). Structure based computational analysis in drug designing with the 3D knowledge in the prediction of the receptor bound to the ligands with a given or congeneric molecule optimization by molecular docking has spurred interest in recent decades in the field of dentistry. The conformational flexibility of virulent protein playing a vital role in endodontic infections is best achieved by docking analysis which is otherwise a perplexing problem and quite challenging.

In the present study, the beta lactam derivatives viz., clavulanic acid, thienamycin, cefoxitin and imipenem docked against the bile salt hydrolase of *E.faecalis* resulted in a promising receptor – ligand complex. Computational docking analysis predicts the exact

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orientation of the protein-ligand docked structures based on the scores achieved by pose and strength (Wang et al., 2003). In addition, the molecular surface structures and interaction of BSH of *E.faecalis* with the beta lactam drugs were analysed based on several properties like interactive charges, and other chemical bonds like Vander Waal's forces which is further determined by

hydrogen bonding (Jiang and Kim, 1991). In this context, accelrys studio visualised and docked structures of BSH of *E.faecalis* yielded excellent docking scores with promising hydrogen bond interactions and the affinity distance scores for the beta lactam derivatives and BSH interactions.

Table 1. 2D and 3D structures and SMILES format of the selected beta lactam derivatives under study

Compounds	M. wt	Mol formula	H Bond Donor	H Bond Acceptor	Log P	TPSA	Rotatable bonds	Vol.	N atoms	Compounds
Clavulanic acid	199.162	$C_8H_9NO_5$	2	6	-2.42	2	0	87.07	161.4	14
Thienamycin	272.319	$C11H_{16}N_2O_4S$	4	6	-1.32	5	0	103.86	232.02	18
Cefoxitin	427.446	$C_{16}H_{17}N3O_7S_2$	4	10	0.02	8	0	148.27	337.31	28
Imipenem	299.345	$C_{12}H_{17}N_3O_4S$	4	7	-0.86	6	0	116.222	255.28	20

Drug likeness calculation of beta lactam derivatives against BSH of *E.faecalis*
Table 2. Molinspiration calculations of beta lactam derivatives

Compounds	GPCR ligand	Ion channel modulator	Kinase inhibitor	Nuclear receptor ligand	Protease inhibitor	Enzyme inhibitor
Clavulanic acid	-0.34	-0.02	-0.98	-0.43	0.70	0.80
Thienamycin	0.09	-0.19	-0.60	-0.38	1.00	0.89
Cefoxitin	-0.33	-0.49	-0.82	-0.64	0.70	0.01
Imipenem	0.29	-0.22	-0.58	-0.24	1.15	0.98

Table 3. Overall docking results of ligands with BSH of *E.faecalis*

BSH docking with compounds	Number of hydrogen bonds	Binding energy	Ligand efficiency	Intermolecular energy desolv Energy	vdW + H Bond +	Electrostatic energy	Torsional energy Unbound	Total internal
Clavulanic acid	6	-5.4	-0.39	-6.59	-6.59	0.01	1.19	-1.29
Thienamycin	6	-4.24	-0.24	-6.63	-5.54	-1.09	2.39	-3.73
Cefoxitin	5	-4.63	-0.17	-7.32	-7.22	-0.1	2.68	-3.22
Imipenem	9	-5.54	-0.28	-8.23	-7.36	-0.86	2.68	-1.51

Figure 1: Accelrys discovery studio visualisation of the hydrogen interactions between BSH and clavulanic acid

Figure 2: Accelrys discovery studio visualisation of the hydrogen interactions between BSH and thienamycin
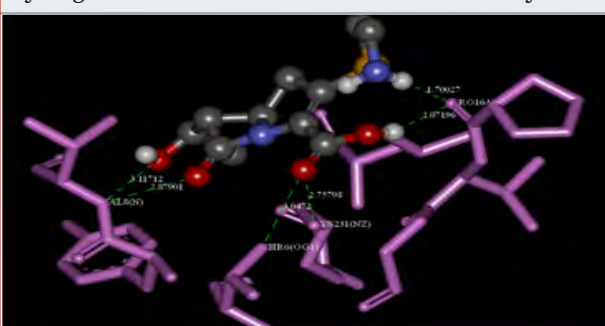
The number of hydrogen bonds between the donors and the acceptors determines the best conformers and the binding energy values predicts the bioactivity value for a ligand to the corresponding receptor suggesting the inhibitory effect of the drugs to target *E.faecalis* based endodontic infections mediated by BSH. In this view, imipenem scores to be the best inhibitory drug of choice against BSH with nine hydrogen bonds followed by clavulanate and thienamycin with six bonds and finally by cefoxitin with five hydrogen bonds. The promising inhibitory activity of imipenem has already been documented in an earlier study (Beadle and Shoichet, 2002) and in the present investigation, we suggest BSH of *E.faecalis* can be best targeted by imipenem.

Figure 3: Accelrys discovery studio visualisation of the hydrogen interactions between BSH and cefoxitin
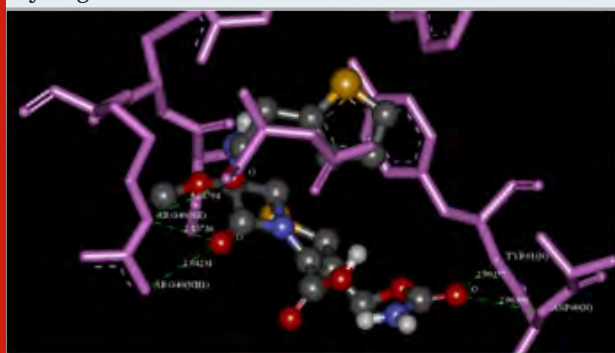
Figure 4: Accelrys discovery studio visualisation of the hydrogen interactions between BSH and imipenem
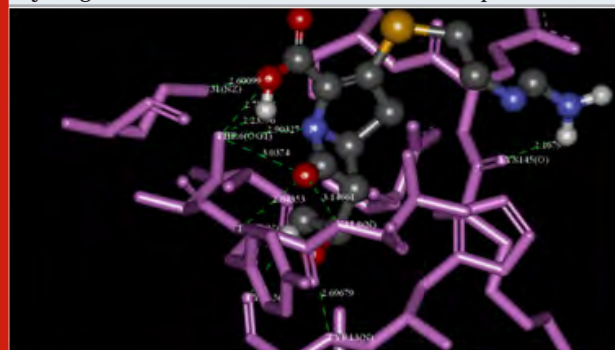
We used auto dock 4.2 to evaluate the interactions of *E.faecalis* BSH, which is considered as a suite of automated docking tools with a software for modelling flexible small molecule binding to 3D structures of receptor proteins. Using genetic algorithms for the conformational search a rapid grid based method of energy evaluation of *E. faecalis* BSH with the drugs was achieved in the study in analysing the docking simulations. In this study, the Lamarckian Genetic Algorithm (LGA) was used to explore the binding conformational landscape of the beta lactam derivatives chosen for inhibiting the BSH. The docking scores on bile salt hydrolase indicated that there is a direct relationship between the energy of the binding affinity, referring to the lowest docking scores and the stability. In accordance with this, the binding scores between the beta lactam derivatives and BSH in

the present study showed potent binding affinity to the binding sites with –5.4, –4.24, –4.63 and –5.54 Kcal/mol for clavulanic acid, thienamycin, cefoxitin and imipenem respectively with more potent and stable binding towards imipenem with the active sites of BSH. In addition, the intermolecular energy, van der waals energy and torsional energy were also at a higher end for imipenem when compared to the other three beta lactam derivatives and the beta lactam inhibitor clavulanate in interacting with the BSH of *E.faecalis*.

In the present study, molinspirational results were very promising with the n-violations of the beta lactam derivatives against BSH as zero satisfying the Lipinsky's rule of five. The application of molinspiration calculations of beta lactam derivatives with bile salt hydrolase suggests its importance in the practical approach to calculate the molecular properties and predicted the bioactivity scores to assess the best inhibitory agent for BSH. In molinspiration analysis, topological polar surface area (TPSA) of a molecule is considered as a useful descriptor to characterize the drug absorption and bioavailability and the values of TPSA and OH-NH interactions indicate that the selected ligands viz, the beta lactam derivatives to possess a smooth and efficient binding to the target proteins. It is a known fact that the drug molecules with TPSA values of >140Å or higher possess a low-absorption (miLogP) substantiating its role for its oral bioavailability for the drugs (Davies et al., 2007), (Priyadharsini et al., 2018). In this context, except cefoxitin all the other ligands score high absorption with clavulanate with high membrane penetration with a TPSA score of 87.07.

In the present study, we also predicted the bioactivity scores of clavulanic acid, thienamycin, cefoxitin, and imipenem towards drug likeness by calculating the activity scores of various inhibitor, ligand and modulator effects. All the derivatives scored above 0.20 as potent protease inhibitor and enzyme inhibitor except cefoxitin (Table 3b) against BSH of *E.faecalis*.

CONCLUSION

This work represents an advance in biomedical sciences in dentistry as there is a high possibility of orienting and scoring of the binding site of any target protein by molecular docking, which is a promising computer based drug design tool. The present investigation thus targets the BSH of *E.faecalis*, which is a potent virulent and pathogenic mechanism portraying challenge in the treatment strategies in *E.faecalis* associated endodontic diseases. In addition, BSH being an evolutionary analogue to penicillin V hydrolase, assessment of the best inhibitory beta lactam derivatives through molecular docking is promising to determine the potent drug of choice to combat resistant forms of *E.faecalis* in an alternate way by inhibiting the bile salt hydrolase. The present study is concluded by stating imipenem as the best inhibitory agent in targeting the BSH of *E.faecalis* towards arresting the bile resistance however requiring further in-vitro experimental validation.

ACKNOWLEDGEMENTS

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Knowledge and Awareness About Natural Anti Diabetic Herbs and its Usage Among General Public

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ABSTRACT

Diabetes mellitus , regularly known as diabetes, is a group of metabolic issues described by hyperglycemia over a prolonged period coming about because of deformities in insulin secretion, insulin activity, or both.India has about 33 million diabetic subjects today, which is quickly contributed by the urban populace. People try varies remedies to prevent and cure it , But drugs are not only the option of choice .Over the most recent couple of years there has been an exponential development in the field of herbal medicine and these medications are picking up fame both in developing and developed countries in view of their common inception and less side effects . The current study says the people's knowledge of natural anti diabetic herbs and made them aware of the same.The present study was conducted in Chennai among randomly selected people using a questionnaire. The question was related to knowledge and awareness on natural Anti diabetic herbs and it's usage among. A total of 20 close ended questions were included. The results were being analyzed using statistical software.On analyzing the results obtained from the present study, it is clear that People are fairly aware and have knowledge about Diabetes , its symptoms, Use of anti diabetic herbs and about its benefits as well.

KEY WORDS: ANTI DIABETIC HERBS; AWARENESS; DIABETES; FENUGREEK; NATURAL REMEDY.

INTRODUCTION

Diabetes mellitus, regularly known as diabetes, is a group of metabolic issues described by hyperglycemia over a prolonged period (Gandhi et al., 2017) coming about because of deformities in insulin secretion, insulin activity, or both. The chronic hyperglycemia of diabetes is related with long term harm ('Diagnosis and Classification of diabetes mellitus', 2014),like diabetic ketoacidosis, hyperosmolar hyperglycemic state, or death.A(Kitabchi et al., 2009) few pathogenic procedures are associated with the advancement of diabetes. These range from immune system obliteration of the β-cells of the pancreas with subsequent insulin lack to irregularities that result in protection from insulin activity. The premise of the variations from the norm in sugar, fat, and protein digestion in diabetes is inadequate activity of insulin on target tissues.

Insufficient insulin activity results from deficient insulin emission or potentially reduced tissue reactions to insulin at least one focuses on the(Gheena, Chandrasekhar and Ramani, 2011) perplexing pathways of hormone activity('Diagnosis and Classification of diabetes mellitus', 2014) Salivary parameters can go about as extras in evaluating the general metabolic status of the patient.

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(Gheena, Chandrasekhar and Ramani, 2011)Control of BP, keeping up appropriate foot care, and eye care are significant for individuals with the disease(Diabetes, 2020). Type 1 diabetes must be made with insulin injections(Diabetes, 2020). Type 2 diabetes might be treated with prescriptions with or without insulin. (Vizcaino, 2014) Insulin and some oral meds can cause low blood sugar.(Irwin et al., 2012).

Weight misfortune medical procedure in those with stoutness is once in a while a compelling measure in those with type 2 diabetes('The clinical effectiveness and cost-effectiveness of bariatric (weight loss) surgery for obesity: a systematic review and economic evaluation', 2010) Gestational diabetes normally settles after the introduction of the baby.India has about 33 million diabetic subjects today, which is quickly contributed by the urban populace(Ramachandran, 2005) The situation is changing quickly due to financial progress happening in the rustic regions too. Accessibility of improved methods of transport, and less strenuously as in the region have brought about diminished physical exercises. Better monetary conditions have delivered changes in diet propensities(Ramachandran, 2005) The conditions are increasingly good for articulation of diabetes in the populace, which as of now has a racial and hereditary defenselessness of the ailment. Later epidemiological information show that the circumstances are comparative all through the nation.(Chin and Smith, 2009)

But drugs are not only the option of choice .Over the most recent couple of years there has been an exponential development in the field of herbal medicine and these medications are picking up fame both in developing and developed countries in view of their common inception and less side effects. Numerous conventional meds being used are obtained from medicinal plants, minerals and natural issues(Grover, Yadav and Vats, 2002) Various medicinal plants, generally utilized for more than 1000 years named rasayana are available in natural arrangements of Indian customary social insurance frameworks(Scartezzini and Speroni, 2000; Grover, Yadav and Vats, 2002) In Indian frameworks of medication most experts define and apportion their very own plans(Grover, Yadav and Vats, 2002).

Medicinal plants are being gazed up once again for treatment of diabetes. Numerous customary medications have been gotten from prototypic atoms in medicinal plants. Metformin embodies an effective oral glucose-bringing down operator. Its advancement depended on the utilization of Galega officinalis to treat diabetes .Prevention and treatment of diabetes include keeping up a sound eating routine, standard physical exercise, an ordinary body weight, and maintaining a strategic distance from utilization of tobacco(Diabetes, 2020) along with which consumption of Indian natural herbs maybe considered , which has a very good effect as anti diabetic herbs.The current study says the people's knowledge of natural anti diabetic herbs and made them aware of the same

MATERIAL AND METHODS

A cross-sectional questionnaire survey was conducted among the general public in Chennai, Tamil Nadu, India during December 2019.This was a poll based examination utilising an online review entry called "Google forms."A total of 100 people were assessed using a structured questionnaire comprising of 10 closed-ended questions regarding the participants' demographic details (age, gender, and place), natural antidiabetic herbs related knowledge, awareness, and side effects.After distributing the questionnaire, awareness on side effects of the natural antidiabetic herbs were given.All the collected data were then analysed through SPSS software and pie charts and bar graphs were plotted.

RESULTS AND DISCUSSION

People are very well knowledgeable about diabetes mellitus (Mirghani et al., 2017)and its related complications and medications .Diabetes management focuses on keeping blood glucose levels as close to normal, without causing low glucose. This can usually be accomplished with dietary changes, work out, weight loss, and utilization of suitable prescriptions (insulin, oral drugs) and also herbs(Kahleova and Pelikanova, 2015) The participants of the survey were asked if drugs were only treatment for diabetes ,57% answered no while and 43% yes. [Figure 1], In the following question, They were asked if they are aware that Indian herbs have anti diabetic properties 58% yes while 42% answered no [Figure 2]

Figure 1. Pie chart depicts the awareness level participants believing that diabetics can be only treated by drugs. Majority(57%) of the respondents said that drugs are not the only option(red). while 43% said drugs are the only option for diabetics(blue).
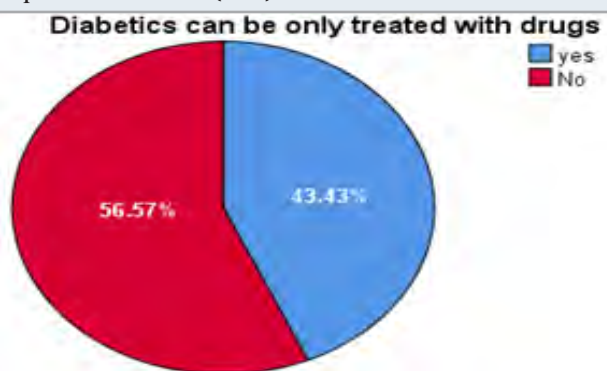
Diabetes is widely treated with medication like insulin secretagogues (sulfonylureas, meglitinides), thiazolidinediones, some newer drugs like GLP1 analog (Exenatide), SGLT 2 inhibitors (Dapagliflozin)(RSSDI Textbook of Diabetes Mellitus, 2012).Most drugs used to treat diabetes act by bringing down glucose levels through various mechanisms. There is an expansive agreement that when individuals with diabetes keep up tight glucose control– keeping the glucose levels in their blood within normal ranges– that they

experience less complications like kidney issues and eye issues(Rosberger, 2013). But it is not the only way to treat diabetes, Participants were inquired if The herbs that we see and use daily like neem ,onion ,amla, holy basil, fenugreek has anti diabetic properties 56% answered yes, While 16 answered no [Figure 3] anti diabetic herbs like Babul (Acacia arabica), bael (Aegle marmelos), church steeples (Agrimonia eupatoria), onion (Allium cepa), garlic (Allium sativum), ghrita kumara (Aloe vera), neem (Azadirachta indica), ash gourd (Benincasa hispida) and etc can also treat diabetics and also is inexpensive(RSSDI Textbook of Diabetes Mellitus,2012).

Figure 2: Pie chart depicts the knowledge of participants abouts indian herbs and its antidiabetic property. Majority(58%) of the respondents said that indians herbs have anti diabetic property(blue). while 42% said no (red).

Figure 3: Pie chart depicts the knowledge of participants in knowing herbs that have anti diabetic properties. Majority(56%) of the respondents knew about herbs that have anti diabetic properties (blue). while 44% didn't know (red).

Most of the participants were aware of that fact. And also yoga has a big impact on blood sugar level , a study says that Impact of the Kapalbhati Pranayama on the glucose level of borderline diabetic patients is significant. Additionally, the examination also infers that regular act of Kapalbhati Pranayama by borderline diabetics can decrease the glucose level(Pal et al., 2016).(Azima Hanin, Vishnu Priya2 and Gayathri, 2018)

The participants were inquired beneficial effects of herbs, 33% answered less side effects 27% regulate blood sugar level , 18% hypoglycaemia, 8% had no idea[Figure 4] In the following question participants of the survey

were asked if herbs were better than drugs 56% said yes while 44% said no [Figure 5]Alternative drugs are getting progressively famous for the treatment of chronic illness,, essentially on account of individuals' perception that plant-based prescriptions are less toxic and have less side effects(American Chemical Society, 2019) All medical products leave side effects , which may be short term or long term, but the side effects caused by natural anti diabetic herbs are less than that of the drugs and quite effective as the drugs (Azima Hanin, Vishnu Priya2 * and Gayathri, 2018).

Figure 4: Pie chart depicts participants knowledge on the benefits of using anti diabetic herbs.Majority(33%) of the respondents said less side effects(blue), 27% said drugs regulate blood glucose level(red),18% said leads to hyperglycemia (green), 13% said acts same as drug(orange) and 8% had no idea about the benefits of using anti diabetic herbs(yellow).
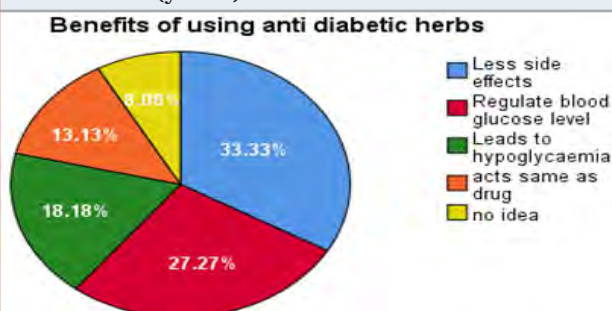
Figure 5: Pie chart depicts the participants' opinion on natural antidiabetic herbs are better than drugs .Majority(56%) of the respondents said yes(blue). while 44% said no(red).
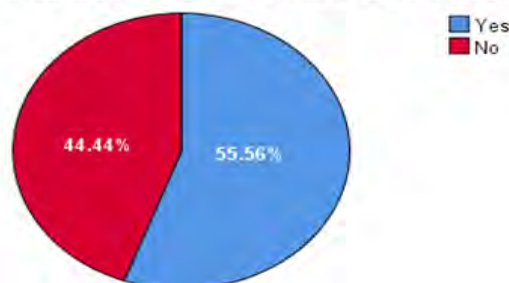
Figure 6. Pie chart depicts the participants response to use of herbs as a preventive measure for diabetes . Majority(45%) of the respondents said yes(blue). 31% said they might use ,and 23% said no(red).
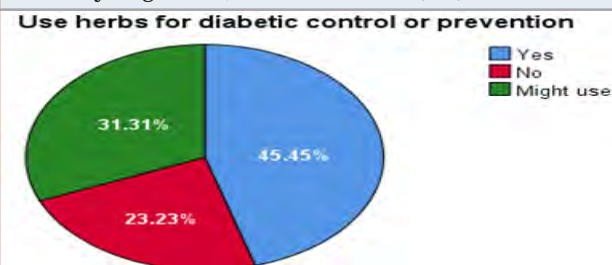
The participants of the survey were asked if they would use it for diabetic control or prevention,45% responded yes , 23% no and 31% might use [Figure 6].Most of the participants have planned to take anti diabetic herbs as a prevention measure for diabetes or to take diabetic control Which is a good sign.

Figure 7: Bar chart showing association between gender and their knowledge on treatment options for diabetes , X-axis represents the gender and Y-axis represents the number of responses , where yes (blue) and no (red), Chi square test performed, Chi square test value = 0.554; p value = 0.457 (p value>0.05). Statistically not significant, however females are more knowledge than males on treatment options for diabetes.
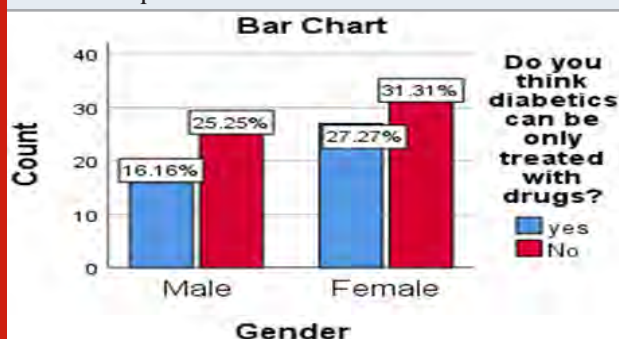
Figure 8: Bar chart showing association between gender and their awareness on indian herbs and its antidiabetic property, X-axis represents the gender and Y-axis represents the number of responses , where yes (blue) and no (red), Chi square test performed, Chi square test value = 0.026; p value = 0.871 (p value>0.05). Statistically not significant, however females are more aware than males on indian herbs and its antidiabetic property
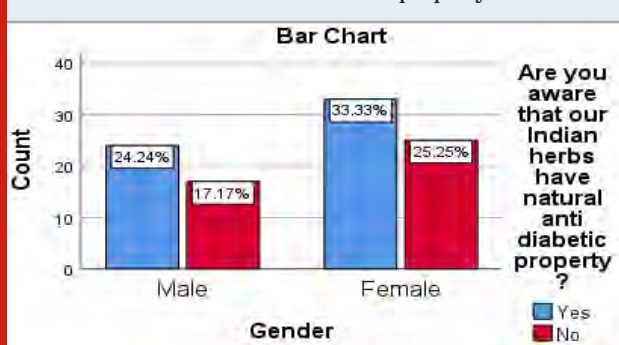
CONCLUSION

On analyzing the results obtained from the present study, it is clear that People are fairly aware and have knowledge about anti diabetic drugs. Females are more aware and knowledgeable about anti diabetic herbs than males. But they still don't have a clear idea about the mechanism of action and method of use and etc which can be self taught by the people with the help of online sources.

Figure 9: Bar chart showing association between gender and their opinion on natural antidiabetic herbs , better than drugs , X-axis represents the gender and Y-axis represents the number of responses , where yes (blue) and no (red), Chi square test performed, Chi square test value = 0.008; p value = 0.927 (p value>0.05). Statistically not significant, however, majority of females say that natural antidiabetic herbs are better than drugs
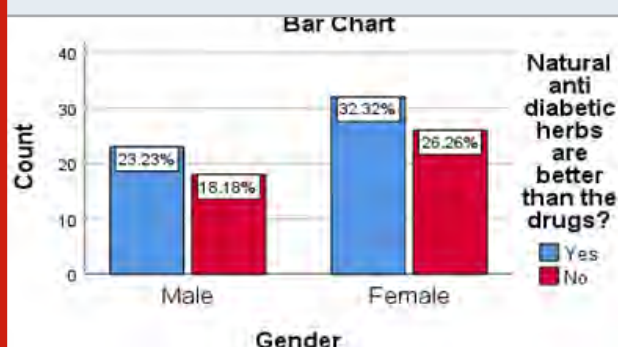
Figure 10: Bar chart showing association between gender and their response to use of herbs as a preventive measure for diabetes, X-axis represents the gender and Y-axis represents the number of responses, where yes (blue), might use (green) and no (red), Chi square test performed, Chi square test value = 0.916; p value = 0.633 (p value>0.05). Statistically not significant, however, the majority of females responded they'll use herbs as a preventive measure for diabetes.
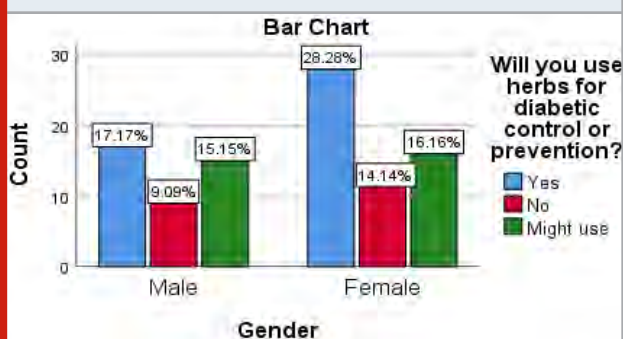
ACKNOWLEDGEMENTS

Conflict of Interest: None to declare

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Awareness of Antiretroviral Drug Therapy in Management of HIV Among Dental Students

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ABSTRACT

The aim of this study was to evaluate the awareness and knowledge of dental students toward the use of antiretroviral drug therapy in management of HIV. HIV is a chronic disease that can be managed by dental practitioners. It can be treated with antiretroviral drugs, which help to control progression into AIDS and reduce the mortality rates. A questionnaire was developed and the survey was conducted online via survey planet with 120 respondents. Data was then collected and analysed with IBM SPSS version 23. In this present study, 6.67% postgraduates and 3.33% interns have excellent knowledge on antiretroviral therapy. Majority of the respondents believed in the importance of knowledge on antiretroviral therapy (97.50%). 63.33% of the respondents stated that they have knowledge on triple combination drugs. 83.33% of the respondents were aware of the adverse effects of antiretroviral therapy. Association between response of the participants and knowledge on antiretroviral drugs was found to be statistically significant ($p < 0.05$). Within the limits of study, the majority of students showed an acceptable level of knowledge and awareness on antiretroviral drugs in management of HIV patients. Association between response of the participants and knowledge on antiretroviral drugs was found to be statistically significant. However, there was a lack of knowledge on the dosage and prescription of the antiretroviral drugs.

KEY WORDS: ANTIRETROVIRAL DRUGS; AWARENESS; DENTISTS; DRUG THERAPY; HIV; KNOWLEDGE.

INTRODUCTION

Nowadays, human immunodeficiency virus (HIV) can be managed as a chronic disease, by both medical and dental practitioners (Website, no date). Although it cannot be cured, the progressions of the disease can be controlled with medical treatment. In general, HIV belongs to the retrovirus family that targets the cells in the human immune system to cause the infections. It usually will infect the CD4 cells. As the infections progressed, the number of CD4 cells in the host body will be decreased and causing decelerations of the cellular immune reaction against the infected cell (Levy, 2007; Blood', German Advisory Committee Blood (Arbeitskreis Blut) and Subgroup 'Assessment of Pathogens Transmissible by Blood', 2016). This will lead to poor functioning of the immune system in the host body causing direct or indirect cell infections. If this opportunistic infection

remains untreated, it will eventually lead to acquired immunodeficiency syndrome (AIDS), which is the last state of HIV infection (Keser, Göcüncü and Pekiner, 2019).

Basically, the first signs of HIV infection could be seen in the oral cavity. Several oral conditions can be used as indicators including hairy leukoplakia, oral candidiasis, necrotizing ulcerative periodontitis, oral ulcers, parotid swelling, linear gingival erythema, and Kaposi's sarcoma (Bonito et al., 2001). Presence of these oral conditions can be used for the detection and determining the progression of HIV into AIDS. These oral conditions can be used as the diagnostic criteria in about 60%-70% of HIV-positive patients (Keser, Göcüncü and Pekiner, 2019). On top of that, there is also invested in the prevalence of decay in HIV patients. Thus, most of the HIV infected patients will seek dental treatment (Magalhães, Oliveira and Prado, 2015). Therefore, dentists should have comprehensive knowledge on HIV and AIDS, in order to identify and manage HIV/AIDS patients when they report to dental clinics. This will help to prevent spreading of infections to the dentists as well as to other patients.

Next, the course of HIV infection is always chronic. Although it cannot be completely cured, with effective treatment and care, the HIV can be controlled. In general, HIV can be treated with antiretroviral drugs. These drugs will help to suppress the disintegration of CD4 cells as well as the clinical symptoms (Broder, 2010). Introduction of highly active antiretroviral treatment (HAART) in most of the countries, showed major reduction on the incidence of AIDS as well as reduction in the mortality rates in association of the disease (Campo et al., 2007). There are major differences in patients treated with antiretroviral therapy with untreated patients. In untreated HIV-1 patients, AIDS usually appears after 10 years, while for HIV-2 patients, HIV usually will progress after 15 years. However, when they are treated with antiretroviral therapy, it would help to prolong the duration of HIV infection before it reaches the last stage of AIDS, with or without severe symptoms (Jaffar et al., 2004; Blood', German Advisory Committee Blood (Arbeitskreis Blut) and Subgroup 'Assessment of Pathogens Transmissible by Blood', 2016).

Based on the previous literature by Grover et al, the majority of dental students have good knowledge about HIV infections (Grover et al., 2014). This shows that most dental students are educated with good knowledge on standard precautions for management of infection of blood borne pathogens (Oberoi, Marya, et al., 2014), especially of HIV. In a study reported by Oberoi et al, most of the dental practitioners have a thorough knowledge regarding HIV and the drugs to be taken under the antiretroviral therapy (Oberoi, Sharma, et al., 2014). Therefore, it is important to have both theoretical and practical knowledge on HIV infections. It can be applied during dental practices and precautions can be taken to handle patients with this opportunistic infection. This will help dentists to identify and provide early diagnosis of HIV and treat it with antiretroviral therapy in order

to halt the progressions into AIDS.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the awareness and knowledge of dental students toward the use of antiretroviral drug therapy in management of HIV.

MATERIAL AND METHODS

This retrospective study was designed to assess the awareness and knowledge of dentists toward the use of antiretroviral drug therapy in management of HIV. A pretest of validated questionnaires was drafted and emphasising on the knowledge of dental students on the use of antiretroviral drug therapy and its adverse effects. The pretested questionnaire consists of two parts. The first part was based upon the demographic data, such as age, gender and level of education. The second part was about the knowledge and awareness along with adverse effects of antiretroviral drugs if presented. The questionnaire was designed in a closed ended question which consists of 12 questions. The survey was conducted online via survey planet from November 2019 till January 2020. The inclusion criteria for this study were undergraduate and postgraduate students aged above 18 years old and have experience training in dental clinics for at least one year. Any students with no experience in clinical practice, age below 18 years old were excluded from the study.

About 120 anonymous undergraduates (including third years, final years and interns) and postgraduates of Saveetha Dental College and Hospitals, Chennai, India completed the online survey under university settings. The survey was conducted online via survey planet and the responses of the students were recorded. Data was then collected via survey planet. Then, the collected data was recorded in MS excel sheet and tabulated. IBM SPSS version 23 was used for importing data. The descriptive and inferential statistics was done for analysis. The Statistical test of Pearson's Chi square test was done. Then, variables definition processes were done by using table and graphical illustrations.

RESULTS AND DISCUSSION

A total of 120 undergraduates and postgraduates were recruited for the present study, where 73 (60.8%) were female and 47 (39.2%) were male. The patients had an age range of 17 - 35 years with mean age of 24.5. Out of 120 students, 20 were third years (16.7%), 24 were

final years (20%), 60 were interns (50%) and 16 were postgraduates (13.3%). [Figure 1].

Figure 1: Pie chart depicting the frequency distribution of undergraduates and postgraduates students based on their year of study. 50% of the respondents were interns (yellow), 20% of the respondents were final year students (green), 16.67% of the respondents were third year undergraduate students (blue) and 13.33% of the respondents were postgraduate students (purple).
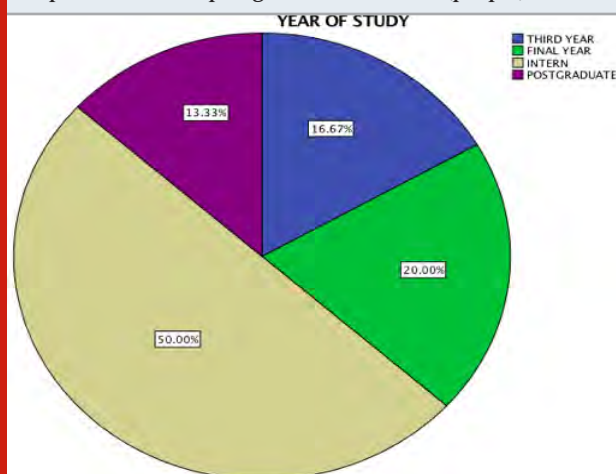
Figure 2: Bar chart depicting associations of the year of study and knowledge of respondents on the antiretroviral therapy. X axis represents the years of study and the Y axis represents the number of participants with their responses based on their knowledge on antiretroviral therapy. 6.67% postgraduates have excellent knowledge (blue) and good knowledge (green). 3.33% interns have excellent knowledge (blue). 14.17% of both final years and third years have moderate knowledge on antiretroviral therapy (yellow). Association between year of study and knowledge of respondents on the antiretroviral therapy was found to be statistically significant (Pearson Chi square value- 49.537; p =0.000)(p<0.05). Hence Statistically significant.
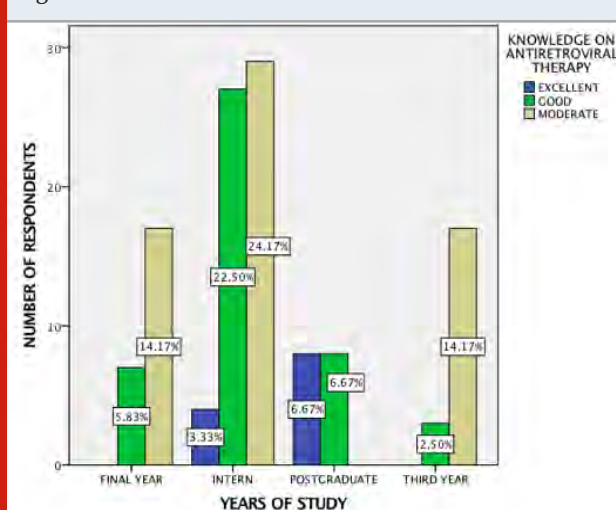
The knowledge of students on the antiretroviral therapy was assessed. Among 20 third year students, good knowledge was observed among 3 students (2.5%) and moderate knowledge was observed among 17 students (14.17%). Among 24 final year students, good knowledge was observed among 7 students (5.83%) and moderate knowledge was observed among 17 students (14.17%). Among 60 interns, excellent knowledge was observed among 4 students (3.33%), good knowledge was observed among 27 students (22.5%) and moderate knowledge was observed among 29 students (24.17%). Among 8 postgraduates, excellent knowledge was observed among 8 students (6.67%) and good knowledge was observed among 8 students (6.67%). The association between year of study and knowledge of respondents on the antiretroviral therapy was found to be statistically significant (Pearson Chi square value- 49.537; p =0.000). [Figure 2].

Based upon the importance of knowledge of antiretroviral therapy in managing HIV patients among dentists. 117 of the respondents believed in the importance of knowledge on antiretroviral therapy (97.5%).

Figure 3: Pie chart showing the importance of knowledge of antiretroviral therapy among dentists. 97.50% of the respondents believed in the importance of knowledge on antiretroviral therapy (blue).
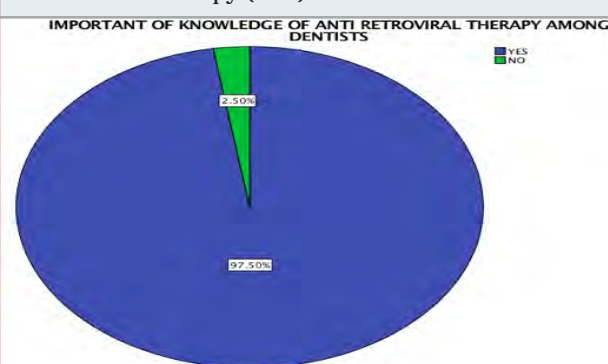
Figure 4: Pie chart showing the knowledge of respondents on 'when to prescribe of administered antiretroviral drugs'. 65.83% of respondents stated that they have knowledge of prescribing antiretroviral drugs (blue).

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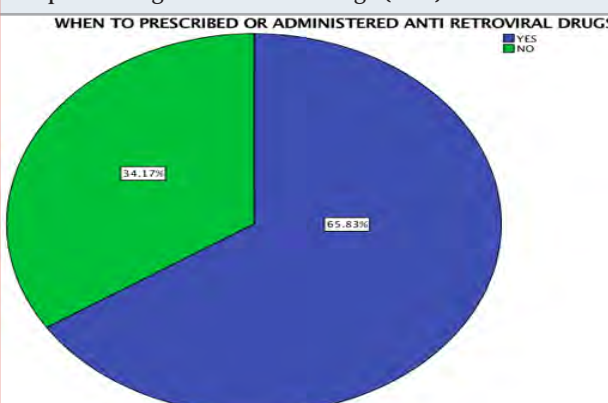
Figure 5: Pie chart showing the experience of respondents in prescribing antiretroviral drugs to HIV patients. Only, 6.67% of the respondents previously prescribed antiretroviral drugs to their patients. 93.33% does not have any experience in prescribing antiretroviral drugs (green).

EXPERIENCE IN PRESCRIBING ANTI RETROVIRAL DRUG TO PATIENT

6.67%

93.33%
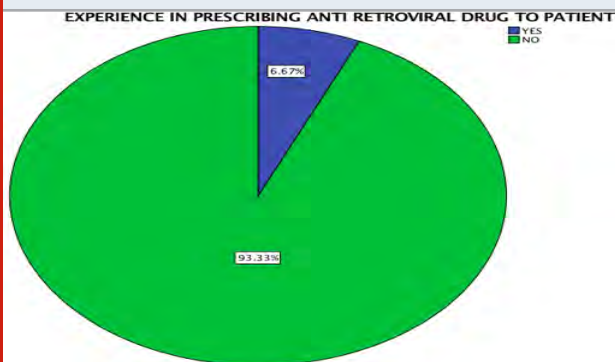
Figure 6: Pie chart showing the knowledge on the exact dosage of antiretroviral drugs. Only 5.83% of the respondents stated that they knew the exact dosage of antiretroviral drugs (blue).
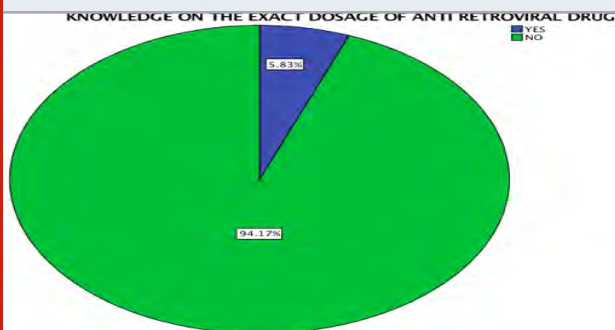
KNOWLEDGE ON THE EXACT DOSAGE OF ANTI RETROVIRAL DRUG

5.83%

94.17%

Figure 7: Pie chart showing the knowledge on the triple combination drug of antiretroviral therapy in HIV. 63.33% of the respondents stated that they have knowledge on triple combination drugs (blue). 36.67% of the respondents stated that they did not have knowledge on triple combination drugs (green).

TRIPLE COMBINATION DRUG OF ANTI RETROVIRAL THERAPY IN HIV

36.67%

63.33%
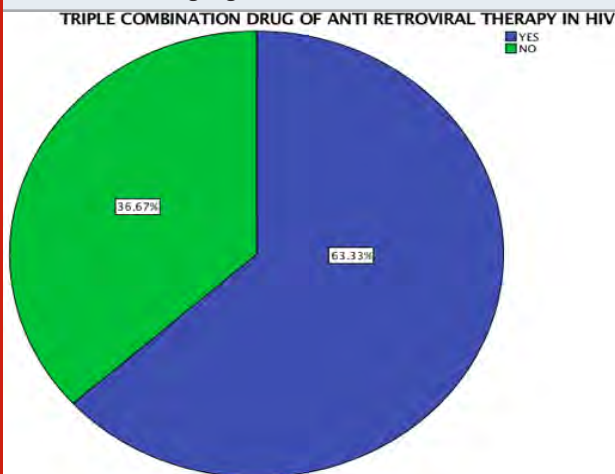
Whereas, only 3 students stated that theoretical knowledge on antiretroviral therapy was not important (2.5%). [Figure 3]. When enquiring about the knowledge of respondents on administration of antiretroviral drugs, 79 students stated that they have knowledge of prescribing antiretroviral drugs (65.83%). While 41 students stated that they did not have knowledge on prescribing antiretroviral drugs (34.17%). [Figure 4].

Figure 8: Pie chart showing knowledge on the failure of antiretroviral therapy due to drug resistance . 83.33% of the respondents stated that they believe drug resistance can cause failure of treatment (blue). 16.67% of the respondents stated that drug resistance did not cause failure of treatment (green).

DRUG RESISTANCE CAN CAUSE FAILURE OF TREATMENT

16.67%

83.33%
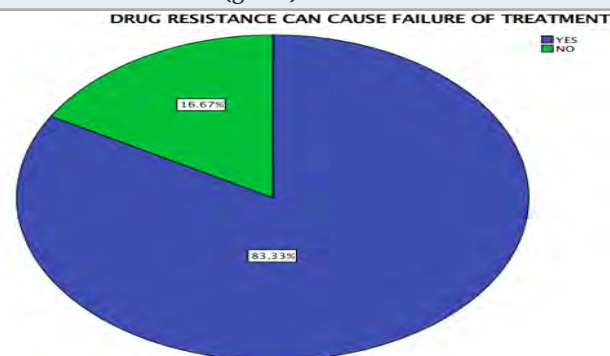
Figure 9: Pie chart showing importance of drug resistance testing. 70.83% of the respondents believe in the importance of drug resistance testing. 29.17% of the respondents stated that drug resistance testing was not important.

IMPORTANT OF DRUG RESITANCE TESTING

29.17%

70.83%
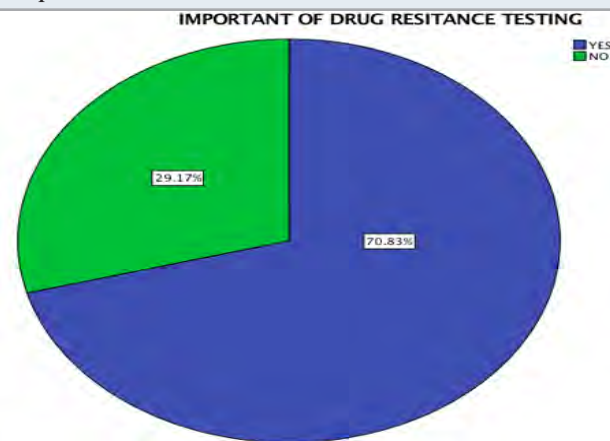
Assessment of experience of respondents in prescribing antiretroviral drugs to HIV patients showed that 6.67% of the respondents previously prescribed antiretroviral drugs to their patients. Whereas, 93.33% had never encountered such an experience. [Figure 5]. Analysation of knowledge on the exact dosage of antiretroviral drugs demonstrated that 7 students were well aware of the exact dosage of antiretroviral drugs (5.83%). Majority of the respondents had no knowledge on the exact dosage of antiretroviral drugs to be administered to HIV patients (94.17%). [Figure 6].

Among 120 students, 63.33% of the respondents stated that they have knowledge on triple combination drugs and 36.67% of the respondents stated that they did not have knowledge on triple combination drugs. [Figure 7]. On top of that, the majority of the respondents stated that they believe drug resistance can cause failure of treatment (83.33%).

Figure 10: Pie chart showing awareness of the adverse effects of antiretroviral therapy. 83.33% of the respondents were aware of the adverse effects of antiretroviral therapy. 16.67% of the respondents had no awareness on the adverse effects of antiretroviral therapy
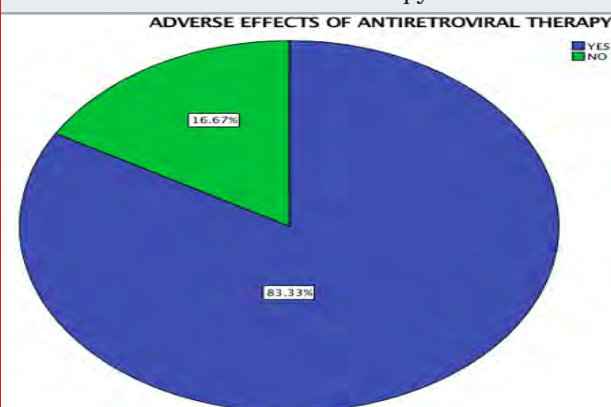
Figure 11: Pie chart showing awareness on development of oral lesions on prolonged use of antiretroviral therapy. 70% of the respondents stated that oral lesions may develop on prolonged use of antiretroviral therapy (blue).
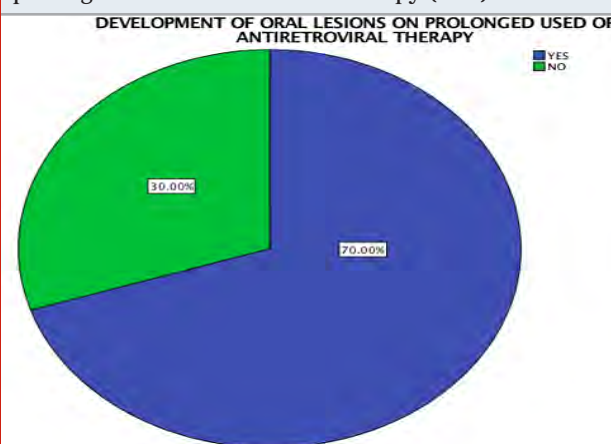
16.67% of the respondents stated that drug resistance did not cause failure of treatment. [Figure 8]. Respondents that were aware of the importance of drug resistance testing for HIV patients were 70.83% . While, 29.17% of the respondents stated that drug resistance testing was not important. [Figure 9].

In addition to this, the majority of the respondents were aware of the adverse effects of antiretroviral therapy on the HIV patients (83.33%). 16.67% of the respondents had no awareness on the adverse effects of antiretroviral therapy. [Figure 10]. When enquiring about the awareness on development of oral lesions on prolonged use of

antiretroviral therapy, most respondents agreed that antiretroviral therapy may cause development of oral lesions on prolonged usage (70%). Only 30% of the respondents stated that antiretroviral therapy would not cause oral lesions. [Figure 11]. Overall, 23.33% of the respondents were aware that antiretroviral therapy caused delay of dental mineralization in paediatric patients. 76.67% of the respondents were not aware of the negative effect of antiretroviral therapy on dental mineralization in paediatric patients. [Figure 12].

Figure 12: Pie chart showing awareness of antiretroviral therapy causing delay in chronology of dental mineralization in paediatric patients. 23.33% of the respondents believed that antiretroviral therapy caused delay of dental mineralization in paediatric patients. 76.67% of the respondents stated that antiretroviral therapy did not affect the dental mineralization of paediatric patients.
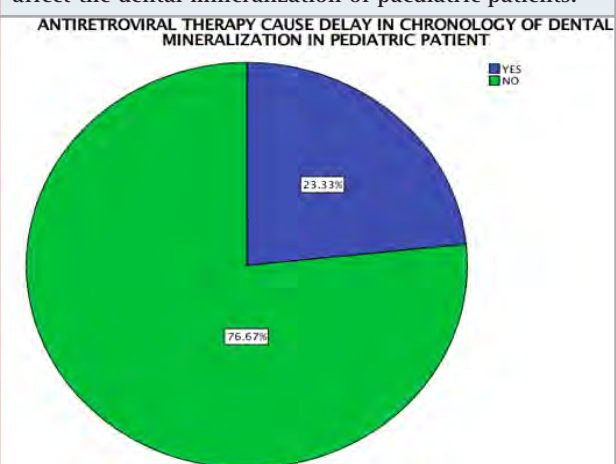
This cross sectional study was used to assess the awareness and knowledge of dentists toward the use of antiretroviral drug therapy in management of HIV. Most of the participants have good knowledge on antiretroviral drug therapy. The findings in the present study was coinciding with studies reported by Oberoi SS et al, Dhanya RS et al and Grover et al, but contradictory with study reported by Abou El Fadl et al (Grover et al., 2014; Oberoi, Sharma, et al., 2014; Dhanya et al., 2017; Abou El Fadl et al., 2019). Hence, it is important for every dentist to acquire their knowledge on antiretroviral therapy through their professional education (Singh et al., 2017), in order to deliver better treatment for their patients. This is because knowledge can affect the attitudes of dentists on treatment modalities for HIV patients (Oberoi, Sharma, et al., 2014).

In this present study, overall majority of the participants showed acceptable knowledge on the triple combination antiretroviral drugs, drug resistance, failure of antiretroviral therapy as well as on the adverse effects of drug reactions. Unfortunately, there were no previous literatures conducted on the knowledge and awareness of dentists of the antiretroviral drugs.

Basically, HIV is neither curable nor vaccine-preventable, but it can be prevented through health education

(Sannathimmappa and Nambiar, 2019). Usually, HIV infected patients would be prescribed with antiretroviral drugs to control the progressions of disease. These antiretroviral drugs will help to increase the survival rate of HIV patients through highly active combination therapy (Raberahona et al., 2019). A study reported by Agu et al stated that antiretroviral therapy may cause adverse drug reactions (Agu, Oparah and Ochei, 2012). These statements justified the results in the present study, where the majority of the respondents believed that antiretroviral drugs may cause drug reactions. Antiretroviral drugs regimens are a combination of minimum three drugs with combined toxicities from the individual drugs. This may lead to adverse drug reactions, causing morbidity and mortality of the patients (Lazarou, Pomeranz and Corey, 1998; Agu, Oparah and Ochei, 2012). Therefore, it is important for dentists to know about the triple combination drugs and its adverse effects.

As the number of people with HIV/AIDS are increasing worldwide, more patients will seek medical and dental care (Singh et al., 2017). Thus, dentists must ensure that their patients strictly adhere to the antiretroviral therapy for effective treatment. However, prolonged use of antiretroviral drugs may lead to drug resistance, thereby limiting therapeutic purposes (ANONIMO et al., 2003; Focà et al., 2014). It also may lead to other complications in the oral cavity. Basically, short term use of HAART will improve the HIV patients oral health, but prolonged use of the drugs may have adverse effects on oral health. In this study, the majority of the respondents believe that HAART will cause oral lesions. This findings was supported by Nittayananta W et al, where he proves that long term use of HAART have adverse effects on oral health including presence of oral lesions (Nittayananta et al., 2010).

In addition to this, M Trigueiro stated that there was positive association between the use of antiretroviral therapy and a delay in the chronology of dental mineralization (Trigueiro et al., 2010). This statement justified the findings in this current study, where most of the participants were aware that antiretroviral therapy caused delay of dental mineralization in paediatric patients. This may be due to the association with HIV and also adverse effects of antiretroviral therapy. Hence, early intervention of dentists on treatment may help to prevent the adverse effects as well as providing better treatment modalities for the patients.

The limitation of the study was that results were based upon subjective assessment of each respondents of the questionnaire. A bigger sample size should be used in order to obtain a better outcome. On top of that, there were no previous literatures reported similar to the study. Thus, in future more studies should be conducted on the knowledge, practice and awareness of dentists of antiretroviral drugs in managing HIV patients.

CONCLUSION

Within the limits of study, the majority of students showed an acceptable level of knowledge and awareness on antiretroviral drugs in management of HIV patients. Association between response of the participants and knowledge on antiretroviral drugs was found to be statistically significant. However, there was a lack of knowledge on the dosage and prescription of the antiretroviral drugs. Hence, implementation of additional courses and programs are needed in order to improve their knowledge on antiretroviral drugs as well as its application in dental practices.

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Awareness of Infection Control Protocols Among Clinical Dental Students and Interns in South Indian Universities

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ABSTRACT

Infection control is the discipline concerned with preventing nosocomial or health care associated infections, a practical sub-discipline of epidemiology. It is essential, though often under-recognized and under-supported, part of the infrastructure of health care. The major aspects looked at in this study are infection control and water lines protocol. The study was performed with the help of a questionnaire prepared based on the latest CDC and OSHA guidelines. In this study an average of correct responses was 56% whereas 51% was the average of incorrect responses. There was a vast variation in the ideologies regarding the infection control protocols among the dental students. This was correlated to a more practical and lesser theoretical knowledge amongst the students. Dental students of south India have a good awareness of various infection control protocols and water lines maintenance protocols. There is still a lot of room for improvement by conducting more workshops, CDE programmes and seminars to further spread knowledge regarding the advancements in the above mentioned protocols. This will go a long way in improving the quality and standard of dental care in the country.

KEY WORDS: INFECTION CONTROL, WATERLINES, STUDENTS, SOUTH INDIA, NEEDLE STICK.

INTRODUCTION

Dentistry as a profession has grown over the past 150 years and the improvement in skills and variety of treatment procedures has grown by leaps and bounds. Present day advancements have seen an astronomical growth in efficiency as well as quality in dental work; for example, a patient can get a complete denture, a crown, a fixed partial denture and much more in just a day's time. There have also been many treatment practices and materials that have become obsolete over time but one aspect of dental practice that has always remained the same was the transmission of infection between the patient, operator and the dental assistant.

This where the role of organisations such as the CDC and OSHA are indispensable as these organizations have taken immense efforts to lay down safety measures that benefits both the practitioner as well as the patient. One of the strategic goals of the Division of Oral Health of the Centers for illness management and prevention (CDC), Atlanta, is to eliminate causes of illness transmission in dental health care settings. Their role is to provide evidence based information and proposals relating to dental infection management by maintenance of these high standards of infection management guidelines

in practice.(of Health and Committee, 2016)The CDC printed infection management recommendations for medical specialty initial in 1986 (Centers for Disease Control, 1986)and subsequently in 1993.(Kohn et al., 2004) These pointers were developed partially in response to reports relating to 9 clusters of viral hepatitis virus (HBV) transmission to patients from infected dental health care suppliers (DHCPs) throughout the 70's and 80's.(Kohn et al., 2003) During those periods, there were high prevalence of markers of past HBV infection among medical personnel and other associates in Nursing and oral surgeons(Cleveland, 1996) and reports of transmission of HIV from an infected dentist to patients. (Ciesielski et al., 1992)

Serologic proofs of past HBV infection among U.S. dentists decreased from pre-vaccine levels of 14% in 1972 to 9% in 1992. In the year 2007, there was a report of transmission of HBV from one infected patient to another in a dental surgeon's workplace. (Redd et al., 2007) In 2009, 5 cases of acute viral hepatitis were diagnosed among 3 patients and 2 volunteers at a dental clinic in West Virginia. (Holmberg, Suryaprasad and Ward, 2012) During an investigation, the CDC investigators and West Virginia public health officials identified multiple infection control breaches that had taken place, but improper documentation did not allow for linkage of specific breaches with transmission. There are no documented cases of patient-to-patient transmission of HIV or hepatitis C virus during a dental setting. There are massive declines in HBV infection and rare occurrences of blood-borne infectious agent transmissions in dental settings owing touse of the HBV vaccines and enhanced use of universal precautions. (Quinley et al., 1989)

Identifying all transmission routes of infectious agents may be a key part of any infection management protocol. In dentistry special care is to be given to those instruments that are not routinely placed into the patient's mouth and are otherwise not routinely disinfected due to their design or another thought. (Biofilms, 2000; Kohn et al., 2004). Dental instruments are classified broadly into three categories depending on the risk of transmitting infection. Critical instruments are grouped as those used to penetrate soft tissue or bone, or come directly into the bloodstream. They should always be sterilized after each time they are used. Sterilization is achieved by autoclaving, dry heat, chemical vapour. Critical instruments include forceps, scalpels, bone chisels, scalers (both ultrasonic as well as hand scalars) and surgical burs. Semi-critical instruments are those that do not penetrate soft tissues or bone but contact mucous membranes or non-intact skin, such as mouth mirrors, impression trays and amalgam condensers.

These devices also should be sterilized after each use just like the critical instruments. Where sterilization is not a feasible option, high-level disinfection is appropriate. Non-critical instruments are those that do not come into contact with any other part of the body other than intact skin, for example x-ray heads, BP cuffs and

stethoscopes. Such devices have relatively very low chances of transmitting infection; and hence, may be reprocessed between patients by intermediate or low-level disinfection. An intermediate-level disinfectant is EPA-registered as a "hospital disinfectant" with a label for "tuberculocidal" activity, like phenolics, chlorine-containing compounds). (Biofilms, 2000) The tuberculocidal activity is given to be used as a benchmark to measure germicidal potency.

Figure 1: Bar Graph shows distribution of responses received for each question included in the present study.
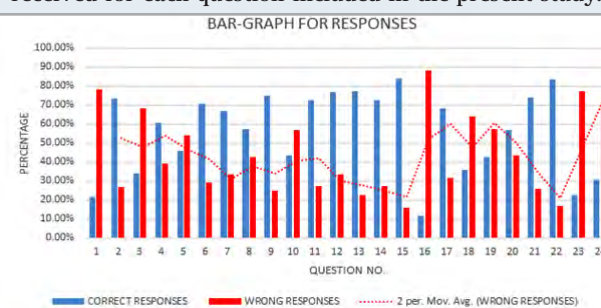
Figure 2: Pie Chart Shows Distribution of answers received for question on factor dependent on deciding precautions before procedures. The most important factor that has been voted for is risk of transmission (37%) and the least important factor is quality of precautions (7%)
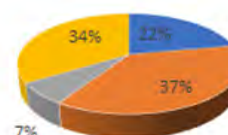
Figure 3: Pie Chart Shows Distribution of answers received for question on hand hygiene prior to wearing gloves. 70% of the study population voted that hand hygiene needs to be practiced every time before wearing gloves and 4% voted it was not mandatory.
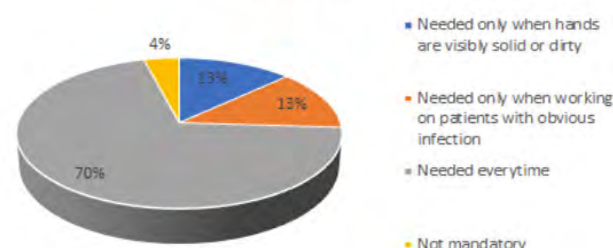
Dental hand items (specifically high-speed drills), air/water syringes and ultrasonic scaler units connected to dental units by a network of small-bore plastic tubes through that water and air are propelled to activate or quiet down the instruments. Hydrodynamics shows that the water column within a small lumen moves within the centre of the tube, leaving a thin layer of liquid just about undisturbed on the walls. Repeated semi-permanent water stagnations during the nights, weekends and holidays combined with high temperatures creates favourable conditions for water flora to form tenaciously adherent microbial colonies. Some dental unit waterlines that are in use for several years could be coated with a biofilm that are visible to the eye, clogs the small-bore tube and gives the water a foul odour. (Miller (Microbiologist) and Palenik, 2018) Biofilm is outlined as a mass and they simply form at anyplace there is a damp non sterile atmosphere.(Yüzbasioglu et al., 2009) Bacteria and yeasts from the biofilms may produce aerosols in the dental surgery. Bacterial species such as Pseudomonas aeruginosa, Pseudomonas cepacia, Legionella pneumophila and mycobacterium chelonae have been identified in biofilms.

Figure 4: Pie Chart Shows Distribution of answers received for question on cleaning waterlines of dental unit. Out of the study population **72%** cleaned the waterlines of their dental unit while **28%** did not.
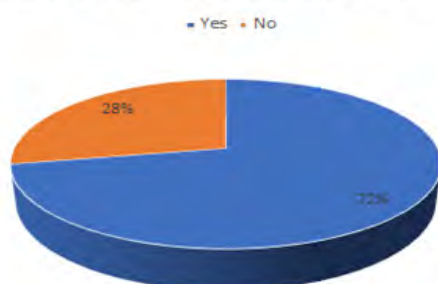
Figure 5: Pie Chart Shows Distribution of answers received for question on flushing the water lines at the start of the day. **84%** of participants flushed the dental air/water lines at the start of each day whereas **16%** did not follow the same.
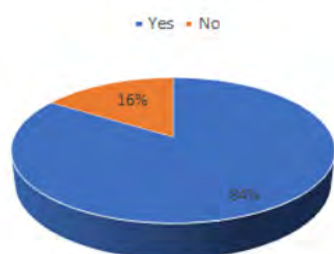
Numerous practice guidelines have been put in place by the CDC and OSHA to help benefit the practitioners and the patients alike. While most of these are implemented

at a Dental School level training, it is not integrated as a part of the curriculum. Hence the infection control practices are followed more mechanically than with meticulous thought and implementation. This survey is conducted to assess the knowledge and awareness not only of the protocols followed, but also of the science and rationale behind their usage. This study was aimed to check the awareness of the dental students of Chennai and other South Indian Universities regarding the latest guidelines in infection control protocols.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about awareness of infection control protocols among clinical dental students and interns in south indian universities.

MATERIAL AND METHODS

This study was performed with the help of a questionnaire consisting of 24 questions and was prepared based on the guidelines of the CDC and OSHA as shown below in FIG 1A,B,C. The questionnaire was given to the 3rd BDS and CRI's students of multiple Dental Colleges in South India. The questionnaire was prepared with the help of google forms and the statistical analysis was done.

Questionnaire
1 The standard Universal Precaution: should be used on:
2. The 'Chain of Infection' involves:
3 According to vouch most important factor in deciding if one of our patients need:
precautions beyond Standard procedures are:
4 You can protect yourself from transmission of Hepatitis B. Hepatitis C and HIV by:
5. Hand Hygiene is a vital part of Infection Control because:
6 Hand byriene practice prior to wearing gloves are:
7. Ways to prevent the spread of the skin infection MRSA is the general community
include?
8. Good "cough etiquette" means?
9 Is it ok to come to work when you're sick and infectious, because the hospice mission is more important than anything?
10. What are the first things you need to know about Infection Control?
11. What is the water temperature you should wash your hands with?

12   What is the first basic element of Infection Control?

13.   Which one of the following is PPE?

14   Do you clean the water lines of your dental unit?

15   Do you flush the dental water lines at the start of each day?

16   If so, for how much duration?

17   Do vou flu:h che dental air water lines in between patients appointment: ?

18   If yes, for how much duration?

19   How many steps are involved in the spray-wipe-spray technique?

20   Do hand lotions: affect the integrity of gloves?

21   Does wearing gloves replace the need for hand washing ?

22   Are you aware of management of blood contaminated instruments?

23   A needle stick injury occurring with s patient with acute HBV infection

necessitate:?

24.   A needlestick injury occurring with a patient who has AIDS necessitates?

RESULTS AND DISCUSSION

A total of 120 participants enrolled in the study. The responses of all 24 questions are depicted in Fig 2. The vast variation in ideas among practitioners regarding infection control questions can be seen from the variations in the responses Some of the results of individual questions that had shown a wide variation in assumptions among the practitioners are shown in the figures below

Figure 6: Pie Chart Shows Distribution of answers received for question on how long they flush the water lines at the start of the day. 9% of the study population were aware that 2 minutes was the ideal duration to flush their water lines at the start of the day whereas the remaining 91% did not know the correct duration.
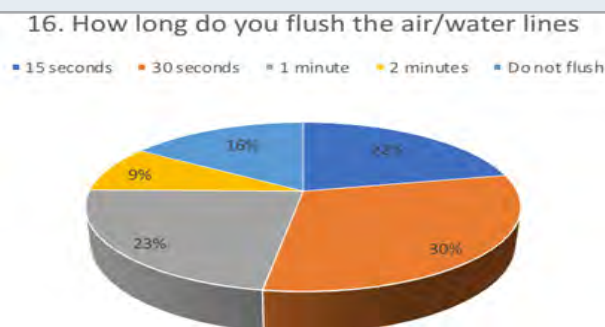
Dental practitioners are especially at high risk of infection by aerosol, blood pathogens, saliva, as they are continually work closest to the patients face and oral cavity and hence exposed to blood and saliva mixed with blood, and may even suffer needle punctures.(Association and Center, 2001) Dental institutes are responsible for

providing appropriate training of dental students toward infection control measures.(Mp, 2016) A wide variety of bacteria, viruses and other pathogens can cause a wide variety of diseases such as Hepatitis B,C,D , HIV, tuberculosis etc. within dental clinical environment if the dental student didn't have enough knowledge, training and education about infection control. (Singh et al., 2011) The spread of infection can be limited by proper awareness of infection control protocols and use of appropriate personal protective equipment and timely vaccination.(Kushiyama, Shimazaki and Yamashita, 2009; Rahman et al., 2013).

Figure 7: Pie Chart Shows Distribution of answers received for question on flushing air/waterlines in between appointments. 68% of the study population flushed the air and water lines between appointments in contrast to remaining 32% that did not.

Figure 8: Pie Chart Shows Distribution of answers received for question on duration of flushing air/waterlines. 30% of the study population were aware of the appropriate time for flushing air/waterlines whereas 70% were not.

Also the post exposure management of the disease is also very important in minimizing the risk to the practitioner. (Ojulong, Mitonga and Iipinge, 2013) The study can be divided into awareness on infection control, waterlines maintenance and infectious diseases and blood products. A majority of the students (73%) were aware about the various modes of spread and basic requirements to prevent spread infectious diseases. While 70% of the students knew the proper hand hygiene protocol, only a contrasting 42.8% of the students knew the actual reason behind the need for proper hand washing. Only 43 % of the students knew that hand-washing was the primary factor in infection control, instead a greater majority

assumed it was biohazards and disinfection. This is due to the fact of the common misconception that the cause of infection isn't the doctor or the patient, but instead the objects. 77% of the participants answered correctly as to what comprises personal protective equipment, this can be attributed to the good amount of clinical exposure they are given at an undergraduate level.

Figure 9: Pie Chart Shows Distribution of answers received for question on need for wearing gloves. 74% of the students believed that wearing gloves replaced the need for hand washing and 26% did not feel the same.

21. Does wearing gloves replace the need for hand washing
- Yes - No
26%
74%
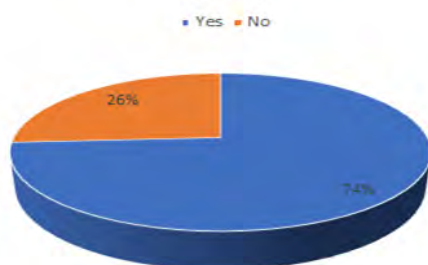
Figure 10: Pie Chart Shows Distribution of answers received for question on necessities for needle stick injury from a patient with HBV. Out of the study population, 51% said they needed hepatitis B vaccine whereas only 23% said HBIG is required.

23. A needle stick injury occurring with a patient with active HBV Infection necessities
- Hepatitis B Vaccination - HAART regimen - HBIG administration - NONE
4%
23%
51%
22%
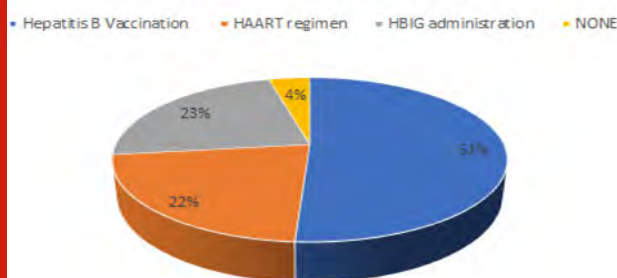
The odds of a patient experiencing an infection could also be related to the quality of water present in the water lines. If the colony forming units(CFU) exceeds the recommended number as per the ADA guidelines of 500CFU/ml, there is a high chance of risk of infection(Holmberg, Suryaprasad and Ward, 2012).It is important for the dental students to be aware of all the above said protocols. As our education system does not focus on the awareness of these protocols, through the four years of their undergraduate education they tend to forget about this aspect of dental practice. This is the reason for a lot of mishaps and problems occurring in the private dental practices.

The majority of the participants flushed and cleaned their water lines both at the beginning of the day as well as between patients. However, only a meagre 9% and 30% of the participants knew the correct protocol wherein

the water lines had to be flushed for 2 minutes and 15 seconds at the start of the day and between patient appointments respectively. This maintains the CFU < 500 CFU/ml to minimize the risk of infections to the patient. (Singh et al., 2011) With reference to the management of sharps and needlestick injuries, the participants showed good awareness regarding the requirement of a post-exposure prophylaxis protocol for needle stick injuries, but a majority (77% and 69%) didn't know the correct drug to be administered in a scenario of a needle stick injury from a patient suffering from Hepatitis B or AIDS,.

In this study an average of correct responses was 56% whereas 51% was the average of incorrect responses. In paralleling studies conducted in Saudi Arabia, the dental students showed a lower percentage of awareness of only 51%,(Rahman et al., 2013) as well as in Qatar the dental students showed a lower percentage of awareness of 44.84%.(Ibrahim and Elshafie, 2016) However, the students of Namibia showed a particularly high awareness of 73%.(Ojulong, Mitonga and Iipinge, 2013). The wide range of fluctuations in the awareness of basic infection control protocols as observed in this survey seem to be present universally across many countries as well. This could be attributed to the fact that in the majority of the dental schools, the infection control protocols are just blindly followed as a part of the clinic practice and there is no academic integration for improvement of the student knowledge regarding the science and logic behind it.

This could be improved by taking meticulous efforts in separately training the dental practitioners and educating them about the serious implications of the same. It is important to reinforce the fact that however long the practitioner has been successful over time, it just takes one little negligence to affect the health of either the practitioner and/or the patient. The role of various local dental bodies is also supposed to focus towards enhancing the knowledge of the practitioners with respect to the infection control practices, apart from the regular programs that only aim in improving skills or demonstrating advanced procedures alone.

Figure 11: Pie Chart Shows Distribution of answers received for question on necessities for needle stick injury from a patient with HIV. Out of the study population, 31% said that HAART treatment is required and 14% said HBIG is required.

24. A needle stick injury occurring with a patient who has AIDS necessities
- HBIG Administration - HIV Vaccination - HAART - Antiviral drugs
24%
14%
31%
31%
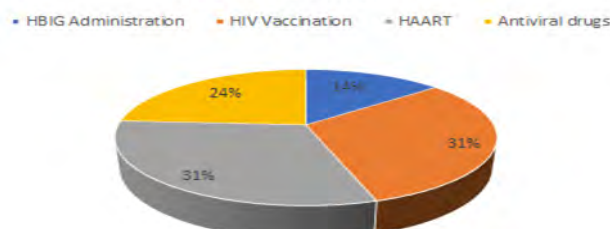
CONCLUSION

Dental students of south India have a fairly good awareness of various infection control protocols and water lines maintenance protocols. However, a wide variation among the ideas and a lot of misconceptions regarding the infection control protocols show that there is still a lot of room for improvement by conducting more number of workshops, continuous dental education programmes and seminars to further spread knowledge regarding the advancements in the above mentioned protocols. This will go a long way in improving the quality and standard of dental care in the country.

ACKNOWLEDGEMENTS

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Dental Communication

A Survey on Use of Colour Pens in Examinations Among the Dental Students

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ABSTRACT

The aim of the study is to find the effectiveness of use of colour pens among the students. Colour pens used in examinations make it easier for the students and teachers to do their task. .Highlighting the important points makes the students to study and score marks easily as from a teacher's point of view it makes paper corrections easier. The use of colour pens in exams has been found to be excellent which makes the exam paper colourful and the exam paper looks neat. There are several methods in using colours in exams either for underlining or for writing the important points with colour pens. A survey is conducted among 100 students with 15 questions in google forms. The students attending the survey are from Saveetha Institutes of medicine and technical Sciences.results were entered in the excel sheet and analysed through SPSS statistical platform. From the results of our study, we conclude that the use of colour pens during an exam increases the grade of the student's performance. Eventhough is not statistically significant, in our study we found the females use colour pens in exams more efficiently than males. Also, the study proved that instead the use of colour pens consumed more time than usual, by practice the time can be adjusted sufficiently along with the colour pen use will increase the performance level in their exams.

KEY WORDS: STUDENT,COLOUR PENS, EXAM, TIME, GRADES.

INTRODUCTION

Blooms taxonomy is a set of three hierarchical models used to classify educational learning objectives into levels of complexity and specificity. The three list covers the learning objectives in cognitive, affective and sensory domains. The cognitive domain list has been the primary focus of the most traditional education and is frequently used to structure curriculum learning objectives, assessments and activities. It is used in problem solving situations by applying the acquired knowledge, facts, techniques and rules. Learners should be able to use prior knowledge to solve problems, identify connections and relationships and how they apply in new situations. Knowledge is the foundational cognitive skills and refers to the retention of specific, discrete pieces of information like facts and definitions. Assessment is an essential element to any educational process(Adams, 2015). Summative assessment is used to measure what students have learnt at the end of a course and moves to higher levels (Umar and Majeed, 2018).

The Neuro-linguistic programming underlying principles have been applied in various performance related and learning contexts. It was introduced by Richard Bandler and James Grinder. Key concepts in Neuro-linguistic

programming is appreciation and understanding individuals to use a representational system based upon each of the sense modalities to understand and interpret the world. These systems are visual, auditory, kinaesthetic, olfactory and gustatory Learning is the dynamic process by which the meaning is created by reciprocal feedback and not simply the transmission of information from one individual to another individual. As Neuro-linguistic programming consists of a wide range of techniques that are held to be effective or useful, rather than coherent theory, it is perfectly acceptable to apply a selected number of these techniques in any particular situation. The strength and weakness of Neuro linguistic programming are described with and recognise the reference to its origin, previous research and comments from critics and supporters (Kudliskis and Burden, 2009).

Mechanical learning has been widely used in image analysis and processing for the purpose of letting the computer recognise specific aspects like colour, shape, texture, size and position. Colour is one of the most important aspects in vision, since it is used generally to discriminate and recognise information. The colour is chosen due to the importance given by humans to this attribute. Also, colour is used in main filter criteria in object recognition and tracking. The effect of the colour is studied from the point of view of the most popular colour spaces available in imaging. The colour is used as a specific wave frequency with a certain amplitude and longitude is not trivial or natural to human beings, it created a system that helps to describe the colour in a more natural and ordered way (Chavolla et al., 2018). Effective assessment is one of the most challenging aspects of teaching. The testing effect is the well demonstrated idea that recalling information in a testing situation is more beneficial than re-reading or re-studying the information(Jensen, Berry and Kummer, 2013).

Examination is an assessment intended to measure a test taker's knowledge, skill, aptitude, physical fitness, or classification in many other topics. A test may be administered verbally, on paper, on a computer, or in a predetermined area that requires a test taker to demonstrate or perform a set of skills. However, each colour represents each meaning here we see some of the colours meaning. Green colour is usually for concentration which improves focus on studies, orange colour is for welcoming and mood lifting colour for learner, which in turn promotes comfort and improves neural functioning, blue is the best for learning situations which are challenging and blue ink, blue paper or blue highlighting can be used to help reader to improves reading comprehension too. (Florea and Radu, 2007). Each colour has a different type of wavelength for example red has more than blue. That is why it is used in traffic signals to stop the vehicles and in correction of paper red ink is more highlighting one for the students to correct their mistakes very easily so that next they won't repeat the same mistakes in their next exams or test. Colour is the most beautiful creature of the world,

without the colors the world would be in black and white which is very awful.(Umar and Majeed, 2018)

The main advantages of using colour in exams is to highlight the important points in paper so that evaluators may easily correct the papers. The most disadvantage is that time management in exams is the most and foremost point in the exam . Some may have time in writing in colour pen use in exams and some may not. Students' performance in exams is one of the primary ways. It impacts on students to pass exams (Devine, 2014). Range of student performance based on academic ability, systemic differences in how different populations of students perform on exams potentially contribute to unequal retention of demographic groups.

Students tend to approach learning superficially when they expect tests to have restricted response questions (e.g. questions from which a student chose from a set of answers like multiple choice questions) (Wright, Eddy and Wenderoth, 2016). The format of the exam also influences how students engage with course material. When students expect a test containing constructed response questions (e.g., questions for which students must generate the response: short answers, essay, graphing/drawing) they tend to take a deeper approach to learning and taking notes that concentrate more on main ideas and core concepts ((Mascolo, Alfonso and Flanagan, 2014).

Exam format can also have a differential impact on students as many studies have demonstrated that males tend to perform better on restricted response questions and women tend to perform better on constructed response questions (Mazzeo, Schmitt and Bleistein, 1993). One way of evaluating the cognitive level of exams and their question is to categorise each question according to bloom's taxonomy of cognitive domains(Adesoji, 2018). Learning taxonomies or classification are commonly used as a way of describing different kinds of learning behaviour and characteristics. The original taxonomy of three parts or domain and these are the cognitive, the affective and the psychomotor. The key categories of psychomotor competence capture the development in learning from initial exposure to final exposure, an unconscious master (Bolloten, 2012). The cognitive domains involve the development of mental skills.

MATERIAL AND METHODS

Sample collection: A survey was conducted among 100 students of Saveetha Dental College and Hospital in the month of November 2019. Nearly 12 valid questions had been prepared and circulated among the students and answers were recorded.

Inclusion Criteria: Selection criteria include all the students of Saveetha dental college who are willing to participate in the study. First, second, third and final

year Undergraduate dental students Exclusion Criteria: Students who were not willing to participate were

excluded from this study. postgraduate students and interns were excluded.

Sampling method: In the present study,the sampling method used is the Random sampling method.

Data Collection and Tabulation: The responses were entered into the excel sheets and then tabulation of the data finally and the question comparison was done. The representation of the data is through the bar graph.

Statistical Analysis: The statistical software used IBM SPSS V22.The statistical tests used were descriptive analysis and Chi Square analysis. Significant p value was set at <0.05.

RESULTS AND DISCUSSION

In the present study, the study population responded were 34% of the first year students, 49% of the second year students, 12% of the third year students, 4% of the fourth year students and 1% were postgraduate students (Figure 1). according to gender distribution, we had studied 72% of the females and 28% of males (Figure 2). Figure 3 shows 92% that the majority of the students use colour pens in exams while 8% of them do not use colour pens. Nowadays students use colour in the examination. Certain colours produce the certain wavelength in the way to give meanings.For Red colour has the high colour wavelength so that for correction of papers red ink pen is used, so it becomes easy for the students to rectify the mistakes(Reed et al., 2014)   Figure 4 shows frequency of colour usage are 44% are occasional users, 40% are frequent users and 16% always use colour pens in exams. Figure 5 shows the way of usage includes either by underlining or writing in colour pens itself both of the way of use.63% use for both underlining and writing in colour pens, 20% for underlining and 17% for writing in colour pens.

Figure 1 In this Pie Chart Blue colour represents the first year students which is 34%, Green colour represents second year students which is 49%, sandal colour represents the third year students which is 12%, Purple colour represents the fourth year students which is 4% and yellow colour represents post graduate which is 1%.
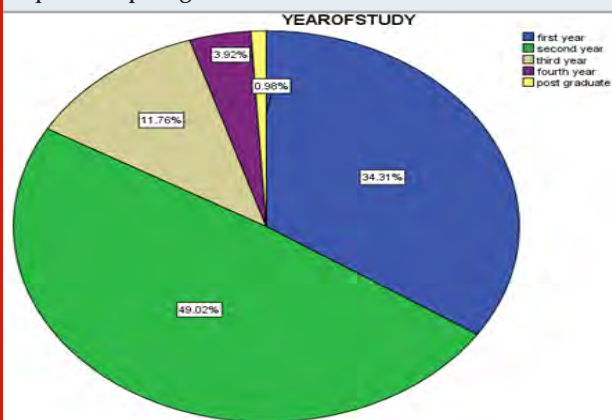
Figure 2: Pie Chart represents the gender. Blue colour represents the female which is 72% and green colour represents the male which is 28%
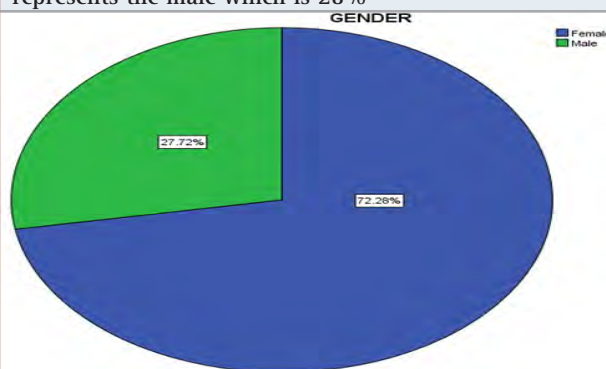
Figure 3: In this Pie Chart blue colour represents the colour pens used in exams which is 92% while green colour represents the colour pens are not used in exam which is 8%

Figure 4: Shows that the majority (43.14%) of the study population, occasionally use colour pens in exam (green), followed by 29.41%(khaki) use the colour pens frequently in exams and 27.45% (blue) always use colour pens in exams.
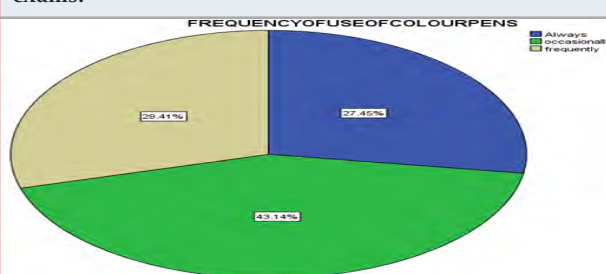
The students nowadays use colour pens for both underlining and writing in colour pen itself. But in a separate point of view that is underlining and highlighting the point separately most of them i.e20% uses underlining and 17% least one uses writing in colour pens.Figure 6 shows the method of colour use is a very crucial thing in exam point of view. Most of the students in this generation uses pen in highlighting the points that is 63% of students, least commonly that is 21% of them uses for heading, and 16% of them uses for decoration and no one uses colour pen for the

diagrammatic purpose .Colour shades may be contrast and same colour. Figure 7 shows 84% uses contrast colour while 16% use the same colour. Here the contrast colour means different colours.

Figure 5 Blue colour shows the colour pen used for underlining which is 19% , Green colour shows colour pens used for writing itself which is 17% and khaki colour indicates the colour pen is used for both underlining and writing in colour pen itself which is 64%
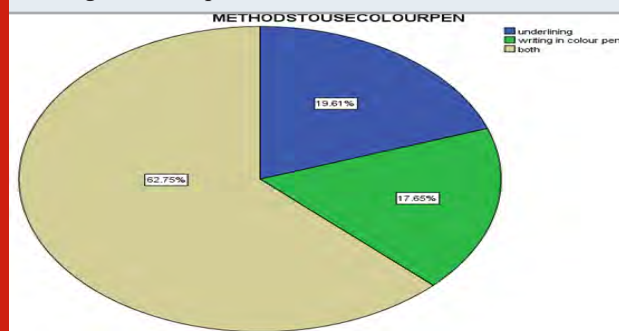
Figure 6 shows the response to the conditions where the colour pens used. Blue colour represents the colour pens used for headings which is 21% , Green colour represents the colour pen used for decoration which is 16% and sandal colour represents colour pens used for highlighting the important points which is 63%.
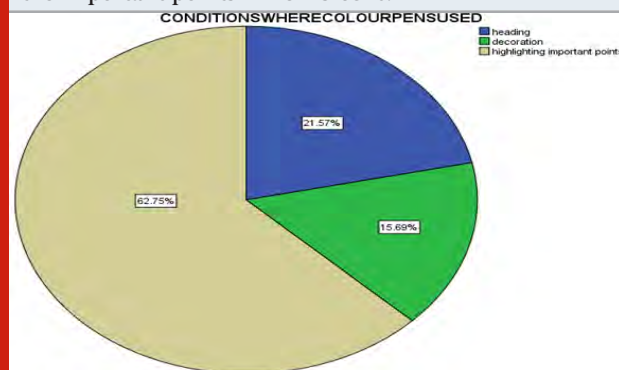
Figure 7: Represents the types of colour shades used. Blue colour represents the percentage of students use contrast colour which is 84% and green colour represents the same colour which is 16%
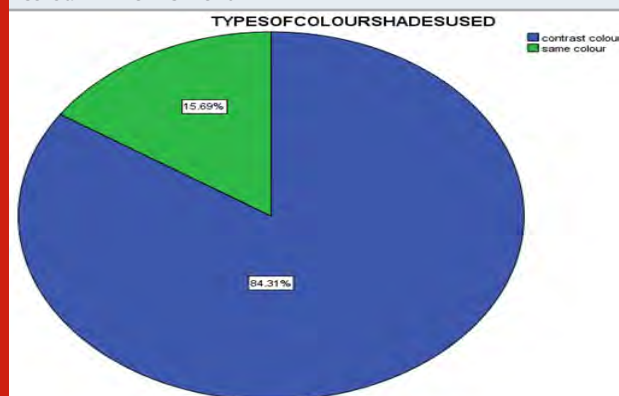
The same colour seems to be monotonous for teachers for corrections while different colours seem to be presenting in good manners. The way of use of colours through colour pens is 68% , 25% uses colour pencils, 5% uses sketches in exams. Colour pens are used by most of the students so it is easy for students in highlighting the points and the least one is sketch pen use which is difficult in use of colour in exams due to its thickness. (Kim et al., 2011)

Figure 8 shows that 76% have sufficient time to use colour pens in exam and 23% do not have time to use colour pens. Time is the most important factor in exams. There should be proper time management in exams. Most of the students nowadays use time efficiently in exams. A study has shown that time management has a relation between the character development and academic performance of students (Misra and Castillo, 2004).

Figure 8 represents the time management in use of colour in exams. 76% of the students opt that they manage time with use of colour pens in exams(blue) and 23.53% of the students opt that they cannot manage time with use of colour pens in exams(green).
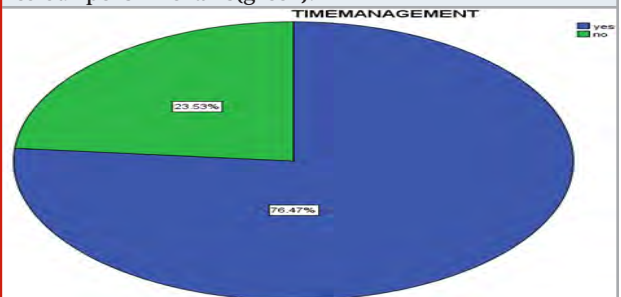
Figure 9: Represents that 86.27% of the students agreed that there is a definite increase in the grades if they use colour pens in exams. The remaining 13.73% of students did not agreed it.
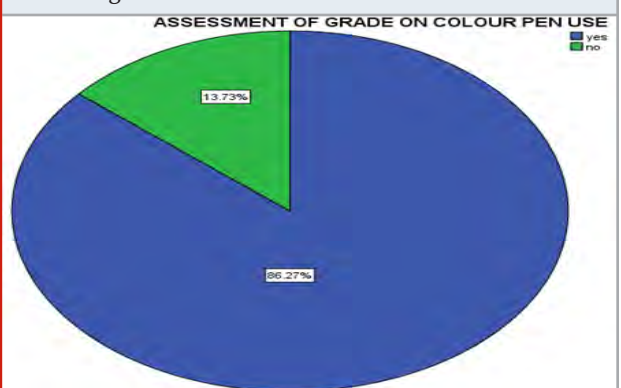
Figure 9 shows 86% shows increase in grades while in 14% of them there is no increase in grades. The most important aim of the exam is to get more marks in the exam. Comparison of grade and time management, it shows that most of the students use colour pen in exam wisely and getting grades more.Figure 10 shows Colour preferences which differs from person to person. Pink,

green and purple colour is preferred by 20%, Orange colour preferred by 18%, Black is preferred by 21% and brown is preferred by 2%. Nowadays, the students in exam use five times in exam which is the least number of times in use, but the maximum number of uses of colour pen is twenty times which is used by least populations (He et al., 2016).

Figure 10: Represents the preference of colour by the students. Pink, green and purple colour is preferred by 20% of the students, Orange colour preferred by 18% of them, Black is preferred by 21% and brown is preferred by 2% of the study population.
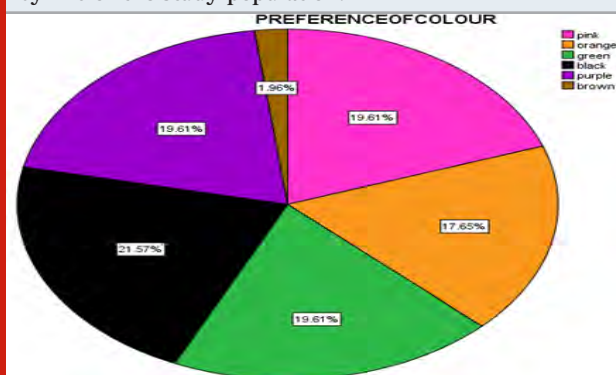
when we compared the gender association with colour pen usage(figure 11-14) we found that the majority of females use the colour pens more in exams than males. However, in the Chi square analysis, it was found that the P value is 0.421 (>0.05)which is not significant, also we obtained that the majority of the females agreed that their grades will increase with the use of colour pens in exams than the males. However the difference is not significant statistically(P value is 0.226). Majority of females use colour pens for both underlining and writing the important points in the exams than the males. However the difference is not significant statistically. The P value is 0.506 (>0.05).Finally, we found that a majority of females manage the time of examination very

Figure 11: Shows the association between the gender and Frequency of use of colour pen in examination. X axis represents the Gender and Y axis represents the frequency of use of colour pens in examination. Majority of females use the colour pens more in exams than males. However, in the Chi square analysis, it was found that the P value is 0.421 (>0.05) which is statistically not significant.
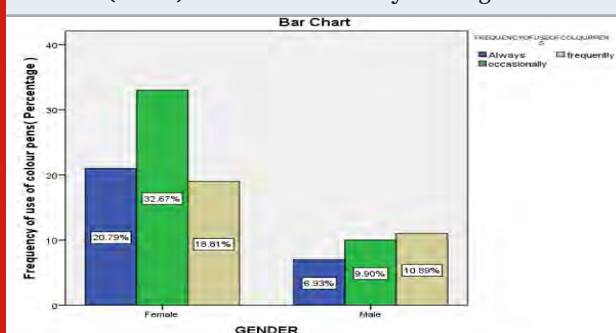
well along with the use of colour pens than the males in our study. However the difference is not significant statistically. The P value is 0.506 (>0.05).

Figure 12: Represents the association between the gender and percentage responses for increasing grade on colour pen usage. X axis represents the gender and Y axis represents the percentage responses for increasing grade on colour pen usage. majority of the females agreed that their grades will increase with the use of colour pens in exams than the males. However the difference is not significant statistically. The P value is 0.226 which is statistically insignificant.
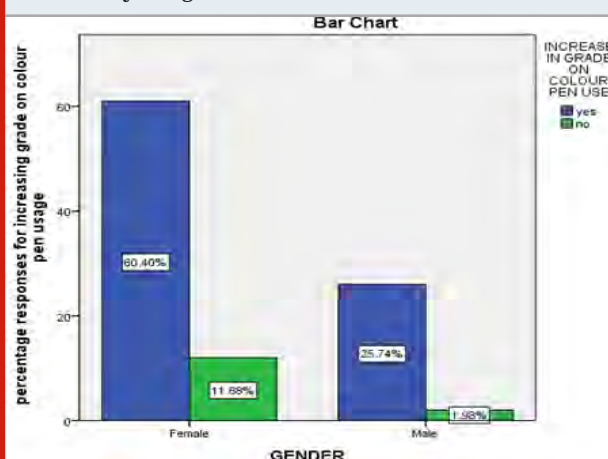
Figure 13: Represents the association between the gender and percentage responses for me on colour pen usage. X axis represents the gender and Y axis represents the percentage responses for methods of using colour pens. Majority of females use colour pens for both underlining and writing the important points in the exams than the males. However the difference is not significant statistically. The P value is 0.506 (>0.05).

Recently, there is a lack of attention at the high school level in their summative assessments. There are several reasons why an examination of the effect of colour of test in a booklet on exam performance in higher education summative evaluation is important. Colour stimuli may vary on lightness, hue and chromatography(Arthur,

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Cho and Muñoz, 2016). In present study, most of the students i.e.,86% show increase in grades. For 14% of them there is no increase in grade. Most of them prefers i.e., 20% of them prefer pink, green and orange colours. A study has shown that children with autism have some colour coding which makes the children have a motivating learning tool.(Hurley-Hanson, Giannantonio and Griffiths, 2019).

Figure 14: Represents the association between the gender and percentage responses for me on colour pen usage. X axis represents the gender and Y axis represents the percentage responses for methods of using colour pens. Majority of females manage the time of examination very well along with the use of colour pens than the males. However the difference is not significant statistically. The P value is 0.506 (>0.05).
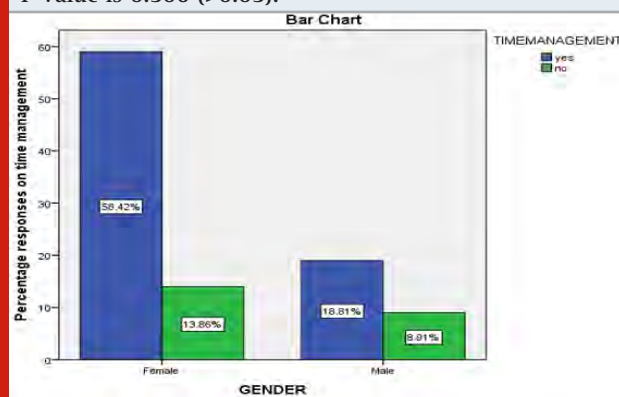
Numerous studies have shown that colours help in learning and remembering the important during examination period. It has also been shown colours also increases the attention towards the studies (Dzulkifli and Mustafar, 2013). Understanding the subject and it concepts based on examination in which the students can write in colour pens during examination with the proper time management will help the students to score excellent marks in forthcoming exams.(Shukla et al., 2014).

CONCLUSION

From the results of our study, we conclude that the use of colour pens during an exam increases the grade of the student's performance.Eventhough is not statistically significant, in our study we found the females use colour pens in exams more efficiently than males. Also, the study proved that instead the use of colour pens consumed more time than usual, by practice the time can be adjusted sufficiently along with the colour pen use will increase the performance level in their exams.

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Awareness on Intraligamentary Injection Among Dental Students- A Questionnaire Survey

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ABSTRACT

Intraligamentary injections are preferred primary technique when anesthesia of short duration is desired and a safer alternative when limited soft-tissue anesthesia for simple single-tooth extraction is required or for patients with bleeding tendencies.This survey aimed at assessing the knowledge and awareness of intraligamentary injection technique among dental students. The study was done in an online setting among the dental students of the Chennai population. The sample size of 150 participants of age group 20-23 years , both males and females were selected by a simple random sampling method. Both descriptive (frequency of the responses) and inferential statistics (Chi - square tests) were done and the results were presented in the forms of graphs. According to this survey based study it was noted that the females(64%) have participated in higher numbers compared to males(36%). It was noted that 59.33% of the population participated in the study were aware of the term PRP (ie. platelet rich plasma) whereas 40.67% of the population was not aware of the term. Within the limitations of this study, it was inferred that the knowledge and awareness of platelet rich plasma was different among both the genders. More appropriately , females were much aware compared to males

KEY WORDS: ANAESTHESIA; AWARENESS; PAIN; PDL.

INTRODUCTION

Local anesthesia forms the major part of pain-control techniques in dentistry (Singh, 2012). Patients expect a painless and comfortable dental treatment, which becomes crucial especially in subjects suffering from dental phobia (Yamashiro and Furuya, 2006). The selection of a local anesthetic for intraoral injection must include considerations of efficacy, safety, and individual patient and operative needs. Drug selection has to consider both components of the anesthetic solution. The local anesthetic agent must have a high intrinsic activity and a low systemic toxicity (Singh, 2012).

Various local anaesthesia injection techniques include infiltration, nerve block, intraosseous, intra pulpal, intra septal, periodontal ligament injection (Reed et al., 2012). The most common method of inducing anesthesia for maxilla is infiltration or supra-periosteal injection technique. In this method, the needle is penetrated in deep vestibular mucosa above the apex of the tooth. Inferior alveolar (I.A) nerve block is the common technique of anesthetizing the mandible. The technique of nerve block anaesthetic injection for adults and children is almost similar. The only difference is that the injection must be a little lower, and more posteriorly for children because the mandibular foramen is lower to the occlusal surface of deciduous teeth (Pinkham and Casamassimo, 1999).

One of the most common complaints following I.A nerve block is soft-tissue injury due to biting lips, tongue, and buccal mucosa. Therefore, the necessity of an alternative method is felt (Sharaf, 1997). Block injection for hemophilic patients who have not received recombinant factors may lead to cervical hematoma or even death (Kumar et al., 2007). However, both methods are characterized by a long-lasting action, mostly longer than needed, and possible significant complications like nerve injuries. Moreover, as patients are getting older, cardiovascular and medicinal issues have to be taken into account when dental anesthesia is performed. A less known and used technique is represented by the intraligamentary anesthesia, which has unique characteristics and advantages (Doris Burtscher, 2019).

In order to reduce these undesirable side effects from other techniques, first attempts were made already at the beginning of the 20th century in order to anesthetize single teeth directly without influencing the nerve structures of the surrounding tissues (Meechan, 1992). In 1920 Chompret published his experiences entitling his work "Anesthésie par injections intraligamenteuses"(Doris Burtscher, 2019) . During the following decades the described technique of intraligamentary anesthesia (ILA) was refined simultaneously to the development of new anaesthetic devices. These instruments enabled the injection of the anesthetic solution in the periodontal ligament against the high periodontal tissue resistance (back-pressure) with only little effort by the dentist himself(Baghlaf et al., 2018). The results of histologic evaluations after the PDL injection was administered indicated minimal damage to the crestal bone, followed by rapid repair and healing(Walton and Garnick, 1982).

Intraligamentary injection was given using short 27- or 30- gauge dental needles for this technique. With the tip of the needle approaching the periodontal sulcus on the mesial or distal aspect of the tooth, the needle should be advanced to the base of the periodontal crevice. With the bevel oriented toward the root surface, the needle is advanced into the PDL between the root surface and the adjacent alveolar bone. A small amount (0.2 milliliters) of anesthetic solution should be administered slowly. To ensure that the solution is being forced into the tissue, we must feel resistance. Although syringes differ among manufacturers, the technique usually requires deposition of at least 0.2 mL for each root of the tooth (Malamed, 2012).

Although occasionally it is used as the primary anesthetic technique (when a single tooth requires anesthesia for a short duration), dentists most often use the PDL technique when mandibular nerve blocks are unsuccessful (Nusstein et al., 2010). The PDL injection provides pulpal anesthesia to the tooth, with only localized soft tissue anesthesia developing. When administered in the mandible, there is no associated extraoral or lingual anesthesia like traditional inferior alveolar nerve block (Saxena et al., 2013). Intraligamentary injections are given in children and mentally handicapped patients. Intraligamentary

anesthesia clearly reduces the risk of post-operative bite injuries since it does not cause numbness in the cheeks, tongue or lips (MIB GmbH, n.d.). The application of high pressure is required to deliver the local anaesthesia into the dense oral tissues at the PDL injection site. This has resulted in many patients complaining that the PDL injection was painful (Saxena et al., 2013).

Previously our department has published extensive research on various aspects of prosthetic dentistry (Anbu et al., 2019; Ariga et al., 2018; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Ganapathy et al., 2017; Gupta et al., 2018; Jain, 2017a, 2017b; Ranganathan et al., 2017; Varghese et al., 2019; World Journal of Dentistry, 2017), this vast research experience has inspired us to research about awareness on intraligamentary injection among dental students.
As intraligamentary injection has various advantages and can be used as an alternative for various other techniques, the present study aimed at assessing the knowledge and awareness of intraligamentary anaesthesia among dental students.

MATERIAL AND METHODS

The study was done in an online setting among the dental students of the Chennai population. Institutional review board approval was obtained for this survey based analysis. 2 reviewers [Primary investigator & guide] were involved in this study. The sample size of 151 participants of age group 20-23 years , both males and females were selected by a simple random sampling method. Randomisation [for all variables] was followed to minimise the bias. Pre tested questionnaires where the internal validity was the homogenisation and replication of experiment. Cross verification with existing studies was the external validity of this study. The set of questionnaires which includes gender, questions on awareness were circulated among the participants through an online link. The results were collected and tabulated . Then the results were exported for statistical analysis to SPSS statistical software. Both descriptive (frequency of the responses) and inferential statistics (Chi - square tests) were done and the results were presented in the forms of graphs.

RESULTS AND DISCUSSION

According to this survey based study it was noted that the males(52.98%) have participated in higher numbers compared to females(47.02%) [Figure 1]. It was noted that 79.47% of the population participated in the study were aware of the term intraligamentary injection whereas 20.53% of the population was not aware of the term [Figure2]. Among the participants, 74.83% of them had given intraligamentary injection to their patients while 25.17% had never given intraligamentary injection [Figure 3]. About 68.87% of participants were aware about the technique used to give intraligamentary injection while 31.13% were not aware about the technique [Figure 4]. For intraligamentary injection, 27- and 30- gauge needles were used and 64.24% of

participants were aware about it but 35.76% were not aware about it [Figure 5].

Figure 1: Pie chart showing percentage distribution of the population according to gender participated in the study. 52.98% were males (Blue) whereas 47.02% were females(Green) participated in the study. N=151. Males have participated in higher numbers in this survey.
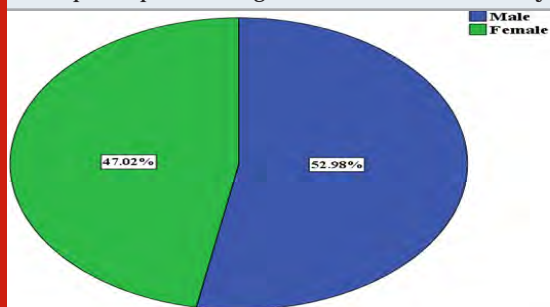
Figure 2: Pie chart showing percentage distribution of the awareness of the term intraligamentary injection among the participants participated in the study. 79.47% were aware of the term (Blue) whereas 20.53% were not aware of the term(Green). N=151. There is increased awareness of the term intraligamentary injection among the study participants.
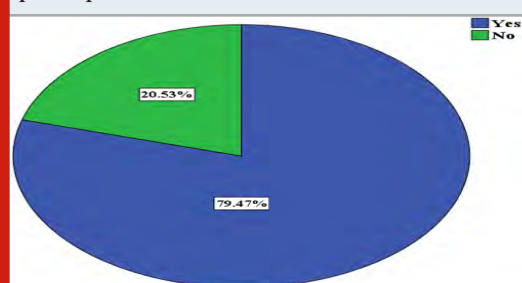
Figure 3: Pie chart showing percentage distribution of the students who had performed intraligamentary injection in patients among the participants. 68.87% had given intraligamentary injections to patients previously (Blue) and 31.13% had never given intraligamentary injections to patients (Green). N=151. There is an increased number of participants who had given intraligamentary injections to their patients.
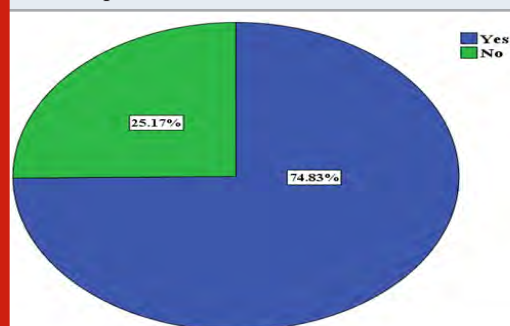
Figure 4: Pie chart showing percentage distribution of the awareness about the technique used to give intraligamentary injection among the participants participated in the study. 64.24% were aware about the intraligamentary injection technique (Blue) whereas 35.76% were not aware of the intraligamentary injection technique (Green). N=151. There is increased awareness of the intraligamentary injection technique among the study participants.
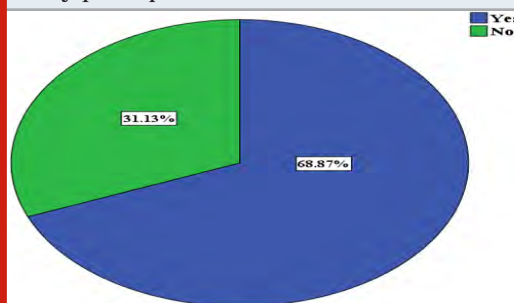
Figure 5: Pie chart showing percentage distribution of the awareness about gauge needle size used to give intraligamentary injection among the participants participated in the study. 64.24% were aware about the gauge needle used during intraligamentary injection (Blue) whereas 35.76% were not aware of the gauge needle used in intraligamentary injection technique (Green). N=151. There is increased awareness of the gauge needle no. used in intraligamentary injection technique among the study participants.
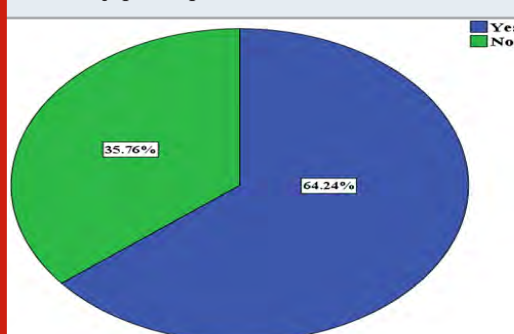
50.99% of participants' patients complained of pain during intraligamentary injection while 49.01% of participants' patients could bear the pain [Figure 6]. Among the participants, 24.50% gave intraligamentary injection into only one surface, 57.62% gave intraligamentary injection into two surfaces and 17.88% gave intraligamentary injection into three surfaces [Figure 7]. About 51.66% of participants were aware about the special apparatus used for intraligamentary injection while 48.34% of participants were not aware about the special apparatus [Figure 8]. Intraligamentary injection is used as alternative when nerve block fails and 66.23% were aware about it while 33.77% were not aware about it [Figure 9].

Figure 6: Pie chart showing percentage distribution of the patient's reaction to intraligamentary injection given by students among the participants participated in the study. 50.99% of patients had pain during the intraligamentary injection (Blue) whereas 49.01% of patients were able to bear the pain during intraligamentary injection (Green). N=151. It is shown that an increased number of patients had pain during intraligamentary injection.
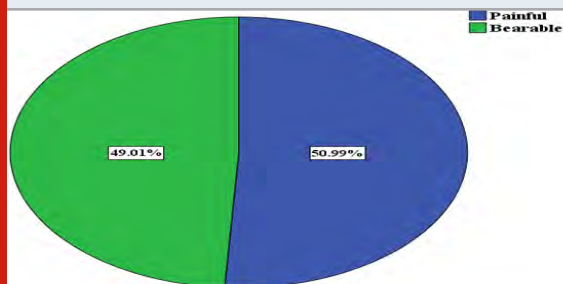
Figure 7: Pie chart showing percentage distribution of the number of surfaces injected during intraligamentary injection by the participants participated in the study. 57.62% of participants injected into only one surface during the intraligamentary injection (Blue) whereas 24.50% of participants injected into two surfaces during the intraligamentary injection (Green) and 17.88% of participants injected into three surfaces during the intraligamentary injection (Brown). N=151. It is shown that an increased number of participants had given intraligamentary injection into one surface.
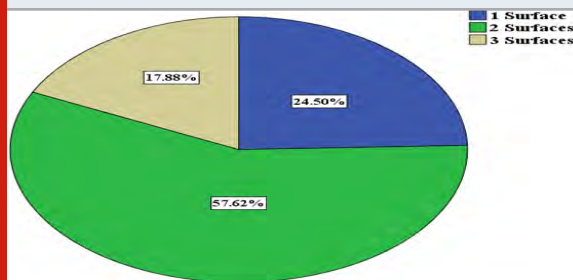
Among the participants, 68.87% were aware that high pressure should be given during intraligamentary injection while 31.13% were not aware about it [Figure 10]. About 25.83% of participants had given intraligamentary injection for pregnant women, 40.40% had given it for hemophilic patients and 33.77% had given intraligamentary injection to immunocompromised patients [Figure 11].

Association of gender and awareness of the term intraligamentary injection was found to be statistically significant with a p value of 0.029 [Figure 12]. Association between gender and the participants who had used intraligamentary injection in their practice was found to be not statistically significant(p=0.423) [Figure 13]. Association of gender and awareness of the technique used in intraligamentary injection was not statistically

significant with a p value of 0.307 [Figure 14]. Association of gender and awareness among the participants that intraligamentary injection was used when nerve block fails was not statistically significant with a p value of 0.084 [Figure 15].

Figure 8: Pie chart showing percentage distribution of awareness about special injection apparatus used in intraligamentary injection by the participants participated in the study. 48.34% of participants are aware about special injection apparatus used in the intraligamentary injection (Blue) whereas 51.66% of participants are not aware about special injection apparatus used in the intraligamentary injection (Green). N=151. It is shown that an increased number of participants were not aware about the special injection apparatus used in the intraligamentary injection
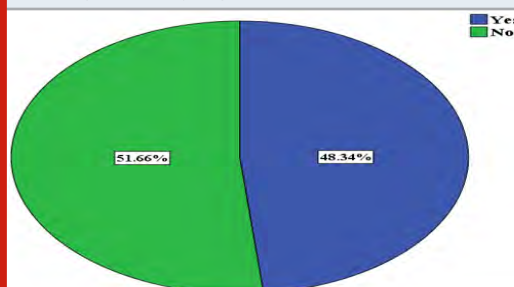
Figure 9: Pie chart showing percentage distribution of participants aware of using intraligamentary injection as alternative during nerve block failure among the participants participated in the study. 66.23% of participants were aware of using intraligamentary injection as alternative during nerve block failure (Blue) whereas 33.77% of participants were not aware about using intraligamentary injection as alternative during nerve block failure(Green). N=151. It is shown that an increased number of participants were aware of using intraligamentary injection as alternative during nerve block failure.
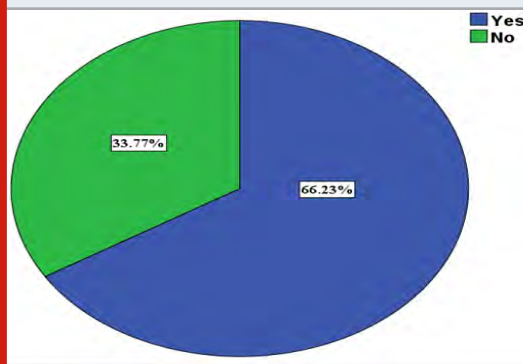
According to the survey, it was found that the participants were more aware about the intraligamentary injection and also males were more aware compared to females. According to Vinitha G et.al, the dental students who were

aware of periodontal ligament injection technique are 68% where 32% of people are not aware of periodontal ligament injection (Vinitha and Student, n.d.).This finding was similar to the present study. Also,.58% of people use 2 surfaces for giving periodontal ligament injection while 23% use 3 surfaces for giving periodontal ligament injection where 18% only use 1surface for giving injection .This finding was in agreement with the present study. According to Vinitha G et.al, 43% dental students use periodontal ligament technique for extraction when routine nerve block fails which was contradictory to the present study since more number of participants use intraligamentary injection as alternative when nerve block fails. And only 25% of students in the previous study had used this technique for haemophilic patients (Vinitha and Student, n.d.)which was opposing the present study since 40.40% of dental students in the present study had used intraligamentary injection for hemophilic patients.

Figure 10: Pie chart showing percentage distribution of participants aware about high pressure given during intraligamentary injection among the participants participated in the study. 68.87% of participants were aware that high pressure should be given during intraligamentary injection (Blue) whereas31.13% of participants were aware that high pressure should be given during intraligamentary injection(Green). N=151. It is shown that increased participants were aware that high pressure should be given during intraligamentary injection.
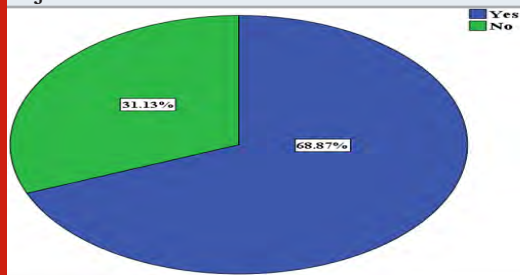
Figure 11: Pie chart showing percentage distribution of type of patients among which intraligamentary injection was used more commonly by the participants participating in the study. 25.83% of pregnant women were given intraligamentary injection (Blue) whereas 40.40% of hemophilic patients were given intraligamentary injection (Green) and 33.77% of immunocompromised patients were given intraligamentary injection (brown). N=151. It is shown that intraligamentary injection was given more commonly among hemophilic patients.
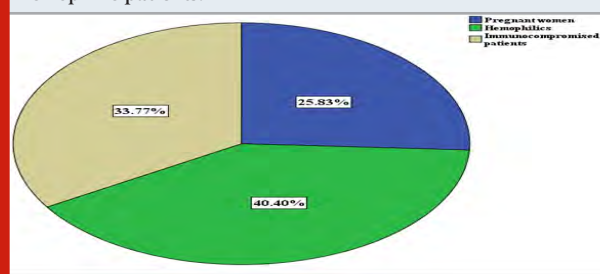
Figure 12: The bar graph represents the association of gender and awareness of the term intraligamentary injection among the participants. The X - axis represents the gender and the Y - axis represents the number of participants. Among the total participants, males (45.7%) were more aware of the term intraligamentary injection compared to females (33.77%). This association was statistically significant.(Pearson Chi square value:4.794; p=0.029(<0.05).
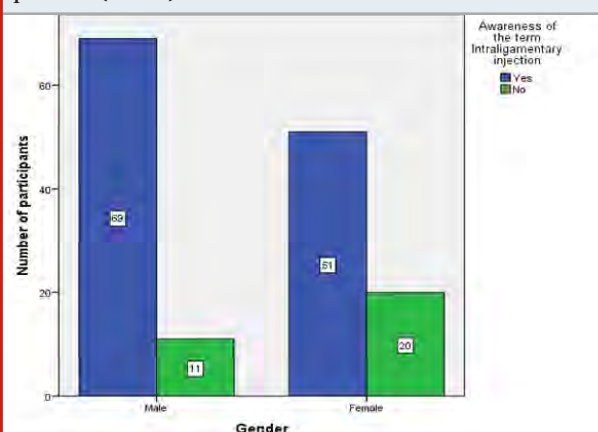
Figure 13: The bar graph represents the association of gender and the number of participants who had given intraligamentary injection among the participants. The X - axis represents the gender and the Y - axis represents the number of participants. Among the total participants, males (41.06%) had given more intraligamentary injections to patients compared to females (33.77%). This association was not statistically significant.(Pearson Chi square value:0.642; p=0.423(>0.05).
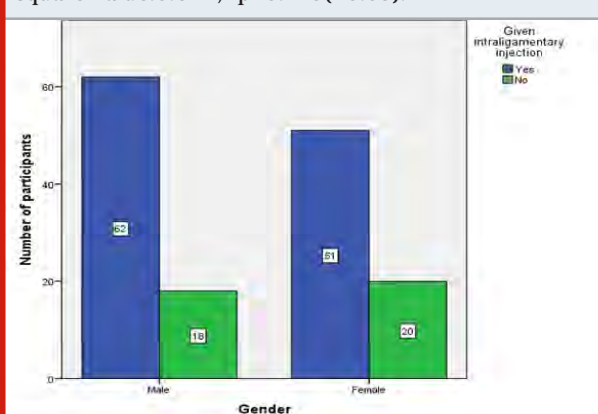
When the inferior alveolar nerve block was inadequate to provide profound pulpal anesthesia in mandibular posterior teeth of patients with irreversible pulpitis, the intraligamentary injection administered with a computer-controlled local anesthetic delivery system was successful approximately 56% of the times. (Nusstein et al., 2005). The intraligamentary injection (periodontal ligament injection) allows placement of a local anesthetic solution

into the cancellous bone adjacent to the tooth to be anesthetized (Walton and Abbott, 1981). The success of supplemental intraligamentary injections in achieving pulpal anesthesia in endodontic therapy has been reported to be 50 to 96%. Traditionally, intraligamentary injections have been administered with a conventional syringe or high-pressure syringe (Nusstein et al., 2005). Milestone Scientific has recently developed a specialized Wand called the Computer-Controlled Drug Delivery System (CCDDS). The new system incorporates all of the previous Wand technology with additional advances. The improved unit includes a visual display showing the precise volume of drug delivered and the pressures developed during drug delivery. A critical factor in the success of intraligamentary injection is achieving strong back pressure (Walton and Abbott, 1981). This new system will allow direct monitoring of the pressures achieved during intraligamentary injection.

Figure 14: The bar graph represents the association of gender and awareness about the technique used to give intraligamentary injection among the participants. The X - axis represents the gender and the Y - axis represents the number of participants. Among the total participants, males (38.41%) were more aware of the technique used to give intraligamentary injection compared to females (30.46%). This association was not statistically significant. (Pearson Chi square value:1.043; p=0.307(>0.05).
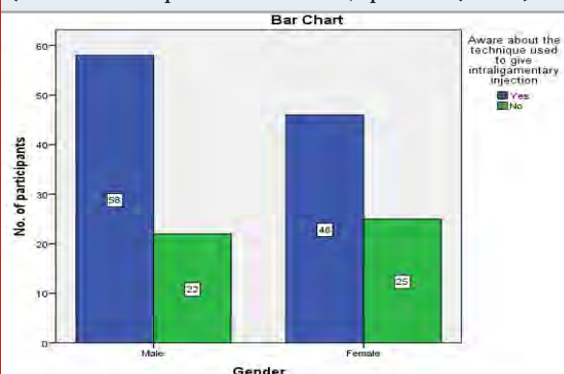
Lalabonova et al., in their prospective study on 220 general dental practitioners to evaluate the use of intraligamentary injection showed that 75.91% Bulgarian dental practitioners use intraligamentary injection in almost all treatments in which 32.94% showed adequate anesthesia (Lalabonova et al., n.d.). Using intraligamentary anesthesia bacteremia was observed in 50-97% (Roberts et al., 1998). With intraligamentary injection, positive aspiration was observed in the form of a thin stream with a frequency of 34/36/94.4% (Petrikas et al., 2019). medicine. Thus understanding the techniques, indications, contraindication, post- operative complications and success rate of intraligamentary injection will help clinicians increase their working efficacy.

Figure 15: The bar graph represents the association of gender and awareness among the participants that intraligamentary injection is used as an alternative when the nerve block fails. The X - axis represents the gender and the Y - axis represents the number of participants. Among the total participants, males (38.41%) were more aware that intraligamentary injection is used as an alternative when the nerve block fails compared to females (27.81%). This association was not statistically significant. (Pearson Chi square value:2.995; p=0.084(>0.05).
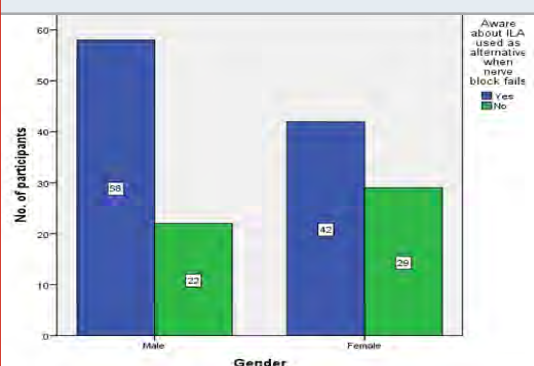
CONCLUSION

Within the limits of the study, dental students were more aware about the intraligamentary injection. Males were more aware of the intraligamentary injection compared to females.More awareness programs should be initiated to further improve the quality of treatment rendered to the patients.

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Knowledge, Awareness and Practice of Road Traffic Safety Among the Dental Students

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ABSTRACT

To evaluate the knowledge and awareness about road traffic safety among dental students. Road safety is important for all road users. Every year more than one million people are injured in road accidents in India. In recent years, the number of vehicles on roads has increased, as has the number of goods transported by road. This makes road safety even more important. Road safety awareness is one of the most important aspects towards safety concerning traffic rules among adolescent children. Adolescent age groups are rapidly emerging as a major population of vehicle owners and may derive a thrill out of taking risks on road without realizing the consequences This is mainly a cross-sectional type of study, in which standardized structured questionnaires were prepared and given to dental students of various colleges. The sample size was about 250 and the duration study was 1 month. The knowledge and awareness about the road traffic safety among dental students was found to be quite satisfactory. The awareness about road traffic safety among the dental students was satisfactory, and more awareness can be given through posters, seminars and mass media.

KEY WORDS: ROAD ACCIDENTS, DENTAL STUDENTS, ROAD VEHICLES..

INTRODUCTION

Road accidents are undesired events that lead to injury or death. These deaths and injuries result in significant social and economic costs. Occupational fatalities occur in road traffic and transportation crashes (Kulkarni et al., 2013;Ravichandran, Priya and Gayathri, 2019;Ranasinghe, Gayathri and Vishnu Priya, 2018;Raj et al., 2011). In addition to professional drivers, other workers, for whom driving is not their core activity, are also frequently required to travel by road, e.g. all commuting workers also use the road. Young people, between 15 and 24 years old, face the largest risk in traffic: they make up 11% of the Population but 17% of all road fatalities. Pedestrians, cyclists, moped riders and motorcyclists have a higher injury rate per kilometre of travel than other road users. Work-related accidents on the road may involve any traffic type. Human error is often seen as the cause of road accidents(Kulkarni et al., 2013;AlZahrani, 2015;Redhwan and Karim, 2010; India, 2017). While it may not be possible to stop people from making mistakes, these mistakes need not result in fatalities. The traffic environment must be developed in such a way that human errors do not lead to serious consequences.

Road safety means safety for all road users. Accident risks on the road, during both work-related driving and leisure time driving, involve risks to the driver, passengers and other road users. Today's continuously changing traffic environment requires constant alertness on the part of road users. Speeding, drunk driving and failure to wear a seat belt are the three main reasons for road accidents (Swami et al., 2006;Mathy, Saveetha College of Nursing and Thenmozhi, 2016). Traffic regulations are intended to decrease the risk of accidents. Improving road safety involves dealing with issues related to road users, the traffic environment, and the condition of vehicles. Investigating road accidents can also prevent further accidents. Work-related road safety should be managed by integrating it into the arrangements for managing overall health and safety at work. Work-related road safety should be managed by integrating it into the employers' arrangements for managing overall health and safety at work. Work-related traffic accidents can be prevented through technical measures and organisational measures at workplaces, and adequate training. In addition, investigating road accidents can prevent future accidents(Kulothungan, 2015;Khanjani, Tavakkoli and Bazargan-Hejazi, 2019).

Road traffic death rates in low and middle income countries are more than double in comparison with high income countries. Worldwide, India has the worst road traffic accident rate, where everyday about 1,374 accidents and 400 deaths take place, which have earned a dubious distinction with over 1,30,000 deaths annually(Khanjani, Tavakkoli and Bazargan-Hejazi, 2019). Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about knowledge, awareness and practice of road traffic safety among the dental students. Hence, the present study aimed to assess the awareness and practice of road traffic safety rules among dental college students in Chennai, Tamil Nadu so that a better overview of the situation can be made.

MATERIAL AND METHODS

This was a quantitative non-experimental study with cross-sectional survey design conducted in the month of December 2019 among dental college students of Chennai, District of Tamil Nadu. The sample size of this particular study is about 250 students. The students were mainly above the age group of 21 years A pre-designed questionnaire was used for the data collection and it mainly has two sections. Section A: Demographic variables of the students which includes their name, age, gender, year of study, residential area, socio-economic status, type of vehicle users. Section B: Structured

knowledge related 20 questions were framed and each question was graded with the score of (1) for each correct answer and the score of (0) for each wrong answer, such as they were classified according to the three categories as poor awareness ((0-5) score, average awareness (6-15) score and good awareness (16-20) score.

The data were Collected from the self- structured administered questions. The collected data were tabulated and analysed in accordance with objectives of the study by using descriptive and inferential statistics with the help of Statistical Package for the Social Sciences version 16 software.

RESULTS AND DISCUSSION

The results from the present study were analysed.

Table 1. Table showing the demographic detail about the dental college students involved in the study.

S.No	Socio-economic variables	Frequency	Percentage
1.	Age		
	19 years	10	4 %
	20 years	15	6 %
	21 years	158	63 %
	22 years	67	28 %
2.	Gender		
	Male	148	59 %
	Female	102	41 %
3.	Year of Study		
	Third year	10	4 %
	Final year	165	66 %
	Interns	48	19 %
	PG	27	11 %
4.	Residential area		
	Urban area	238	95 %
	Rural area	12	5 %
5.	Vehicle used most		
	Two wheeler	170	68 %
	Four wheeler	80	32 %
6.	Socio-economic status		
	High class	100	40 %
	Middle class	138	55 %
	Low class	12	5 %

Section 1: Demographic detail about the dental college students: The analysis of the demographic variables of the dental college students were presented [Table 1]. The most of the students participated were above the age group of 21 years (63%). There were more final year students participating in the survey (66%). Majority of the students (59%) were male who participated in the study. The residential area of all the students were mostly urban areas (95%). Most of the students (55%) were from the middle class type of family. Among the

students participated in the study most of them were 2 wheeler users (68%).

Section 2: Description level of awareness and practice about road traffic safety among the dental students: The study findings of awareness regarding road safety rules among dental college students revealed that 5(2%) had had poor awareness, 167(66.8%) had average awareness and 78(31.2%) had good awareness. The mean and standard deviation of the awareness score regarding road safety rules was 23.6 ± 3.46. The item wise awareness regarding road safety rules were depicted [Table 2]. The study findings of practice regarding road safety rules among dental college students revealed that 10(4%) had had unsatisfactory practice, 195(78%) had partially satisfactory practice and 45(18%) had satisfactory practice. The mean and standard deviation of the practice score regarding road safety rules was 5.86 ± 0.96. The item wise practise regarding road safety rules were depicted [Table 3]

Table 2. Table showing the distribution of description level of awareness and practice about road traffic safety among the dental students.

S.No	Questionnaire	Number with correct response	Percentage %	Correct answer
1.	Eligible age to get a driving license	222	89 %	18 years
2.	Average speed limit for driving in Tamil Nadu	165	66 %	50-60 Kph
3.	Safety limit of blood alcohol concentration for driving (BAC)	190	76 %	20-30 mg of alcohol/100ml
4.	Recently updated penalty for driving without license	218	87 %	Rs.5000
5.	Identify :	173	69 %	Narrow road ahead
6.	Which side you must drive your vehicle	180	72 %	Left side

Road safety awareness is one of the most important aspects towards safety concerning traffic rules among adolescent children. Adolescent age group is rapidly emerging as a major population of vehicle owners and may derive a thrill out of taking risks on road without realizing the consequences, hence it is very important to assess awareness and practice on road safety rules and sensitise this population as they are future of the nation (Kalbandkeri, G. and Ghooli, 2018;Tripathi et al., 2014).

The findings of the present study showed that the majority of final year dental students i.e. 68.8% had average awareness and only 31.2% had good awareness. This finding is similar to the study conducted among college students in Indore, Chandigarh and Guntur city. 65.3% of the students were aware about the traffic rules.This finding is consistent with findings of the study conducted among medical students in Barabanki, UttarPradesh. 56.7% of the students were aware about the rules for pedestrians (Ratna et al., 2017;Peden, 2008;Zador, Krawchuk and Voas, 2000). This finding is contradictory to study conducted among medical students in Barabanki, Uttar Pradesh where the awareness was high.

About 89% of the students knew the legal age for the driving license. This finding is similar with the studies conducted in Indore, Chandigarh, Guntur city, whereas it is high as compared to the study conducted among the medical students in Barabanki, UttarPradesh. 72% of the students were aware about the right way of overtaking. This finding is similar to the study conducted among college students in Indore and Chandigarh (R., Vijaylaxmi and Dorle, 2017).

Almost half of the students were able to identify the given traffic sign correctly Similar findings were observed in the study conducted among college students in Guntur city and rural area of Tamil Nadu (Mukhopadhyay et al., 2017). This awareness was much higher than the study conducted among the various College students in Indore, Guntur city and Barabanki, UttarPradesh (Zaidi et al., 2017).

The findings of the present study showed that there was a significant positive correlation (p=0.001) between awareness and practice of road safety rules. This finding is consistent with the findings of a study conducted among students in Barabanki, UttarPradesh(Zaidi et al., 2017). The present study on the awareness of the dental students revealed the relationship between the age, year of study, type of vehicle usage and the socio-economic status.

Table 3. Table showing the distribution of various practices regarding road safety rules among dental college students.

S.No	Questions	Response	Percentage %
1.	Do you think following traffic rules and regulations will reduce accidents		
	Yes	218	87 %
	No	32	13 %
2.	Do pedestrians must be given importance regarding their security.		
	Yes	198	79 %
	No	52	21 %
3.	Is it necessary to have a driving license while driving a vehicle		
	Yes	215	86 %
	No	35	14 %
4.	Does road signs and symbols helps in reducing road accidents		
	Yes	205	82 %
	No	45	18 %
5.	Do you wear the necessary safety protective equipment while driving		
	Yes	210	84 %
	No	40	16 %
6.	What are the main reasons which make you speed up while driving ?		
	Stress	80	32 %
	Thrilling experiences	43	17 %
	Morning attendance	90	36 %
	Delay in your daily routine	37	15 %

CONCLUSION

The majority of dental students had good awareness and partial satisfactory practice; so there is a need to sensitise this population. Efforts should be made in improving the awareness about road safety through posters, seminars and mass media. Strict enforcement of laws and periodic organization of traffic awareness campaigns and practice relating to road safety should be encouraged to reduce the morbidity and mortality related to road traffic accidents. Essential self-interest for safety measures to be present to control the road accidents.

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Awareness of Golden Proportion in Tooth Forms Among Dental Students

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ABSTRACT

An attractive smile is a key feature in maintaining and improving a person's esthetic appearance and, consequently, self-esteem. In addition, a smile has been described as one of the best methods to influence people. Even though societies dictate their own standards for beauty, meticulous analysis of attractive smiles has shown that repeatable, quantifiable, and unbiased principles can be methodically applied to assess and improve dental esthetics in predictable ways. The aim of this study was to evaluate the awareness regarding golden proportion among students of Saveetha Dental College and Hospitals. A structured questionnaire was given out to 100 randomly selected dental students of Saveetha dental college and hospitals, Chennai during December, 2019. Their responses were recorded manually. The questionnaire had questions regarding the golden proportion, ratio, importance in smile designing, etc. During the survey it was found that 79.2% of the students considered a smile of a patient to be very important. Keeping that in mind it was found that around 72.3% of the students knew about the golden proportion rule of teeth. Around 60.4% of the students were correct to answer 1:618 as the GP ratio. From the entire group around 80.4% told that GP rule is used to design smiles and around 62.4% answered for rotation, crowding or spacing being the reason that affected the golden proportion of tooth. For the instrument used in measuring the GP ratio 71.3% of the students voted for vernier callipers to be the reason. According to the survey, the students

INTRODUCTION

Dental esthetics is a primary consideration for patients. New materials for dentistry and techniques were introduced maximizing the likelihood of an attractive outcome. The size and shape of the maxillary anterior teeth are important not only to dental esthetics, but also to facial esthetics. The principles that make up esthetics are subtle. Methodical analysis has revealed that principles can be applied to evaluate and alter

dental esthetics with predictability. Each principle can be considered, recognised, assessed and developed individually in aesthetic management.(Hasanreisoglu et al., 2005)(Chander, Kumar and Rangarajan, 2012) Among the esthetic principles, the proportion can be predicted with a formula that defines the ratio of the component from one constituent to the next.

The golden proportion (1.618 : 1.0) is a mathematically constant ratio that defines the dimensions between larger and a smaller length. This specific relation is unique, perfect, ideal, and desirable. One of the most important guidelines is golden standard value. (Ong, Brown and Richmond, 2006) According to this standard, the ideal width-to-height proportion of maxillary central incisor should be approximately 80% width compared with height. A higher width/height ratio means a squarer

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tooth, and a lower ratio indicates a longer appearance. It has been used from studying beauty to design esthetic restorations. (Wolfart et al., 2006).

According to Kanaparthy et.al, (Kanaparthy et al., 2016), to the Greeks the human body was based in mathematical proportions, which could be reproduced in artistic endeavours. To them, beauty was all about the details, mainly in the face. Always based on mathematical standards or references, the Greek built some of the most gorgeous and magnificent temples, such as Partenon and the most beautiful sculptures, such as Venus de Milo or Apollo of the Belvedere. These masterpieces were built following the Golden Ration principle. (Swileh, Abuaffan and Alhajj, 2019)

One of the critical aspects of esthetic dentistry is creating geometric or mathematical proportion to relate the successive width of anterior teeth. Golden proportion, golden percentage and recurring esthetic dental are theories introduced in this field. Ricketts was the first to suggest the application of the golden proportion in dentistry. He said that the golden proportion was 'too strong' for use in determining tooth size. He also described the use of a 'repeated ratio' in the maxillary anterior teeth. This implies that an optimized dentofacial composition of the lateral to central incisor width and the canine to lateral incisor width are repeated in proportion. (Ricketts, 1982)(Sarver and Ackerman, 2003)

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to evaluate the awareness of golden proportion in tooth forms among the students of Saveetha dental college.

MATERIAL AND METHODS

This study was conducted via a questionnaire consisting of 10 multiple-choice questions. A questionnaire was formulated for the dental students, which included undergraduates and postgraduates to evaluate the awareness about Golden proportion in tooth form among students of Saveetha Dental College. This survey was taken in December 2019. The questionnaire consisted of questions regarding the golden proportion, golden proportion ratio, smile designing, golden proportion ratio in determination of the facial aspects and instrument used for measurement. This cross sectional questionnaire was conducted in the Department of Prosthodontics of Saveetha Dental College and Hospitals, Chennai. Inclusion criteria were dental students, undergraduates and postgraduates, students of Saveetha Dental college and subjects consented to participate. Students outside

Saveetha dental college, other medical students and patients unwilling to participate were excluded from the study.

Questionnaire:
1.   How important is a smile for a patient?
a.   Very important   b) Moderately important c) Low importance
   2. Have you heard of golden proportion for smile designing?
a.   Yes   b) No
   3. What is the golden proportion in tooth forms?
a.   Ration between 2 teeth   b) Fraction between two teeth
   4. What do you think is the GP ratio?
a.   1:212   b) 1:618   c) 1:445
   5. Golden proportion helps in the determination of ?
a.   Aesthetics   b)Facial form   c)Size of tooth   d) All of the above
   6. Does golden proportion help design smiles?
a.   Yes   b) No   c) I don't know
   7. Does rotation, crowding or spacing affect the golden proportion?
a.   Yes   b) No   c)I don't know
   8. Do all age groups have the constant GP?
a.   Yes   b) No   c) I don't know
   9. What can be used to calculate the GP?
a.   Vernier calliper b) Scale   c) Compass d) None of the above
   10. WHich has the highest value?
a.   Maxillary centrals   b) Maxillary laterals   c) Maxillary canine

RESULTS AND DISCUSSION

In the survey taken among the dental students of Saveetha Dental College, when asked about the importance of smile of a patient, around 79.2% (N=80) voted for very important and around 13.9% (N=14) said it's moderately important. The rest 6.9% (N=7) said it was less important. (Figure 1) When asked about the Golden proportion rule for smiles, around 72.3% (N=73) of the students knew about it and around 27.7% (N=28) did not know about the rule. (Figure 2)

Figure 1: Bar chart represents the number of students to important of smile. X axis denotes the importance of smile and Y axis denotes the number of students. Most of the students (79.2%) opted for very important (green)
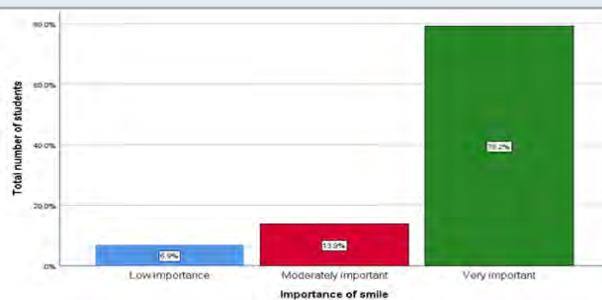
Figure 2: Bar chart represents the number of students if they have ever heard of golden proportion. X axis denotes the if they have ever heard of golden proportion and Y axis denotes the number of students. Most of the students (72.3%) opted for yes (red).
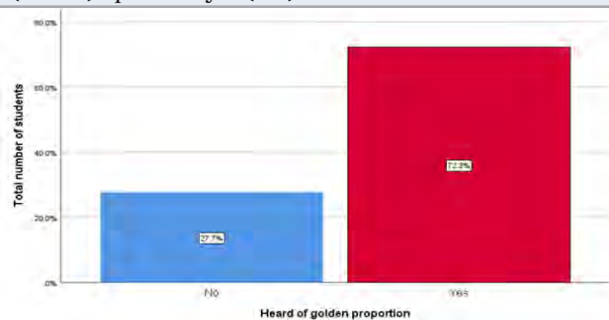
Figure 3: Bar chart represents the number of students to what they thought what golden proportion is. X axis denotes what golden proportion is and Y axis denotes the number of students. Most of the students (79.2%) opted for a ratio between 2 teeth. (red)

When asked what the golden proportion for tooth forms is, 79.2% (N=80) of the students answered the ratio between two teeth and 20.8%(N=21) replied the fraction between two teeth. (Figure 3) The students were asked about the GP ratio of a tooth and 60.4%(N=61) of the students voted for 1:618 and 27.7%(N=28) of the students voted for 1:212. The rest 11.9%(N=12) of the minority crowd voted for 1:445. (Figure 4) The students were asked whether Golden proportions help in determination of what aspect of the face. With options of Aesthetics, Facial form and Size of the tooth 69.4%(N=60) chose all of the above. 19.8%(N=20) chose Aesthetics, 15.8% (N=16) chose Facial form and 5%(N=5) chose Size of the tooth. (Figure 5)

When questioned if the golden proportion helped in designing smiles 80.2%(N=81) of them answered Yes, 11.9%(N=12) didn't know the answer and 7.9% (N=8) of them answered No. (Figure 6) When asked if rotation, crowding or spacing affected golden proportion, 62.4%(N=63) of them answered Yes 21.8%(N=22) of them answered No and the rest 15.8%(N=16) of them did not know the answer. (Figure 7) Around 49.5%(N=50) of the students denied that all age groups have the same GP ratio and voted No. Roughly around 36.6%(N=37) voted

Yes and rest 13.9%(N=14) did not know the answer.. (Figure 8)

Figure 4: Bar chart represents the number of students to what they thought the GP ratio is. X axis denotes the GP ratio and Y axis denotes the number of students. Most of the students (60.4%) opted for 1:618 (Red)
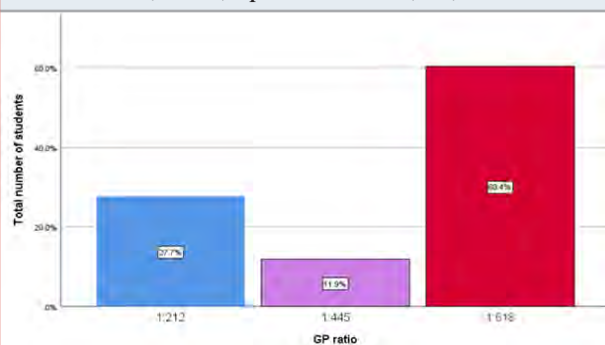
Figure 5: Bar chart represents the number of students to important of smile. X axis denotes the importance of smile and Y axis denotes the number of students. Most of the students (79.2%) opted for very important (green)
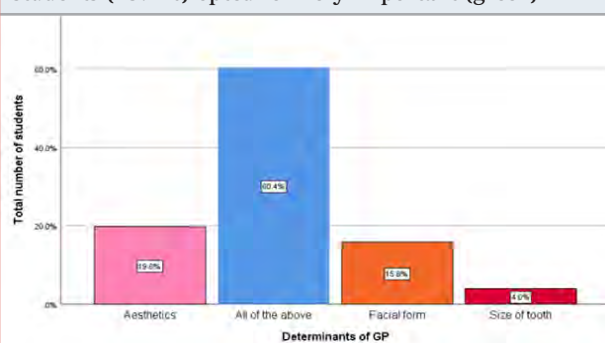
Figure 6: Bar chart represents the number of students and if GP helps in designing smiles. X axis denotes the does GP help in smile design and Y axis denotes the number of students. Most of the students (80.2%) opted for yes (Orange).
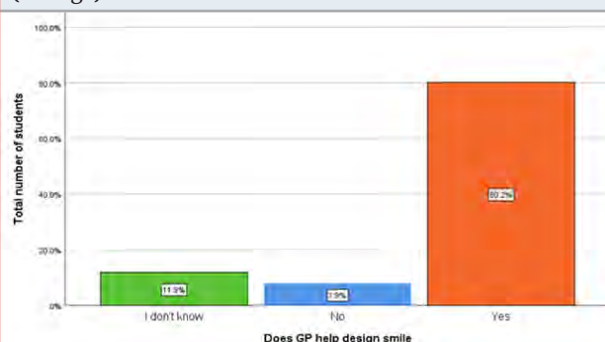
When asked about the instrument used to calculate the GP ratio 71.3%(N=72) voted for Vernier Calliper, 14.9%(N=15) voted for scale to be the instrument. The remaining 14 votes were divided equally between Compass at 6.9%(N=7) and none of the above also at 6.9%(n=7). (Figure 9) The students were asked about

which tooth has the highest value and 73.3%(N=74) voted for maxillary centrals,15.8%(N=16) and the rest 10.9% (N=11) voted for maxillary canine. (Figure 10)

Figure 7: Bar chart represents the number of students to if rotation or crowding affects GP. X axis denotes the if rotating affects GP and Y axis denotes the number of students. Most of the students (79.2%) opted for Yes (Purple).
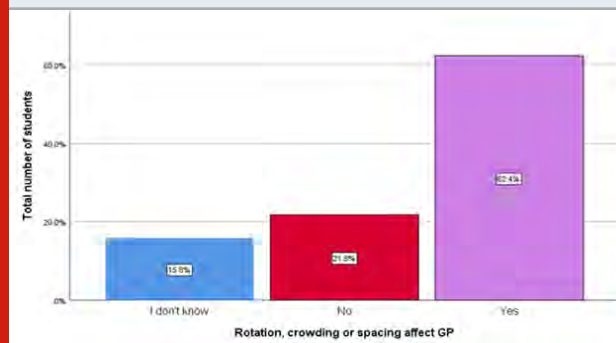
Figure 8: Bar chart represents the number of students to age having a constant GP. X axis denotes if age has a constant GP and Y axis denotes the number of students. Most of the students (49.5%) opted for No (red).

Figure 9: Bar chart represents the number of students the calculation of GP. X axis denotes the calculation of GP and Y axis denotes the number of students. Most of the students (71.3%) opted for vernier calliper (Red).
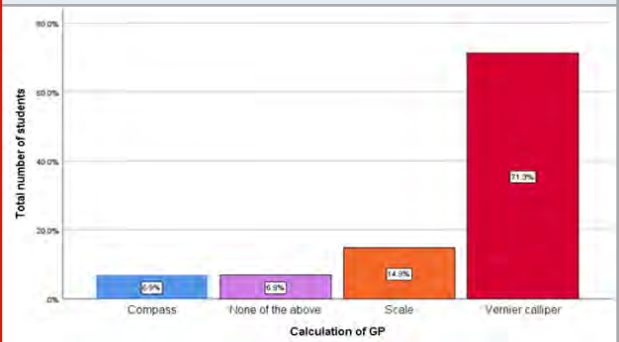
Figure 10: Bar chart represents the number of students to which tooth has the highest GP ratio. X axis denotes the tooth having the highest GP and Y axis denotes the number of students. Most of the students (73.3%) opted for Maxillary centrals (Orange).

The golden proportion (1.618 : 1.0) describes the ratio between the dimensions of a larger and a smaller length. Various researchers have opined for and against the use of this mathematical proportions in dentistry. Levin observed the golden proportion between the width of the central incisor, lateral incisor and the canine. George and Bhatt found that the golden proportion is reliable predictors for determining the width of the maxillary central incisors in the south Indian population. Lombardi recommended a repeated ratio concept in contrast to golden proportion. Mahshid (Gillen et al., 1994) et al. reported that the golden proportion did not exist between the widths of the maxillary anterior teeth and it was substantiated by Ward, Gillen et al, Rosenstiel (Rosenstiel, Ward and Rashid, 2000) et al.The variation of thoughts among researchers and lack of similar study on Indian population aimed this study to evaluate the existence of golden proportion between anterior teeth in the Indian population.

Many dental and facial characteristics differ following the geographical location and historical background.

Therefore, information regarding tooth norms in a group of population is useful to dentists when restoring teeth. (Levin, 1978) The general Malaysian data can be used in the current study to compare with other populations as the golden proportion and golden standard was not found in all ethnic groups.Determination of a mathematical or geometrical relation between anterior teeth is important to achieve an esthetic result. It would be helpful if statistically reliable results existed to support existing theories. However, the golden proportion idea can no longer be considered since many articles found that golden proportion didn't exist. (Snow, 1999)(Mahshid et al., 2004)

The results for Malaysian population were comparable to the results reported in similar studies of other populations, including Turkish, Iranians, Jordanians, Americans, Indians and Caucasians. Fayyad et al. (Fayyad, Jamani and Aqrabawi, 2006) reported that the ideal W/H ratio for the central incisor should lie between 75 and 80%. However, the ratio which allows an aesthetically acceptable appearance is in the 65 to 85% range.

According to Ricketts et al.,(Ricketts, 1982) the highest W/H ratio is found in squarer teeth due to shorter height

and/or greater width than those of other populations which came in agreement with the result of this study. The mean width to height ratio for the right lateral incisor of male patients involved in research is close to the golden proportion of 0.80. A Significant difference between the mean ratios of widths of maxillary anterior teeth compared with the ideal golden proportion for lateral to central incisor and between lateral incisor to canine was observed. Similarly, significant differences between mean W/H ratios of lateral to central incisor and canine to lateral incisor and the golden proportion existed. Also, a significant difference in the mean values of the W/H ratio for tooth number between males and females was seen. (Sarver and Ackerman, 2003)

CONCLUSION

The golden proportion is an element of design that a surgeon should be aware of. An understanding of this enigmatic proportion that has long stood for beauty may provide us with useful guidelines that can be combined with our existing knowledge and applied to our dental work for restoring dental esthetics with reasonable assurance of success. According to the survey, the students of Saveetha Dental College and Hospitals had adequate knowledge regarding the Golden proportion.

Authors Contributions: First author (Palak Mayur Shah) performed the analysis, and interpretation and wrote the manuscript. Second author (Dhanraj Ganapathy) contributed to conception, data design, analysis, interpretation and critically revised the manuscript. Both the authors have discussed the results and contributed to the final manuscript.

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Knowledge and Awareness About Plasma Substitutes Among Dental Students

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ABSTRACT

Plasma substitutes aim to replace a fluid which is colloidal in nature by virtue of its content of different species of highly specialized proteins. They include any liquid used to replace blood plasma, usually a saline solution, often with serum albumins, dextrans or other preparations. Considering the importance and uses of plasma substitutes, the aim of this questionnaire study was to assess the awareness about plasma substitutes among dental students in a university setting. A structured self assessed online questionnaire having 15 questions on plasma substitutes was prepared and distributed to the dental students who have clinical exposure including 3rd BDS, final BDS, interns and postgraduates of all specialities. It was circulated using an online software, survey planet and the response was collected through it. Statistical analysis was done using SPSS software. Considering the responses, it can be interpreted that the knowledge regarding plasma substitutes is above average among dental students. Also, postgraduate students were more knowledgeable than undergraduate students. Interns showed more awareness than third year or final year undergraduate students. Educational workshops, conferences and CDE's are essential for both undergraduates and postgraduates to improve their knowledge regarding various plasma substitutes and their adverse reactions

KEY WORDS: AWARENESS; DENTAL STUDENTS; DEXTRANS; PLASMA SUBSTITUTES.

INTRODUCTION

Blood and blood products have limited availability and there is increasing concern over infectious and immunologic risks and the costs involved in obtaining, storing, crossmatching, processing and dispersing blood and blood products continue to rise(Grobbelaar and Smart, 1967). There is, therefore, a clear role for effective blood and plasma substitutes(Stehling, Zauder and Rogers, 1975). Not only do these solutions provide a cost-effective alternative to blood products, they also allow conservation of this limited resource for those patients who most need it(Stehling, Zauder and Rogers, 1975).

Plasma substitutes replace the fluid which is colloidal in nature by virtue of its content of different highly specialized proteins. This include liquid used to replace blood plasma, normally a saline solution, often with serum albumins, dextrans or other preparations(Underwood, Gowing and Johnston, 1967). These substances do not enhance the oxygen-carrying capacity of blood, but merely replace the volume(Kirch, Kühler and Gizycki,

1979). They are also used to treat dehydration. They can be used to expand and maintain blood volume in shock arising from conditions such as burns or septicaemia. Plasma substitutes can be used as an immediary short-term measure to treat massive haemorrhage until blood is available, but large volumes of some plasma substitutes can increase the risk of bleeding by depleting coagulation factors(Lamke and Liljedahl, 1976).

Following Starling's concepts in 1896 of colloid osmotic pressure as a regulator of the plasma volume, interest arose in developing colloid plasma expanders(Stacca et al., 1989). The first colloid plasma substitutes were tested around the turn of this century, when gum acacia was used as a volume expander. This substance is a carbohydrate exudate from Acacia trees and was used clinically during World War I. It proved to be highly antigenic, however anaphylaxis was common following its infusion(Solanke, Khwaja and Madojemu, 1971). Gelatin solutions derived from collagen were also developed in the early 1900s and these too were used clinically during World War I. The plasma expansion following gelatin infusion is short lived because of rapid urinary excretion. Further, gelatin infusions are antigenic and anaphylaxis may occur, particularly with repeated infusions(Chattri, 2012).

Modern plasma substitutes include dextrans, hydroxyethyl starch, per fluoro-chemical emulsions and stroma-free hemoglobin(Sayman and Garrott Allen, 1959). Each of these is a colloid fluid with the potential for efficient plasma volume expansion. Stroma-free hemoglobin solutions and per fluoro-chemical emulsions not only expand plasma volume but can transport additional oxygen as well(Sewta, 2009). Considering the importance and uses of plasma substitutes, this study evaluates the level of awareness among dental students.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the awareness about plasma substitutes among dental students in a university setting.

MATERIAL AND METHODS

The present study is an online based survey conducted among dental students of a University. Ethical approval was obtained from the institution's ethical committee. The number of people involved in this study include the guide, reviewer and principle investigator. A structured self assessed online questionnaire having 15 questions on plasma substitutes was prepared with the aim to assess the awareness among 215 dental students. The

questions were validated and reviewed closely. Sampling was done by convenient sampling. The questionnaires were distributed to the dental students who have clinical exposure including 3rd BDS, final BDS, interns and postgraduates of all specialities. It was circulated using an online link from the survey planet and the response was collected through it. Only the completed surveys were included for analysis. The collected results were entered in Microsoft excel and statistical analysis was done using SPSS software (IBM SPSS Statistics 20.0). Frequency distribution of each response among the dental students and Chi-square association using Pearson correlation with a level of significance set at $p<0.05$ was done to determine the association between year of study and the responses for each question.

RESULTS AND DISCUSSION

The study was conducted among 215 dental students. Out of 215, 20.93% were third year undergraduate students, 12.56% were final year undergraduate students, 34.42% were interns and 32.09% were postgraduates [Figure 1]. About 54.42% of students answered that both plasma protein solution and albumin were natural plasma substitutes [Figure 2]. Out of the 54.42%, 24.65% were postgraduates, 14.88% were interns, 7.91% were third year students and 6.98% were final year undergraduate students. There was a significant association ($p=0.003$) between the year of study and the response for the question, 'Which of the following are natural colloids?' [Figure 3]. About 54.88% of the students answered correctly that both dextran and hydroxyethyl starch were synthetic plasma substitutes [Figure 4]. Among them, 25.58% were postgraduates, 19.53% were interns, 4.19% were final year undergraduates and 5.58% were third year undergraduate students. There was a significant association ($p=0.000$) between the year of study and the response for the question, 'Which of the following are synthetic colloids?' [Figure 5].

Figure 1: Pie chart represents the year of study of dental students included in this study. Majority of the study population were interns (34.42%), followed by postgraduates (32.09%), third year students(20.93%) and final year students (12.56%).
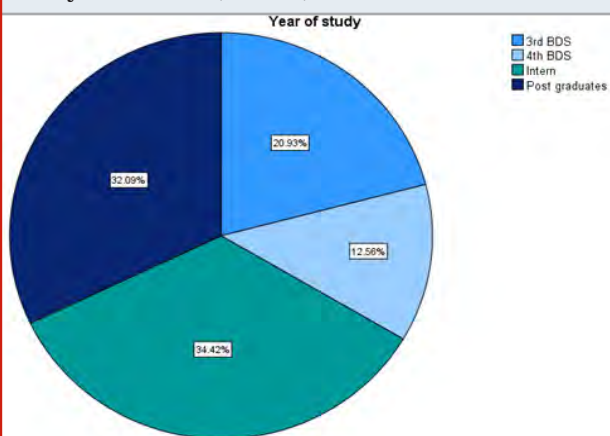
Figure 2 : Pie chart represents the responses received from the participants for the question, 'Which among the following are natural colloids?. About 54.42% of the participants answered both albumin and plasma protein solutions, which is the correct answer.

Figure 3: Bar chart representing the association between the year of study and the responses for the question, 'Which among the following are natural colloids?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically significant. Pearson Chi square value = 25.042; p-value = 0.003(<0.05). Majority of postgraduates knew the correct answer which is both albumin and plasma protein solutions.
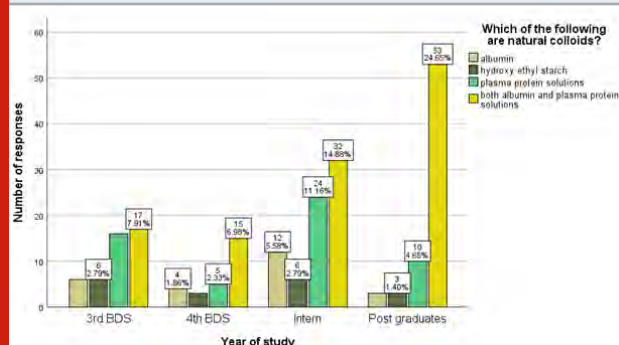
Figure 4: Pie chart represents the responses received from the participants for the question, 'Which among the following are synthetic colloids?'. About 54.88% of the participants answered both dextran and hydroxyethyl starch, which is the correct answer.

Figure 5 : Bar chart representing the association between the year of study and the responses for the question, 'Which among the following are synthetic colloids?' . X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically significant. Pearson Chi square value = 42.337; p-value = 0.000(<0.05). Majority of postgraduates knew the correct answer which is both dextran and hydroxyethyl starch.
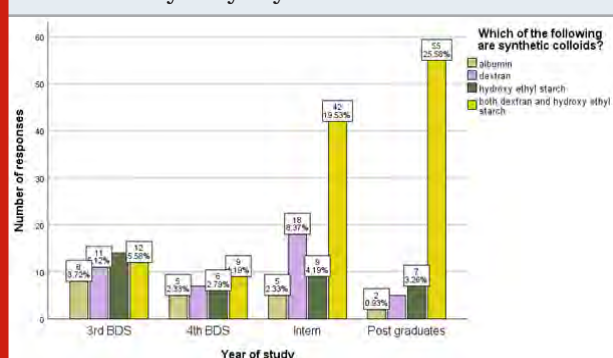
About 57.67% of the students were aware that synthetic colloids can be stored for long periods of time independent of storage temperature[Figure 6]. Out of the 57.67%, 26.05% were postgraduates, 18.6% were interns, 6.51% were final year undergraduates and 6.51% were third year undergraduate students. There was a significant association (p=0.000) between the year of study and the response for the question, 'Are you aware that synthetic colloids can be stored for long periods of time independent of storage temperature?' [Figure 7]. 70.7% were aware that synthetic colloids should be free of pyrogens and antigens [Figure 8]. Out of the 70.7%, 26.98% were interns, 25.58% were postgraduates, 8.84% were final year students and 9.3% were third year undergraduate students.

Figure 6: Pie chart represents the responses received from the participants for the question, 'Are you aware that synthetic colloids are capable of being stored for long periods of time independent of the storage temperature?'. About 57.67% of the students answered yes.
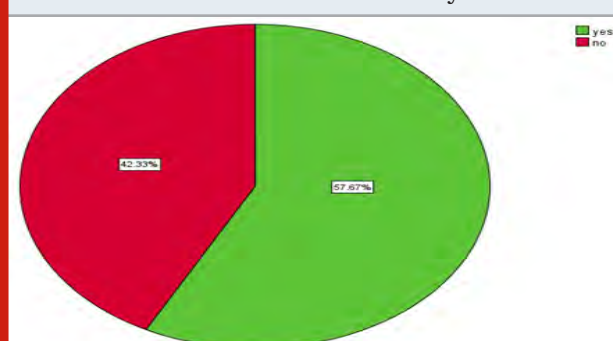
There was a significant association (p=0.000) between the year of study and the response for the question, 'Are you aware that synthetic colloids should be free of pyrogens and antigens?' [Figure 9]. Only 31.16% of the entire study

population knew that Leuconostoc mesenteroides are the bacteria used in the production of dextrans [Figure 10]. Among them, 16.74% were postgraduates, 5.58% were interns, 2.79% were final year undergraduates and 6.05% were third year undergraduate students. There was a significant association (p=0.000) between the year of study and the response for the question, 'Which of the following bacteria are used in the production of dextrans?' [Figure 11].

Figure 7: Bar chart representing the association between the year of study and the responses for the question, 'Are you aware that synthetic colloids are capable of being stored for long periods of time independent of the storage temperature?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically significant. Pearson Chi square value = 29.370; p-value = 0.000(<0.05). Majority of postgraduates answered yes, followed by interns.
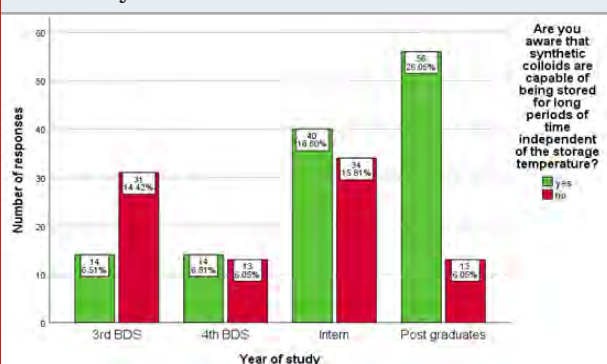
Figure 8: Pie chart represents the responses received from the participants for the question, 'Are you aware that synthetic colloids should be free of pyrogens and antigens?'. About 70.7% of the students answered yes.
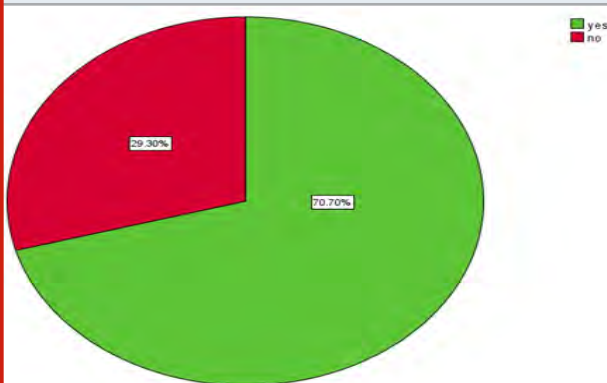
About 60% were aware that gelatins are produced by the hydrolysis of animal collagens [Figure 12]. Among them, 24.19% were postgraduates, 20.93% were interns, 5.58% were final year undergraduates and 9.3% were third year students. There was a significant association (p=0.003) between the year of study and the response for the question, 'Are you aware that gelatins are produced by the hydrolysis of animal collagens?' [Figure 13].

Figure 9: Bar chart representing the association between the year of study and the responses for the question, 'Are you aware that synthetic colloids should be free of pyrogens and antigens?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically significant. Pearson Chi square value = 19.786; p-value = 0.000(<0.05). Majority of interns answered yes, followed by postgraduates.
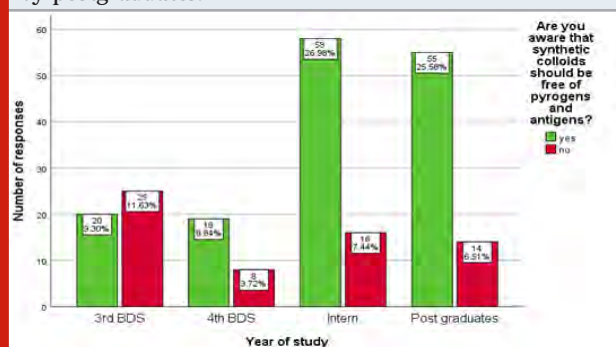
Figure 10: Pie chart represents the responses received from the participants for the question, 'Which of the following bacteria are used in the production of dextrans?'. About 31.16% of the participants answered Leuconostoc mesenteroides, which is the correct answer.
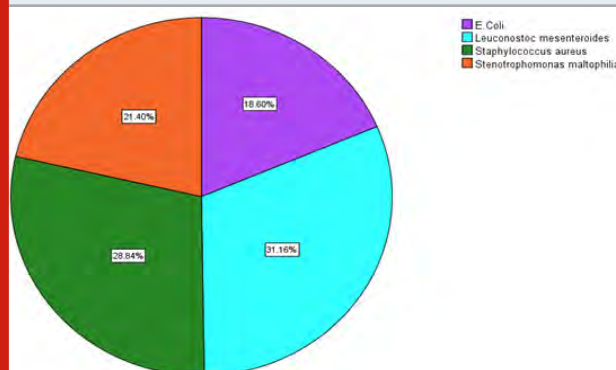
70.23% were aware that the principal use of colloid plasma substitutes is in the treatment of hypovolaemia [Figure 14]. Out of the 70.23%, 27.44% were postgraduates, 24.19% were interns, 6.51% were final years and 12.09% were third year students. There was a significant association (p=0.002) between the year of study and the response for the question, 'Are you aware that the principal use of colloid plasma substitutes is in the treatment of hypovolaemia?' [Figure 15]. Only 31.63% of the dental students knew that the molecular weight of plasma protein is 50,000 Da [Figure 16].

Among them, 11.63% were postgraduates, 11.63% were interns, 4.19% were final year students and 4.19% were third year undergraduate students. There was no significant association (p=0.472) between the year of study and the response for the question, 'What is the mean molecular weight of plasma protein?' [Figure 17]. About 35.81% of students were aware that the half life of

Dextran 60 is six hours [Figure 18]. Among them, 16.74% were postgraduates, 9.76% were interns, 4.19% were final year students and 5.12% were third year students. There was no significant association (p=0.561) between the year of study and the response for the question, 'What is the half life of Dextran 60?' [Figure 19]. Only 32.56% of students knew that blood volume was increased the least by gelatin [Figure 20]. Among them, 13.02% were postgraduates, 12.56% were interns, 3.26% were final year students and 3.72% were third year students. There was no significant association (p=0.447) between the year of study and the response for the question, 'Which among the following increases blood volume the least?' [Figure 21].

Figure 11: Bar chart representing the association between the year of study and the responses for the question, 'Which of the following bacteria are used in the production of dextrans?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically significant. Pearson Chi square value = 34.016; p-value = 0.000(<0.05). Majority of postgraduates knew the correct answer which is Leuconostoc mesenteroides.
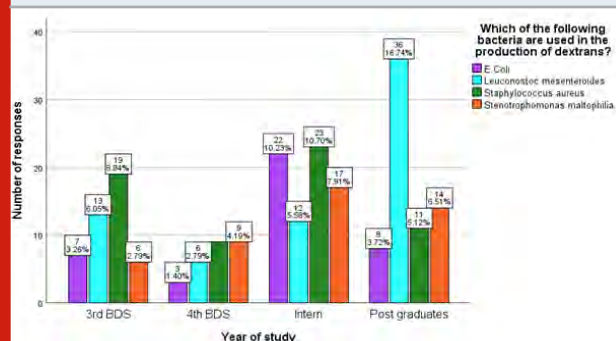
Figure 12: Pie chart represents the responses received from the participants for the question, 'Are you aware that gelatins are produced by the hydrolysis of animal collagen?'. About 60% of the students answered yes.
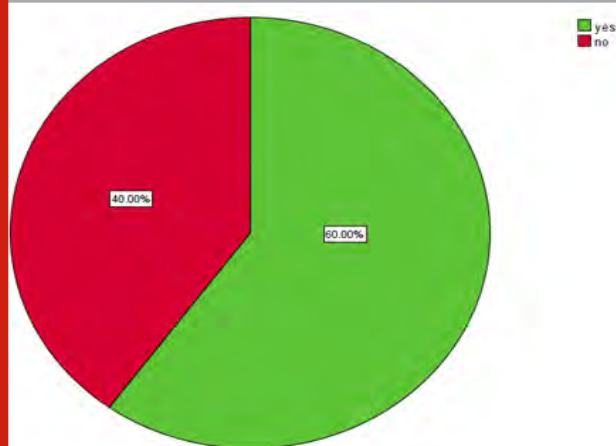
Figure 13: Bar chart representing the association between the year of study and the responses for the question, 'Are you aware that gelatins are produced by the hydrolysis of animal collagen?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically significant. Pearson Chi square value = 14.065; p-value = 0.003(<0.05). Majority of postgraduates answered yes, followed by interns.
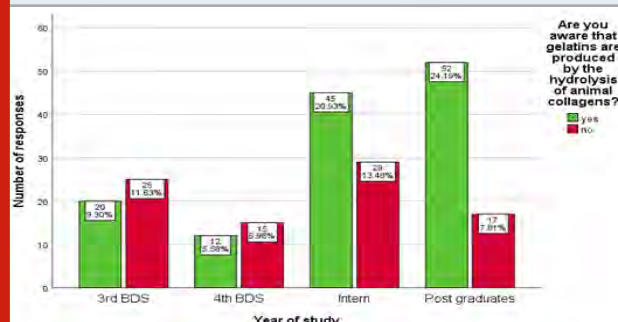
Figure 14: Pie chart represents the responses received from the participants for the question, 'Are you aware that the principal use of colloid plasma substitutes is in the treatment of hypovolemia?'. About 70.23% of the students answered yes.
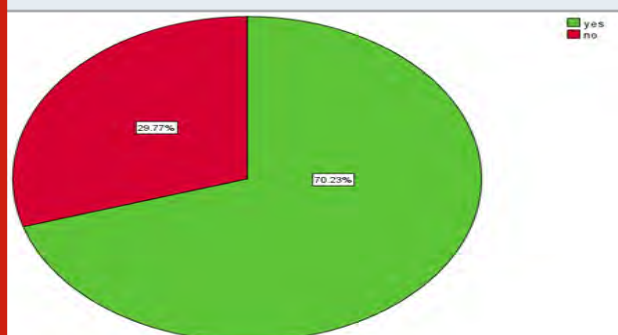
Figure 15: Bar chart representing the association between the year of study and the responses for the question, 'Are you aware that the principal use of colloid plasma substitutes is in the treatment of hypovolemia?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically significant. Pearson Chi square value = 15.403; p-value = 0.002(<0.05). Majority of postgraduates answered yes, followed by interns.
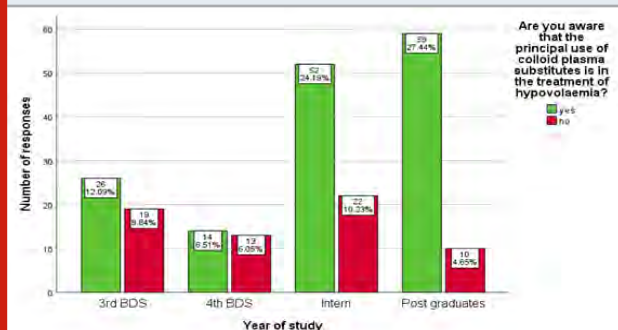
Figure 16: Pie chart represents the responses received from the participants for the question, 'What is the mean molecular weight of plasma protein?'. About 31.63% of the participants answered 50,000 Da, which is the correct answer.
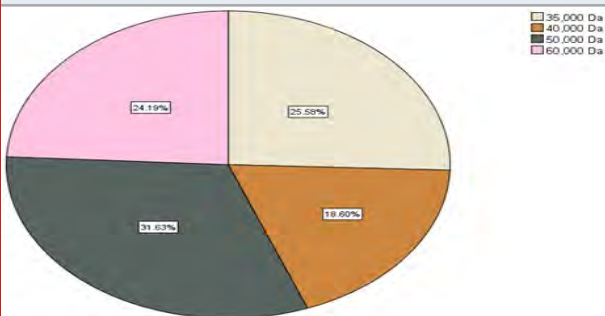
Figure 17 : Bar chart representing the association between the year of study and the responses for the question, 'What is the mean molecular weight of plasma protein?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically not significant. Pearson Chi square value = 8.630; p-value = 0.472(>0.05). Majority of postgraduates knew the correct answer which is 50,000 Da.
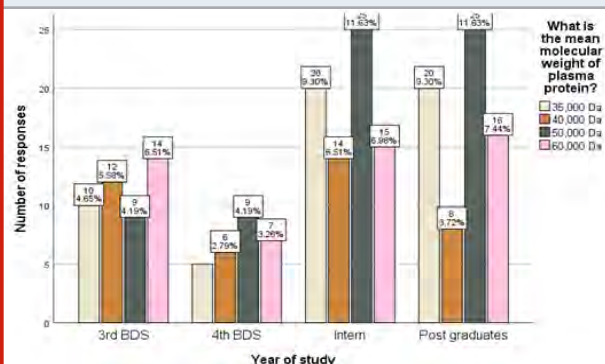
Figure 18: Pie chart represents the responses received from the participants for the question, 'What is the half life of Dextran 60?'. About 35.81% of the participants answered 6 hours, which is the correct answer.
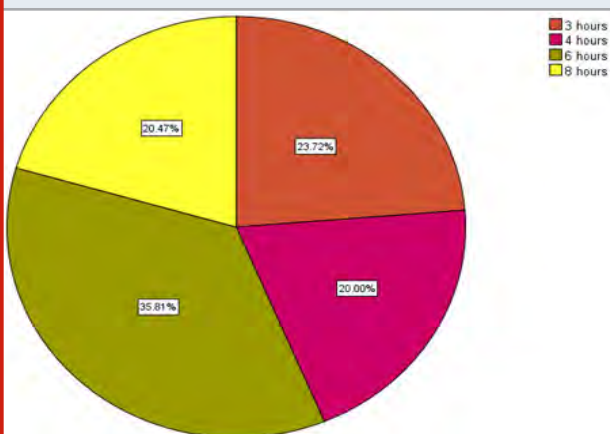
Figure 19 : Bar chart representing the association between the year of study and the responses for the question, 'What is the half life of Dextran 60?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically not significant. Pearson Chi square value = 16.584; p-value = 0.561(>0.05). Majority of postgraduates knew the correct answer which is 6 hours.
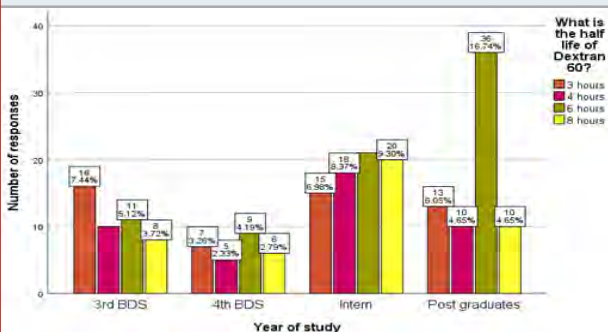
Figure 20: Pie chart represents the responses received from the participants for the question, 'Which among the following increases blood volume the least?'. About 32.56% of the participants answered gelatin, which is the correct answer.
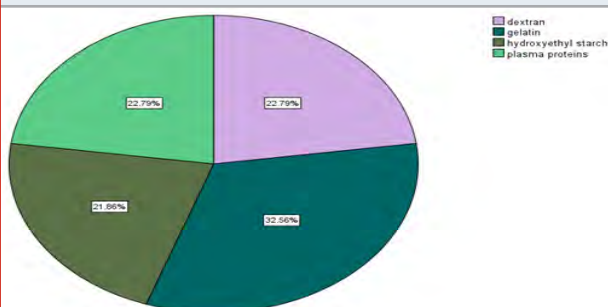
Figure 21: Bar chart representing the association between the year of study and the responses for the question, 'Which among the following increases blood volume the least?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically not significant. Pearson Chi square value = 8.894; p-value = 0.447(>0.05). Majority of postgraduates knew the correct answer which is gelatin.
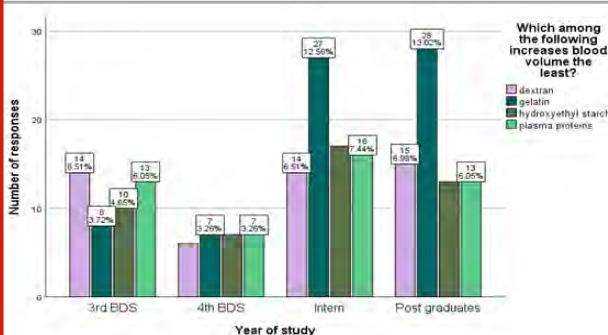
Figure 22: Pie chart represents the responses received from the participants for the question, 'Are you aware that anaphylactoid reactions may occur after administration of plasma substitutes?'. About **74.8%** of the students answered yes.
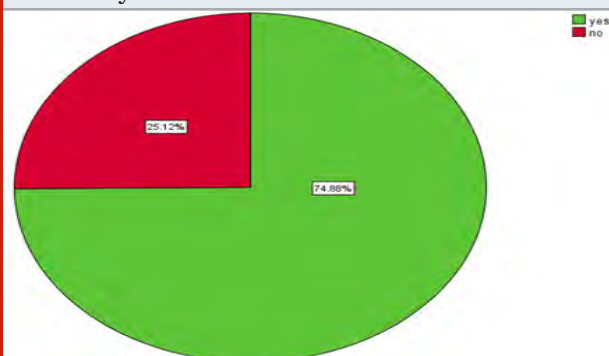
Figure 23: Bar chart representing the association between the year of study and the responses for the question, 'Are you aware that anaphylactoid reactions may occur after administration of plasma substitutes?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically significant. Pearson Chi square value = 21.146; p-value = 0.000(<0.05). Majority of postgraduates answered yes, followed by interns.
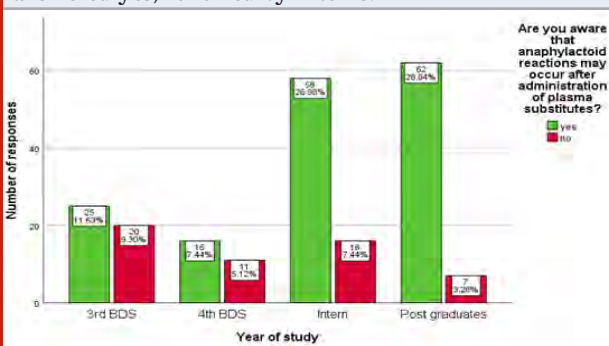
Figure 24: Pie chart represents the responses received from the participants for the question, 'Are you aware that histamine is released in humans by gelatin than dextran?'. Only 28.37% of the students answered yes.
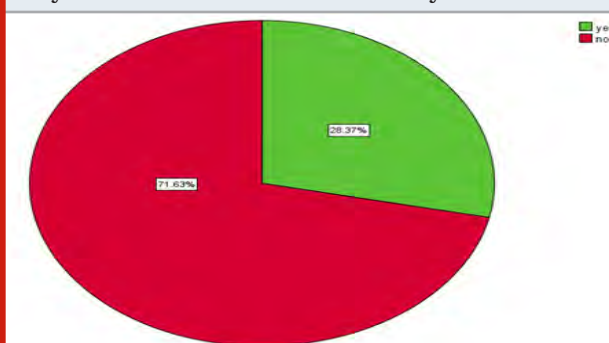
of plasma substitutes [Figure 22]. Out of 74.88%, 28.84% were postgraduates, 26.98% were interns, 7.44% were final year students and 11.63% were third year students. There was a significant association (p=0.000) between the year of study and the response for the question, 'Are you aware that anaphylactoid reactions may occur after administration of plasma substitutes?' [Figure 23]. Only 28.37% of students were aware that histamine is released in humans following administration of gelatin than dextran [Figure 24]. Among them, 13.02% were postgraduate students, 8.37% were interns, 3.26% were final year students and 3.72% were third year students. There was no significant association (p=0.421) between the year of study and the response for the question, 'Are you aware that histamine is released in humans following administration of gelatin than dextran?' [Figure 25]. About 46.05% of students were aware that anaphylactoid reactions to dextrans are related to anti-dextran antibodies such as IgG and IgM [Figure 26]. Out of the 46.05%, 18.6% were postgraduates, 12.56% were interns, 6.51% were final year students and 8.37% were third year students.

Figure 25: Bar chart representing the association between the year of study and the responses for the question, 'Are you aware that histamine is released in humans by gelatin than dextran?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically not significant. Pearson Chi square value = 8.221; p-value = 0.421(>0.05). Majority of postgraduates answered yes, followed by interns.
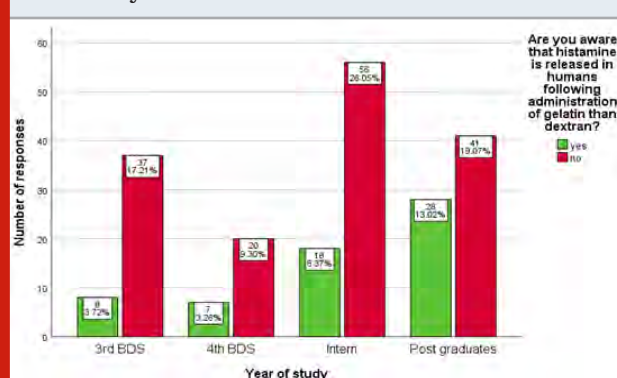
Figure 26: Pie chart represents the responses received from the participants for the question, 'Are you aware that anaphylactoid reactions to dextran are related to anti dextran antibodies such as IgG and IgM?'. About 46.05% of the students answered yes.

About 74.88% of dental students were aware that anaphylactoid reactions may occur after administration
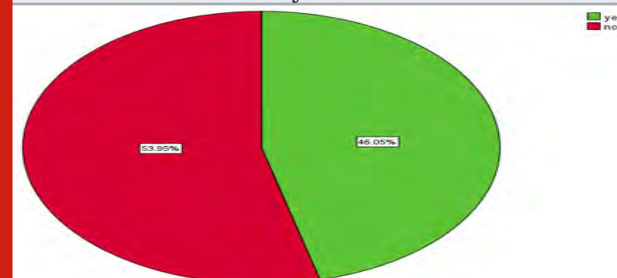
Figure 27: Bar chart representing the association between the year of study and the responses for the question, 'Are you aware that anaphylactoid reactions to dextran are related to anti dextran antibodies such as IgG and IgM?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically not significant. Pearson Chi square value = 7.700; p-value = 0.531(>0.05). Majority of postgraduates answered yes, followed by interns.
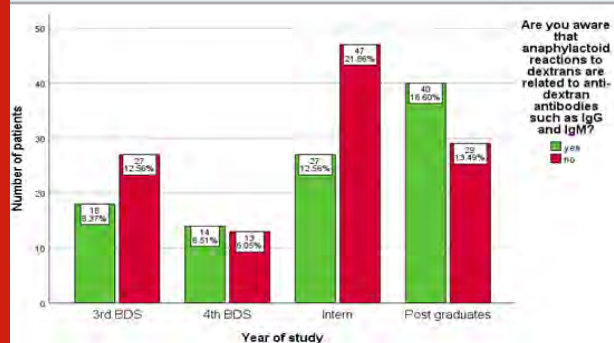
Figure 28: Pie chart represents the responses received from the participants for the question, 'What is the mechanism of action involved in the anaphylactoid reaction to hydroxyethyl starch?'. About 32.56% of the participants answered complement activation, which is the correct answer.
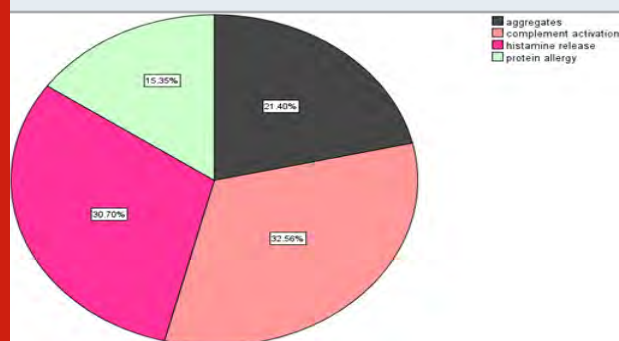
There was no significant association (p=0.531) between the year of study and the response for the question, 'Are you aware that anaphylactoid reactions to dextrans are related to anti-dextran antibodies such as IgG and IgM?' [Figure 27]. Only 32.56% of students knew that complement activation is the mechanism involved in the anaphylactoid reaction to hydroxyethyl starch [Figure 28]. Among them, 13.02% were postgraduates, 11.63% were interns, 4.19% were final year students and 3.72% were third year students. There was a significant association (p=0.000) between the year of study and the response for the question, 'What is the mechanism involved in the anaphylactoid reaction to hydroxyethyl starch?' [Figure 29]. About 43.72% of students were aware that human albumin should be used as an alternate solution in case of severe anaphylaxis to plasma substitutes [Figure 30]. Out of the 43.72%, 16.74% were postgraduates, 13.96% were interns, 4.65% were final year students and 8.37% were third year undergraduate students. There was

no significant association (p=0.579) between the year of study and the response for the question, 'In case of severe anaphylaxis to plasma substitutes, which solution should be used as an alternative?' [Figure 31]

This study was done to evaluate the level of awareness of plasma substitutes among dental students, including both undergraduates and postgraduates. Considering the responses, it can be interpreted that the knowledge regarding plasma substitutes is above average among dental students. Also, postgraduate students were more knowledgeable than undergraduate students. Interns showed more awareness than third year or final year undergraduate students. Students were also more aware of the anaphylactoid reactions associated with the administration of plasma substitutes.
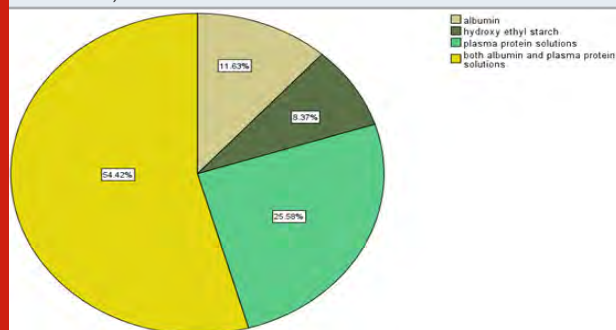
Figure 29 : Bar chart representing the association between the year of study and the responses for the question, 'What is the mechanism of action involved in the anaphylactoid reaction to hydroxyethyl starch?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically significant. Pearson Chi square value = 21.539; p-value = 0.000(<0.05). Majority of postgraduates knew the correct answer which is complement activation.
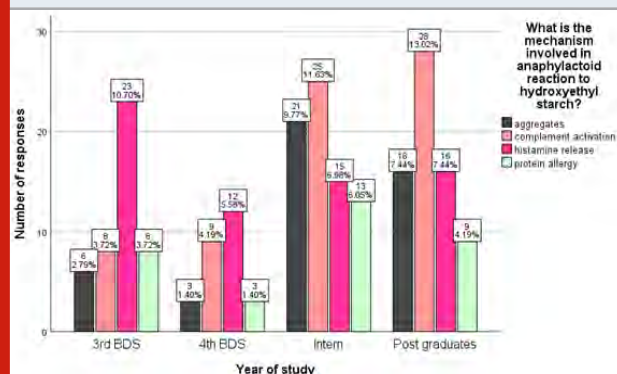
Figure 30: Pie chart represents the responses received from the participants for the question, 'In case of severe anaphylaxis to plasma substitutes, which solution should be used as an alternative?'. About 43.72% of the participants answered human albumin, which is the correct answer.
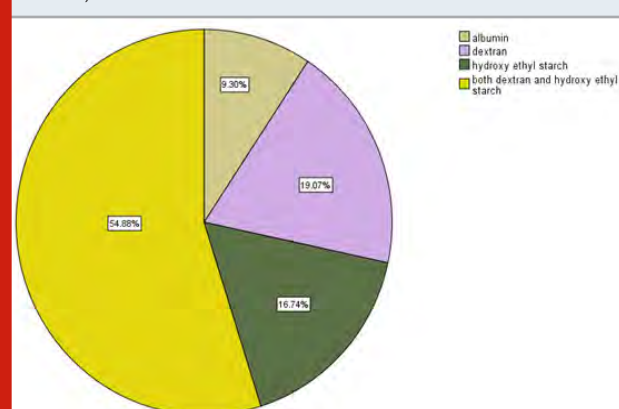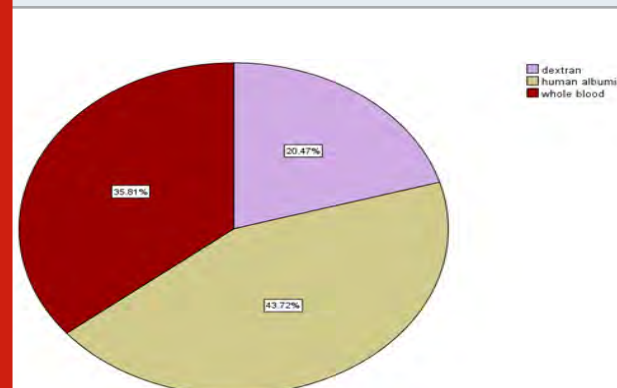
Figure 31: Bar chart representing the association between the year of study and the responses for the question, 'In case of severe anaphylaxis to plasma substitutes, which solution should be used as an alternative?'. X axis represents the year of study and Y axis represents the number of responses. Chi square test was done and it was found to be statistically not significant. Pearson Chi square value = 32.098; p-value = 0.579(>0.05). Majority of postgraduates knew the correct answer which is human albumin.
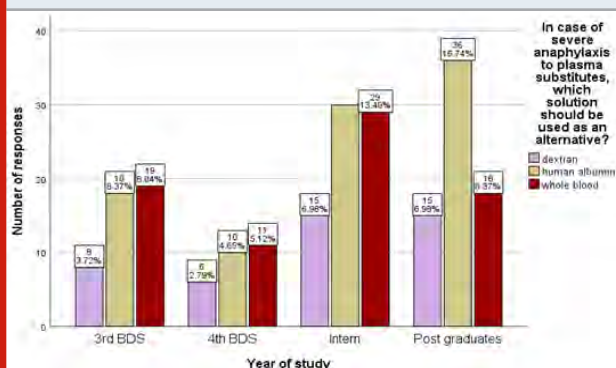
The plasma substitutes of greatest clinical use are: the natural colloids (plasma protein solutions, human albumin) and the synthetic colloids (dextrans, gelatins and hydroxyethyl starches) prepared from materials derived from animals or plants. In our study about 54.42% and 54.88% knew the various natural and synthetic colloids. Any synthetic colloid should have the following desirable properties. First, it should maintain an adequate colloid osmotic pressure with a half-life of several hours. Second, it should be stable and capable of being stored for long periods independent of the storage temperature. Third, it should be free of pyrogens and antigens. Finally, its metabolism and elimination should not affect the organism and it should not cause haemolysis or red cell agglutination(Moe, 1970). Knowledge regarding these properties among dental students was average.

Very few students knew about the production of dextrans and gelatins. They are produced by the bacterium Leuconostoc mesenteroides B512 from an agar-sugar compound to which a yeast extract is added as a source of nitrogen(Moffitt, 1975). Gelatins are prepared by the hydrolysis of animal collagens. There are three modified solutions available: a modified fluid gelatin, a urea-linked gelatin and an oxypoly gelatin. Starch solutions prepared by the acid hydrolysis of corn or soya may be used as plasma expanders only after the introduction of hydroxyethyl groups into the glucose units. To obtain a satisfactory half-life in the circulation the commercially available solutions have hydroxyethyl units attached to 70% of the glucose units(Ring et al., 1976).

Majority of the students were aware that the principal indication for the use of colloid plasma substitutes is in the treatment of hypovolaemia. Only few of them knew about the half life of plasma substitutes. The

duration of action of Dextran 60 is about 6 h as is that of hydroxyethyl starch (HES), whilst gelatins and Dextran 40 last only 2-3 h(Hankeln et al., 1997). The increase in blood volume is least with gelatin(Ring and Messmer, 1977) and only about 32.56% of dental students were aware of this.

There was increased awareness among students regarding the anaphylactoid reactions associated with plasma substitutes. A prospective comparative study in 31 hospitals in Southern Bavaria observed 69 anaphylactoid reactions following 100906 units of the commonly used colloidal plasma substitutes. There were differences between the agents: following plasma proteins there were reactions in 0.014% of patients, following dextran in 0.032%, following gelatins in 0.115% and following hydroxyethyl starch in 0.085%. The types of anaphylactoid reaction seen varied in intensity from skin reactions with flushing and mild urticaria to more severe effects such as shock and cardiac and respiratory arrest. The frequencies of life-endangering reactions were: 0.003% for plasma proteins, 0.008% for dextran, 0.038% for gelatins and 0.001% for hydroxyethyl starch(Johnson and Laurell, 1974).

The extent to which histamine release is involved in these reactions was investigated and it was concluded that histamine can be released in humans by gelatin and to a smaller degree by dextran(Lorenz et al., 1973). However, knowledge regarding the role of histamine was very poor among the students as only 28.37% were aware of this. There was also very little awareness among the students regarding the mechanism involved in anaphylaxis of various plasma substitutes(Lorenz et al., 1976). If there is only mild urticaria, stopping the infusion usually is all that is needed, but if the urticaria is severe, calcium antihistamines and corticosteroids should be used. High doses of corticosteroids should also be given and the plasma volume should be expanded using a human albumin solution. Considering cases of severe anaphylaxis, only about 43.72% of students were aware that human albumin has to be used as a plasma expander(Lorenz et al., 1972).

According to this study, post graduates had more awareness followed by interns. Limitations of this study include dishonest answers in the questionnaire by respondents and usage of a single online survey platform in a single university setting. Future studies should aim at conducting surveys using multiple online survey platforms to include more participants in different university settings.

CONCLUSION

This study shows that postgraduates have the most awareness of plasma substitutes among all dental students. Educational workshops, conferences and CDE's are essential for both undergraduates and postgraduates to improve their knowledge regarding various plasma substitutes and their adverse reactions.

ACKNOWLEDGEMENTS

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Comparative Evaluation of Two Topical Anaesthetic Gels to Reduce Pain During Local Anaesthesia Administration

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ABSTRACT

Topical anesthetic agents are widely used in the field of pediatric dentistry to reduce pain and apprehension during administration of local anesthesia. Various topical anesthetic agents are available, among which the most commonly used ones are lignocaine and benzocaine. Hence we planned this study to compare and evaluate the effectiveness of topical anesthesia on needle insertion pain during administration of inferior alveolar nerve block. This double blind clinical study included 50 children of 7-9 years of age who were divided equally into two groups: Group A-2% lignocaine hydrochloride gel (Lox 2%) and Group B-20% benzocaine gel (ProGel-B). The intervention involved assessment of pain perception by the child during administration of inferior alveolar nerve block. The child's pain assessment was done using visual analog scale. The ratings were subjected to statistical analysis. Student paired t- test showed statistically significant difference in the VAS score between Progel B and the LOX in males as well as females. Independent Student t-test showed no statistically significant difference in VAS score between males and females. This study demonstrates that there is a highly significant difference between the topical anesthetic effectiveness of 2% lignocaine and 20% benzocaine on needle insertion pain in inferior alveolar nerve block. Twenty percent benzocaine showed better results than 2% lignocaine in reducing the needle insertion pain.

KEY WORDS: BENZOCAINE; CHILDREN; LIGNOCAINE; PAIN SCALE; PROGEL-B.

INTRODUCTION

Pain is defined as an unpleasant sensory and emotional experience arising from actual or potential tissue damage or described in terms of such damage.(Zacny et al., 2002) In pediatric dentistry, pain sensation is generated by stimuli like sound of the drill or touch of the needle at the time of local anesthetic administration and is not necessarily dependent on tissue damage.(Taani and Quteish, 2001) Ointments, anesthetic sprays, gels, or adhesive patch are topical application of local anesthetic which are utilized to reduce pain of local anesthetic injections, but these methods have their own limitations. (Cho et al., 2017)

Anxiety is defined as a state of obnoxiousness with an associated fear of danger from within or a learned process of one's own environment. It mostly depends on the capability to imagine. (Nair and Gurunathan, 2019)Anxiety is the most common issue stumbled upon

by pedodontists in the dental operatory. Children tend to refuse dental treatment because of which dental anxiety becomes the major source of challenge for pediatric dentists. Dental anxiety is defined as state anxiety as it arises because of the treatment procedure and is associated with negative prospects that are often associated with earlier traumatic experiences, negative outlook of the family, fear of pain and trauma, and perceptions of an unsuccessful previous dental treatment. Few studies claim that there is a significant effect of topical anesthetics on dental anxiety. A randomized clinical trial by Cho et al., stated that highly anxious participants reported higher pain scores, however, topical anesthetic agents reduced the effect of anxiety on needle insertion pain. (Cho et al., 2017)

Injecting local anesthesia in children is in itself an anxiety evoking procedure. (Fiset et al., 1985) In addition, pain management is the vital aspect in pediatric dentistry. The dentist can overcome the issue of injection pain by altering the pH and temperature of local anesthetic solution and by reducing the speed of injecting the solution into the tissues.(Courtney, Agrawal and Revington, 1999) Another technique is to prepare the tissues before injection, i.e., surface anesthesia, which includes refrigeration, (Ghaderi, Banakar and Rostami, 2013) transcutaneous electronic nerve stimulation (TENS), (Choudhari et al., 2017) and topical anesthesia.

Topical anesthetic gel/ointment is easily available and is not technique sensitive. Hence, topical anesthetic gel/ointment has become the "holy grail" of painless technique of local anesthesia in pediatric dentistry. They have the ability to cross the oral mucosal membrane and produce analgesia. (Ship, Williams and Osheroff, 1960; Adriani et al., 1964) They block the conduction of signals from the terminal fibers of the sensory nerves, thereby producing surface anesthesia for a depth of 2–3 mm. This change takes place secondary to an alteration in transmission through voltage-sensitive sodium channels, resulting in an increment in the action-potential threshold. This trait of topical anesthesia enables it to minimize needle insertion pain effectively.

There are various topical anesthetic agents available ranging from gels to sprays. Benzocaine is most widely used by dentists, and it is rapidly absorbed on the mucosal membrane. It is less soluble in water and is long acting with less toxicity. Topical benzocaine is commercially marketed in 10% and 20% concentrations. It is acknowledged as safe and effective as an external source for temporary pain relief owing to minor trauma in mucosa or gingiva, minor dental procedures, teething, etc. Despite its well-documented literature of innocuous use, there have been rare cases of adverse effects such as methemoglobinemia.

Lignocaine is the most commonly used topical anesthetic agent (Vickers and Punnia-Moorthy, 1992) followed by benzocaine. However, there are side effects such as allergic skin reactions, blisters, ulcers, and rarely methemoglobinemia. This research was conducted to

evaluate the effectiveness of 2% lignocaine gel and 20% benzocaine gel as a topical anesthetic agent prior to administration of local anesthesia. Twenty percent benzocaine gel, i.e., ProGel-B is a new topical anesthetic agent marketed by Septodont Healthcare India Pvt Ltd.

Our department is passionate about child care, we have published numerous high quality articles in this domain over the past 3 years (Govindaraju, Jeevanandan and Subramanian, 2017a, 2017b; Nagaveni et al., 2017; Panchal, Gurunathan and Shanmugaavel, 2017; Ravikumar, Jeevanandan and Subramanian, 2017; Jeevanandan and Govindaraju, 2018; Nair et al., 2018; Ravikumar et al., 2018, 2019; Ravindra et al., 2018, 2019; Subramanyam et al., 2018; Vishnu Prasad et al., 2018; Jeevanandan, Ganesh and Arthilakshmi, 2019; Ramadurai et al., 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Veerale Panchal, Jeevanandan and Subramanian, 2019; Vignesh et al., 2019; V. Panchal, Jeevanandan and Subramanian, 2019; Mathew, Roopa, et al., 2020; Mathew, Samuel, et al., 2020; Samuel, Acharya and Rao, 2020). With this inspiration we planned to pursue research on comparison and evaluation of two anesthetic gels to reduce pain during local anesthesia administration.

MATERIAL AND METHODS

The study was a double-blinded randomized controlled clinical trial. This randomized controlled trial compared the effectiveness of two topical anesthetic agents, i.e., 2% lignocaine gel and 20% benzocaine gel. For sample size calculation, a sampling error of 5% was considered, the power was set to 85% and a minimum sample size of 50 was obtained. The study consisted of 50 healthy children (22 males and 28 females) in the age group of 7-9 years who had bilateral molars that required local anesthesia for dental treatment. Prior to the participation in this study, a medical history was acquired from all the participants, and a brief oral examination was done.

Each child would receive both topical anesthetic agents. To decide which agent each child would get at at the first appointment was decided by coin toss. The other topical agent would be used in the next appointment on the opposite tooth . Group A was 2% lignocaine gel and Group B was20% benzocaine gel. The topical anesthetic gel was applied to the test area using a cotton swab applicator that was completely dipped in the gel by the investigator. Following this, 1.2 ml of local anesthetic agent was administered preceded by aspiration through inferior alveolar nerve block onto the areas that were surface anesthetized. The needle was concealed to avoid fear/anxiety-provoking situations in the child as that will alter the pain perception. The child was advised to choose the emoticon that best describes the amount of pain he/she had experienced at the time of needle insertion, and his/her response was recorded by the investigator. The clinical trial for each child was accomplished in a single visit. All the data acquired were analyzed using SPSS software.

RESULTS AND DISCUSSION

The total number of participant was 50 and male to female ratio was 22 males (44%) and 28 females (56%), their age ranged from 7 -10 years(8±1.2) years

Table 1. Comparison of LOX gel and ProGel–B based on the gender.				
Gender	Number	Mean±SD VAS (ProgelB)	Mean±SD VAS (LOX)	P Value
Male	22	12.5±8.07	25.3±11.3	0.000
Female	28	15.1±10.2	22.2±10.1	0.011

Student paired t- test showed statistically significant difference in the VAS score between Progel B and the LOX in males as well as females.

Table 2. Comparison of Visual Analogue Scale in male and female in both injection methods			
Injection Method	Mean±SD VAS in Male	Mean±SD VAS in Female	p Value
Progel B	12.5±8.07	15.1±10.2	0.420
LOX	25.3±11.3	22.2±10.1	0.450

Independent Student t-test showed no statistically significant difference in VAS score between males and females Local anesthesia is a combination of two Greek words "an" (without) and "aesthesis" (sensation). In dentistry, local anesthesia is classified on the basis of their effects as (a) Conduction anesthesia, (b) Infiltration anesthesia, and (c) Topical anesthesia. (Boyce, Kirpalani and Mohan, 2016) Local anesthetics are classified into ester linkage agents (benzocaine) and amide linkage agents (lignocaine) and are the most widely used topical anesthetic agents.(Stewart et al., 1982) Topical anesthesia can be defined as loss of sensation on the mucous membrane that is produced by direct application. The first local anesthetic was a topical anesthetic, that is, cocaine and was discovered in 1860 by Albert Niemann. (Wulf et al., 1999)

Benzocaine is a para-aminobenzoic acid ester. Because it has low systemic toxicity, it is safe to use. However, there are rare cases of methemoglobinemia in the literature. Lignocaine is the most widely used local anesthetic agent and is an antiarrhythmic drug. It is eliminated from the body through the liver; hence, its metabolism is compromised in patients with liver dysfunction. Lidocaine acts by blocking the sodium channels, and topical administration of the same blocks ectopic discharges from afferent fibers. Topical application of lidocaine slows down the peripheral nociceptor sensitization and central hyperexcitability. (Jorge, Feres and Teles, 2011)

Topical anesthesia targets the free nerve-endings that reversibly blocks nerve conduction near the site of administration, which in turn induces a temporary loss of sensation in that area. The permeability of cell membrane to sodium ions is decreased, and therefore, nerve conduction is blocked. This eventually decreases the depolarization and increases excitability threshold until the capacity to induce action potential is completely lost.(Kumar, Chawla and Goyal, 2015) Topical anesthesitic agents do not contain vasoconstrictor as it weakens the mucosal permeability. In addition, topical anesthetics are more concentrated than injectable ones to promote diffusion within the mucosa.

In a study conducted by Garg et al., among 30 children (12 males and 18 females) in the age range of 4–8 years to evaluate the efficacy of 2% lignocaine and 20% benzocaine as a topical anesthetic agent. Topical anesthesia was used prior to administration of nerve blocks. To standardize the protocol, only mandibular arch and therefore inferior alveolar nerve blocks were included. This study showed a significant difference between the mean pain scores in Group A and Group B. Both the topical anesthetic agents were rubbed with moderate pressure over the surface for 30 s and left for 1 min. In a clinical trial, 2% lignocaine gel and 20% benzocaine gel were compared with placebo, and it was concluded that the effectiveness of both 2% lignocaine and 20% benzocaine were similar.(Garg et al., 2016)

Giddon et al. compared topical anesthetic agents in dosage forms and reported that there was no statistical difference among 20% benzocaine, 5% lidocaine, and placebo when applied for 30 s on palate using 25gauge needle.(Giddon et al., 1968)In a study, benzocaine gel and lignocaine spray were compared, and the results revealed that benzocaine gel had the least VAS score than lignocaine spray,(Koppolu et al., 2016) which corresponds to the findings of the present study. A clinical study of 510 extractions (Grade II and III) were carried out with lignocaine hydrochloride gel 5% and bupivacaine hydrochloride gel 5% as topical agents, and it was concluded that 5% lignocaine hydrochloride gel was better than 5% bupivacaine hydrochloride gel.(Satya Bhushan and Nayak, 2010).

Another topical anesthetic agent introduced in the 1980s was Eutectic Mixture of Local Anesthetics (EMLA) 5%. The first clinical study using EMLA was done by Holst and Evers in 1985.(Holst and Evers, 1985) Nayak et al. compared EMLA 5%, benzocaine 18%, and lignocaine 5% in 6–12 years aged children and found out that EMLA 5% was the best agent in pain reduction than lignocaine and benzocaine. However, taste acceptance was favorable for benzocaine.(Nayak and Sudha, 2006) Di Marco et al. compared the effectiveness of fast acting refrigerant topical agent with 20% benzocaine in a split mouth study and concluded that both refrigerant and 20% benzocaine gave similar benefits, however, the refrigerant had a fast onset of action.(DiMarco and Wetmore, 2016) Vongsavan et al. stated that 20% benzocaine gel was more effective than the placebo in reducing needle insertion pain in

palatal injections.(Nakrathok et al., 2020)Another clinical trial revealed that 2.5% lignocaine + 2.5% prilocaine gave better results than 20% benzocaine in reducing needle insertion pain in maxillary vestibule.(Al-Melh, Abu Al-Melh and Andersson, 2017).

There are various alternatives to topical anesthesia, but they are much technique sensitive, for example computer-controlled local anesthetic delivery (CCLAD) and TENS. CCLAD works on the idea of slow delivery of local anesthesia. The speed of the delivery of the solution is under computer control. In a clinical trial, comparing CCLAD with conventional method in pediatric patients showed that CCLAD gave better results than the traditional technique.(Mittal et al., 2015) TENS device stimulates the neurons that in turn activates the descending inhibitory system, and hence, hyperalgesia is reduced.

CONCLUSION

This study demonstrates that there is a high significant difference between the topical anesthetic effectiveness of lignocaine 2% and benzocaine 20% on needle insertion pain in inferior alveolar nerve block.

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Knowledge of School Teachers Regarding Dental Trauma Before and After the Use of Flash Cards

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ABSTRACT

Traumatic dental injuries (TDIs) are very common in childhood. Majority of TDIs occur at schools. The prognosis of TDIs to a great extent is dependent on emergency measures taken at the site of the accident. Hence, it is of paramount importance to assess the knowledge of people present at the site of the accident that generally includes parents, teachers, and sports coaches.A cross-sectional survey was conducted on 100 school teachers using a close- ended questionnaire. The questionnaire had eight questions regarding management of dental trauma.The questionnaire was administered again after the use of flash cards and the responses were compared. The data was statistically analysed.The overall knowledge of school teachers regarding management of TDIs was not found to be satisfactory before the use of flash cards. It was observed that most of the teachers were unaware of the steps to be taken on their part to minimize complications and improve prognosis.Despite the lack of knowledge and awareness regarding management of dental trauma initially, they had a good attitude towards management of dental trauma and its education after the use of flash cards.

KEY WORDS: AVULSION;KNOWLEDGE;MEDIUM;SCHOOL,TEACHERS.

INTRODUCTION

Physical activity is a basic need for the growth of children. During these physical activities, injuries to the face are one of the most common risks associated with it. Trauma to both primary and permanent dentition continues as a frequent dental problem. As long as young children remain active, trauma to both primary and permanent dentition continues to be a frequent dental problem.(Andreasen, 1985) It is known that the majority of dental injuries are seen in children between ages of 8 and 11 years. The prevalence of dental injuries is 60% out of which over 48% involve maxillary teeth. Over 16% was in the school environment and 19% of the injury due to fall.(Mohandas and Chandan, 2009).

An untreated and unsightly fracture of an anterior tooth can affect the behavior of a child, his progress in school, and can have more impact on their daily living.(Kumar et al., 2011). Epidemiological studies indicate that dental trauma is a significant problem in young people and that in the near future, the incidence of trauma will exceed that of dental caries and periodontal disease in the young population ((Neena et al., 2017), (Nagaveni, Yadav and Poornima, 2017), (Nagaveni, Poornima and Valsan, 2018).

Traumatic dental injuries seen to be a serious dental public health problem among children in deprived areas. Thus there is an urgent need to collect the local data on dental injuries in order to obtain a more comprehensive picture of the dental health.(Juneja, Kulkarni and Raje, 2018). The main cause of TDI among school-age children are unprecedented falls in schools. It has been previously reported that approximately 50% of schoolchildren have experienced a TDI prior to graduation (Ravn, 1974). Therefore, it is highly likely that first aid would be provided by teachers and other school staff.(Awad et al., 2017)Immediate care is particularly important for the avulsed permanent tooth as the prognosis stays high as long as the replantation takes place within 30 minutes after avulsion. The prognosis of the avulsed tooth depends on the viability of periodontal ligament remaining on the root surface (Lieger et al., 2009).

The role of school teachers in the prevention of traumatic dental injuries is a topic that has received a great deal of attention in recent years (Pani et al., 2014). Most of the studies conducted in different regions of the world have demonstrated that teachers' knowledge about traumatic dental injuries is inadequate.(Chandukutty et al., 2017) Flashcards exercise the mental process of active recall: given a prompt (the question), one produces the answer. They are a classic study tool one among the better practices through which our brains learn most effectively. Not only do they help learners memorize facts quickly, they also enable long-term retention of information in the human brain. Especially when it comes to reviewing concepts, nothing comes close to the effectiveness of flashcards.(What are Flashcards and Why They Are a Good Tool for Mobile Learning? - Disprz, 2018)

Our department is passionate about child care, we have published numerous high quality articles in this domain over the past 3 years (Govindaraju, Jeevanandan and Subramanian, 2017a, 2017b; Panchal, Gurunathan and Shanmugaavel, 2017; Ravikumar, Jeevanandan and Subramanian, 2017; Jeevanandan and Govindaraju, 2018; Nair et al., 2018; Ravikumar et al., 2018, 2019; Ravindra et al., 2018, 2019; Subramanyam et al., 2018; Vishnu Prasad et al., 2018; Jeevanandan, Ganesh and Arthilakshmi, 2019; Ramadurai et al., 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Veerale Panchal, Jeevanandan and Subramanian, 2019; Vignesh et al., 2019; V. Panchal, Jeevanandan and Subramanian, 2019; Samuel, Acharya and Rao, 2020). With this inspiration we planned to pursue research on Knowledge of school teachers regarding dental trauma before and after the use of flash cards. In order to contribute to the effective strategies of creating awareness of traumatic dental injuries among school teachers, this study was conducted.

MATERIAL AND METHODS

A cross sectional survey of school teachers working in private and government schools of Chennai, India, was carried out to assess knowledge of management of dental trauma among them. A multistage sampling was adopted

for selection of school teachers. Private and government schools were chosen randomly. In the second stage, all school teachers who gave consent to participate in the survey were included to make the final sample of 100 participants. A questionnaire containing eight questions was used in the study. The questionnaire consisted of questions regarding management of dental trauma.To help the participants make prompt decisions, they were given multiple choices.

This questionnaire was pretested on a sample of ten teachers who were later on excluded from the study. While they were filling up the questionnaire, a few questions were asked so that it could be confirmed if they understood the questions in the questionnaire. Any confusion or difficulty in comprehension so highlighted was rectified instantly. The nature and purpose of the study were explained to the teachers in their preferred language. Its voluntary nature was emphasized and strict confidentiality was assured. Two pre trained investigators were available throughout to make any required clarifications to the participants.Filled questionnaires were collected on the same day.

Figure 1: Pie chart representing the gender distribution of teachers that took part in this study more number of females took part in the study.

Figure 2: Bar chart shows the different sectors of work of teachers who took part in the study.X axis represents the sectors and Y axis shows the frequency of teachers who took part.There were more teachers from private sectors
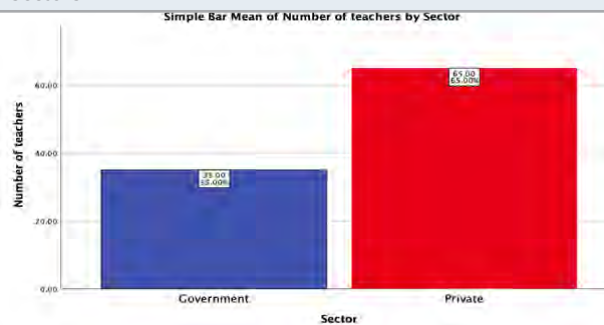
RESULTS AND DISCUSSION

A total of 100 school teachers took the questionnaire. Most of them were women (73%), under 50 years of age (70.1%)[Figure 1]. 65% of the teachers belonged to the

private sector and 35% belonged to the government sector[Figure 2].30 % of the teacher that took part in the study were from primary schools ,45 % from secondary schools and 25% from higher secondary schools[Figure 3] .They were also sorted into groups based on their age [Figure 4].Majority of them had not received any first aid training (88.%) and had not witnessed any dental trauma accidents (92%)[Table 1].

Table 1. Shows the responses of the questions asked to teachers before administration of the questionnaire.

Sno	Personal details	Yes	No
1	Have you visited a dentist before?	82	18
2	Do you have any previous experience with of traumatic dental injury in the school?	8	92
3	Have you been given training on first aid before?	12	88
4	Was traumatic injury a part of first-aid training?	3	97

The questionnaire was distributed among the teachers, each question had multiple choices and each answer was given a score if they had the ideal answer their score would be 2,if it was an acceptable answer it would be 1 and if it was the incorrect answer the score would be 0. The questionnaire was administered again after the use of flash cards to increase the teachers knowledge on dental trauma .This time the scores were calculated again based on the same above mentioned criteria. The scores were then statistically analyzed and were given their p value.

It was observed that 56.6% school teachers could correctly identify the damaged front tooth in a 9-year-old child as a permanent tooth. A significant association was found between previous first aid training received, service span, and question regarding identification of tooth. Most of the respondents 94.43% considered dental trauma an emergency situation. Majority of them 60.99% possessed the knowledge of how to correctly manage a fractured tooth after the use of flash cards.In the case of an avulsed tooth falling to the ground, only 52% school teachers responded that they would look for the lost tooth, and among them, 72.76% would clean it gently with water or some liquid whereas 10.84% would not clean the tooth and put it directly back into the socket. Regarding cleaning of dirty avulsed teeth, 42.86% male school teachers reported that they would look for the tooth and wash it with tap water. Moreover, among female teachers, 90% reported that they would look for the lost tooth and put it back into the socket. Regarding cleaning of that tooth, 79.57% female teachers knew the correct method of cleaning the tooth.

A lesser number of school teachers -15.17% were aware of the correct solution to clean a dirty avulsed tooth with. Most-31.58% of them preferred an antiseptic solution to clean a dirty avulsed tooth. Significant association was found between previous first aid training, history of witnessing trauma, and question regarding solution used to clean a dirty avulsed tooth. Majority -78.33% of school teachers were in favor of seeking professional help immediately in case of dental trauma. A large proportion of the participants -93.18% were unaware of the medium to store avulsed tooth in, till the use of flash cards. Most of them preferred to store the tooth in tissue paper (58.51%), filtered water (27.86%), tap water (6.81%), milk (3.72%), or the child's mouth (3.10%). A significant association was found between previous first aid training received and the question regarding mode of transport of avulsed tooth the dentist. Teachers after using the flash cards opted for milk (83.33%) whereas teachers before the use of flash cards opted for paper tissue (58.51%).

A large number of them did think that tetanus should be administered to the child after trauma only after the use of flash cards [Table 2]. A significant number of school teachers were not satisfied with their knowledge regarding the emergency of dental trauma and most of them were willing to receive a short training regarding the emergency of dental trauma. The main objective of replanting an avulsed tooth is to retain it in its socket to maintain the patient's esthetic appearance and occlusal function and also to prevent root resorption(Rao, Kommula and Tummala, 2014). Storage media such as Hank's balanced salt solution and milk were considered to be the best examples of osmolality-balanced media for storing an avulsed tooth.(Andersson et al., 2012) Natural products such as coconut water, propolis, and green tea have been used and showed their ability to maintain the viability of periodontal ligament cells of an avulsed teeth.(Jain, Dasar and Nagarajappa, 2015) Milk is usually available at home or in grocery where one has easy accessibility in case of trauma.

Table 2. Shows the responses to the questions asked to the teachers before and after the use of flash cards.The data was statistically significant. (P value <0.001).

	BEFORE			AFTER			
	0	1	2	0	1	2	P value
What is the best way to manage fractured tooth?	35	25	40	1	18	81	0.001
If a tooth is loose due to trauma, what should be done?	30	27	43	3	7	90	0.001
Do you think you can put the tooth completely back in place ?	94	0	6	0	0	100	0.001
How will you hold a tooth that was knocked out ?	95	0	5	5	5	95	0.001
How will you carry the knocked out tooth ?	90	5	5	0	4	96	0.001
Where will you go for treatment of knocked teeth?	94	3	3	0	3	97	0.001
Do you think tetanus injection is required after a traumatic injury ?	56	9	35	5	10	85	0.001
How urgently will you seek treatment for an injured tooth ?	73	7	20	5	4	91	0.001

The use of milk as a storage medium of the avulsed tooth has been reported to preserve the viability of periodontal ligament cells for up to 60 min at room temperature, and if refrigerated, it will preserve the tooth for an additional 45 min.(Blomlöf, Lindskog and Hammarström, 1981) In the current study, very few teachers gave a proper response regarding transportation medium of the avulsed tooth before the use of flash cards. The prognostic outcome of replanting an avulsed tooth depends on

appropriate management immediately after the trauma. The main prognostic factors for better outcome of replanting the avulsed tooth are minimal extraoral time, appropriate transporting medium with minimal damage to root surface, and periodontal ligament.(Alzahrani, Almaqboul and Others, 2019; Nagaveni, Poornima and Bajaj, 2019; Mebin George Mathew et al., 2020; Nagaveni, Poornima and Mathew, 2020).Significant difference in the knowledge of dental trauma among the teachers was found before and after the use of flash cards (P = 0.001).

Figure 3: Bar chart shows the different types of schools of teachers who took part in the study.X axis represents the types of schools and Y axis shows the frequency of teachers who took part.There were more teachers from secondary schools
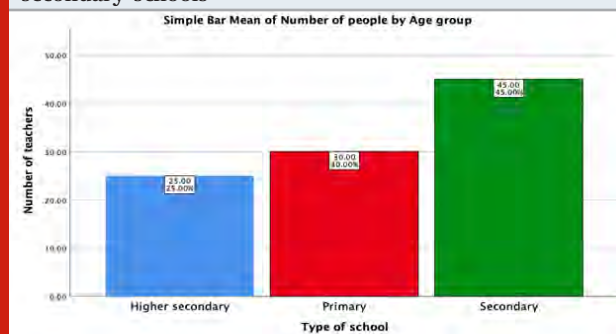
Figure 4: Bar chart shows the age group of teachers who took part in the study.X axis represents the age groups and Y axis shows the frequency of teachers who took part.There were more teachers from the 20-30 year age group.
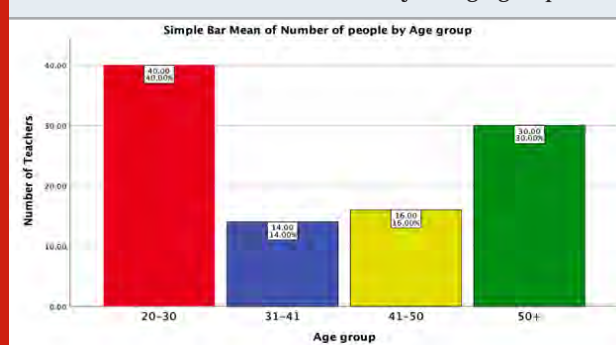
Children spend more time at school than at any other location outside the home; while at school they are involved in various physical activities that expose them to the risk of dental trauma. Thus, the school environment is a suitable place to promote oral health-related campaigns targeting the welfare of children. School teachers are the most likely people to connect with children soon after a traumatic incident, and it is their knowledge and understanding of emergency procedures that ensure the best prognosis for the clinical treatment provided by the dentist. Consequently, school staff are key strategic vectors for imparting knowledge and awareness of TDIs(Al-Sehaibany et al., 2018)

Flashcards engage the ability to think. The majority of this generation learns best by seeing the information in an example format. People of all ages are far more likely to remember visuals rather than words ((Mathew and Soni, 2019; M. G. Mathew et al., 2020). This technique will help increase their understanding of dental trauma and give them experience in the right direction ((Mathew, Roopa and Soni, 2020). The results of this study may help in making strategic plans to enhance the school teachers knowledge about TDIs .Flashcards can be implemented in their training to help in the better management of TDIs.

CONCLUSION

The results of this study shows that a significant number of school teachers had very little knowledge regarding the emergency of dental trauma before the use of flash cards and most of them were willing to receive a short training regarding the emergency of dental trauma.After the use of flash cards their knowledge on dental trauma had significantly increased .

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Effect of Music Therapy for Anxiety in Children

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ABSTRACT

Dental anxiety has been identified as a significant problem in both children and adults and is considered an obstacle in the provision of quality dental care by dental care providers. Music is an alternate treatment option which has been used in different medical fields. Suitable music has been shown to have a strong influence on human brain waves. The aim of the study is to estimate the effect of music therapy for anxiety in children. 60 children aged 7-9years were divided into two groups, Group I: treatment without music and Group II: treatment with music. The treatment done for the children included scaling and pit and fissure sealant application. The method followed for this study was the coin toss method. The analysis was done using SPSS software.The results showed that the pulse rate in children treated with music is decreased. The systolic and diastolic blood pressure is also decreased in children treated with music. A drastic variation was observed in the pulse rate, systolic blood pressure and diastolic blood pressure. Within the limits of the study, music therapy helps children with anxiety.

KEY WORDS: ANXIETY; CHILDREN; MUSIC THERAPY; PULSE RATE.

INTRODUCTION

Dental anxiety can be defined as a state where an individual is evoked and prepared for something to happen, with a non-specific feeling of apprehension, associated with abnormal conditions((Nagaveni, Yadav and Poornima, 2017; Neena et al., 2017). The etiology of dental anxiety can be attributed to traumatic or painful dental experiences as well as fearful attitudes learnt from dentally anxious family members (Locker, Liddell and Shapiro, 1999; Maulina, Djustiana and

Nurhalim Shahib, 2017). ('Advances in pain and anxiety management', 2012). Regardless of the classification of dental anxiety, patients with dental anxiety will show some refusal symptoms during treatment. These refusal symptoms of anxiety, can be classified into physiological symptoms, behavioural symptoms, cognitive symptoms, and emotional symptoms (Shives, 1995).

Music surrounds our lives. We hear it on the radio, television, our cars, and home stereos. Even warbling in our bathroom gives us a happy start of the day. Music is also clinically recognized to influence biological responses such as blood pressure , heart rate, respiratory rate, cardiac output, muscle tone, papillary responses, skin responses, and endorphin production. It can entrain the body to calm or to accelerate, depending on the type of music used (Stabholz and Peretz, 1999). Sedative music can lower the anxiety, pain, tension ((Nagaveni, Poornima and Bajaj, 2019; Nagaveni, Poornima and Mathew, 2020)

and stress levels resulting in less use of anesthetics and pain medication, distraction from thoughts, and higher patient compliance and satisfaction(Corah, Gale and Illig, 1978). By definition, music therapy is the systematic application of music in the treatment of physiological and psychological aspects of an illness or disability. (Fukayama and Yagiela, 2006)

One effective method of providing support for anxiety in children is music therapy, where music becomes the main tool the therapist uses to connect and work with the patient. This kind of therapy has been shown to be effective when treating children and young people living with anxiety based disorders (British Association for Music Therapy, no date). Saarikallio and Erkkilä, 2007).

Music reduces anxiety through its effect on the autonomic nervous responses which regulates bodily functions such as the heart rate, digestion, respiratory rate and pupillary response (Packyanathan, Lakshmanan and Jayashri, 2019).(Chlan, 1998). Several studies have demonstrated reduction in cortisol and other hypothalamic–pituitary–adrenal axis neuropeptides following music listening. This triggers the limbic system releasing endorphins which minimizes discomfort and pain and maximise pleasure (Cooke et al., 2005), (Labrague and McEnroe-Petitte, 2016).

Our department is passionate about child care, we have published numerous high quality articles in this domain over the past 3 years (Govindaraju, Jeevanandan and Subramanian, 2017a, 2017b; Panchal, Gurunathan and Shanmugaavel, 2017; Ravikumar, Jeevanandan and Subramanian, 2017; Jeevanandan and Govindaraju, 2018; Nair et al., 2018; Ravikumar et al., 2018, 2019; Ravindra et al., 2018, 2019; Subramanyam et al., 2018; Vishnu Prasad et al., 2018; Jeevanandan, Ganesh and Arthilakshmi, 2019; Ramadurai et al., 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Veerale Panchal, Jeevanandan and Subramanian, 2019; Vignesh et al., 2019; V. Panchal, Jeevanandan and Subramanian, 2019; Samuel, Acharya and Rao, 2020). With this inspiration we planned to pursue research on the effect of music therapy for anxiety in children.

MATERIAL AND METHODS

In this study, a sample size of 60 children of 7 to 9 years of age who have visited Saveetha Dental College and Hospitals, were randomly selected and were equally divided into two groups. Group I: treatment without music(control group) and Group II: treatment with music(test group). The treatment done for the children included only scaling and pit and fissure sealant application. The subjects were made to choose their own choice of music and were given headphones during the treatment. The pulse rate, systolic and diastolic blood pressure were noted for both the groups before and after the treatment. The analysis was performed using SPSS software by IBM. The mean and standard deviations were calculated for the pulse rate, systolic

and diastolic blood pressure, both before and after the treatment. The Pearson's correlation test was performed to correlate the changes in the pulse rate, systolic and diastolic blood pressure before and after the treatment in both the groups.

RESULTS AND DISCUSSION

The aim of this study was to estimate the effect of music therapy for anxiety in children. The study results showed that, out of 60 samples, 30 samples are of the control group(Group I) where there were 16 boys(53.4%) and 14 girls(46.7%). The test group also had 30 samples where there were 17 boys(56.7%) and 13 girls(43.4%). All the samples were from the age group of 7 to 9 years (Table 1).

Table 1. Demographic details			
PARAMETER	CONTROL GROUP	TEST GROUP	P VALUE
AGE (years)	7.1 ± 0.7	7.2 ± 0.9	0.712
SEX	Male - 16(53.4)	Male - 17(56.7)	
	Female - 14(4.7)	Female- 13(43.4)	0.795

Before the treatment, the pulse rate in the control group is 102.4 ± 15.8 and the test group is 100.5 ± 15.4 where the p value is 0.763 which is statistically insignificant.The systolic blood pressure in control group is 124.0 ± 12.2 and the test group is 122.3 ± 12.5, which is statistically insignificant (P = 0.697). The diastolic blood pressure in the control group is 81.2 ± 10.8 and the test group is 79.7 ± 12.6, where the p value is 0.654 which is statistically insignificant (Table 2).

Table 2. Pulse rate,SBP, DBP, in control and test group before treatment			
VARIABLE	CONTROL GROUP	TEST GROUP	P VALUE
PULSE RATE	102.4 ± 15.8	100.5 ± 15.4	0.763
SBP	124.0 ± 12.2	122.3 ± 12.5	0.697
DBP	81.2 ± 10.8	79.7 ± 12.6	0.654

After the treatment, the pulse rate in the control group is 107.4 ± 19.8 and the test group is 87.1 ± 12.1, where the p value is 0.001 which is statistically significant. The systolic blood pressure in the control group is 127.8 ± 9.5 and the test group is 118.8 ± 12.1, which is statistically significant (P= 0.004). The diastolic blood pressure in the control group is 83.4 ± 8.0 and the test group is 78.2 ± 12.5, where the p value is 0.234 which is statistically insignificant (Table 3).

In this study, it was observed that the pulse rate was decreased after the treatment in the test group when

compared to the control group. In the study given by Marwah N, et.al, 2005 (Marwah, Prabhakar and Raju, 2005), pulse rate is decreased in pediatric dental patients who were subjected to audio distraction but not to a very significant level. Audio distraction is one such nonaversive technique in which a patient listens to music during the dental procedure. Because of its success in medical settings and in adult dental patients many dentists believe that this technique may be successful in management of pediatric dental patients ((Mathew et al., 2020; Mathew, Roopa and Soni, 2020). This study shows similar ethnicity to the present study.

Table 3. Pulse rate,SBP, DBP, in control and test group after treatment			
VARIABLE	CONTROL GROUP	TEST GROUP	P VALUE
PULSE RATE	107.4 ± 19.8	87.1 ±12.1	0.001
SBP	127.8 ± 9.5	118.8 ±12.1	0.004
DBP	83.4 ± 8.0	78.2 ±12.5	0.234

In the current study it was observed that the systolic blood pressure is found to be lower in the test group after the treatment than the diastolic blood pressure. In the study given by Dviya Singh, et.al, 2014 (Singh et al., 2014), Systolic blood pressure was found to be lower in music group than DBP which was not having significant variations between both the groups. The study given by Mimi M Y, et.al, 2005 (Tse, Chan and Benzie, 2005), also shows that systolic blood pressure is slightly lower than the diastolic blood pressure.Both the studies show similar findings with the present study. When exposed to slow beat music the parasympathetic nervous system is stimulated decreasing the heart rate and while listening to fast beat music the sympathetic nervous system is stimulated and increases the heart rate. (Mathew, 2020a, 2020b)

The salivary cortisol values before the treatment in both the groups is statistically insignificant where the p value is 0.924. And the p value of salivary cortisol after the treatment is 0.001 which is statistically significant(Table 4).

Table 4. Salivary Cortisol values in control and test group			
SALIVARY CORTISOL	CONTROL GROUP	TEST GROUP	P VALUE
BEFORE TREATMENT	1.64 ± 1.31 ug/dl	1.59 ± 1.24 ug/dl	0.924
AFTER TREATMENT	5.33 ± 1.72 ug/dl	1.79 ± 2.04 ug/dl	0.001

While the use of music has been explored within various clinical settings in both medicine and dentistry, the evidence-base for its use in reducing dental anxiety in children remains inconclusive and of limited quality ((Mathew and Soni, 2019).

CONCLUSION

Within the limits of our study we conclude that music therapy reduced anxiety in children. Hence music therapy is significant in reducing anxiety in children visiting dental clinics. However more studies should be done to explore the various reasons and treatment planning for pediatric dental patients with anxiety. This study will act as a guide to understand the effect of music therapy for anxiety in children.

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Awareness of Recent Advances in Dental Extraction Techniques Among Interns

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ABSTRACT

The aim of this study was to assess the awareness on recent advances in dental extraction techniques among interns. There have been several exciting technological advances in dental extraction techniques within the last decade. There have been several exciting technological advances in extraction techniques and outpatient oral surgery within the last decade. A variety of new instruments and techniques are revolutionizing the fields of oral and maxillofacial surgery and dentistry. A set of questionnaire was framed and an online survey was conducted among inteerns using survey planet. 100 people have taken the survey and the results were statistically analyzed. In this study 59% of students are not aware of recent advances in dental extraction techniques.61% students are aware of physics forceps, sonosurgery and benex technique.58%, 59%, 57% students are not aware about piezo surgery, luxator periotomes and EASY X-TRAC system respectively. 95% students found this survey helpful to gain knowledge about recent advances. Hence, the study draws attention that the students are not aware about recent advances of extraction. We need to create more awareness by seminars, CD programs and hands on lectures on recent advances in dental extraction techniques.

KEY WORDS: RECENT ADVANCES, EXTRACTION, PHYSICS FORCEPS, PIEZO SURGERY, SONO SURGERY, BENEX TECHNIQUE, LUXATOR PERIOTOMES.

INTRODUCTION

Dental extraction is removal of a tooth from the mouth. It is the most common procedure performed in oral surgery, and it is often the first surgical procedure carried out by interns and dental residents(Cicciù et al., 2013; El-Kenawy and Ahmed, 2015; Senthil Kumar et al., 2019).An ideal

tooth extraction may be defined as painless removal of the full tooth or tooth roots with minimal trauma to the investing tissues, therefore the wound heals uneventfully with no postoperative prosthetic problems(Howe, 1962; El-Kenawy and Ahmed, 2015; Wahab et al., 2018). However tooth extraction is a traumatic procedure that results in immediate destruction and loss of surrounding alveolar bone and soft tissue(Caplanis, Lozada and Kan, 2005; Patel et al., 2016). The sequence of extraction by conventional methods involves stripping of the periodontium around the tooth followed by luxation with an elevator or forceps(Feck, 2010; Jain et al., 2017).

This method invites inadvertent trauma to the surrounding hard and soft tissues and may aggravate if forceps extraction fails and surgical removal is performed, the

amount of soft tissue and bone loss increases,which may lead to unfavorable postoperative sequel, thereby comprising the harmony (Misch and Perez, 2008; Jain et al., 2017). Immediately after tooth removal , bony walls of the extraction socket undergo remodelling by simultaneous resorption and deposition, which leads to reduction in the bone height by 1 to 2 mm in all dimensions (Patil, Rakhewar and Doiphode, 2012; Jain et al., 2017). Once the wound is left to heal, considering ignorance and economy of rehabilitation, atrophy occurs as the socket is not replaced with a suitable prosthetic component(Jain et al., 2017).This disuse atrophy causes further loss in bone width by a quarter.(Jain et al., 2017).

There are several exciting technological advances in extraction techniques in oral surgery within the last decade(Weiss, Stern and Dym, 2011). A variety of new techniques and instruments are revolutionizing the fields of oral and maxillofacial surgery and dentistry(White, Holtzclaw and Toscano, 2009; Weiss, Stern and Dym, 2011). Atraumatic dental extraction techniques have gained prominence and may ultimately become the standard technique for teeth removal(Saund and Dietrich, 2013; El-Kenawy and Ahmed, 2015). Atraumatic extraction technique helps in preserving the bone, gingival structure, and allows for the choice of future or immediate implant placement(Dym and Weiss, 2012; El-Kenawy and Ahmed, 2015). A number of tools and techniques have been proposed for minimally invasive tooth removal such as physics forceps, powertome, proximators, periotomes and benex extractor(Kosinski, 2012; El-Kenawy and Ahmed, 2015).

With a rich case bank established over 3 decades we have been able to publish extensively in our domain((Abdul Wahab et al., 2017; Eapen, Baig and Avinash, 2017; Patil et al., 2017; Jain and Nazar, 2018; J et al., 2018; Marimuthu et al., 2018; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019; Senthil Kumar et al., 2019; Sweta, Abhinav and Ramesh, 2019). Based on this inspiration we aimed to assess the awareness on recent advances in dental extraction techniques among interns. In this study we asked the students about atraumatic extraction techniques like physics forceps , sonosurgery, piezosurgery,luxator periotomes,Benex technique and EASY X-TRAC system to assess the awareness on recent advances in dental extraction techniques among interns.

MATERIAL AND METHODS

This is a questionnaire-based study. A questionnaire was prepared with questions pertaining to recent advances in dental extraction techniques . The survey was conducted among interns .The participants volunteered for the survey.The questionnaire was administered through a survey planet link to all the participants. 100 students have participated in the survey. There were 15 questions posed to assess the awareness of recent advances in dental extraction including the knowledge about physics forceps, sonosurgery, Benex technique, vertical

pulling technique, piezosurgery, EASY X-TRAC, luxator, periotomes and their mechanical advantages.

RESULT AND DISCUSSION

In this study 59% of students are not aware of recent advances in dental extraction techniques. We found that 61% students are aware of physics forceps and advantages of it.The Physics Forceps uses first-class level mechanics to atraumatically extract a tooth from its socket(Golden, 2005; Weiss, Stern and Dym, 2011). One handle of the device is connected to a "bumper," which acts as a fulcrum during the extraction(Golden, 2005; Weiss, Stern and Dym, 2011)(15,10). This bumper is usually placed on the facial aspect of the dental alveolus, typically at the mucogingival junction(Misch and Perez, 2008; Weiss, Stern and Dym, 2011).

Figure 1

Figure 2

Figure 3

The beak of the extractor is positioned most often on the lingual or palatal root of the tooth and into the gingival sulcus(Misch and Perez, 2008; Weiss, Stern and Dym, 2011).Unlike conventional forceps, only one point of contact is made on the tooth being extracted. Together

the "beak and bumper" design acts as a simple first-class lever. A squeezing motion should not used with these forceps. By contrast, the handles are actually rotated as one unit using a steady yet gentle rotational force with wrist movement only(Weiss, Stern and Dym, 2011).The chances of root fracture diminish and the buccal height is maintained with the use of physics forceps(Patel et al., 2016). An immediate implant placement can be considered after using physics forceps(Weiss, Stern and Dym, 2011).

61% students are not aware of sonosurgery .It provides precise cutting without inducing any injury to the soft tissue(Papadimitriou et al., 2012). Advantages include reduced operative time, average heat generated is less. Smooth cutting surface with minimal damage to adjacent structures provides better tactile perception and makes it safer for adjacent hard and soft tissues(Weiss, Stern and Dym, 2011; Papadimitriou et al., 2012). Disadvantages are long working time. If the direction of instrument while insertion is wrong, it may fracture while oscillating. Sonic instruments are contraindicated in patients with pacemaker as the oscillations might interfere with their functioning. In addition to this, it is not advised to use sonic instruments in patients with infectious diseases as the aerosols may further aggravate the condition(Weiss, Stern and Dym, 2011; Papadimitriou et al., 2012).

Figure 4

Figure 5

Figure 6

Figure 7
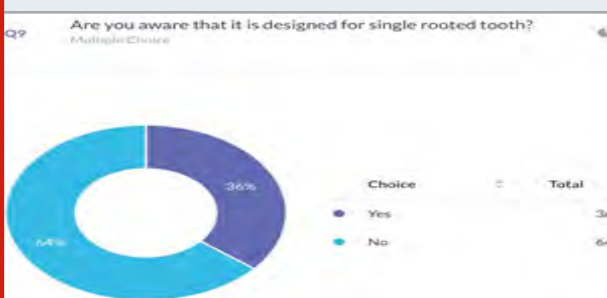
Figure 8

Figure 9

Figure 10

61% students are not aware of benex technique.It works on the principle of vertical pulling only(Saund and Dietrich, 2013). This technique is specifically designed for single-rooted tooth below the marginal gingiva. The apparatus comprises a Benex extractor, diamond

drill (1.6, 1.8 mm), self-tapping screws, a pullstring, and a sectional impression tray(Muska et al., 2013). The disadvantages of this technique are that it cannot be used in the cases where there is inappropriate root morphology and in grossly carious teeth where retention of screw is not possible(Jain et al., 2017).

Figure 11
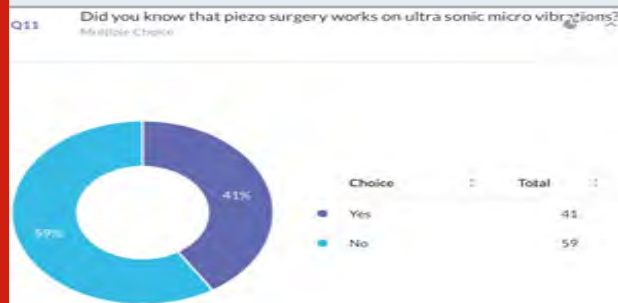
Figure 12
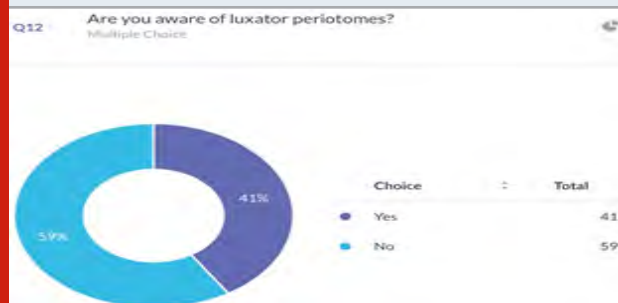
Figure 13
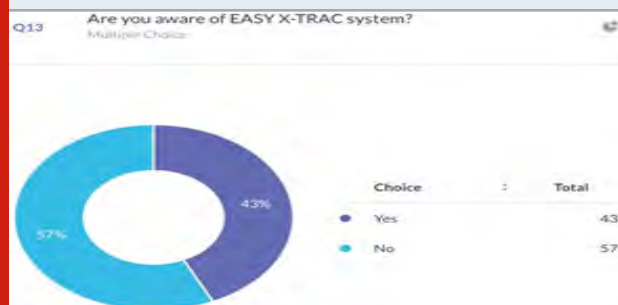
58% students are not aware of piezo surgery.It is a procedure for hard tissue surgery, sparing the soft tissue surrounding it(Jain et al., 2017). The working principle is based on the ultrasonic micro vibrations. Performing dental extractions with piezoelectric instruments aids in faster healing as the damage to surrounding soft tissue is significantly reduced and it also leads to reduced postoperative pain.The advantages of this technique include reduced bleeding, thereby, providing a clearer surgical field and causing insignificant damage to adjacent soft tissues including lingual nerve, inferior alveolar nerve, and Schneiderian membrane. Disadvantages during its use are increased heat generation and increased surgical time along with

high cost of its armamentarium.(Pavlíková et al., 2011). 59% students are not aware of luxator periotomes. These sharp slender instruments are inserted between the tooth and the gingiva trying to engage them in a plane that strips the periodontal fibers through slight, yet firm, rotatory motion. While stripping these fibers when a rocking motion is given continuously, the socket also expands. The amount of force applied during its use is significantly less.(Jones, 2012).

57% students are not aware about EASY X-TRAC system respectively.Easy X-Trac engages into the tooth root through a screw,which aids in better retention and control. With equal distribution of forces, both the screw and root can be removed. Three color-coded drills in increasing diameter are available with two X-Trac screws of sizes 28 and 33mm respectively, along with protective plates to disperse the pressure equally on both sides and a ratchet wrench to engage the screw. This technique can be used for single- and double-rooted tooth, which are ankylosed or fractured (Jain et al., 2017). 95% students found this survey helpful to gain knowledge about recent advances.

Figure 14
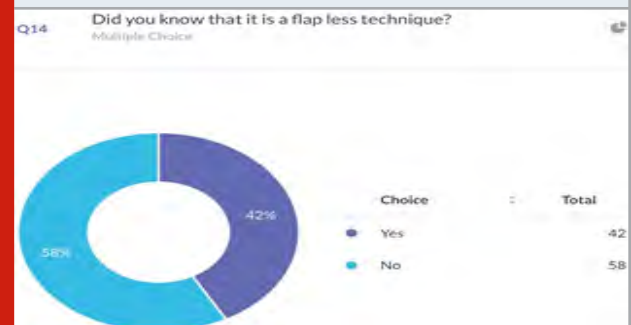
Figure 15
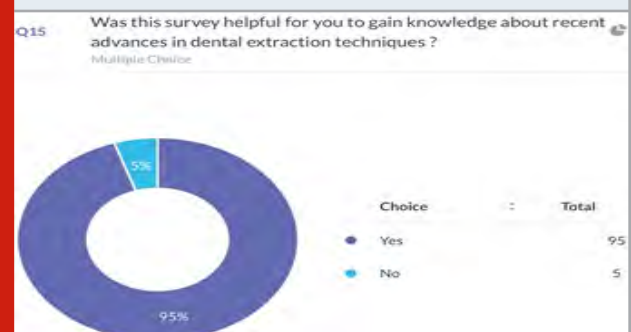
CONCLUSION

According to this survey, students are not aware about the recent advances in dental extraction techniques. The conventional forceps extraction is being followed traditionally. Whether it is the lack of practical exposure, unavailability of access to the equipments due to cost or other factors need to be further explored. Devising newer equipments to ease an existing procedure fails to meet

the purpose when unknown and unused. More awareness has to be created by conducting seminars, CDE programs and by giving hands on lectures about recent advances in dental extraction techniques.

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Three Dimensional Descriptive Study of Maxillary Sinus Variation and it's Association with Age and Gender for Implant Placement

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ABSTRACT

The maxillary sinuses (MS) are of particular importance to dentists because of their close proximity to the teeth and their associated structures, so increased risk of maxillary sinusitis has been reported with periapical abscess, periodontal diseases, dental trauma, tooth extraction, and implant placement. Complications of MS are related to its anatomic and pathologic variations. Thus, study was conducted to assess the anatomic variations in MS in association with age and gender by using cone-beam computerized tomography. The aim of this study is assess the variations in maxillary sinus related to implants using cone beam computed tomography. CBCT scans of 25 subjects were collected between the age group of 18 years to 70 years and were analyzed for MS anatomical variation. The linear measurements were performed by selection of the cuts which was based on the presence of certain anatomical landmarks. According to the anatomical fact that the MS is pyramidal in shape with an almost square base oriented medially, the measurements of the sinus dimensions were conducted as follows:1. Linear measurements of the MS height on the sagittal section (craniocaudal extension). 2. Linear measurements of the MS width (mediolateral dimension) and antero-posterior (A-P) dimensions on the axial section. The average height of the right MS is 33.28mm, width is 25.94mm and depth is 34.85mm and average height of the left MS is 33.76mm, width is 26.13 mm and depth is 33.00mm. It was seen that the average height and width of the left maxillary sinus was larger when compared to right maxillary sinus. But the average depth of the right maxillary sinus was larger when compared to the depth of the left maxillary sinus. The size of maxillary sinus increases as age increases, but is not statistically significant (p>0.05). The size of maxillary sinus of males was larger when compared to that of females, but is not statistically significant (p>0.05).Within the limits of the study it can be concluded that average height of the right MS is 33.28mm, width is 25.94mm and depth is 34.85mm and average height of the left S is 33.76mm, width is 26.13 mm and depth is 33.00mm. Also, the size of MS increases as age increases and size of MS of males is larger than females.

KEY WORDS: ANTERIOR POSTERIOR, CONE BEAM COMPUTED TOMOGRAPHY, IMPLANT, MAXILLARY SINUS.

INTRODUCTION

The paranasal sinuses are four paired sets of air-filled cavities of craniofacial complexes.The maxillary sinus is the largest of the paranasal sinuses (Van Cauwenberge et al., 2004). It fills the body of the maxilla and is pyramidal in shape .The base is medial on the lateral wall of the nasal cavity. The floor is formed by the alveolar process and part of the palatine process of the maxilla. The apex of the maxillary sinus extends into the zygomatic process of the maxilla. The maxillary sinus serves many functions such as to decrease the weight of the skull, increases voice resonance, protects against blows to the face, insulation of the eyes and roots of the teeth against temperature fluctuations, humidification of inhaled air and contributes to the maxillary growth (Johna, 2006) .Of the four paranasal sinuses the maxillary sinuses (MS) are of particular importance to dentists because of their close proximity to the teeth and their associated structures. So increased risk of maxillary sinusitis has been reported with periapical abscess, periodontal diseases, dental trauma, tooth extraction, and implant placement (Kretzschmar and Kretzschmar, 2003). Complications of maxillary sinus are related to its anatomic and pathologic variations (Zijderveld et al., 2008).

The very close relationship between teeth roots and maxillary sinus (MS) is referred to as "draping." The teeth which are commonly involved are the roots of premolars and molars. Maxillary sinus are small at birth, after birth, it enlarges with the growing maxilla, though it is fully developed following the eruption of permanent dentition. Maxillary sinus anatomy varies from person to person. The main characteristics of these structures are pneumatic. Genetic diseases, environmental conditions, and past infections can affect the process of pneumatization of maxillary sinuses (Ritter et al., 2011). The size of maxillary air sinuses are reported to increase with age. Spurts of maxillary sinus growth occur for both genders from birth to 2 years, from 7.5 to 10 years, and from 10 to 12 years. Thereafter, growth is slow but steady until 14 to 18 years (Ariji et al., 1994).

The ostium located posterosuperiorly on the medial surface helps in the communication of maxillary sinus with the homolateral nasal fossa. Normal physiology of the Maxillary sinus is highly dependent on the proper function of both the Maxillary sinus ostium and the mucosal lining (Underwood, 1910). Three-dimensional assessment of maxillary sinus pneumatization is of most usefulness, considering the anatomical variability related to the maxillary sinus, its intimate relation to the maxillary posterior teeth and because of all the implications that pneumatization may possess. Anatomic variations within the sinus, such as septa, increase the risk of the sinus membrane perforation during pre-implant surgery in posterior maxilla. Computed tomography (CT) images allow the location of anatomic structures and provide information about bone dimensions and morphology (Dobele et al., 2013).

The advantage of cone-beam computerized tomography (CBCT) is its lower cost, smaller device size, and CBCT can produce an image with significantly less radiation than traditional CT, because it uses an image intensifier, this is particularly important for children (Cha, Mah and Sinclair, 2007). With the development of cone beam computed tomography (CBCT), the errors produced in conventional radiography can be eliminated and the excessive radiation produced in the CT could be reduced. (Kavarthapu and Thamaraiselvan, 2018). CBCT provides excellent tissue contrast, eliminates blurring, and overlapping of adjacent structures. It is important to know the three dimensional variations- height, width and anterior posterior dimension among large populations as this would help in implant dimensions for implant placement (Mehra and Murad, 2004). This is because CBCT shows a great potential for proper preoperative planning and is an indispensable alternative for CT when 3D imaging is mandatory for all dental practitioners.

Providing normative values for paranasal sinus size and their changes with age and gender could be helpful in evaluating the presence of any abnormality. Implant placement becomes difficult in case of chronic periodontitis due to the bone loss that occurs (Ramesh et al., 2018,) . This could be treated by sinus augmentation procedures like bone grafts, growth factors, etc (Kavarthapu and Malaiappan, 2019).Also, knowing about the average dimensions of maxillary sinus would help the implant manufacturers to have a rough knowledge on the implant dimensions to be manufactured for the people belonging to that particular geographic location and also to place implants without any complications. Previously we have worked on plenty of topics in periodontology (Jain and Nazar, 2018; Ramamurthy, 2018;; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Vijayashree Priyadharsini, 2019). Now we are planning to assess the Three Dimensional descriptive study of Maxillary Sinus variations and its association with age and gender by Cone Beam Computed Tomography for Implant placement.

MATERIAL AND METHODS

Study setting: It is a university setting study, conducted in Saveetha Dental College from November 2019 to January 2020. The pros of the study are flexibility, low cost. The cons of the study are that it is limited to a certain population. CBCT scans of 25 subjects who reported to Saveetha Dental College were collected between the age group of 18 years to 70 years and were analyzed for MS anatomical variation. Approval was obtained from the Institutional Ethical Committee (IEC), Saveetha Dental College. Two examiners were included in the study.

Sampling: Simple random sampling was done to minimise sampling bias. It was generalised to South Indian population.

Data collection: CBCT scans of 25 subjects who reported to Saveetha Dental College were collected between the

age group of 18 years to 70 years and were analyzed for MS anatomical variation.

The following measurements of maxillary sinus were done:

1. Maxillary sinus Height was measured as the longest distance from the lowest point of the sinus floor to the highest point of the sinus roof in the coronal view.
2. Maxillary sinus Width was measured as the longest distance perpendicular from the medial wall of the sinus to the most lateral wall of the lateral process of the maxillary sinus in the axial view
3. Maxillary sinus Depth (Anteroposterior) was measured as the longest distance from the most anterior to the most posterior point of the medial wall in the axial view.
4. .

Analysis: The statistical analysis was performed using the Statistical package for Social Sciences version (SPSS) 20. Differences in mean values between groups were analysed using descriptive statistics, while correlation studies were performed using the Pearson's correlation coefficient. Values were deemed significant if $p < 0.05$.

Table 1. Shows mean and standard deviation values of right Maxillary sinus dimensions. It is seen that the average height of the right MS is 33.28mm, width is 25.94mm and depth is 34.85m

Dimensions (in mm)	N	Mean	Std. Deviation
Right MS height	25	33.28	1.27
Right MS width	25	25.94	0.82
Right MS depth	25	34.85	1.58

Table 2. Shows mean and standard deviation values of left Maxillary sinus dimensions. It is seen that the average height of the left MS is 33.76mm, width is 26.13 mm and depth is 33.00mm.

Dimensions (in mm)	N	Mean	Std. Deviation
Left MS height	25	32.76	1.79
Left MS width	25	26.13	0.83
Left MS depth	25	33.00	1.29

RESULTS AND DISCUSSION

In relation to the average size of the right maxillary sinus it was seen that the average height of the right MS is 33.28mm, width is 25.94mm and depth is 34.85mm. [Table 1]. In relation to the average size of the left maxillary sinus it was seen that the average height of the left MS is 33.76mm, width is 26.13 mm and depth is 33.00mm [Table 2]. It was seen that the average height

and width of the left maxillary sinus was larger when compared to right maxillary sinus. But the average depth of the right maxillary sinus was larger when compared to the depth of the left maxillary sinus.

Figure 1: Shows association between age and mean dimensions of right Maxillary Sinus. X axis denotes the age group and Y axis denotes the mean dimensions of right maxillary sinus. (Right MS height, Pearson Chi square= 63.988, p =0.680 (>0.05), Right MS width , Pearson Chi square= 64.271, p =0.184 (>0.05) and Right MS depth, Pearson Chi square =82.639, p=0.552 (>0.05), hence not statistically significant) .It is seen that the size of right maxillary sinus (height, width and depth) increases as the age increases, but was not statistically significant.
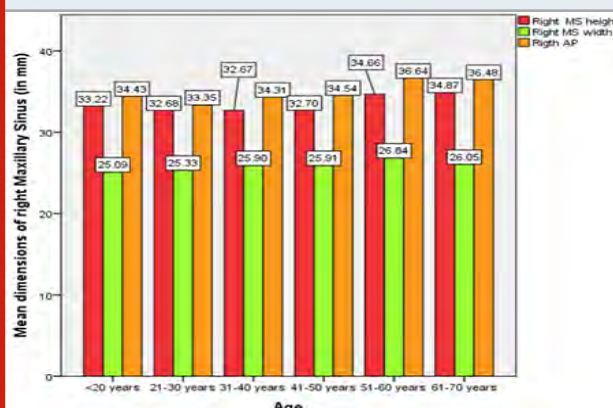
Figure 2: Shows association between age and mean dimensions of left Maxillary Sinus. X axis denotes the age group and Y axis denotes the mean dimensions of left maxillary sinus. (Left MS height, Pearson Chi square= 16.098, p =0.149 (>0.05), Left MS width, Pearson Chi square= 12.876, p =0.425(>0.05) and Left MS depth, Pearson Chi square =19.028, p=0.154 (>0.05), hence not statistically significant). It is seen that the size of left maxillary sinus (height, width and depth) increases as the age increases, but was not statistically significant

In relation to the association between age and mean dimensions of right maxillary sinus it is seen that the size of right maxillary sinus (height, width and depth) increases as the age increases, but was not statistically

significant .(Right MS height, Pearson Chi square= 63.988, p =0.680 (>0.05), Right MS width , Pearson Chi square= 64.271, p =0.184 (>0.05) and Right MS depth, Pearson Chi square =82.639, p=0.552 (>0.05), hence not statistically significant) [Figure 1]. In relation to the association between age and mean dimensions of left maxillary sinus it is seen that the size of left maxillary sinus (height, width and depth) increases as the age increases, but is not statistically significant (Left MS height, Pearson Chi square= 16.098, p =0.149 (>0.05), Left MS width , Pearson Chi square= 12.876, p =0.425(>0.05) and Left MS depth, Pearson Chi square =19.028, p=0.154 (>0.05), hence not statistically significant) [Figure 2].

In relation to the association between gender and mean dimensions of right maxillary sinus it is seen that the size of right maxillary sinus (height, width and depth) of males was larger when compared to females, but was not statistically significant. (Right MS height, Pearson Chi square= 17.898, p =0.211 (>0.05), Right MS width , Pearson Chi square= 612.351, p =0.338 (>0.05) and Right MS depth, Pearson Chi square =20.942, p=0.229 (>0.05), hence not statistically significant) [Figure 3]. In relation to the association between gender and mean dimensions of left maxillary sinus it is seen that the size of the left maxillary sinus (height, width and depth) of males was larger when compared to females, but was not statistically significant .(Left MS height, Pearson Chi square= 22.971, p =0.346 (>0.05), Left MS width , Pearson Chi square= 14.177, p =0.655 (>0.05) and Left MS depth, Pearson Chi square =18.236, p=0.507 (>0.05), hence not statistically significant) [Figure 4].

Figure 3: Shows association between gender and mean dimensions of right Maxillary Sinus. X axis denotes the gender and Y axis denotes the mean dimensions of right maxillary sinus.(Right MS height, Pearson Chi square= 17.898, p =0.211 (>0.05), Right MS width , Pearson Chi square= 612.351, p =0.338 (>0.05) and Right MS depth, Pearson Chi square =20.942, p=0.229 (>0.05), hence not statistically significant) . It is seen that the size of the right maxillary sinus (height, width and depth) of males was larger when compared to females, but was not statistically significant.
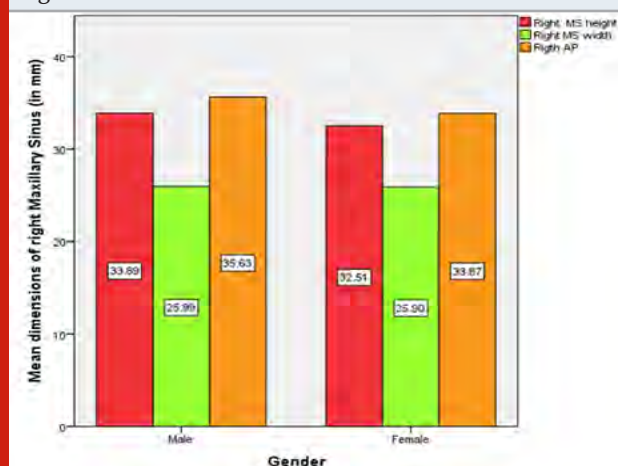
In the present study, it was found that the average height and width of the left maxillary sinus was larger when compared to right maxillary sinus. But the average depth of the right maxillary sinus was larger when compared to the depth of the left maxillary sinus. This was in line with the study by Sahlstrand et al(Sahlstrand-Johnson et al., 2011)where similar results were observed. However this was contradictory to the study by Emirezeoglu et al (Emirzeoglu et al., 2007) where the average height and width of right maxillary sinus was more when compared to that of left maxillary sinus. Also the average depth of left maxillary sinus was more when compared to that of right maxillary sinus. The probable reason for this varying results could be differing sample size and geographic location.

Figure 4: Shows association between gender and mean dimensions of left Maxillary Sinus. X axis denotes the gender and Y axis denotes the mean dimensions of left maxillary sinus.(Left MS height, Pearson Chi square= 22.971, p =0.346 (>0.05), Left MS width , Pearson Chi square= 14.177, p =0.655 (>0.05) and Left MS depth, Pearson Chi square =18.236, p=0.507 (>0.05), hence not statistically significant) . It is seen that the size of the left maxillary sinus (height, width and depth) of males was larger when compared to females, but was not statistically significant.

In relation to the association between age and mean dimensions of maxillary sinus, it was seen that both right and left maxillary sinus size increases as age increases. This was in line with the study by Jasim et al (Jasim and Al-Taei, 2013) and Baweja et al (Baweja, Dixit and Baweja, 2013) The physiological reasons would be at birth, the size of maxillary sinus is small, which enlarges as age increases. Similarly to accommodate the increased size of maxilla, size of maxillary sinus increases. However in old age, there is no increase in size of maxilla, but size of maxillary sinus increases. The reason could be as age progresses, tooth loss is common. So as the premolars and molars are lost and not replaced, resorption of the posterior maxillary ridge occurs and also the floor of the maxillary sinus dips down due to the pneumatization process (Sinus gets filled with air-filled cavities), where volume and size of the maxillary sinus increases. In case of pneumatized sinus and ridge resorption, sinus augmentation can be done prior to placement of implants

with various techniques like bone grafts and PRF (Platelet Rich Fibrin) (Kaarthikeyan, Jayakumar and Sivakumar, 2019;). This augmentation procedure requires a lot of biomaterials and is a cumbersome exercise.(Ramesh, Ravi and Kaarthikeyan, 2017)

In relation to the association between gender and mean dimensions of maxillary sinus, it was seen that both right and left maxillary sinus size was larger in males when compared to females. This was in line with the study by Uthman et al(Uthman et al., 2011). However contradictory findings were found in study by Teke et al (Teke et al., 2007), where he observed that depth of maxillary sinus of females were large when compared to males. The probable reason could be differing sample size and geographic location. The reason why maxillary sinus of males were larger when compared to females was stated by Dean et al (Dean, 1991) in his study, where he stated that males need to have correspondingly bigger lungs to support their relatively more massive muscles and body organs. Also, males need a larger airway, which begins with the nose and nasopharynx.

In other words, physiological changes in nasal cavity size and shape occur as a direct result of respiration-related needs, such as warming and humidifying inhaled air. The increase in the size of the maxillary sinus is attributed to its location in the naso-maxillary complex. Many factors like age, ethnic,racial differences, body stature,physique and pneumatization process attributes to these differences. The limitations of the study include small sample size, single centered study. The future scope of this study is to do extensive research with large sample size to know about the average dimensions of maxillary sinus would help the implant manufacturers to have a rough knowledge on the implant dimensions to be manufactured for the people belonging to that particular geographic location and also to place implants without any complications.

CONCLUSION

Within the limits of the study it can be concluded that average height of the right MS is 33.28mm, width is 25.94mm and depth is 34.85mm and average height of the left MS is 33.76mm, width is 26.13 mm and depth is 33.00mm. The average height and width of the left maxillary sinus was larger when compared to right maxillary sinus. But the average depth of the right maxillary sinus was larger when compared to the depth of the left maxillary sinus. Also, the size of Maxillary Sinus increases as age increases and size of Maxillary Sinus of males is larger than females. So knowing about the average dimensions of Maxillary Sinus, would help the implant manufacturers to have a rough knowledge on the implant dimensions to be manufactured for the people belonging to that particular geographic location and also to place implants without any complications.

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Evaluation and Comparison of Anti Cholesterol And Antioxidant Potential of Allium Sativum, Zingiber Officinale, Allium Parvum and it's Polyherbal Formulation

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ABSTRACT

Cholesterol is an essential sterol found in our body.However, with high cholesterol levels, fatty deposits can develop in the blood vessels and cause heart disorders. Hypercholesterolemia along with Non elimination of free radicals and its accumulation in the body, on the other hand causes serious disorders such as atherosclerosis, cancer, inflammatory joint disease, asthma, diabetes etc. Including some of the naturally available anti cholesterol and antioxidant agents would prevent such disorders in the long run, and this study aims in throwing limelight on three such natural ingredients-ginger, garlic and small onions. The aim of this study is to evaluate and compare the anticholesterol and antioxidant potential of *Allium sativum, Zingiber officinale, Allium parvum* and it's polyherbal formulation. Pure extracts of ginger, garlic and small onions were prepared followed by its antioxidant potential analysis using DPPH Free radical scavenging activity, Nitric oxide radical scavenging activity and In vitro anti cholesterol activity. The results thus obtained were statistically compared with each other and also with the combination of the three extracts. Statistical analysis shows that the allium sativum (garlic) has the individual anti cholesterol and antioxidant activity a little more when compared to the other two, while *Zingiber officinale* (ginger) shows more antioxidant activity when compared to the other two extracts. *Allium parvum* (Small onion), has almost equal anti cholesterol and antioxidant activity. The combination of the extracts in the ratio 1:2:1 (garlic:ginger:small onion) shows almost equal anti cholesterol and antioxidant potential when compared to the standard. The above results show that including ginger, garlic and small onion extracts in regular diets can boost health to a great extent and prevent early onset of cardiac related disorders, which are prevalent in the present generation

KEY WORDS: ALLIUM SATIVUM, ZINGIBER OFFICINALE, ALLIUM PARVUM, ANTI CHOLESTEROL, ANTIOXIDANT.

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INTRODUCTION

Since a protracted time has passed, humans have acknowledged the health advantages of food. (Ferguson and Everett, 1982). However, with the development of chemical drugs and pills, they have forgotten that the food they eat are directly linked to their health (Afzal et al., 2001). Food that include herbal products acts as a remedy for so many prevailing disorders and diseases.Firstly, choosing the right diet and the right food to eat can help improve health and body functions (Prance, Duke and Ayensu, 1985). Secondly, using food for health benefits has been a norm and that scientists are looking forward to creating foods that can fight diseases (Qureshi et al., 1989). Not surprisingly, there are some similarities and differences in the views on the health benefits of foods between two different generations. Moreover, food can also be used as medicine to treat diseases like chemical pills as well(Dugasani et al., 2010).

Cholesterol is an essential sterol found in our body. However, with high cholesterol levels, fatty deposits can develop in the blood vessels and cause heart disorders (Gull et al., 2012) Hypercholesterolemia along with Non elimination of free radicals and its accumulation in the body, on the other hand causes serious disorders such as atherosclerosis, cancer, inflammatory joint disease, asthma, diabetes etc.(Lanzotti et al., 2012) (Leuschner and Ielsch, 2003).

Garlic (Allium sativum) is used as a spice and medicinal herb. Most recent research on garlic has used garlic in the form of tablets, flesh, raw, boiled, cooked and dried (Santas, Almajano and Carbó, 2010). As an herbal remedy commercially available garlic pills and oils are used to lower serum LDL levels and also to decrease hypertension.(Lu et al., 2011) Garlic exhibits a wide range of properties including immunomodulatory hepatoprotective, antimutagenic and anticarcinogenic effects (Li et al., 2017). Garlic and garlic extracts are believed to possess beneficial effects for the prevention of cardiovascular diseases (Micová et al., 2018).Garlic modulates lipid metabolism . Several studies have also shown that garlic contains active hypocholesterolemic and hypoglycemic components, known as diallyl disulfide and dipropyl disulfide(Perry et al., 2009) . It has also been reported that garlic supplements in human subjects lead to the increased resistance of low density lipoprotein to oxidation and may be one of the powerful mechanisms accounting for the antioxidative and anti-atherosclerotic properties of garlic (Piscitelli et al., 2002). With regard to the antioxidative activity of garlic, results have demonstrated that components of aged garlic extract inhibit the in vivo oxidation of LDL by chelating $Cu+2$, scavenging superoxide ions, thus inhibiting the oxidation of protein and lipid moiety of human LDL-Cholesterol (Gaafar, 2012).

Ginger (Zingiber officinale), a popular spice and vegetable in worldwide, is used as a traditional medicine in China and East Asia countries to treat rheumatism, toothaches, asthma, constipation, and diabetes (Ogodo and Ekeleme, 2013). Many studies on ginger are focused on fresh ginger and their bioactive components. In several studies, ginger and its active compounds have been shown to exert strong antioxidant activities in vitro and in vivo (Singh et al., 2009). Though fresh and dried ginger are used in food and medicine, the antioxidant properties in both differ enormously.Small Onions are strong in flavor and high in polyphenolic compounds called flavonoids. Flavonoids may have anti-inflammatory abilities, antioxidants, anticancer abilities, antiproliferative abilities, or the ability to stop cell growth.

Studies also suggest that small onions may help improve cholesterol levels. In one study, flavonoids in small onions reduced the low-density lipoprotein (LDL), or "bad" cholesterol in obese people at risk of cardiovascular disease. The researchers attributed this to the specific flavonoid quercetin, an antioxidant found in onions and other fruits and vegetables. High-density lipoprotein (HDL), or "good" cholesterol, levels were not affected (Prakash, Singh and Upadhyay, 2007). Another study looked at the effect of small onion extract on cholesterol in rats. The researchers noted a significant decrease in cholesterol levels, though triglyceride levels remained unchanged. Some of the rats were given small onion extract and zinc sulfate, while others were only given small onion extract or zinc sulfate.

Better results were seen among the rats that were given a combination of small onion extract and zinc sulfate (Van Damme et al., 1993). Small onions (allium parvum) may also benefit cholesterol levels. In a previous study done, male hamsters were fed with a diet rich in high-cholesterol. Some of the rats' diet was supplemented with small onion powder. The rats that received the small onion powder experienced lower LDL cholesterol levels and maintained high HDL cholesterol levels (Ye, Dai and Hu, 2013). The rationale of this study is that no study has been conducted so far in which the properties of all the three elements- Ginger (Zingiber officinale), Garlic (Allium sativum L.) and small onions (allium parvum) were reinforced together as a polyherbal formulation and studied for their anticholesterol and antioxidant potential. Hence, this study aims to Evaluate and compare the anticholesterol and antioxidant potential of allium sativum, zingiber officinale, allium parvum and it's polyherbal formulation.
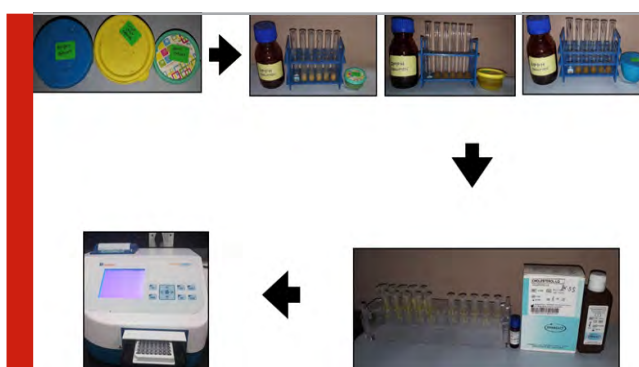
MATERIAL AND METHODS

Pure extracts of ginger, garlic and small onions were prepared followed by its evaluation of antioxidant potential by using DPPH Free radical scavenging activity, Nitric oxide radical scavenging activity and In vitro anti cholesterol activity. The results thus obtained were statistically compared with each other and also with the combination of the three extracts.

DPPH Free Radical Scavenging Activity: Scavenging of 2,2-Diphenyl-1-picrylhydrazyl (DPPH) radical was assessed by the method of Hatano et al, (1989). DPPH solution (1.0 ml) was added to 1.0 ml of extract at different concentrations (0.1 to 0. 5mg/ml). The mixture was kept at room temperature for 50 minutes and the activity was measured at 517nm. Ascorbic acid at the same concentrations was used as standard. The capability to scavenge the DPPH radical was calculated and expressed in percentage (%) using following formula:

$$DPPH \text{ radical scavenging } (\%) = \frac{control \ OD - sample \ OD}{control \ OD} \times 100$$

Nitric oxide radical scavenging activity: Scavenging of nitric oxide radical was assayed by the method of Garratt et al. (1964). In the total volume of 3ml reaction mixture, 2ml of sodium nitroprusside, 500μl of phosphate buffered saline (PBS) were mixed with 500μl of different concentrations (0.1 to 0.5 mg/ml) of extract and incubated for 1 hour 30 minutes at 25°C. Then, 500μl of reaction mixture containing nitrite was mixed with 1 ml of sulfanilic acid and allowed to stand for 5 minutes for completing diazotization. Then, 1 ml of naphthyl ethylene diamine dihydrochloride was added, mixed and allowed to stand for 30 minutes at 25°C. Ascorbic acid at the same concentrations was used as standard. The activity was measured at 550 nm and the results were expressed in percentage (%) using following formula:

$$NO \text{ radical scavenging } (\%) = \frac{control \ OD - sample \ OD}{control \ OD} \times 100$$

In vitro anti–cholesterol activity: The anti-cholesterol assay was carried out as described as per the kit method (Spinreact, S.A.U-Ctra Santa Coloma, Girona, Spain). Cholesterol was dissolved in chloroform at a concentration of 2.5 mg mL/ml. Ten microliter of the extract was pipetted into a microtiter plate followed by the addition of 2000 μL of R1 reagent and 10 μL of cholesterol as sample. Twenty microliter of distilled water and 2000 μL of R1 reagent were used as blank. Negative control consisted of 20 μL cholesterol and 2ml R1; standard consisted of 20 μL simvastatin and 2000 mL R1 reagent. The contents were incubated between 0-30 min at room temperature and the absorbance was read at 500 nm in a UV-Vis spectrophotometer against reagent blank. Anti-cholesterol assay of the extract was calculated using the following equation:

$$Inhibition \ (\%) = \frac{Negative \ control - Sample.}{Negative \ control} \times 100$$

Statistical analysis: The data were subjected to statistical analysis using one-way analysis of variance (ANOVA) and Duncan's multiple range test to assess the significance of individual variations between the groups. In Duncan's test, significance was considered at the level of $p<0.05$.

Figure 1: The bar chart shows the comparison of DPPH free radical scavenging activity of Ginger (*Zingiber officinale*), Garlic (*Allium sativum* L.) and small onions (*Allium parvum*) with the Vitamin C (standard drug). The X axis represents the concentration in mg/ml and the Y axis represents the % of inhibition. Dark green colour denotes the standard (vitamin c), Red colour denotes ginger, Blue colour denotes small onions and light green colour denotes garlic. Among the three elements, Ginger (*Zingiber officinale*) shows higher DPPH free radical scavenging activity when compared to the Garlic (*Allium sativum* L.) and small onions (*Allium parvum*).

Each line represents mean ± SEM of 3 independent observations. Significance at *p<0.05*
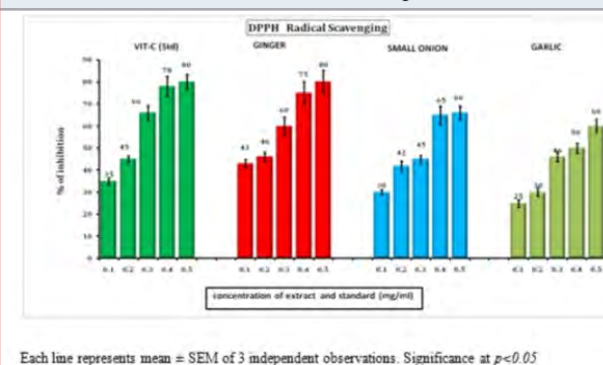
RESULTS AND DISCUSSION

Statistical analysis shows that the allium sativum (garlic) has the highest anticholesterol activity almost equal to the standard(85% inhibition at 0.5mg/ml conc) when compared with the Allium parvum (small onions) (65%inhibition at 0.5mg/ml conc) and Zingiber officinale (ginger)(75%inhibition at 0.5mg/ml conc (from Figure 3). In the DPPH free radical scavenging activity analysis, we can able to find that Zingiber officinale (ginger) has the highest antioxidant activity(80%inhibition at 0.5mg/ml conc) when compared to the other two, followed by Allium parvum (small onions)(66%inhibition at 0.5mg/ml conc) and the least antioxidant activity was shown by the Allium sativum (garlic)(60%inhibition at 0.5mg/ml conc) (From Figure 1). Similar antioxidant activities were obtained in cases of nitric oxide free radical scavenging activity also. (From Figure 2).

Interpretation of the polyherbal formulation of the extracts (ginger,garlic and small onions in the ratio 1:2:1) reveals that the combination extracts show an equal (or

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even slightly greater in higher concentrations) when compared to the standards. (From Figure 4,5&6).with antioxidant activity of (90%inhibition at 0.5mg/ml conc) and anticholesterol activity of (95%inhibition at 0.5mg/ml conc), which are much greater than the individual extracts and also the standard Vit C and Agarbose. So to conclude the results, we can say that allium sativum (garlic) has the individual anti cholesterol and antioxidant activity a little more when compared to other two, while zingiber officinale (ginger) shows more antioxidant activity when compared to the other two extracts. Allium parvum (Small onion), has almost equal anti cholesterol and antioxidant activity. The combination of the extracts in the ratio 1:2:1 (garlic:ginger:small onion) shows almost equal anti cholesterol and antioxidant potential when compared to the standard.

Figure 2: The bar chart shows the comparison of Nitric oxide free radical scavenging activity of Ginger (*Zingiber officinale*), Garlic (*Allium sativum* L.) and small onions (A*llium parvum*) with the Vitamin C (standard drug). The X axis represents the concentration in mg/ml and the Y axis represents the % of inhibition. Dark green colour denotes the standard (vitamin c), Red colour denotes ginger, Blue colour denotes small onions and light green colour denotes garlic. Among the three elements, Ginger (*Zingiber officinale*) shows higher Nitric oxide free radical scavenging activity when compared to the Garlic (*Allium sativum* L.) and small onions (*Allium parvum*).
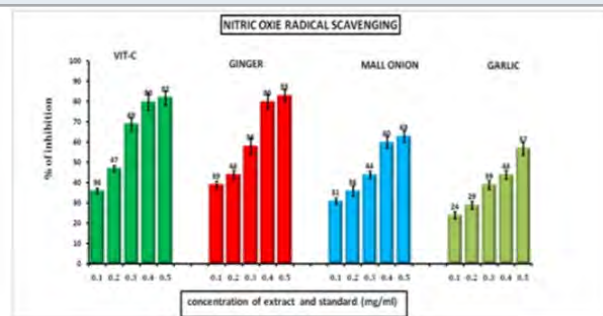
Each line Represents Mean SEM of 3 independent observations. Significance at *p.0.05.*

Also, Lu et al., have found an important radical scavenging activity of Allium species(Lu et al., 2011). Our results were also comparable to those found by singh et al in 2017 who found that both aqueous and methanolic extracts of Allium sativum have an important anti cholesterol Activity, with better efficiency than the standard used. (Singh and Kumar, 2017) the β-carotene bleaching test, the antioxidant effect of Zingiber officinale and Allium parvum observed by chung et al in 2019 is perfectly consistent with ours; in fact, He also found that ginger extracts possessed antioxidant activities via the β-carotene/linoleate system. Likewise, the study noticed a significant hypolipidemic effect substantiated by a notable decline in plasma lipid profile with respect to Allium parvum and also who all have reached a common conclusion which is that the Allium species have a very noticeable hypolipidemic effect (Chung et al., 2019).

Limitations of the study is the fact that the study was conducted in vitro, so it cannot be assumed that the results of anti cholesterol and antioxidant activity could be translated into clinical effectiveness.

Figure 3: The bar chart shows the comparison of Anticholesterol activity of Ginger (*Zingiber officinale*), Garlic (*Allium sativum*) and small onions (*Allium parvum*) with the Agarbose (standard drug). The X axis represents the concentration in mg/ml and the Y axis represents the % of inhibition. Dark green colour denotes the standard (Agarbose), Red colour denotes ginger, Blue colour denotes small onions and light green colour denotes garlic. Garlic (*Allium sativum*) shows higher Anticholesterol activity when compared to the Ginger (*Zingiber officinale*) and small onions (*Allium parvum*).
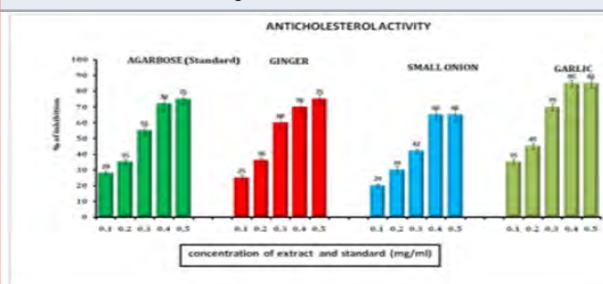
Each line Represents Mean SEM of 3 independent observations. Significance at *p<0.05.*

Figure 4: The bar chart shows the comparison of DPPH free radical scavenging activity of Ginger (*Zingiber officinale*), Garlic (*Allium sativum*) and small onions (*Allium parvum*) reinforced together as a polyherbal formulation with the Vitamin C(standard drug). The X axis represents the concentration in mg/ml and the Y axis represents the % of inhibition. Green colour denotes ginger, small onions and garlic extracts together as a poly herbal formulation and yellow colour denotes the standard (Vitamin C). It is observed for the graph that the polyherbal formulation shows almost equal DPPH free radical scavenging activity when compared to the standard.
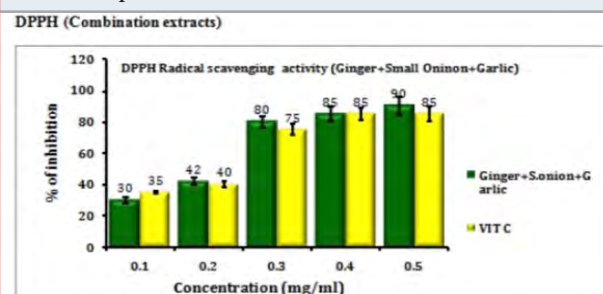
Each line represents mean ± SEM of 3 independent observations. Significance at *p<0.05*

The significance of our research however, when compared to other articles is that we have also found out the anti cholesterol and antioxidant activity of the polyherbal formulation i.e, a mixture of the ginger, garlic and small onion extracts in the ratio 1:2:1. This throws a new

limelight on the beneficial effects of not only a single plant extract, but a mixture of plant extracts. The above results show that including ginger, garlic and small onion extracts in regular diets can boost the health to a great extent and prevent early occurring disorders prevalent in the present generation which goes hand in hand with the old saying, "prevention is better than cure".

Figure 5: Figure 5- The bar chart shows the comparison of Nitric oxide free radical scavenging activity of Ginger (*Zingiber officinale*), Garlic (*Allium sativum*) and small onions (allium parvum) reinforced together as a polyherbal formulation with the Vitamin C(standard drug). The X axis represents the concentration in mg/ml and the Y axis represents the % of inhibition. Green colour denotes ginger, small onions and garlic extracts together as a poly herbal formulation and orange colour denotes the standard (Vitamin C). It is observed for the graph that the polyherbal formulation shows almost equal Nitric oxide free radical scavenging activity when compared to the standard.

NO radical (Combination extracts)
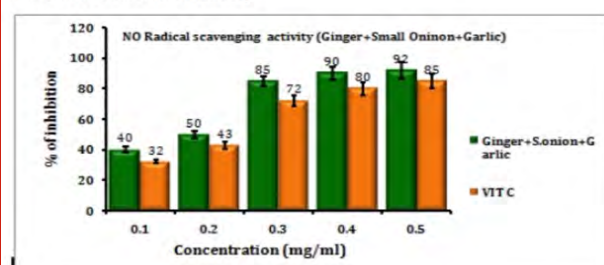
Each line Represents Mean SEM of 3 independent observations. Significance at *p.0.05*.

Figure 6: The bar chart shows the comparison of Anticholesterol activity of Ginger (*Zingiber officinale*), Garlic (*Allium sativum*) and small onions (*Allium parvum*) reinforced together as a polyherbal formulation with the Agarbose (standard drug). The X axis represents the concentration in mg/ml and the Y axis represents the % of inhibition. Green colour denotes ginger, small onions and garlic extracts together as a poly herbal formulation and Red colour denotes the standard (Agarbose). It is observed for the graph that the polyherbal formulation shows slightly higher Anticholesterol activity when compared to the standard.

ANTI CHOLESTEROL (COMBINATED EXTRACTS)
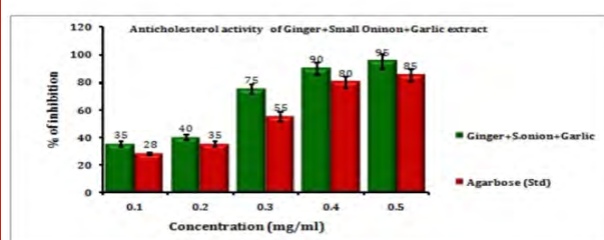
Each line Represents Mean SEM of 3 independent observations. Significance at *p<0.05*.

CONCLUSION

This study has revealed that the extracts of garlic, ginger and small single or as a mixture, possess high polyphenolic content and high antioxidant, anti cholesterol activities in different systems providing support for their acclaimed health benefits. Therefore, further study of their effectiveness in animal models of disease and oxidative stress would be undertaken to provide a useful basis for nutritional advice. Currently there is considerable interest in natural antioxidants and anti cholesterol agents to replace the synthetic ones. "Take healthy food as medicine, before you start taking medicine as food".

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Conflict of Interests: None declared.

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Knowledge and Awareness on Gynaecological Issues Among Female Housekeepers – A Survey

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ABSTRACT

With the typical age at menopause being between the ages of 50 to 55 years, women in the geriatric age group are well into their postmenopausal phase of life. The most common gynaecological problems encountered in elderly women are vulvovaginal inflammation, genital prolapse, postmenopausal bleeding, and alterations in bladder function. To create awareness on gynaecological issues among housekeepers above 50 years. This was a survey based study and was conducted in an online forum "Google forms". This survey was taken by around 50 female housekeepers. The questionnaire was framed to evaluate the ideas and knowledge of dental students about halitosis. The information collected through the survey was analysed using SPSS and presented as descriptive statistics.The results were obtained and statistically analysed through SPSS software, chi square test was done to check the association and a p value of 0.05 was said to be statistically significant. The survey was conducted in the month of May, 2020.54 housekeepers from private dental colleges were examined for the survey out of which, 32 participants confessed that they've experienced abdominal, joint and hip pain after their 50's. According to the survey, it is noted that the majority of the housekeepers have experienced almost all of the gynaecological issues like post menopausal bleeding, vulvar disorder symptoms, difficulty in waking, etc. Hence awareness regarding self care and proper maintenance of their own self was given in this survey like dietary changes, regular exercises, maintaining a healthy weight, surrounding themselves with right people and less stress to make them understand that' Menopause is not an illness, it's just a natural part of life

KEY WORDS: HOUSEKEEPERS, HEALTH ISSUES, OLDER AGE, PROPER MAINTENANCE, SELF CARE.

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INTRODUCTION

With the typical age at menopause being between the ages of 50 to 55 years, women in the geriatric age group are well into their postmenopausal phase of life (Haimov-Kochman, Sciaky-Tamir and Hurwitz, 2005; Rowe, 2008). As women age, they face a variety of comorbid medical problems as well as gynaecological problems that may differ from those of younger women (Rowe, 2008)(Wu et al., 2019). It is important that primary care clinicians be aware of common gynaecological concerns and the potential impact of these on the function and quality of life of older women (Howell, 2002). For example, genitourinary problems can significantly affect daily function, self-esteem, well being, and even longevity in elderly women (Howell, 2002; Ponnulakshmi et al., 2019). The most common gynaecological problems encountered in elderly women are vulvovaginal inflammation, genital prolapse, postmenopausal bleeding, and alterations in bladder function (Ke et al., 2019)(Ma et al., 2019).

Low-income, ethnic minority females also encounter economic and other barriers to cancer care and an association between economic stress and depressive symptoms has been found for older females. The reproductive system of women is very complex and an unhealthy lifestyle and ignorance can cause more trouble to it (Li et al., 2020)(Chen et al., 2019). Lower back pain is one of the common symptoms of gynecological problems (Wang et al., 2019). Since the ovaries and uterus are located near the spinal cord, the back gets affected very quickly whenever something goes out of the place (Roter, 1999). The majority of the female housekeepers mainly undergo back pain in their early 50s, which is all due to:

Urinary tract infection (UTI): UTI is a condition caused due to infection in the urinary tract like urinary bladder, urethra, kidneys, etc (Gan et al., 2019). The infection is caused mainly due to bacteria, but fungi and viruses are also responsible.

Pregnancy: Body goes through a lot of changes, which sometimes may not be good. Back pain is one such problem, which is inevitable during pregnancy (Rengasamy et al., 2018). The womb grows bigger with the increase in the weight of the baby and creates a lot of pressure on the spinal cord causing back pain (Ma et al., 2019).

Ectopic Pregnancy: Being pregnant is a different feeling a woman gets in her lifetime, but it can be a dreadful experience as well (G et al., 2018). Fertilization of eggs in the fallopian tube without getting implanted in the uterus is the major cause of ectopic pregnancy and its complications.(Rengasamy et al., 2016).

Reactive Arthritis: Inflammation in joints is one of the main symptoms of reactive arthritis (Gerber and Lo Sasso, 2006; Rengasamy et al., 2016). Infection transmitted sexually can be a major reason for the inflammation in the joints.The disorder is not dreadful but it causes severe back pain (Juraskova et al., 2003).

Cervical Cancer: Cancer, as we all know, is a life-threatening disease where there is an abnormal growth of cells in a specific organ spreading all across the body (Menon, V and Gayathri, 2016). Cervical cancer is one such form of cancer occurring in the cervix causing tremendous back pain followed by unusual discharge (Jainu, Priya and Mohan, 2018)(Mohan, Veeraraghavan and Jainu, 2015). These are some of the gynaecological problems, which cause severe back pain among older females often leading towards life-threatening diseases (Shukri et al., 2016). Hence, this study was conducted to create awareness on gynaecological issues among housekeepers above 50 years.

MATERIAL AND METHODS

This was a survey-based study and conducted in an online forum, google forms. This survey was taken by 54 housekeepers above 50 years from private dental college. The questionnaire consisted of 15 questions. The questions were framed to evaluate the knowledge and awareness on gynaecological issues among female housekeepers.

Data Collection: The collected answers from the questionnaire were tabulated in an excel sheet and using SPSS software the results were obtained. The results were obtained and statistically analysed through SPSS software, chi square test was done to check the association and a p value of 0.05 was said to be statistically significant. The survey was conducted in the month of January, 2020.

Sampling: 50 housekeepers who do everyday work.

A customized examination was used to collect data and a specific table for collected data records was prepared.

Ethical approval: The study protocol was approved by the institutional review board and ethical approval was obtained. All data were analyzed by multiple logistics regression analysis using SPSS software version, inference of the study is given below.

RESULTS AND DISCUSSION

54 housekeepers from private dental colleges were examined for the survey out of which the majority of the females were at the age between 55-60 years. When the question regarding diet in their regular life was asked, it was noted that half the individuals around 27 out 54 confessed that they maintain a proper food diet while the rest were not able to maintain a good diet due to their financial issues (Figure 1) (Bodurka and Sun, 2006).

As we all know pregnancy plays one of the most important roles in every woman's life, because only the proper care and our lifestyle changes after pregnancy

in a female will define how her health is going to be for the rest of their life's (Hartmann et al., 2004; Brotto et al., 2008). When it was examined regarding the number of pregnancies among housekeepers it was noted that, majority of women had three pregnancies (Figure 2).

Figure 1: The bar graph depicts the response to the given question "Do you maintain a proper diet ?". X axis represents the type of response to the question and Y axis represents the number of participants who told Yes (Blue) and No (Green). The participants have given an equal response that 50% of them have answered yes and 50% of them have answered no.
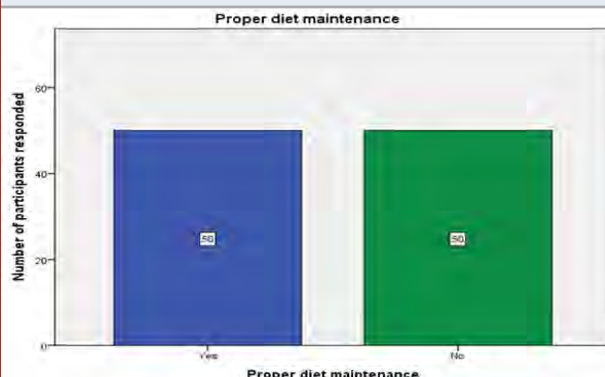
Figure 2: The bar graph depicts the response to the given question "How many pregnancies you had ?". X axis represents the type of response to the question and Y axis represents the number of participants who told One (Violet), Two (Red), Three (Green) and Four (Orange). Majority of the participants (50%) have undergone three pregnancies.
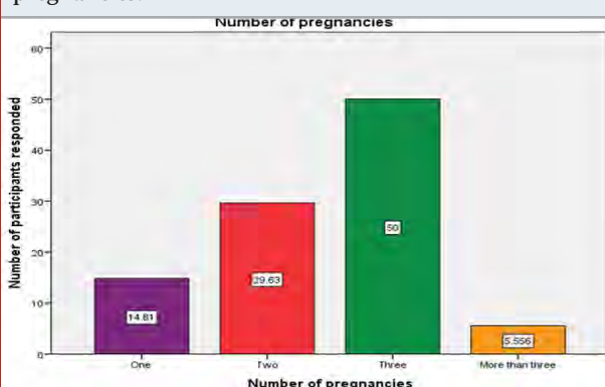
Out of 54, 32 participants confessed that they've experienced abdominal, joint and hip pain after their 50's (Figure 3). From this it was well noted that the amount of work done by housekeepers in their everyday life is the main reason for the health issues (Creasman, 2005; Ussher, Chrisler and Perz, 2019). Correlation between the age and the number of participants experienced abdominal or joint pain was done and the P value was found to be 0.270 > 0.05, which is statistically not significant (Figure 5).

Figure 3: The bar graph depicts the response to the given question "Have you experienced abdominal or joint pain ?". X axis represents the type of response to the question and Y axis represents the number of participants who told Yes (Blue) and No (Green). Majority of the participants (59.26%) have experienced abdominal or joint pain.
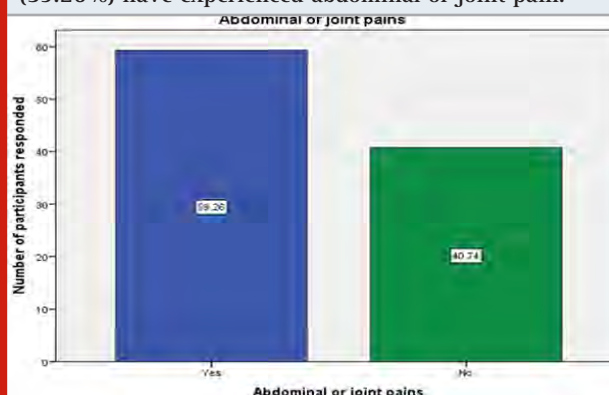
Figure 4: The bar graph depicts the response to the given question "Have you undergone any depression or mood swings recently ?". X axis represents the type of response to the question and Y axis represents the number of participants who told Yes (Blue) and No (Green). Majority of the participants (72.22%) have undergone depression or mood swings recently.
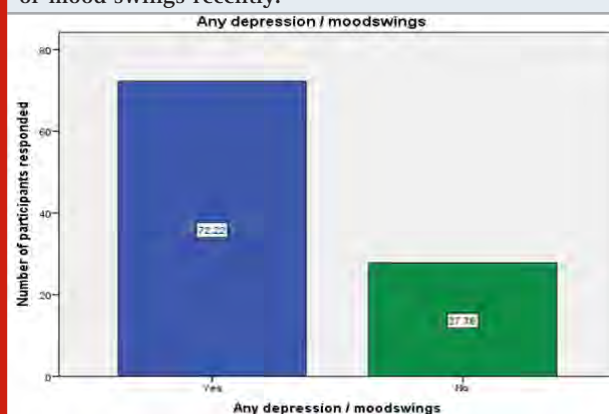
Also when a proper diet is not maintained by a female it will definitely lead to weakness of the body, which eventually leads to problems in their periods (Creasman et al., 1987). Hence from the current study it was seen that around 35 participants out of 54 have undergone irregular periods before their menopause. And also 40 participants out of 54 have already undergone their menopause (Lee et al., 2006). Correlation between the age and the number of participants who have undergone menopause was done and P value was found to be 0.098 > 0.05, which is statistically not significant (Figure 6).

Post menopausal bleeding is not something very common which usually occurs due to thinning of vaginal lining or womb lining or due to side effects of some medications, which is experienced by 34 out of 54 participants in the current study (Gerber and Lo Sasso, 2006).

Figure 5: The bar graph represents the association between the age and their responses to the question. X axis represents the age of the participants and Y axis represents the number of responses, Yes (Blue) and No (Green). Higher number of participants above 60 years (28.30%) and 55 - 60 years participants (18.87%) have answered that they have experienced abdominal or joint pains. Chi square analysis was done (P value was found to be 0.270 > 0.05, which is statistically not significant. There was no significant difference between the age and the response to the question asked.
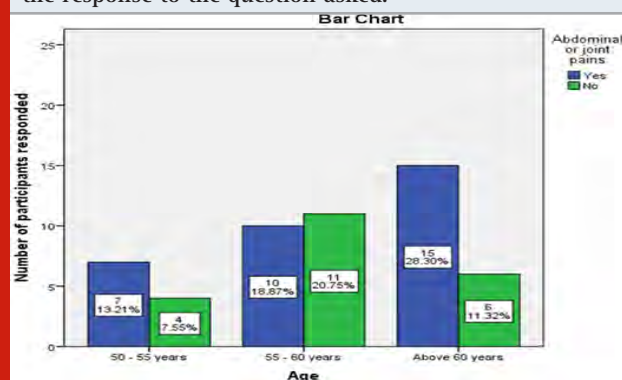
Figure 6 – The bar graph represents the association between the age and their responses to whether they have undergone menopause.. X axis represents the age of the participants and Y axis represents the number of responses, Yes (Blue) and No (Green). Higher number of participants above 60 years (35.85%) and 55 - 60 years participants (24.53%) have answered that they have undergone menopause. Chi square analysis was done (P value was found to be 0.098 > 0.05, which is statistically not significant. There was no significant difference between the age and the response to the question asked.
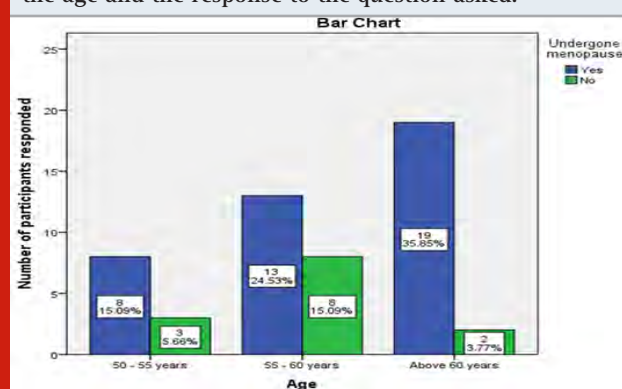
And also it was noted that the majority of the participants have experienced vulvar disorder symptoms like burning and pain most often, also less often itching and bleeding. Majorly females above 50s have hypertension and diabetes which is also one of the main causes for gynaecological issues and it is noted in the current study (Gerber and Lo Sasso, 2006). Correlation between the age and the number of participants who have any systemic

disease was done and P value was found to be 0.279 > 0.05, which is statistically not significant (Figure 7).

Figure 7: The bar graph represents the association between the age and their responses to whether they suffer from diabetes or hypertension. X axis represents the age of the participants and Y axis represents the number of responses, Yes (Blue) and No (Green). Higher number of participants above 60 years (28.30%) and 55 - 60 years participants (18.87%) have answered that they have systemic diseases like hypertension and diabetes. Chi square analysis was done (P value was found to be 0.279 > 0.05, which is statistically not significant. There was no significant difference between the age and the response to the question asked.
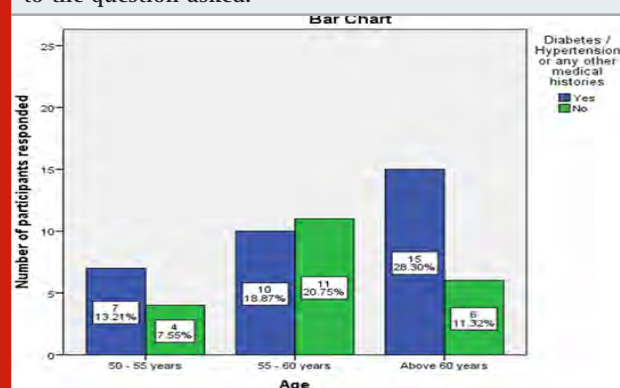
Figure 8: The bar graph represents the association between the age and their responses to whether they suffer from depression or mood swings. X axis represents the age of the participants and Y axis represents the number of responses, Yes (Blue) and No (Green). Higher number of participants above 60 years (35.85%) and 55 - 60 years participants (24.53%) have answered that they have recently undergone depression which is due to menopause. Chi square analysis was done (P value was found to be 0.077 > 0.05, which is statistically not significant. There was no significant difference between the age and the response to the question asked.
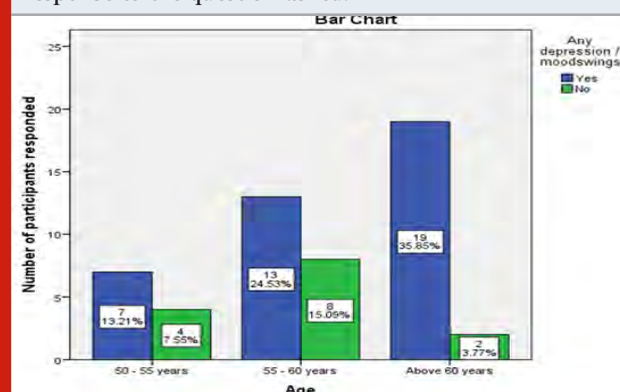
And the surprising event noted from the survey is, around 72.2% of the housekeepers undergo depression and mood swings after their 50's, which to their shock reveals that

it is due to the menopause they're undergoing and not due to their age (Figure 4). Correlation between the age and the number of participants who have undergone any depression or mood swings was done and P value was found to be 0.077 > 0.05, which is statistically not significant (Figure 8).

Stress and anxiety is one the major life threatening pain that every individual in their lifetime at least once will they undergo. Definitely a female above 50 years will have a history of depression, discouragement and hopelessness that most of us will not note down (Elsaie et al., 2016). That too when it comes as housekeepers, it might affect their piece of mind a lot more because of the family and financial problems they face everyday which is also one of the major reasons for the gynaecological issues they face after their menopause.

Analysed from the previous study it is noted that, majority of the older females undergo gynaecological issues especially in the time of menopause, majorly due to stress and depression which only can be corrected by their family support and lifestyle changes (Stiles et al., 2012).

CONCLUSION

From the study it is noted that, around the majority of the women undergo sorrowful and cheerless lifestyles once they enter the menopause. The reason to sort out housekeepers in this survey is that unprivileged women like them need more acknowledgement to fight this burdensome world with great strength. Hence awareness regarding self care and proper maintenance of their own self was given in this survey like dietary changes, regular exercises, maintaining a healthy weight, surrounding themselves with right people and less stress to make them understand that' Menopause is not an illness, it's just a natural part of life. Though its symptoms can be difficult to deal with, eating the right diet and exercising regularly may help alleviate and prevent them from getting stressed.

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Importance of Physiotherapy in Rehabilitation of Fractures- A Cross Sectional Questionnaire Based Study

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ABSTRACT

The process of fracture healing is a complex one. It involves various changes and specific patterns that involve several genes. Fractures are a very common injury to the human body. But its healing process is complicated. After a fracture various processes like cell migration, differentiation, tissue synthesis and growth factor release occur. The role of physiotherapy in fracture healing is an important one. The aim of this study was to create awareness and to analyse the importance of physiotherapy in fracture healing. For this study, a questionnaire consisting 16 questions was circulated among people who have suffered a fracture. The questionnaire was distributed to 100 people and their responses were obtained and analysed.The conclusion of this study would be that the 55% of the population have undergone a physiotherapy treatment; they should further be made aware of the various benefits of physiotherapy. We also found that a significantly high number of people belonging to the age group of 15-20 are known to have undergone a Physiotherapy treatment for their fracture, a higher number of people belonging to the ages between 15-20 have been relieved of their pain after the Physiotherapy treatment and a higher number of people belonging to the age group 15-20 have had a Physiotherapy treatment once a day. There can be more emphasis on the role of physiotherapy in healing of fractures and how it helps in regaining normal posture, stature, gait and other physical activities after a fracture.

KEY WORDS: PHYSIOTHERAPY, FRACTURES, TRAUMA, HEALING, CALLUS, BLOOD VESSELS.

INTRODUCTION

The process of fracture healing is a complex one. The healing of fractures involves various changes and specific patterns with the influence of genes(Marsell and Einhorn, 2011; Markel, 2019). Fracture healing and skeletal tissue repair involve an initial anabolic phase (increase in tissue volume, formation of callus, formation of new blood vessels, ends with chondrocyte apoptosis), a prolonged phase (reduction in volume of callus tissues) and a terminal catabolic phase (cartilage resorption, resorption by osteoclasts)(Saraf, 2007)(Einhorn and Gerstenfeld, 2015). Fractures are a very common injury to the human body. But its healing process is complicated. The immune system plays a very crucial role in the process of wound healing.(Park and Barbul, 2004) After a fracture various

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processes like cell migration, differentiation, tissue synthesis and growth factor release occur (Ghiasi et al., 2017).

Certain trauma, tumour, delayed unions, non-unions, multi fragmentary fractures result in large bone defects. This has been a current challenge for surgeons (Oryan, Monazzah and Bigham-Sadegh, 2015). Usually fractures of the hand result in significant impairment, disabilities and functional limitations (LaStayo, Winters and Hardy, 2003). Multiple factors may influence the natural process of fracture healing. Obesity/fat accumulation is detrimental to bone mass. It may affect bone metabolism by decreasing osteoblast differentiation, promoting osteoclasts activity and bone resorption (Gao et al., 2018).

Physiotherapy means, "The treatment of a disease or deformity by physical methods such as massage, exercise and heat treatment instead of using surgical methods or medications." Physiotherapy has proven to be effective in facilitating the treatment of fractures. The role of the pathologist is to improve the mobility and relieve pain to a significant level for the person affected from the fracture. There can be various methods of physiotherapy that can be employed for the treatment. It can be a single treatment or a mixture of 2 or more treatments. The various methods employed can be ice therapy, scar management, wax therapy, soft tissue massage, and stretching exercises to regain the mobility equivalent to the mobility before the fracture (Physiopedia contributors, September, 26, 2018).

The role of physiotherapy in fracture healing is an important one. Physiotherapy improves the speed of healing, reduction of pain and swelling, improvement in range of movement, the muscles that are weakened will be strengthened, and weight bearing on the affected area is encouraged. (Scutt, 1990) Physiotherapy treatment can help in rehabilitation of the fractured part(s) to full function very quickly (Fracture Treatment, no date). The physiotherapist plays a major role in planning the treatments to accelerate the healing and repair thereby reducing the complications. During the period of immobilisation, the aims of physiotherapy are to reduce edema, maintain function, improve range of movement (ROM) and to teach the patient the use of walking aids like crutches, etc, and to regain the full muscle power and to re-educate full function.

The physiotherapy techniques should be chosen carefully in accordance to the case. The treatment should be gradually intensified but should always be within the capability of the patient. The manner in which the treatment has to be carried out is also decided after analysing how much the patient can perform. Ultrasound is also used in the treatment and it is done to facilitate stretching of the tissues. Simple treatments like heat and ice therapy are done for relaxation of the tissues and management of swelling around the tissues. In some cases, Cryotherapy is also used, which means cooling of muscles and surrounding skin to a temperature so low that it affects the conduction velocity of a nerve. This method is most effective for relieving pain. In cases of restoration of gait, the patient has to be re-educated with various walking aids along with different types of exercises.

Proprioceptive neuromuscular facilitation (PNF) exercises are extremely useful for restoring coordination and motor control besides strengthening exercises (Abd El-Kader, no date). Successful fracture healing is not only determined by complete union but the major factor determining success is by functional use of the affected part after the fracture. Additional techniques in physiotherapy and electro modalities have been used lately specifically for fracture healing. For example, Ultrasound, LASER, Pulsed Electromagnetic Field (PEMF), and electrical stimulation. (Hughes, no date)(Alayat et al., 2017). A program of physiotherapy is necessary after fracture as it prevents deformity by strengthening of the muscles and promotes postural retraining. Physiotherapy serves to facilitate primary mobilisation and that is why it is prescribed after a fracture. (Hoppenfeld and Murthy, 2000; Nakayama, 2001; Dionyssiotis, Yannis & Dontas, Ismene & Economopoulos, D. & Lyritis, George., 2007) This study is conducted to analyse and assess the importance given to physiotherapy by fractures patients.

MATERIAL AND METHODS

Sample collection: A survey was conducted among 150 people who had suffered from a fracture irrespective of their age and gender of November 2019. Nearly 16 valid questions had been prepared and circulated among them.

Inclusion Criteria: Selection criteria include all the people in the general population who are willing to participate in the study.

Exclusion Criteria: Age and gender of the participants, people who did not have a past history of fracture were excluded from the study.

Sampling method: In the present study,the sampling method used is the Random sampling method.

Data Collection and Tabulation: The responses were entered into the excel sheets and then tabulation of the data finally and the question comparison was done. The representation of the data is through the bar graph.

Statistical Analysis: The statistical software used IBM SPSS V22.The statistical tests used were descriptive analysis and Chi Square analysis. Significant p value was set at <0.05.

RESULTS AND DISCUSSION

Physiotherapy is a form of occupational therapy that provides relief from injury, illness and disability. A cross sectional simple randomized questionnaire based survey was conducted among the out patients that visited the

Orthopaedic department in Saveetha Medical college. The data obtained was compiled and analysed from 100 responses. There were 49% males and 51% females that participated in this study as seen in Figure 1. Out of these people, 55% of the respondents belonged to the age group of 15-20. 28% of the total were of age 21-25. This can be seen in Figure 2. 9% of the people that responded to the questionnaire belonged to the age group 26-30 and 8% of the people were aged 30 or above. Among the people that were a part of the study, various types of treatment was carried out to heal the fracture. The various methods were Surgical, Non-surgical (cast/splint), Physiotherapy and Surgical along with Physiotherapy. 36% of the respondents had a Non-surgical treatment which included positioning of cast or splint. 31% of the people underwent a surgery to treat the fracture. 28% employed Physiotherapy to treat their fractures and only 5% had got both Surgical treatment as well as Physiotherapy. This is depicted in Figure 3. Figure 4 represents the various etiology of the fracture. The population were given 4 choices, out of which 30% had fractures due to falling down. 35% of the respondents suffered a fracture due to any accident. 14% had fights which led to fractures and 21% were playing sports which led to a fracture.

Figure 1: Pie chart showing 49% of the respondents were males (Pink) and 51% of the respondents were females (Blue).
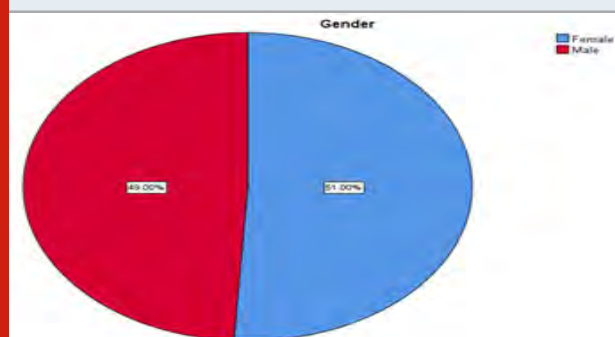
Figure 2: Pie chart represents the age group of the people that participated in the study. 55% were of the age group 15-20 (Blue). 28% of the respondents were between the ages of 21-25 (Pink). 9% of the population belonged to the age group 26-30 (Green) and 8% of the respondents were aged 30 and above (Orange)
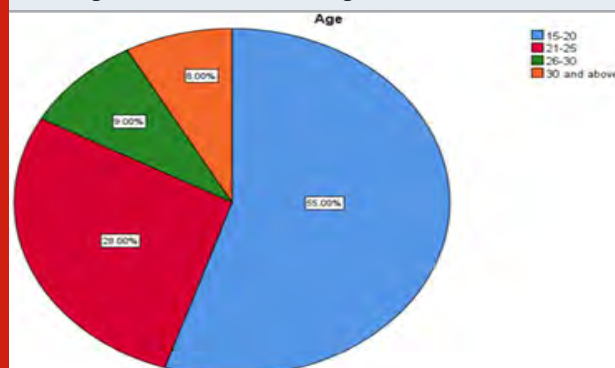
Figure 3: The pie chart represents responses for fracture treatment. Among these responses, 36% had a Non-surgical treatment. (Pink) 28% of the respondents underwent Physiotherapy for treating the fracture. (Green) 31% people had to get a Surgical treatment done (Orange) and 5% of the people had undergone Surgical as well as Physiotherapy for treatment of the fracture.
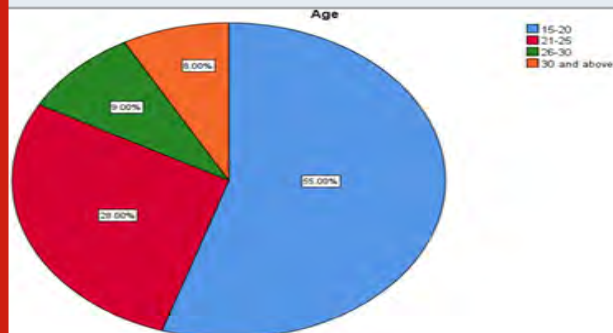
Figure 4: This pie chart depicts the responses for causes of fracture. Among the responses, 14% had a fracture due to any fights (Pink). 35% of the people suffered a Road Traffic Accident that led to a fracture. (Green). 21% of the people suffered a fracture while playing a sport (Orange). While 30% of them fractured themselves due to a fall. (Blue).
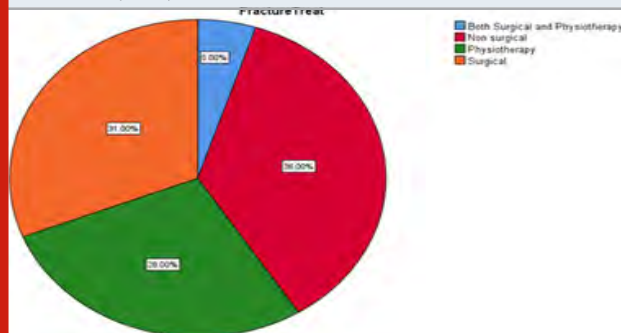
On being asked whether they are taking any measures to reduce the risk of fractures, 33% of the respondents chose that they are not taking any medications. 32% respondents mentioned that they have increased their intake of Calcium and Vitamin D. This can be compared to the result obtained by Sprague et al, in which 65.8% of surgeons indicated that they routinely prescribe vitamin D to fragility fracture patients. (Sprague, Bhandari, et al., 2016; Sprague, Petrisor, et al., 2016) The average time taken for the fracture to heal was observed to be 6-8 weeks. 52% of the population reported that their fracture healed within this time frame. On the other hand, for 29% of the respondents, it took more than 10 weeks for the fracture to heal completely.

This is in relation to the study conducted by Leo Massari et al, wherein 12% of fractures healed after 6 months from trauma. (Massari et al., 2018) When asked if they had any other injuries at the time of the fracture, 47% of the people did suffer other injuries while 53% did not suffer any injuries at that time. After the fracture,

63% of the people did not find any change in physical activities but on the other hand, 37% of the people observed a change in physical activity. When it was asked if the patients experienced any other major or minor injuries during the fracture, 56% did not have any other injuries at that time. But out of the population that was questioned, 44% did experience other injuries like bruises, lacerations, etc.

Figure 5: Bar graph representing the correlation between Age and Treatment of Fracture using Physiotherapy. X axis represents the Age and the Y axis represents the number of responses. A significantly high number of people belonging to the age group of 15-20years are known to have undergone a Physiotherapy treatment for their fracture. Chi square analysis was done, Pearson Chi Square Value= 73.847, the P value was 0.000 (p<0.05), which was found to be statistically significant. There is a significant number of people that have undergone a Physiotherapy treatment.
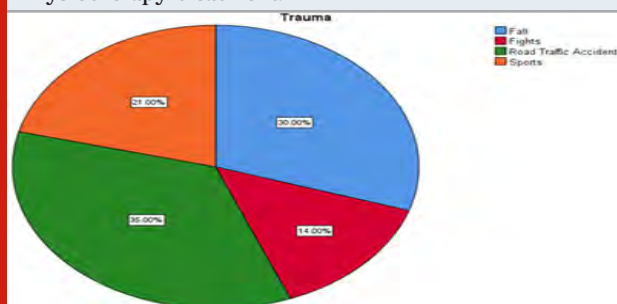
Figure 6. Bar graph representing the association between Age and Pain relief obtained after Physiotherapy. X axis represents Age and the Y axis represents the number of responses. A higher number of people belonging to the ages between 15-20 have been relieved of their pain after the Physiotherapy treatment. Chi Square Analysis was done, Pearson Chi Square Value= 75.589, the P value obtained was 0.000 (p<0.05), which indicates that it is statistically significant. There is a significant number of respondents that have felt pain relief after a Physiotherapy treatment.
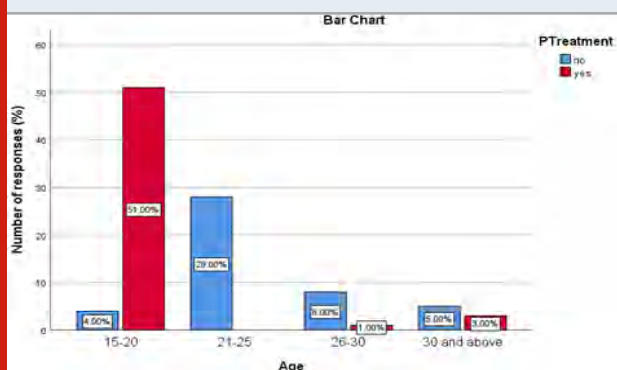
A correlation was drawn between Age and other factors. Figures 5,6 and 7 depict the comparison of Age of the person with 3 factors. It compared age with the following

3 questions; "Have you undergone a Physiotherapy treatment for your fracture?" ; "Was the Physiotherapy treatment pain relieving?" and "How often did you visit the Physiotherapy clinic?" The limitations of our study are considered, it is a pilot study as the sample is small, the time taken for this study is less than one month and this study did not discuss the consequences when proper follow up and physiotherapy exercise are not followed. It also shows that many of the respondents are still not fully aware of the importance and role of physiotherapy in faster healing.

Figure 7: Bar graph representing the association between Age and the frequency of visit to the Physiotherapy clinic. X axis represents Age while the Y axis represents the number of responses. Higher number of people belonging to the age group 15-20 have had a Physiotherapy treatment once a day. Chi square analysis was done, Pearson Chi Square Value= 99.513, the P value was 0.000 (p<0.05), which was found to be statistically significant. There is a significant number of people that undergo a Physiotherapy treatment once a day.
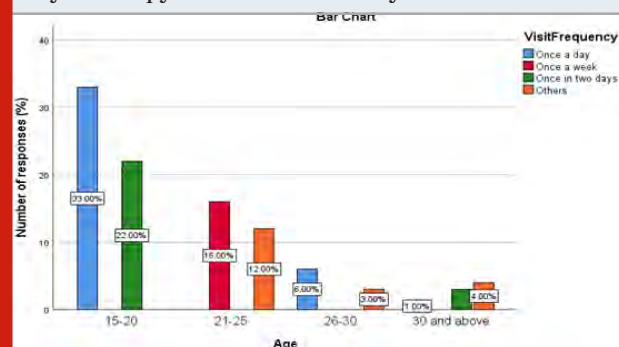
CONCLUSION

The conclusion of this study would be that the 55% of the population have undergone a physiotherapy treatment; they should further be made aware of the various benefits of physiotherapy. We also found that a significantly high number of people belonging to the age group of 15-20 are known to have undergone a Physiotherapy treatment for their fracture, a higher number of people belonging to the ages between 15-20 have been relieved of their pain after the Physiotherapy treatment and a higher number of people belonging to the age group 15-20 have had a Physiotherapy treatment once a day. There can be more emphasis on the role of physiotherapy in healing of fractures and how it helps in regaining normal posture, stature, gait and other physical activities after a fracture.

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Maxillary Labial Frenum Morphology and Midline Diastema Among Children Aged 3-12 Years- A Cross-Sectional Study

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ABSTRACT

Dentofacial aesthetics plays a major role in a child's development and affects the child's psychology. Therefore, early identification of Midline diastema is crucial. This study aims to evaluate the Maxillary labial frenum morphology and associate it with Midline diastema among children aged 3-12 years in Chennai. A total of 100 children were evaluated and grouped. The Morphology of frenum and Midline diastema was assessed according to sewerin's typology. Data was tabulated and exported to SPSS version 20.0, IL, Chicago, USA for analysis. Simple frenum (60%) was predominant in terms of morphology, followed by Persistent tectolabial frenum (28%). Male children were common (52%). Children aged 7-9 years were 48%, followed by children aged 3-6 years (32%). 36% of the children had Midline diastema. Frenum morphology and Midline diastema had a statistically significant association (p=0.00, p<0.05). Most children with a Persistent tectolabial frenum had Midline diastema (20%). Age groups and Midline diastema also showed significant association (p=0.00, p<0.05). 25% of the children aged 3-6 years had midline diastema, whereas 10-12 year olds had the least (2%). Therefore, it can be concluded that Morphology of the Maxillary labial frenum is associated with Midline diastema.

KEY WORDS: FRENUM; LABIAL FRENUM; MIDLINE DIASTEMA; MORPHOLOGY OF FRENUM; PERSISTENT TECTOLABIAL FRENUM; SIMPLE FRENUM.

INTRODUCTION

The lips and the cheeks are attached to the Gingiva or the underlying periosteum by the labial frenum which is a fold of mucous membrane (Marques et al., 2006). The main function of a frenum is to provide stability to the lips and tongue to which it is attached (Newman and Takei, 2006). Various freni present in the oral cavity are namely, Maxillary labial frenum, Mandibular labial frenum, and Lingual frenum (Mintz, Siegel and Seider, 2005). The perception of people in society and the psychological well being of an individual is greatly influenced by dentofacial aesthetics (Jonathan et al., 2018). Any abnormality in frenum morphology has always led to orthodontic treatment complications and relapse of treatment (Edwards, 1977).

The types of maxillary labial frenum morphology was given and classified by Sewerin's typology which is as follows - (Sewerin, 1971)
Simple frenum
Simple frenum with appendix

Persistent tectolabial frenum
Simple frenum with nodules
Frenum with nichum
Double frenum
Bifid frenum

Miller states that the frenum should be considered as pathogenic when it is unusually large and wide with little or no area of attached gingiva along the midline. It is also considered abnormal if there is a shift in interdental papilla when it is shifted (Miller, 1985).

Our department is passionate about child care, we have published numerous high quality articles in this domain over the past 3 years (Govindaraju, Jeevanandan and Subramanian, 2017a, 2017b; Panchal, Gurunathan and Shanmugaavel, 2017; Ravikumar, Jeevanandan and Subramanian, 2017; Jeevanandan and Govindaraju, 2018; Nair et al., 2018; Ravikumar et al., 2018, 2019; Ravindra et al., 2018, 2019; Subramanyam et al., 2018; Vishnu Prasad et al., 2018; Jeevanandan, Ganesh and Arthilakshmi, 2019; Ramadurai et al., 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Veerale Panchal, Jeevanandan and Subramanian, 2019; Vignesh et al., 2019; V. Panchal, Jeevanandan and Subramanian, 2019; Samuel, Acharya and Rao, 2020). With this inspiration we planned to pursue research on Maxillary labial frenum morphology and its association with Midline diastema.

The main aim of the study are as follows :
1. To estimate the prevalence of different morphologic types of Maxillary labial frenum among children aged 3–12 years.
2. To assess the association between Frenum morphology and Midline diastema in children.
3. To assess the association between Age and Midline diastema in children.

MATERIAL AND METHODS

For the study, 100 children belonging to 3–12 years were grouped into 3-6 years, 7-9 years and 10-12 years.

Inclusion criteria: Children in the age group of 3-12 years with normal dentition for their age group .

Exclusion criteria: Children with no systemic illness, no restorations done in the anterior teeth and children who haven't undergone orthodontic or orthopaedic treatment such as Rapid maxillary expansion or Milwaukee brace (Agarwal and Mathur, 2010).

Armamentarium: Mouth mirror, probe, tweezer, mouth masks, gloves, cotton roll, light source.

Study setting: General clinical examination for the children was done by the principal researcher. Instruments were sterilised. The type of morphology was evaluated under visual light according o Sewerin's typology. Data was tabulated.

Statistical analysis: Microsoft Excel 2016 data spreadsheet was used to collect data and later exported to the Statistical package for social science for windows (SPSS version 20.0, IL, Chicago, USA) for analysis. The distribution percentages were obtained following which associations were assessed using Chi square tests.

RESULTS AND DISCUSSION

The final data set consisted of 100 children within the range of 3-12 years who were assessed for Maxillary labial frenum morphology and Midline diastema.

Children belonging to the age group of 7-9 years were 48%, followed by children aged 3-6 years (32%), whereas 10-12 year olds were the least among the study population (20%). (Table 1) Male children were more in number among the study population (52%). (Figure 1).

Table 1. Shows children within the age group of 7-9 years (48%), followed by children aged 3-6 years (32%), whereas 10-12 year olds were the least among the study population (20%).

Age groups (in years)	Number of Children (in percentages)
3-6	25.2
7-9	40.1
10-12	34.7

Figure 1: Shows the gender distribution of the study population (N=100). X axis represents the gender and Y axis represents the number of children. Male children were more compared to female children.
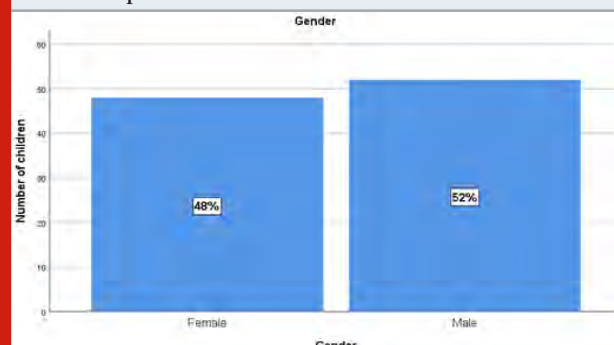
Simple frenum was predominant in terms of morphology (60%), followed by Persistent tectolabial frenum (28%). Bifid frenum and double frenum were not observed. (Figure 2) 36% of the children were diagnosed with Midline diastema. (Figure 3) Frenum morphology and Midline diastema showed a statistically significant association (p=0.00, p<0.05). Most children with a Persistent tectolabial frenum had Midline diastema (20%), followed by those with Simple frenum (12%), only 2% of children with a Simple frenum, either with appendix and nodules were observed to have midline diastema. (Figure 4).

Figure 2: bar chart depicts the morphology of the labial frenum among the study population (N=100). X axis represents the frenum morphology and Y axis represents the number of children. Most common type of morphology was the Simple frenum (Red), followed by Persistent tectolabial frenum (Blue), whereas Simple frenum with nodules (Orange) were the least common. There were no children with bifid and double frenum.
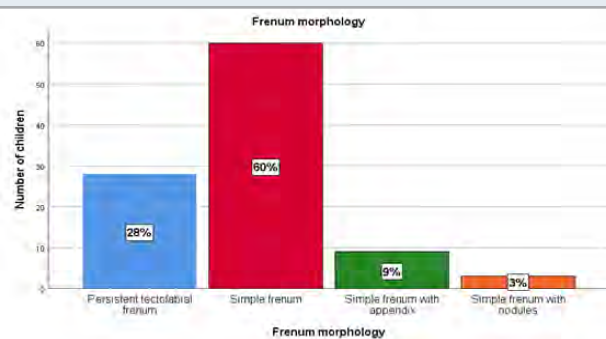
Figure 3: bar chart depicts Midline diastema among the study population (N=100). X axis represents the Midline diastema and Y axis represents the number of children. 36% of the children were diagnosed with Midline diastema.
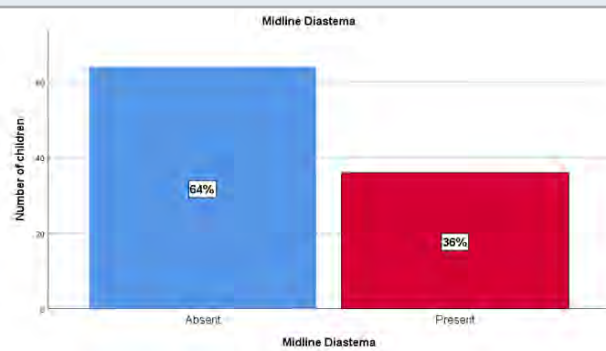
Age of the children and Midline diastema showed a statistically significant association (p=0.00, p<0.05). 25% of the children aged 3-6 years had Midline diastema, whereas 10-12 year olds had the least occurrences (2%). (Figure 5).

Sewerin's typology was used in classifying the frenum (Figure 2), and it was found that the most prevalent morphologic type of maxillary labial frenum was the Simple type with a prevalence of 60%, followed by Persistent tectolabial frenum with a prevalence of 28%. Simple with appendix and simple with nodules were seen in 9% and 3% of children respectively. Similar studies by Díaz-Pizán et al and Braga et al (D'ıaz-Piz'an, Lagrav'ere and Villena, 2006; Braga et al., 2007), also had similar results where the Simple type of upper labial frenum showed the highest prevalence followed by the Persistent tectolabial. Simple with nodule, Simple with appendix, Double, and frenum with nichum and Bifid were uncommon.

Figure 4: Bar graph depicting the association between Frenum morphology and Midline diastema. X-axis represents the type of morphology of the Maxillary labial frenum and y-axis represents the number of children. Blue depicts absence of Midline diastema, whereas red depicts the presence of Midline diastema. There was a statistically significant association between the Maxillary labial frenum morphology and the presence of Midline diastema (Pearson Chi-Square test, p value- 0.000, p<0.05). Most children with a Persistent tectolabial frenum had Midline diastema (20%), followed by those with simple frenum (12%), only 2% of children with a Simple frenum, either with an appendix or nodule were observed to have midline diastema.
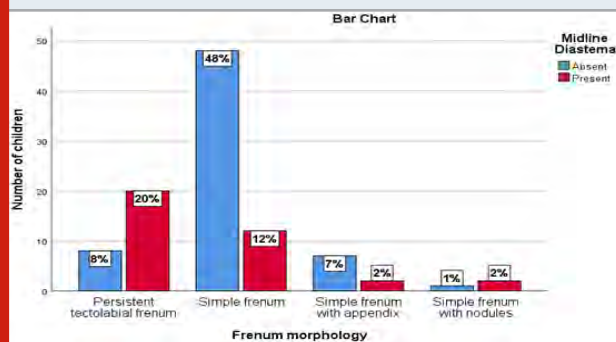
Figure 5: Bar graph depicting the association between Age groups and Midline diastema. X-axis represents the age groups and y-axis represents the number of children. Blue depicts absence of Midline diastema, whereas red depicts the presence of Midline diastema. There was a statistically significant association between the presence of Midline diastema and age of the children (Pearson Chi-Square test, p value- 0.000, p<0.05). 25% of the children aged 3-6 years had Midline diastema, whereas 10-12 year olds had the least (2%). (Figure 5).
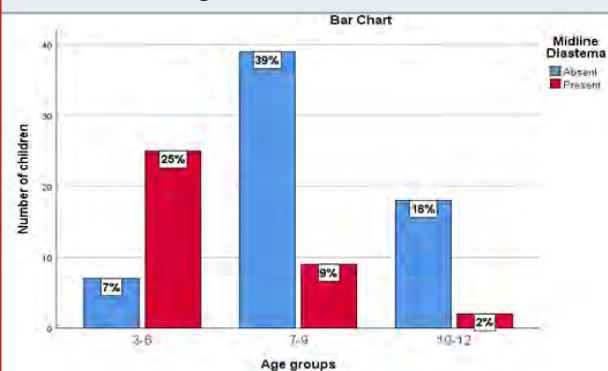
In previous studies conducted by Kakodkar et al and Thosar et al (Kakodkar, Patel and Patel, 2008; Thosar et al., 2017), the persistent tectolabial frenum type had the maximum potential to become a contributing factor in children with persistent midline diastema. The present study (Figure 4), also shows that most children with Midline diastema had this type of frenum (20%) There are studies which also prove otherwise, for example a study

performed by Bowsiya et al, concludes that the frenal attachment has an association with Midline diastema (Bowsiya and Arjunkumar, 2019) (21). Therefore, there are variations in association of level of insertion of frenum with midline diastema but persistent tectolabial frenum seen among children aged 3-6 years of age had a positive association with midline diastema .

On assessing the occurrence of Midline diastema among different age groups (Figure 3, Figure 5, 5), 36% of the children had Midline diastema, and the highest prevalence was observed among children aged 3-6 years (25%), whereas 10-12 years old had the least. These findings are consistent with the results of the study conducted by Rajani et al (Rajani, Biswas and Emmatty, 2018). Studies conducted by Bergström et al, Popovich et al, Taylor and Weyman, (Taylor, 1939; Weyman, 1967; Bergström, Jensen and Mårtensson, 1973; Popovich, Thompson and Main, 1977) also suggested that Midline diastema decreases with increasing age of the individual. Another study conducted by Richardson et al (Richardson et al., 1973), concluded that children aged 6 years had the highest prevalence of Midline diastema, which is also within the range of 3-6 years, proving that the prevalence observed in the present study is coherent with other studies. In a study conducted by Sagar et al, among children aged 15-25 years in the South Indian population, there were no incidences of double frenum which is similar to that of the present study (Sagar, Heraldsherlin and Moses, 2016).

Midline diastema occurring due to eruption of permanent canines are commonly seen as the ugly duckling stage among children aged 8-11 years, and is highly unlikely to occur in the age group of 3-6 years. Since 3-6 years of age is the predominant age group observed to have Midline diastema in this study and most children had a persistent tectolabial frenum attributing to their Midline diastema. It can be concluded that the persistent tectolabial frenum type occurring among 3-6 year old children can cause Midline spacing if left untreated.

Previous studies suggest that the level of frenal attachment migrates upwards with age. Current literature also suggests that orthodontists now consider frenectomy only after the orthodontic treatment is complete but persistent abnormal labial frenum causes midline diastema (Boutsi and Tatakis, 2011).

CONCLUSION

Within the limitations of the present study, Simple type of frenum was more prevalent. Out of children with Midline diastema in the sample (36%), 20% was found to be associated with Persistent tectolabial frenum. Frenum morphology and age of the children were both statistically associated with Midline diastema (p=0.00, p<0.05). Children aged 3-6 years of age had the highest occurrences of midline diastema (25%). Therefore, utmost care must be taken to eliminate persistent midline diastema at the earliest.

Conflict Of Interests: No conflict of interests

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Comparative Evaluation of Antimicrobial Efficacy of Calcium Hydroxide Mixed with Different Vehicles on Enterococcus faecalis – an in Vitro Study

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ABSTRACT

Calcium hydroxide [Ca(OH)2] has been popularly used as an intracanal medication because of its good antibacterial properties and biocompatibility. The aim of this study is to compare the antimicrobial efficacy of CaOH and vehicles on E. faecalis – An in-vitro study. The study was done by cutting wells in Tryptose soya agar and filling the wells with the different combinations of medicaments. The bacterial suspension of standard strains of E. faecalis is spread on the entire surface of the media using a sterile swab. The three different plates were incubated at 37 degree Celsius aerobically for 24hrs. After the incubation, the zone of inhibition is measured and tabulated for each mixture. There was a significant difference in the antimicrobial activity of calcium hydroxide mixed with chlorhexidine against Enterococcus faecalis. This study showed that the combination of calcium hydroxide with chlorhexidine gluconate showed relatively higher antimicrobial action against E. faecalis when compared to the other two combinations of medicaments.

KEY WORDS: CALCIUM HYDROXIDE, CHLORHEXIDINE, ENTEROCOCCUS, MEDICAMENT, ROOT CANAL.

INTRODUCTION

Pulp interventions combine a pulp treatment technique and a medicament. The primary objective of pulp interventions is to maintain the integrity of the tooth and the health of its supporting tissues. Several medicaments are available for the obturation of the decontaminated surfaces or canals, the most frequently used are mineral trioxide aggregate (MTA), calcium hydroxide, formocresol or ferric sulphate (Smaïl-Faugeron et al., 2018). Calcium hydroxide intracanal dressing is considered as the most favorable antimicrobial agent. Several well controlled in-vitro and in-vivo studies have shown intra-canal reduction of microbial population or at least inhibit bacterial proliferation. Calcium hydroxide also alters bacterial cell walls and denatures a potent endotoxin, lipopolysaccharide, thereby rendering it less antigenic (Anjaneyulu and Nivedhitha, 2014). Calcium hydroxide has been shown to create superficial necrosis which inhibits bleeding and fluid loss however, problems with internal resorption and less long-term success were reported (Huth et al., 2012).

In addition to the widespread clinical use of Ca(OH)2, studies have tested various Ca(OH)2 formulations and mixtures of Ca(OH)2 powder with different substances in an attempt to improve Ca(OH)2 performance (L. L. C. E. Silva et al., 2019). Ca(OH)2 is composed of calcium ions, which react with the carbon dioxide present in tissues, producing calcite granules. This process leads to the accumulation of fibronectin, which allows cell adhesion and differentiation, thus resulting in the formation of mineralized tissue (Araújo et al., 2018). However, Ca(OH)2 inactivates endotoxin and impedes the increase in cytokine chemical inflammatory mediators to inhibit periapical inflammation after a root canal cleaning procedure.

The antimicrobial activity of Ca(OH)2 is dependent on the release of hydroxyl ions in an aqueous environment and the lethal effects of hydroxyl ions on bacterial cells are probably due to damage to the bacterial cytoplasmic membrane, denaturation of proteins, or damage to the DNA (Mohammadi et al., 2012). For calcium hydroxide to act effectively as an intracanal dressing, the hydroxyl ions must be able to diffuse through dentine and pulpal tissue remnants (Siqueira and Lopes, 1999). CHX is a positively charged hydrophobic and lipophilic molecule that interacts with phospholipids and lipopolysaccharides on the cell membrane of bacteria and then enters the cell through some type of active or passive transport mechanism. Its efficacy is due to the interaction of positive charge of the molecule and negatively charged phosphate groups on the microbial cell walls, thereby altering the cells' osmotic equilibrium. This increases the permeability of the cell wall, which allows the CHX molecule to penetrate into the bacteria (Mohammadi and Abbott, 2009). In a study done by Oncag et al. it was stated that the 2% chlorhexidine gluconate and Cetrexidin was significantly more effective on *E. faecalis* than the 5.25% NaOCl at 5 min (Oncag et al., 2003).

E. faecalis a normal inhabitant of the oral cavity; . *E. faecalis* is associated with different forms of periradicular disease including primary endodontic infections and persistent infections. In the category of primary endodontic infections, *E. faecalis* is associated with asymptomatic chronic periradicular lesions significantly more often than with acute periradicular periodontitis or acute periradicular abscesses (Stuart et al., 2006). It was also found that *E. faecalis* was significantly more associated with asymptomatic cases than with symptomatic cases (Rocas et al., 2004). We have numerous highly cited publications on well designed clinical trials and lab studies (Azeem and Sureshbabu, 2018; Govindaraju et al., 2017; Janani and Sandhya, 2019; Jenarthanan and Subbarao, 2018; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Poorni et al., 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique et al., 2019a, 2019b; Siddique and Nivedhitha, 2019; Teja et al., 2018). This has provided the right platforms for us to pursue the current study. Hence the aim of this study is to compare the antimicrobial efficacy of CaOH and vehicles on *E. faecalis* – An in-vitro study.

MATERIAL AND METHODS

Preparation of bacterial suspension: Standard strain of *E. faecalis* is grown in Brain- heart infusion agar. Fresh cultures are used to make suspension in sterile saline with turbidity matching 0.5 Mc Farland standard. 100ml is transferred to the plates and they are spread on the entire surface using a sterile swab.

Agar well diffusion method: The test is done on Tryptose soya agar by cutting well using a 4mm metal tube. The agar is poured and when it is set, the flame sterilized tube is used to cut the well. The wells were cut without removing the agar at the bottom level. The bacterial suspension of standard strains of *E. faecalis* is spread on the entire surface of the media using a sterile swab. Three different plates are used for each group, with each plate containing four wells. The three different mixtures are placed in the well occupying the entire capacity and touching the boundaries. Then the plates were incubated at 37 degree Celsius aerobically for 24hrs. After the incubation, the zone of inhibition is measured and tabulated for each mixture.

Statistical analysis: The data was tabulated and assessed for statistical significance using the SPSS software. Percentage, mean, standard deviation, frequency of parameters were employed in the analysis. Anova test and Post Hoc test was used to detect the significance between the different groups of intracanal medicaments. P value less than 0.05 was considered to be statistically significant.

RESULTS AND DISCUSSION

A total of three groups were included in this study: Ca(OH)$_2$ + Saline, Ca(OH)$_2$ + Chlorhexidine and Ca(OH)2 + Eugenol. An equally measured quantity of each of these groups was tested for its antibacterial efficacy. The zone of inhibition of each of these groups were measured from the culture plates and were tabulated. The region without bacterial colonies that is the Zone of Inhibition will be in a different color as compared to other regions of bacterial growth. There is a marked difference and easily visible to the naked eye [Figure 1,2,3]. The measurement of the diameter of this Zone of Inhibition will conform if the medicament is effective in treating the patient or not. Larger the diameter more will be the effectiveness of the medicament. From the study it was found that, the mean zone of inhibition for the group Ca(OH)$_2$ + Saline was 18mm, 25.5 mm for the group Ca(OH)$_2$ + Chlorhexidine and 21 mm for the group Ca(OH)$_2$ + Eugenol [Figure 4]. From the graph it is evident that the maximum zone of inhibition was shown in the group Ca(OH)$_2$ + Chlorhexidine. The descriptive data for the zone of inhibition of each of these groups is shown in Table 1.

On doing the Anova test, it was found that there was a significant difference between the three groups of

Ca(OH)$_2$ (p value=0.001<0.05) [Table 2]. On doing the Post Hoc test, it was found that there was significant difference in antibacterial effects between the groups Ca(OH)$_2$ + Saline and Ca(OH)$_2$ + Chlorhexidine (p value 0.001<0.05). The comparison of antibacterial effects between the groups Ca(OH)$_2$ + Chlorhexidine and Ca(OH)$_2$ + Eugenol was also found to be statistically significant (p value 0.01<0.05) [Table 3].

Table 1. Table representing the descriptive statistics of the zone of inhibition of each group. From the table it is evident that the combination of Ca(OH)2 with Chlorhexidine showed maximum zone of inhibition when compared to the other groups.

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Ca(OH)$_2$ + Saline	4	18.00	.816	.408	16.70	19.30
Ca(OH)$_2$ + Chlorhexidine	4	25.50	.577	.289	24.58	26.42
Ca(OH)$_2$ + Eugenol	4	21.00	2.708	1.354	16.69	25.31
Total	12	21.50	3.555	1.026	19.24	23.76

Table 2. Table shows the results from the one-way Anova test between the three groups. From the graph it can be interpreted that there is a statistically significant difference between the three groups. (p value= 0.001<0.05).

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	114.000	2	57.000	20.520	.000
Within Groups	25.000	9	2.778		
Total	139.000	11			

Table 3: Table representing the results from the Post Hoc test done between the three groups to compare their significance. The combination of Calcium hydroxide with chlorhexidine was found to be significantly better than calcium hydroxide with saline (p value= 0.001<0.05). The combination of calcium hydroxide with chlorhexidine was also found to be significantly better than Calcium hydroxide with eugenol (p value= 0.01<0.05). There was no significant difference between the groups Calcium hydroxide and Saline and Calcium hydroxide and eugenol (p value = 0.073>0.05).

Figure 1: Culture plate showing the visible zone of inhibition produced by the group Ca(OH)2 + Saline against *E. faecalis*

Table 3. Table representing the results from the Post Hoc test done between the three groups to compare their significance. The combination of Calcium hydroxide with chlorhexidine was found to be significantly better than calcium hydroxide with saline (p value= 0.001<0.05). The combination of calcium hydroxide with chlorhexidine was also found to be significantly better than Calcium hydroxide with eugenol (p value= 0.01<0.05). There was no significant difference between the groups Calcium hydroxide and Saline and Calcium hydroxide and eugenol (p value = 0.073>0.05).

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.
Ca(OH)$_2$ + Saline	Ca(OH)$_2$ + Chlorhexidine	–7.500*	1.179	.000
	Ca(OH)$_2$ + Eugenol	–3.000	1.179	.073
Ca(OH)$_2$ + Chlorhexidine	Ca(OH)$_2$ + Saline	7.500*	1.179	.000
	Ca(OH)$_2$ + Eugenol	4.500*	1.179	.010
Ca(OH)$_2$ + Eugenol	Ca(OH)$_2$ + Saline	3.000	1.179	.073
	Ca(OH)$_2$ + Chlorhexidine	–4.500*	1.179	.010

*. The mean difference is significant at the 0.05 level.

Enterococcus faecalis (*E. faecalis*) is one of the common pathogens recovered from patients suffering from recurrent root canal treatment failures. The ability of *E. faecalis* to form biofilm both on the root canal walls and within the dentinal tubules contributes to their persistence. Moreover, the complex structure of the root canal system allows bacterial evasion from the immune system and antibiotics (Shlezinger et al., 2019). In dentistry, *E. faecalis* is particularly prevalent in root canals with a diagnosis of apical periodontitis and has been implicated as the main pathogen in secondary endodontic infections. In endodontic treatment, intracanal medications are used as adjuvants during biomechanical preparation (S. Silva et al., 2019). Calcium hydroxide, as an intracanal disinfectant with increasing application, can release hydroxyl ions which are strongly alkaline. Its abilities have been reported to destroy the cell membrane and protein structure of bacteria and can disinfect the root canal (Jia et al., 2019). Despite its excellent properties, the buffering action of dentin can neutralize the antimicrobial activity of CH at deeper layers of dentinal tubules, and E. faecalis resistance to this medicament has consequently been demonstrated (Lei et al., 2016).

Figure 2: Culture plate showing the visible zone of inhibition produced by the group $Ca(OH)_2$ + CHX against *E. faecalis*
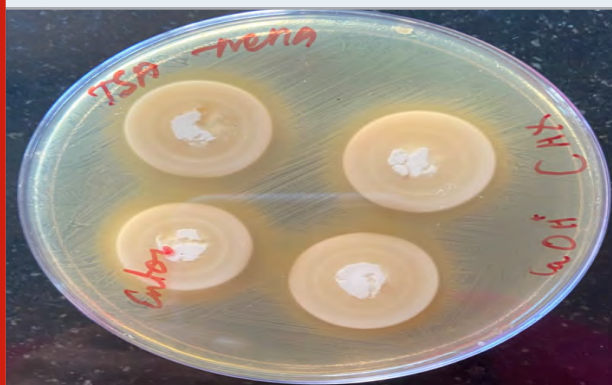
Figure 3: Culture plate showing the visible zone of inhibition produced by the group $Ca(OH)_2$ + Eugenol against *E. faecalis*

In this study the efficacy of calcium hydroxide when mixed with different vehicles such as saline, chlorhexidine and eugenol is tested. Eugenol is a para-substituted phenolic compound contained in several plants including clove and bay leaves and has been widely used as an analgesic and anti-inflammatory drug to treat toothache and pulpitis in the dental clinic. It is used in combination with zinc oxide as a pulp-capping agent, temporary filling and a root canal sealer (Tammannavar et al., 2013). CHX can be applied clinically as antimicrobial agent during all phases of the root canal preparation, including the disinfection of the operatory field; during the enlargement of the canals orifices; removal of necrotic tissues before performing the root canal length determination; in the chemomechanical preparation prior to the foraminal patency and enlargement; as an intracanal medicament alone or combined with other substances (i.e. calcium hydroxide - CH) (Gomes et al., 2013).

Figure 4: Bar graph representing the mean of zones of inhibition of the three groups. X axis represents the combination of $Ca(OH)_2$ with three different vehicles and Y axis represents the zone of inhibition against the bacteria in millimeter (mm). Green colour represents the group $Ca(OH)_2$ + Saline, blue colour represents the group $Ca(OH)_2$ + Chlorhexidine and purple colour represents the group $Ca(OH)_2$ + Eugenol. From the graph it was evident that the maximum zone of inhibition of an average of 25.5 mm was seen in $Ca(OH)_2$ + Chlorhexidine mixture followed by 21 mm in $Ca(OH)_2$ + Eugenol mixture.
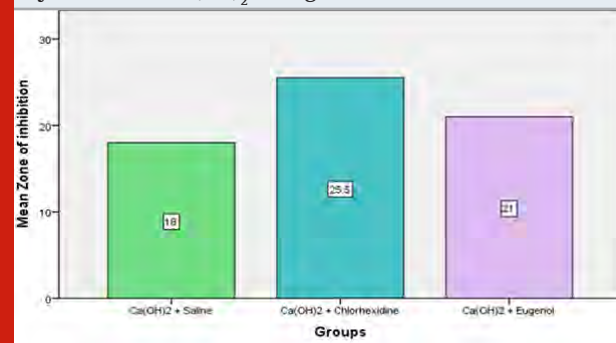
In this present study, it was found that the combination of Calcium hydroxide with Chlorhexidine showed greater zones of inhibition when compared to the other two groups. This is in accordance with a study done by Rao et al which showed that there is a significant decrease in colony forming units in the group Ca(OH)2 and CHX (Muralidhar and Soonu, n.d.). Another study showing similar results stated that by mixing Ca(OH)2 with CHX, the antimicrobial activity of Ca(OH)2 can be increased (Kim and Kim, 2014). Although this is contradicted by a study which stated that CHX does not increase the antibacterial effect of Calcium Hydroxide (Saatchi et al., 2014). This may be due to deprotonation of CHX at high pH, which reduces its solubility and alters its interaction with bacterial surfaces as a result of the altered charge of the molecule. Another study by Carmen et al stated that higher concentration of CHX (2%) alone showed

a greater capacity to inhibit E. faecalis growth (Ferrer-Luque et al., 2014). A previous study also showed that the addition of chlorhexidine with calcium hydroxide did not interfere with the chemical properties of calcium hydroxide (Signoretti et al., 2011).

The filling ability of calcium hydroxide pastes is probably more important in retarding root canal recontamination than the chemical effect. Because calcium hydroxide has low water solubility, it is slowly dissolved in saliva, remaining in the canal for a long period, delaying the bacterial progression toward the apical foramen (Siqueira and Lopes, 1999). Despite the vehicle used, calcium hydroxide seems to act as an effective physical barrier.

CONCLUSION

Within the limitations of this study in vitro study it can be concluded that there is significant difference in the antimicrobial activity of calcium hydroxide mixed with chlorhexidine against Enterococcus faecalis. There was also a statistical difference between the groups $Ca(OH)_2$ + Saline and $Ca(OH)_2$ + Chlorhexidine and $Ca(OH)_2$ + Eugenol and $Ca(OH)_2$ + Chlorhexidine.

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Assessment of Antibacterial Property of Mineral Trioxide Aggregate with Chlorhexidine

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ABSTRACT

Infected root canals contain a variety of microorganisms which include aerobes, anaerobes, and fungus. Root canal teeth are more likely to harbor *E. faecalis* than primary cases. Mineral Trioxide Aggregate is an endodontic repair material which possesses several advantageous properties such as good sealing property, biocompatibility, and antibacterial property. Chlorhexidine is a broad-spectrum antibacterial agent that has shown its effectiveness on various microbes particularly *E. faecalis* and *C. albicans*. The aim of this study is to compare and assess the antibacterial property of MTA when mixed with water and Chlorhexidine respectively. The test materials were divided into 2 groups namely group 1. MTA with MTA liquid and group 2. MTA with chlorhexidine. These materials were placed in wells on tryptone soya agar using the Well diffusion method on *E. faecalis* strain. The agar was incubated at 37°C for 24 hours and the zone of inhibition was recorded. Independent sample t test was used to compare the zone of inhibition of the materials being tested. It was found that the zone of inhibition of MTA with distilled water was higher than that of MTA with chlorhexidine. (independent t test, $p<0.05$, statistical significance). From the study, it was found that MTA with MTA liquid (distilled water) had better antibacterial properties than MTA with chlorhexidine

KEY WORDS: ANTIBACTERIAL, MTA, E.FAECALIS, CHLORHEXIDINE, ENDODONTIC THERAPY.

INTRODUCTION

Pulpal inflammation also called pulpitis is mainly caused by an opportunistic infection of the pulpal space with oral microorganisms. (Rechenberg, Galicia and Peters, 2016) The most common path of entry for microorganisms is dental caries. (Bergenholtz, 1981; Hahn, Falkler and Minah, 1991) Other potential pathways for pulpal microbial infection include trauma, cracks, exposed dentinal tubules, or the main apical foramen (Bergenholtz, 1981).

The aim of endodontic treatment is thorough debridement and cleaning of the root canal of an infected pulp tissue so that the canal space can be shaped and prepared to be filled with an inert material thus preventing or minimizing any chances of reinfection (Tabassum and Khan, 2016). The Ideal inert materials for sealing root-end cavities should prevent leakage, have dimensional stability, adhere to the cavity walls, resist resorption,

and should be moisture resistant; they should also be nontoxic and biocompatible to promote healing (Gartner and Dorn, 1992; Torabinejad, Smith, et al., 1995; Anjaneyulu and Nivedhitha, 2014). However, even after these chemomechanical procedures are performed, bacteria might still be found inside the dentinal tubules with the potential for the disease to persist or emerge leading to endodontic failures (Orstavik, 1981).Failure after endodontic therapy is due to persistent or secondary infection especially of *Enterococcus faecalis* in poorly and in well-treated root canals (Siqueira, 2001). Hence, apart from the other properties, the inert material which is used to seal the canal must provide some antibacterial property (Torabinejad, Hong, Pitt Ford, et al., 1995; Kayaoglu et al., 2005).

Mineral trioxide aggregate (MTA), which was introduced in 1993 by Mahmoud Torabinejad, have been examined since 1995 as potential antibacterial material (Torabinejad, Hong, McDonald, et al., 1995; Torabinejad, Hong, Pitt Ford, et al., 1995). MTA is a powder consisting of fine hydrophilic particles that in the presence of water forms a colloidal gel that solidifies to form hard cement within approximately 4 h(Torabinejad, Hong, McDonald, et al., 1995). According to recent studies, MTA is a biocompatible dental material and it was suggested that these biological properties may be due to its excellent sealing ability (Wu, Kontakiotis and Wesselink, 1998), high alkalinity(Tziafas et al., 2002), induction of hard tissue formation(Zhu et al., 2000), and antibacterial effects(Torabinejad, Hong, Pitt Ford, et al., 1995). Because of its physical and chemical properties, the use of MTA as a biomaterial for a wide variety of endodontic treatments has been recommended (Torabinejad and Chivian, 1999).

Chlorhexidine (CHX) initially was used as a general disinfectant because of its broad antibacterial action (Birch and Melville, 1961; Grossman, 1972). It was later shown to inhibit dental caries and reduce the formation of dental plaque. In the early 1960s, chlorhexidine was introduced as an endodontic irrigant and has since been reported as effective in vitro against *E. faecalis* (Siqueira et al., 2002). It is clear that more uses for chlorhexidine in endodontics are being developed with the purpose of improving prognosis by enhancing the antimicrobial properties of endodontic materials. (Stowe et al., 2004) Because chlorhexidine has been incorporated into other dental products with some success, this study aims to assess the antibacterial property of MTA when mixed with Chlorhexidine.

We have numerous highly cited publications on well designed clinical trials and lab studies (Govindaraju, Neelakantan and Gutmann, 2017; Azeem and Sureshbabu, 2018; Jenarthanan and Subbarao, 2018; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Teja, Ramesh and Priya, 2018; Janani and Sandhya, 2019; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Poorni, Srinivasan and Nivedhitha, 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique and Nivedhitha, 2019; Siddique et al., 2019; Siddique, Nivedhitha and Jacob, 2019). This has provided the right platforms for us to pursue the current study. Our aim is to asses the antibacterial property of MTA when mixed with Chlorhexidine.

MATERIAL AND METHODS

In this study, we had compared 2 groups as follows: group 1: MTA with distilled water and group 2: MTA with 2% Chlorhexidine. (Vishal apiseal MTA and hexidine mouth wash). The study was conducted on double-layered plates, in which the base layer was made of tryptone soya agar which was poured in sterilized Petri plates. A total number of 5 plates were employed. A sterile swab was used to inoculate *E. faecalis* on the surface of the agar to achieve a lawn of growth. The strains were obtained from the Department of Microbiology, Saveetha Dental College, and Hospital. Two uniform wells (4 mm diameter, one for each test material) were punched at equidistant points in agar by means of a sterile copper coil after 24 hours. MTA was mixed with a sterile glass slab using sterile spatula according to the manufacturer's instructions by using 1 g of powder for every 0.35 ml sterile water.

The CHX groups were mixed exactly the same way, substituting 2% CHX liquid The cavities were filled immediately by materials after being mixed. The plates were then incubated for 24 hours at 37C after which the Zone Of Inhibition was checked. All assays were carried out under aseptic conditions. The diameter of bacterial growth inhibition zones was measured using a millimeter scale with an accuracy of 0.5 mm in two perpendicular scales for all the samples respectively by an independent observer. The independent sample t test was used to compare the mean Zone Of Inhibition among the materials tested. Statistically significant differences among the groups were set at p<0.05.

RESULTS AND DISCUSSION

The Zone of Inhibition of MTA with MTA liquid was found to be higher than that of MTA with Chlorhexidine. The mean zone of inhibition of MTA with MTA liquid was found to be 25mm and that of MTA with Chlorhexidine was found to be 21.8 mm. (figure 1) MTA with distilled water has statistically higher Zone Of Inhibition when compared to MTA with Chlorhexidine. (p<0.05, statistically significant) (table 1 and 2). In the current study the microorganism E.faecalis particularly was used because it is the most frequently isolated microorganism recovered from failed endodontically treated cases. The prevalence of *E. faecalis* in root canals was ranging from about 24% to 77%. (Baumgartner and Falkler, 1991; Vineet and Nayak, 2016)It possesses several virulence factors that contribute to its ability to survive the effects of conventional root canal therapy.(Chavez De Paz et al., 2003; Bhardwaj, 2013) Hence, when a conventional Root canal treatment fails the need for surgical intervention comes into limelight.

The agar diffusion method was employed in the current study as it is one of the most employed techniques for testing and assessing the antimicrobial property of materials. This technique has a few limitations. It does not distinguish between bacteriostatic and bactericidal effects of the materials and Zones Of Inhibition is not only related to the inhibitory effects of the material, but also depend on the diffusibility of the material across the medium(Leonardo et al., 2000; Asgary, Akbari Kamrani and Taheri, 2007; Tanomaru-Filho et al., 2007). Also, factors like incubation time,inoculum size, and good agar material also may interfere with the results. However, if most of these factors are handled properly, harmonious and homogenous results may be obtained. Hence, various materials can be compared for their antibacterial effects under similar and favourable test environments. (Tobias, 1988)

In the current study, the Zone Of Inhibition of MTA with distilled water was found to be slightly higher than that of MTA with Chlorhexidine. A few studies have been done which replaced MTA liquid with Chlorhexidine to mix with MTA powder in order to enhance its antimicrobial activity. From the reports, it was suggested that MTA when mixed with Chlorhexidine produced greater Zone Of Inhibition than MTA when mixed with MTA liquid(Stowe et al., 2004; Bidar et al., 2012). Another study stated that the antimicrobial activity of MTA is improved with incorporation of silver nanoparticles. (Samiei et al., 2013)

It is known that the antimicrobial activity of MTA is attributed to its elevated pH values. Initially when mixed, the pH of MTA is 10.2 which rises to 12.5 in 3 hours. It is noted that pH levels of approximately 12 could terminate the growth of the majority of microorganisms, including E. faecalis.(Silva et al., 2014) Also, the antifungal effect of MTA might also be attributed to its high pH or to substances that are released from MTA into the media. (Al-Nazhan and Al-Judai, 2003)

In the current study, MTA had an inhibitory effect against *E faecalis*. Another study reported that MTA did not possess any inhibitory effects against *E.faecalis*. This difference might be because of varied differences in the studies. In the present study, wells were made in the agar in which the test material was condensed allowing an exact amount of MTA per sample and the surface area through which the material could diffuse

Table 1. This table represents the Zone of Inhibition of MTA with Distilled water and MTA with Chlorhexidine

	MTA with Distilled water	MTA with Chlorhexidine
Sample 1	24mm	21mm
Sample 2	26mm	22mm
Sample 3	27mm	21mm
Sample 4	24mm	22mm
Sample 5	24mm	23mm

Table 2. Showing the Independent sample t test for the Zone of Inhibition of MTA with Distilled Water and MTA with Chlorhexidine. From the table it is evident that MTA with distilled water has statistically higher Zone Of Inhibition when compared to MTA with Chlorhexidine. (p<0.05, statistically significant)

MTA mixed with distilled water/ Chlorhexidine	Levine's Test for Equality For Variances		T test for equality of means					
	F	Sig	t	df	Sig. (2 tailed)	Mean difference	STD. Error difference
Equal variance Assumed	0.144	0.714	-4.824	8	0.001	-3.200	0.663
Equal variance not Assumed			-4.824	7.066	0.002	-3.200	0.663

Figure 1: showing the mean Zone Of Inhibition of MTA with Distilled Water (Blue) and MTA with Chlorhexidine (Green) from the graph it is evident that MTA with Distilled Water showed a higher Zone Of Inhibition than MTA with Chlorhexidine. (p<0.05, statistically significant)
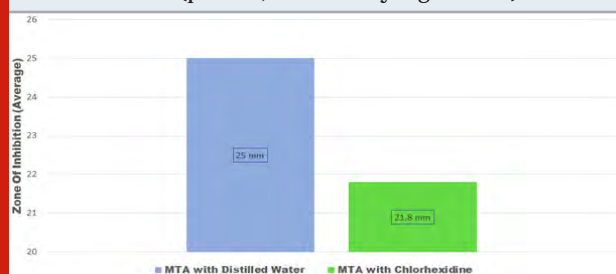
could be increased. In the comparison study, the materials were placed directly on the surface of the agar before incubation. Other differences might be the varied formulations of MTA which are used.

A few studies state that enhancing the antibacterial property of MTA by adding various liquids might adversely affect properties like the compressive strength and biocompatibility of the material.(Holt et al., 2007) However, further studies are necessary to evaluate the properties of this mixture.

CONCLUSION

Based on the findings of the study, MTA with distilled

water showed statistically higher Zone Of Inhibition against E.faecalis when compared to MTA with Chlorhexidine. Hence, it is seen that MTA possessed better antibacterial properties against *E. faecalis* with distilled water than with Chlorhexidine.

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Root Canal Morphology of Mandibular Premolars – Cbct Analysis

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ABSTRACT

The root canal system is complex and the canal may branch, divide and rejoin taking various pathways to the apex. One of the predominant causes of the failure of root canal treatment in mandibular premolars is due to the variations in root canal anatomy. The aim of this study was to survey the root canal morphology of mandibular first and second premolar teeth in a South Indian population using CBCT analysis.The sample included 150 CBCT images comprising mandibular first premolars and second premolars were collected from Saveetha Dental College and Hospitals.The study showed that Type 1(1-1) vertucci classification is seen in most of the mandibular first and second premolars.Within the limits of this study, Type I [1-1] Vertucci's classification is seen in most of the first premolar and second premolars.It can be concluded from the results of this study that mandibular first and second premolar teeth present a wide variety of radicular features, with one root and one canal being found in majority of cases

KEY WORDS: MANDIBULAR PREMOLARS, CBCT, VERTUCCI CLASSIFICATION, ROOT CANAL MORPHOLOGY.

INTRODUCTION

A proper knowledge of root canal morphology is necessary for successful endodontic treatment (Alfawaz et al., 2019). The root canal system is complex and the canal may branch, divide and rejoin taking various pathways to the apex. Vertucci's established a proper method for differentiating root canal variations into the eight types.The classification has been widely used in several studies(Vertucci, Seelig and Gillis, 1974).

As a group, the mandibular premolars are considered the most difficult teeth to treat endodontically and have high flare ups and high failure rates, as they have a high incidence of multiple roots or canals(Liu et al., 2013). Mandibular premolars may have extra root, not obvious in preoperative radiograph, challenging for shaping, cleaning, and obturation. Furthermore, the incidence, location, and morphology of root canal systems may vary in different ethnic or regional populations(Barakat et al., 2018; Alfawaz et al., 2019).

CBCT is more accurate when compared to digital radiographs in establishing root canal systems, which can also be used in vivo studies for diagnosis and assessment. (Alrahabi and Zafar, 2015; Mathew et al., 2018). There are various methods to recognize root canal morphology such as digital radiographic techniques,radiographic assessment enhanced with contrast media canal staining and tooth clearing, conventional radiograph, cone beam

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computed tomography (CBCT) techniques and modified canal staining and clearing.Several studies revealed that CBCT is verified as a reliable tool for studying internal anatomy of tooth(Neelakantan et al., 2010).

CBCT technique uses a specific beam to fabricate three dimensional images to reveal anatomic details clearly. The main advantages of using CBCT are that it is non-invasive and permits 3-D reconstruction of the root c anals(LiyanaHannahBintiIzhamAkmal et al., 2019). CBCT is considered as better than other techniques to understand the root and canal systems(Mathew et al., 2018).Many studies regarding root canal morphology performed using CBCT revealed that the application of CBCT is favourable in recognizing variations in canal configuration Therefore, the aim of this study is to assess the Root canal morphology of mandibular premolars using CBCT analysis.

MATERIAL AND METHODS

The sample included 50 CBCT CDs of patients comprising mandibular first premolars and second premolars were collected from Saveetha Dental College and Hospitals. The Number of roots and canals, and canal configuration according to Vertucci's classification were recorded. CBCT Analysis was done using SIRONA, Analysis was done using software SIDEXES. Samples of fully erupted permanent mandibular first and second premolars were included.

Inclusion criteria: The study included only Qualifying mandibular premolars each demonstrated fully developed apices

Exclusion criteria: Root canal fillings, posts and crown restorations were not considered in the study.

Statistical analysis: Data was recorded in Microsoft excel and later exported to IBM SPSS (version 20.0 Chicago USA) and subjected to Statistical analysis. Chi Square test was then employed with level of significance set at P<0.05.The statistical analysis between teeth number and vertucci classification was carried out in SPSS software. Chi square test was done to compare the parameters. The outcome was represented in a form of tables and bar charts.

RESULTS AND DISCUSSION

Out of 150 teeth, 63.76%(n=95) of the teeth showed Type 1 vertucci classification, 2.01%(n=3) of the teeth had Type 2 Vertucci's classification,4.03%(n=6) of the teeth had type 3 vertucci classification, 19.46%(n=29) of the teeth had Type 4 Vertucci's classification and 10.74%(n=16) of the teeth had Type 5 vertucci classification as shown in (Graph 1). Association between tooth number and vertucci classification showed that Type I vertucci classification was the most common type in which tooth number 34 was 24.83%, 35 was 24.16% , 44 was 4.03% and 45 was 10.74% as shown in (Graph 2).Pearson Chi

square value:151.966,DF:12,p value:0.000(<0.05 which is statistically significant) as shown in (Table 1).

Graph 1: Bar graph represents the types of Vertucci's classification, where pink , yellow, blue, violet and green colours denote the Type 1,2,3,4 & 5 respectively. X axis represents the types of vertucci classification and Y axis represents the number of samples present.
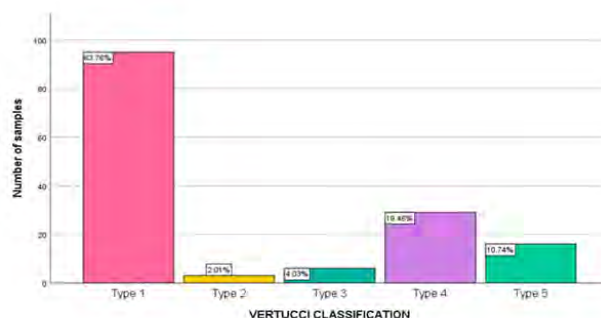
Graph 2: Bar graph represents the association between the tooth number and vertucci classification,where grey, green, orange and blue colour denotes the tooth number 34,35,44 and 45 respectively. X axis represents the Vertucci's classification and Y axis represents the number of samples of the CBCT images.All types of vertucci classification from type 1 to type 5 were present in mandibular premolars and type I(1-1) was the most common followed by type 4 and type 5.Chi square test (Table 1)was done and association was found to be statistically significant, P value:0.01 (<0.05) hence statistically significant.
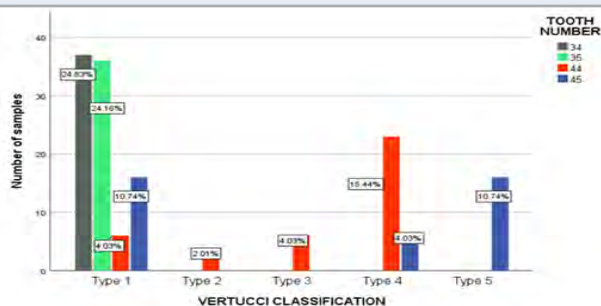
Table 1. Shows the Chi Square Test for the association between Tooth number and Vertucci's classification. From this table it is evident that Type 1 is seen mostly in 34 and 35, Type 4 is seen mostly in 44 and Type 5 is mostly seen in 45.

	Value	df	Asymptotic Significance (2-sided)
Pearson-ChiSquare	151.966	12	.000
Likelihood ratio	153.681	12	.000
Linear by Linear Association	57.936	1	.000
N valid cases	150		

This study aiming at finding out the root canal morphology of mandibular premolars using CBCT images.Successful endodontic therapy needs significant knowledge of the anatomic features of the root and root canal system.The CBCT images of the mandibular premolars have been represented in(fig 1,2,3,4).

Figure 1: Type 1(1-1)

Figure 2: Type 2(2-1)

Figure 3: Type 3(2-1-2)

Many studies denoted an increased level of endodontic failures due to complexity and diversity of root canal configurations in mandibular premolars.(England, Hartwell and Lance, 1991).The lack of knowledge and missing a root canal are the most common reasons for failure in endodontic treatment.A study conducted by Sepanta Hosseinpour et al, showed that 70.9% were Vertucci's type I, followed by 10.4% type III, 7.18% type IV, 5.23% type II and 5.16% type V in mandibular first

premolar and among mandibular second premolars, 82.86% were type I, 6.25 type III, 5.32% type II, 4.27% type IV, and 0.69% type V which was similar to our study. (Hosseinpour et al., 2016).

According to Velmurugan et al, reported that 97.10% of the mandibular first premolar teeth were found to have one root (134 teeth) whereas 2.89% teeth were found to have two roots (4 teeth) (Velmurugan and Sandhya, 2009). In 2007, Rahimi et al, in a study on Tabriz population demonstrated the highest prevalence of type V (16.9%) between reviewed studies. (Rahimi et al., 2007). Bolhari et al. noted that 91.24% of root canals classified as type I in mandibular premolar and the 8.86% were going to other types in Tehran population(Bolhari, Assadian and Fattah, 2013).

Figure 4: Type 4(2-2)

Figure 5: Type 5(1-2)

A study conducted by Vega-Lizama et al, reported that the most variations in the first mandibular premolar in this Maya population had a C-shaped configuration, had more than one root canal, and were located from the middle to the apical portion of the root.It showed that 54 teeth with one canal were Vertucci´s Type I (Vertucci). Of the 35 cases with two canals, 13 (37.1 %) corresponded to Type III, 19 (54.3 %) to Type V, two cases were Type VII (5.7 %) and one had a 12121 (2.9 %) pattern(Vega-Lizama et al., 2018). The most commonly observed root morphology was the single rooted mandibular first premolars (80%), followed by 2 (18%), and 3 rooted (2%). It is interesting to note the higher prevalence of two rooted mandibular first premolars in Saudi population compared to Egypt (3.2%), Indian (6%) populations(Alhadainy, 2013),(Singh and Pawar, 2014). The study from the Kuwait population reported a high

incidence of two rooted teeth (15%), but it assessed only twenty mandibular first premolars(Zaatar et al., 1997).

A study conducted by Maghfuri et al, reported that the majority of the study samples had a single root and one root canal, two roots were found in 18% and two canals in 26%. Such morphological variations should be taken into consideration to ensure successful root canal treatment of these teeth(Maghfuri et al., 2019). Thus, this study helps in knowing the importance of locating all the canals and its configuration for a successful root canal therapy and also the importance of CBCT.

CONCLUSION

From this study, it can be concluded that Type I [1-1] and Type 4 Vertucci's classification was mostly seen in mandibular first premolars. Type 1 and Type 5 were mostly seen in mandibular second premolars.Missing a root canal are the most common reasons for failure in endodontic treatment. Clinicians should be aware of the canals and its configurations because its morphology varies largely in different individuals.Thus, CBCT is the gold standard diagnostic method in recognizing canal configurations.

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Incidence of Number of Roots in Maxillary Second Molars – A Cbct Analysis

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ABSTRACT

The aim of the study is to find the incidence of the number of roots in maxillary second molars. In endodontic therapy, a comprehensive awareness of the root-canal anatomy is of great importance, and clinicians' failure to recognize an unusual canal morphology may lead to unsuccessful treatment. It is generally accepted that a serious explanation for the failure of passage therapy is an inability to localize and treat all of the canals of the basis canal system. In the present study, a total of 50 CBCT scan reports were collected from the Radiology department, Saveetha Dental College, Chennai, for evaluation. The CBCT scans were analysed for the number of roots and number of root canals present in maxillary second molars. The collected results were entered in Microsoft excel. Data analysis was done using SPSS software 20.0. The study results that the incidence of three roots are 83% , two roots are 10%, one root is 5% and four roots are 2 %. The incidence of three root canals is 86% , four root canals are 11% and two root canals are 3 % . Although the occurrence of maxillary second molar with one root or two roots isn't high, diagnosing these unusual cases at its early treatment stage is of significance for the success of endodontic treatment

KEY WORDS: MAXILLARY SECOND MOLARS, ROOT CANAL MORPHOLOGY, NUMBER OF ROOTS, NUMBER OF ROOT CANALS.

INTRODUCTION

Endodontic therapy consists of a series of treatments, including removing pulpal tissue, filing and shaping root canals, obturation of the root canal space, and placement of a permanent restoration for the tooth. In endodontic therapy, a comprehensive awareness of the root-canal anatomy is of great importance, and clinicians' failure

to recognize an unusual canal morphology may lead to unsuccessful treatment (Sha, Sun and Chen, 2018). It is generally accepted that a serious explanation for the failure of passage therapy is an inability to localize and treat all of the canals of the basis canal system. The risk of missing anatomy during passage treatment is high due to the complexity of the basis canal system.

All categories of teeth may have extra roots and/or canals, but the likelihood of finding aberrant canal configurations is higher in premolars and molars. The impact of missed anatomy on the result of endodontic treatment is difficult to assess, and therefore the literature on this subject is limited; a promising approach for future investigation may be a comparison of the amount of canals found in failed treatment cases and after re-treatment. The clinical impact of missed anatomy is often clearly demonstrated with an outsized number of re-treatment case reports

available within the literature; within the majority of those cases, failure of endodontic therapy is related to untreated canal space. Localization and treatment of this missed anatomy typically results in complete clinical and radiographic healing. (Cantatore, Berutti and Castellucci, 2006). The standard configuration of maxillary second molars has been described to have three roots and either three or four canals, with the fourth canal usually being the second mesiobuccal (MB2).

Peikoff et al. (Peikoff, Christie and Fogel, 1996) conducted a retrospective study of 520 endodontically treated maxillary second molars and have classified the anatomical root and canal variations found in maxillary second molar into six variants:

- Three separate roots (MB, DB, and P-palatal) with one canal in each root;
- Three separate roots (MB, DB, and P) and four canals (two in the MB root);
- Three roots but MB and DB canals combine to form a common buccal (B) with a separate P canal;
- One B and one P canal with a single canal in each;
- Single canal in a single conical root; and
- four separate roots – MB and DB and two palatal roots – a mesiopalatal and a disto palatal root.

Most of the researchers have focused on more number of roots (Deveaux, 1999) (Libfeld and Rotstein, 1989) (Fahid and Taintor, 1988), (Kottoor et al., 2010) and root canals in the maxillary second molar. Presence of single root and single canal is commonly found in mandibular second molar, describing the possibility of single root and single canal in maxillary second molar. Researchers have found only 0%–3.1% incidence of occurrence of single root and single canal in maxillary second molar. (Peikoff, Christie and Fogel, 1996)

We have numerous highly cited publications on well designed clinical trials and lab studies (Govindaraju, Neelakantan and Gutmann, 2017; Azeem and Sureshbabu, 2018; Jenarthanan and Subbarao, 2018; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Teja, Ramesh and Priya, 2018; Janani and Sandhya, 2019; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Poorni, Srinivasan and Nivedhitha, 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique and Nivedhitha, 2019; Siddique et al., 2019; Siddique, Nivedhitha and Jacob, 2019). This has provided the right platforms for us to pursue the current study. Our aim is to find the incidence of the number of roots in maxillary second molars.

MATERIAL AND METHODS

In the present study, a total of 50 CBCT scan reports were collected from the Radiology department, Saveetha Dental College, Chennai, for evaluation. The CBCT scans were analysed for the number of roots and number of root canals present in maxillary second molars. Dependent variables were the maxillary second molars, number of root canals, number of roots. Independent variables were the name, age, gender. The data collected were cross verified by another examiner. The collected results were entered in Microsoft excel. Data analysis was done using SPSS software 20.0. Statistics used for analysis was Descriptive statistics and comparison of variables were done using chi square test where p<0.05, statistically significant.

RESULTS AND DISCUSSION

The study results that the incidence of three roots are 83% , two roots are 10%, one root is 5% and four roots are 2 % (Figure 1). The incidence of three root canals are 86% , four root canals are 11% and two root canals are 3 % (Figure 3). According to figure 2 chi-square tests p value = 0.9 > 0.05 statistically not significant. And according to figure 4 chi-square tests p value = 0.7 > 0.05 statistically not significant. The study revealed the occurrence of three roots with three root canals (76%) were higher than three roots with four root canals (7%). The incidence of fused roots, that is, the presence of two roots with three root canals (7%) were more prevalent than one root with three canals (3%). There were also incidence of four roots with four root canals (2%). And according to chi-square tests p value = 0.0 <0.05 statistically significant. (Figure 5).

Figure 1: This graph represents the number of roots present in the maxillary second molars. X- axis depicts the number of roots and Y-axis depicts the number of teeth. The results from this graph show that maxillary second molars (17 and 27) mostly have three roots (green-83%) but sometimes they may also contain two roots (red-10%) or a single root (blue-5%) and in very rare conditions it may also contain four roots (orange-2%).
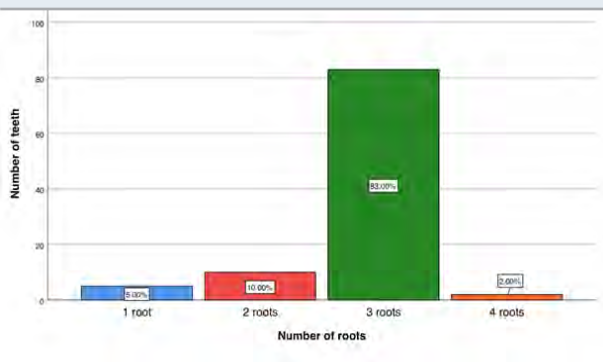
Most studies on anatomical variations of maxillary molars appear to deal with maxillary first molars, as anatomical variations in second molars are not so common. Only a few cases of maxillary second molars have been reported with variations in the number of roots and root canals such as two MB roots, three MB canals, two palatal roots with two or three root canals, and a second distobuccal (DB) canal. (Deveaux, 1999) (Libfeld and Rotstein, 1989) (Fahid and Taintor, 1988) (Kottoor et al., 2010)

Figure 2: This graph shows the association between the tooth number and the number of roots present. X-axis depicts the tooth number and Y-axis depicts the number of the teeth. The results from this graph show that there is no significant difference between the right (17) and left (27) maxillary second molars in the number of roots. Chi-square tests were done and the association was found to be statistically insignificant ; p value = 0.9 (> 0.05) hence not statistically not significant.
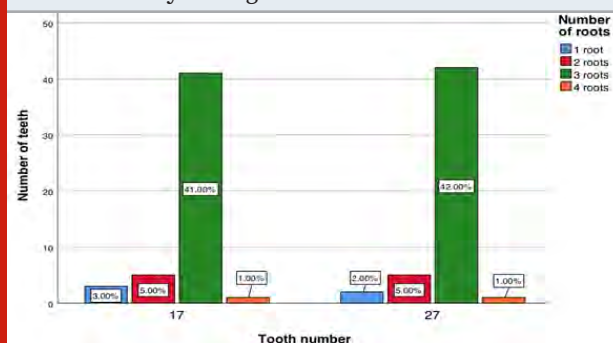
Figure 3: This graph represents the number of root canals present in the maxillary second molars. X- axis depicts the number of root canals and Y-axis depicts the number of teeth. The results from the graph shows that the maxillary second molars (17 and 27) mostly have three root canals (blue-86%) but sometimes they may also contain four root canals (pink-11%) and in rare conditions it may also contain two root canals (Yellow-3%). The incidence of three root canals (86%) are more prevalent than other numbers of root canals.
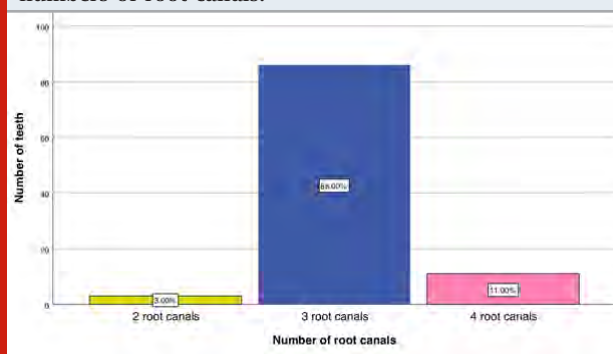
Peikoff et al. (Peikoff, Christie and Fogel, 1996) stated that 3.1% of maxillary second molars had one root and one canal. The incidence of fused roots in maxillary second molars was investigated by Kim et al (Kim, Lee and Woo, 2012) in a Korean population using CBCT and was found to be 10.7%. Similarly, Zhang et al. (Zhang et al., 2011) in a Chinese population using CBCT found the incidence of a single root in maxillary second molars to be 10%. When only one root is present, the root canal system may commonly present with a single broad root canal or two canals that may or may not join or a C-shaped canal.

Carlsen et al (Carlsen et al., 1992) investigated 104 single-rooted maxillary second molars from a Scandinavian population by sectioning technique and found that 25.96% of single-rooted maxillary second molars had a single canal at the mid-root level. Hartwell and Bellizzi (Hartwell and Bellizzi, 1982) in their study of 176 teeth concluded that the occurrence of maxillary second molars with a single root and a single canal was 0.6%. Libfeld and Rotstein (Libfeld and Rotstein, 1989) in an Israel population reported that this configuration was present in 0.5% of teeth.According to Wang et al., (Wang, Hui and Huang, 2011) the occurrence of maxillary second molars with single root and a single canal is very rare. Christie et al. (Christie, Peikoff and Fogel, 1991) have reported four-rooted maxillary second molar abnormalities, that included two palatal roots.

Figure 4: This graph shows the correlation between the tooth number and the number of roots canals present. X-axis depicts the tooth number and Y-axis depicts the number of the teeth. The results from this graph shows there is no significant difference between the right (17) and left (27) maxillary second molars in the number of roots canals. Chi-square tests were done and the association was found to be statistically insignificant ; p value = 0.7 (> 0.05) hence statistically not significant.
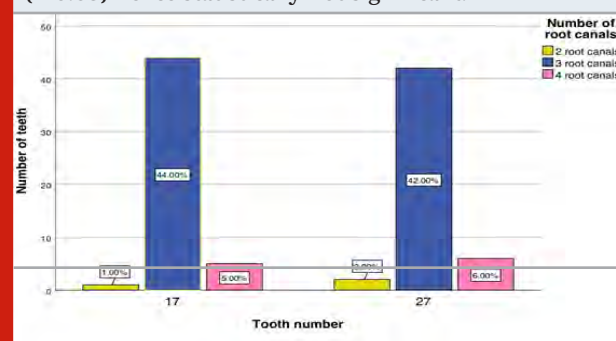
Figure 5: This graph shows the correlation between the number of roots and the number of roots canals present. X-axis depicts the number of roots and Y-axis depicts the number of the teeth. The results from this graph shows that three roots with three canals (blue) was mostly commonly seen (76%) followed by three roots and four canals (pink-7%) and two roots and three canals (blue - 7%). Chi-square tests were done and the association was found to be statistically significant ; p value = 0.00 (<0.05) hence statistically significant.
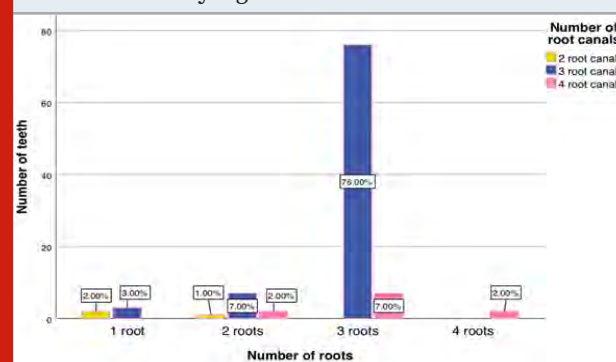
CONCLUSION

This study revealed that occurrence of the "standard" configuration in maxillary second molars, i.e. three roots with three canals (76%) or four canals(7%) was most frequent. Although the occurrence of maxillary second molar with two roots or one root isn't high, diagnosing these unusual cases at its early treatment stage is of significance for the success of endodontic treatment. CBCT must be utilized in these cases when conventional radiographic examination isn't conclusive in identifying the aberrations within the canal anatomy so as to stop excessive dentin removal in search of other canals.

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Assessing and Comparing the Fracture Strength of Typodont Versus Natural Teeth

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ABSTRACT

Working on a live human tooth takes expertise that only comes with pre-clinical practice. The typodont is an educational model of the oral cavity used by dental students pre-clinically. But for efficient practice, a model with comparable physical properties is imperative. Fracture strength (FS) among a few others, is a very necessary component of understanding the structure and behaviour of a natural tooth. Thus, we have aimed to compare the FS to assess whether typodont teeth prove to be an apt representation of natural teeth to practise on pre-clinically. 10 samples were split into two groups - Group 1 consisted of 5 natural premolars. Group 2 consisted of 5 typodont premolars. The FS of all the typodont teeth were higher than that of all the natural teeth. Thus, more force is required to cause a displacement within the material of the typodont teeth than in actual teeth, leading to a difference in work style. This hints that pre-clinical students and clinicians apply dissimilar pressures on their instruments while attempting to bring about the same results. The FS of typodont teeth and natural teeth are significantly dissimilar, thus enlightening the need for a different material to represent a human tooth pre-clinically.

KEY WORDS: FRACTURE STRENGTH, TYPODONT TEETH, NATURAL TEETH, DISSIMILARITIES, PRE-CLINICAL.

INTRODUCTION

Dentistry is a highly specialized and exacting science which requires the exercise of great skill. Since the development of such skill cannot be done without relentless systematic practice, it is logical to say that a trainee cannot, as a bud in training, be permitted to practice by trial and error on live patients and thus certain specialized training apparatuses that simulate the human jaw and tooth structures have been developed over time as pre-clinical aids (Garson, 1969). The most widely used training apparatus in use today is the typodont - a typodont is an educational model of the oral cavity simulating teeth, the gingiva and the palate, used by dental and hygienist students pre-clinically. Typically, typodonts have replaceable teeth that can be screwed-in, and are composed of materials that allow students to prepare cavities and fill them with restorative materials such as amalgam, composite or glass ionomer cement; bond orthodontic brackets or to prepare temporary teeth for crowns and bridges (Oliver and Volp, 1991; Titshall, McKnight and Hunt, 1996; Enochs et al., 2018).

The use of typodonts have established various advantages and disadvantages over the years. It is economical, easy to handle and standardised – allowing room for comfortable learning. The advent of new technology has also resulted

in the use of entities like computer programmed mannequins (LeBlanc et al., 2004; Epps, White and Tofil, 2013; Hemmer, 2014) with sound indicators to alert the operator that the mannequin is in pain from an overprepared cavity to simulate a real patient. The computer-assisted simulator DentSim (Tavkar and Pawar, 2017), is a clinical counterfeit for pre-conservative work providing real-time tactile feedback using three-dimensional graphics. It consists of a mannequin, a typodont with teeth and a set of rotary instruments (Welk et al., 2004, 2008). The attached infrared cameras and LEDs allow the user to visualise three-dimensional images of their work area from different angles and can also compare the student's preparation to an 'ideal preparation' already pre-fed into the computer (Zheng et al., 2014; Pavaloiu et al., 2016).

As remarkable as these replicas are, they still do pose with certain limitations. The apprehension of the patient to dental treatments is one of the most crucial walls that a dentist is met with in an actual practice (Kleinknecht, Klepac and Alexander, 1973; Jöhren et al., 2000; Erten, Akarslan and Bodrumlu, 2006). This psychological aspect can only be understood and dealt with while interacting with real patients in clinics and not on a typodont in a pre-clinical laboratory. Saliva is another such concern. The challenge of maintaining complete dry isolation (Costello, 2001) during a procedure from saliva is not encountered in a typodont and so pre-clinical work appears to be much easier. Similarly, the movement of a patient's tongue (Anthony, 1956), difference in the difficulty level of retraction of soft tissues, fogging of the mouth mirror (O'hara, 1958), varied mouth openings differing from patient to patient, the potential to close his/her mouth and the patient's tendency to move giving rise to a margin for gross error are all problems that occur only in real patients and not pre-clinically.

These are to be expected as they are beyond our current scientific outreach. But there are parameters such as the various physical properties of typodont teeth that can be controlled and optimised to bring about a better pre-clinical experience. To do so, we must assess each physical aspect and make a comparison between the two for natural and typodont teeth and propose a change in material if the physical properties are vastly different. One such important property is the fracture strength of teeth (Steagall, Ishikiriama and de Lima Navarro, 1980). Fracture strength or breaking strength is the ability of a material to resist failure and it is designated specifically according to the mode of applied loading such as tensile, compressive or bending stress; or it can be defined as the stress at which a specimen fails due to fracture (DeGarmo et al., 1997). It is commonly recorded for a given specimen through a tensile test which charts a stress-strain curve, where the final point represents the fracture strength.

The fracture strength of a typodont tooth and a natural tooth talks about how much stress it can take before it fractures, thus indirectly painting a picture about how much operator adaptation is needed while handling each type of tooth. Ideally, there should not be much of a difference between the two types of teeth and the need to adapt handling techniques between them should be minimal or none at all. If there is a large difference in the compressive stress at maximum force (fracture strength) between the two groups, it indicates that typodont teeth and natural teeth are physically dissimilar and that increases the need for adapting handling techniques while working between the two types of teeth, thus treating them as two different entities altogether – therefore destroying the purpose of a pre-clinical model for students to practice on before working on a real tooth.

We have numerous highly cited publications that are well designed clinical trials and lab studies (Govindaraju, Neelakantan and Gutmann, 2017; Azeem and Sureshbabu, 2018; Jenarthanan and Subbarao, 2018; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Teja, Ramesh and Priya, 2018; Janani and Sandhya, 2019; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Poorni, Srinivasan and Nivedhitha, 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique and Nivedhitha, 2019; Siddique et al., 2019; Siddique, Nivedhitha and Jacob, 2019). This has provided the right platforms for us to pursue our present study. Hence, we have aimed to compare the fracture strength and to assess whether typodont teeth prove to be an apt representation of natural teeth to practise on pre-clinically because idealising pre-clinical models to represent real teeth as much as humanly possible is a great attempt to improve the efficiency of clinical performance.

MATERIAL AND METHODS

Study Design and Setting: A total of 10 samples were split into two groups and were tested for fracture strength using compressive stress in an Instron universal testing machine (UTM) (Annappa and Panditrao, 2012). The first group (Group 1) consisted of 5 natural mandibular first premolars that were free of caries, tooth wear, cracks and fractures and were freshly extracted for therapeutic reasons and were stored until required for use post disinfection. The second group (Group 2) consisted of 5 new unrestored Nissin typodont (PRO 2001-UL-HD-HM-32) mandibular first premolars. The samples were embedded in auto-polymerizing acrylic resin blocks made from a putty polyvinyl siloxane 3x3 square mould and were mounted parallel to the long axis of the teeth. The graphs and values were obtained digitally and the compressive stress at maximum force was recorded in MPa units. The data obtained was collected for statistical analysis.

Data Collection and Statistical Analysis: Data was recorded in Microsoft Excel 2016 (Microsoft Office 10) and was later exported to the Statistical Package for the Social Sciences for Windows (Version 20.0, SPSS, Inc., Chicago, USA) and was then subjected to statistical analysis. An Independent-Samples T Test (Levene's Test

for Equality of Variances & T Test for Equality of Means) was used with the level of significance set at p<0.05.

teeth. 5 out of 5 typodont samples have greater values of compressive stress at maximum force (MPa) than natural teeth.

Figure 1: Shows 5 samples from Group 1 (natural teeth) and Group 2 (typodont teeth) which were embedded in acrylic resin.

Figure 3: Showing a sample from Group 2 (a new unrestored Nissin typodont mandibular first premolar) post fracture along with its broken half after being tested for fracture strength in an Instron universal testing machine. The fracture appears to be vertical and along the long axis of the tooth.
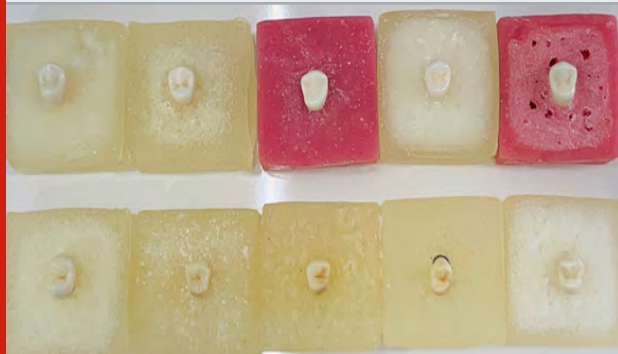
Figure 2: Showing a sample from Group 2 (a new unrestored Nissin typodont mandibular first premolar) mounted parallel to the long axis of the tooth and ready to be tested for its fracture strength in an Instron universal testing machine.

RESULTS AND DISCUSSION

The final dataset comprised of 10 samples of teeth which were evenly split into 2 groups – Group 1 and Group 2. Group 1 consisted of 5 natural mandibular first premolars that were free of caries, tooth wear, cracks and fractures and were freshly extracted for therapeutic reasons and were stored until required for use post disinfection. Group 2 consisted of 5 new unrestored Nissin typodont (PRO 2001-UL-HD-HM-32) mandibular first premolars. According to the results from Figure 4, there is a considerable difference in the fracture strengths of natural teeth when compared to that of typodont

Figure 4: Bar chart representing the fracture strength for each sample where Group 1 (natural teeth) and Group 2 (typodont teeth) are in the 'X' axis and the compressive stress at maximum force (MPa) is in the 'Y' axis. Group 1 is represented by the colour light blue while Group 2 is represented by a darker blue, with the values of their individual compressive stresses at maximum force labelled above each bar column. It shows a clear difference in fracture strengths between the samples in Group 1 and 2, where the typodont teeth in Group 2 have a higher fracture strength when compared to the natural teeth in Group 1. (Independent-Samples T Test – Levene's Test for Equality of Variances & T Test for Equality of Means, statistically significant 'p' value – 0.003, p<0.05)
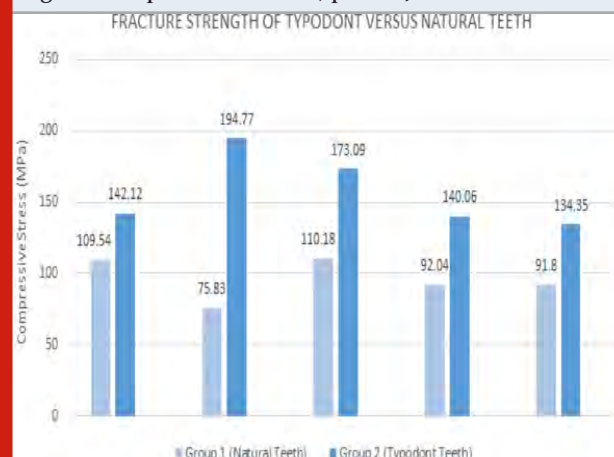
Figure 5: Bar chart representing the difference between the mean compressive stress at maximum force for Group 1 (natural teeth) and Group 2 (typodont teeth) where the 'X' axis shows the two groups and the 'Y' axis shows the compressive stress at maximum force in MPa units. The lighter blue represents the natural teeth in Group 1 and the darker blue represents the typodont teeth in Group 2. The mean compressive stress at maximum force for natural teeth (95.878 MPa) is lower than that for typodont teeth (156.878 MPa) hinting that the fracture strength for typodont teeth is significantly higher. (Independent-Samples T Test - Levene's Test for Equality of Variances & T Test for Equality of Means, statistically significant 'p' value – 0.003, p<0.05).
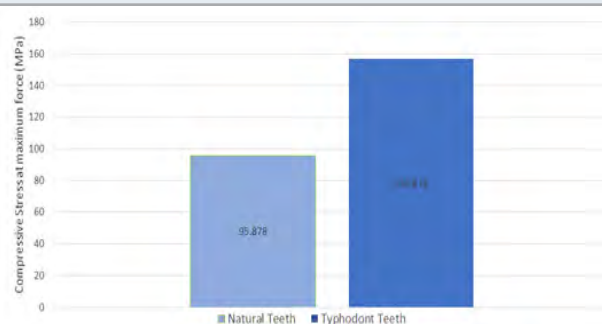
The values of compressive stress at maximum force for the natural tooth samples in Group 1 are 109.54 MPa, 75.83 MPa, 110.18 MPa, 92.04 MPa and 91.8 MPa while the values for the same parameter in Group 2 are 142.12 MPa, 194.77 MPa, 173.09 MPa, 140.06 MPa and 134.35 MPa respectively. Interestingly, even the lowest value of 134.35 MPa for typodont teeth is greater than the highest value of 110.18 MPa for natural teeth. The means for compressive stress at maximum force (MPa) were calculated for both groups as inferred from Figure 5, where the mean compressive stress at maximum force for natural teeth (95.878 MPa) is lower than that for typodont teeth (156.878 MPa) hinting that the fracture strength for typodont teeth is significantly higher. To check for statistical reliability, an Independent-Samples T Test - Levene's Test for Equality of Variances & T Test for Equality of Means was carried out where we obtained the statistically significant 'p' value of 0.003, where p<0.05. (Refer Table 1) This means that there is a significant difference in the fracture strength of the two materials, and that they have different physical properties.

As inferred from Table 2, the maximum force used among the samples of Group 1 for natural teeth was 1101.81 N, which is comparable to a maximum force of 1192.30 N as used on intact natural premolar teeth (positive control group) in a study conducted by Göktürk et al. in 2018 (Göktürk et al., 2018). In contrast, the maximum force

Table 1. Tabulation showing the results of an Independent-Samples T Test - Levene's Test for Equality of Variances & T Test for Equality of Means conducted between the compressive stress at maximum force (MPa) and the two groups of natural teeth (Group 1) and typodont teeth (Group 2) where we have obtained a statistically significant 'p' value of 0.003 where p<0.05 after rejecting our null hypothesis of equal variances assumed (p=0.002). Hence, this means that there is a reliable difference between the compressive stress at maximum force for Group 1 and Group 2.

Compressive Stress at Maximum Force (MPa)	Levene's Test for Equality of Variances		T-Test for Equality of Means					
		F	Sig.	t	df	Sig. (2 tailed)	Mean Difference	Std. Error Difference
Equal Variances Assumed		3.878	0.084	-4.591	8	0.002	-61.000	13.288
Equal Variances Not Assumed				-4.591	6.230	0.003	-61.000	13.288

used among the samples of Group 2 for typodont teeth was 1947.68 N. This vast difference calls for the birth of new materials to replace the current acrylic used in typodont teeth to ensure a closer experience pre-clinically to real life practice.

Mandibular premolars were selected because they are easy to collect in the disease-free form (they are commonly

extracted for orthodontic purposes) and have a single root. In addition, these teeth are highly susceptible to fracture and frequently require replacement prostheses. But testing other teeth like incisors, canines or molars may have yielded the possibility of different results. Since the study does present with such limitations, further research must be done to confirm the generalisability of our findings.

Table 2. Tabulation showing the maximum force applied on the samples in both groups in newton units (N), the compressive stress at maximum force in megapascal units (MPa) and their means for compressive stress at maximum force – also in megapascal units (MPa).

Group	Maximum Force [N]	Compressive Stress at Maximum Force [MPa]	Mean [MPa]
Group 1 – Natural Teeth	1095.36	109.54	95.878
	758.25	75.83	
	1101.81	110.18	
	920.38	92.04	
	918.02	91.8	
Group 2 - Typodont Teeth	1421.16	142.12	156.878
	1947.68	194.77	
	1730.89	173.09	
	1400.58	140.06	
	1343.47	134.35	

CONCLUSION

To ensure sound preparation for an actual clinical set-up, students must be given the closest possible resemblance to it pre-clinically. The fracture strengths of typodont teeth and natural teeth are significantly dissimilar, thus enlightening the need for a different material to represent a human tooth pre-clinically. Idealising pre-clinical models to represent real teeth as much as humanly possible is a great attempt to improve the efficiency of clinical performance. But since the study does present with limitations, further research needs to be done to confirm the validity of our findings.

ACKNOWLEDGEMENTS

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A Preliminary Study on Application of Vibrating Device Instead of Topical Anaesthetic Gel During Injection of Local Anaesthesia

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ABSTRACT

The "gate control" theory suggests pain can be reduced by simultaneous activation of nerve fibers that conduct non-noxious stimuli. Local anaesthesia can be an anxiety inducing or a fearful experience. Vibration technique has been used for many years to reduce the pain. Patients were subjected to local anaesthetic injections after one of the following mucosal preparations. Three infiltration injections were given for each patient in three different quadrants between first and the second premolars. During the first injection direct infiltration was given without the application of topical anesthesia, then while injecting the second injection 20% benzocaine topical anesthesia was applied for 2 minutes and with application of vibrating stimulus the third infiltration was given. Patients were then given a score on the injection discomfort after each administration on a visual analogue scale. Statistical analysis was done using SPSS and Pearson chi-square test was performed. Results show that application of topical anaesthesia was better than vibrating device. Based on the results it is conclusive that the topical application is better than vibration stimulus.

KEY WORDS: VIBRATING DEVICE, LOCAL ANAESTHESIA, TOPICAL ANAESTHESIA.

INTRODUCTION

In dentistry managing pain and anxiety in patients has always been an essential part. To prevent pain, dentists must administer local anaesthesia (LA) via a needle injection. Anxiety and fear arise prior to or during the injection and remains as a barrier for many children and adults from receiving dental treatment. Therefore there is a constant search for newer techniques to alleviate the invasive and painful nature of the needle injection. In recent years, many researchers have developed alternative methods which can enable dental anaesthesia to be less invasive and more patient-friendly. The most common alternative methods in providing anaesthesia in dentistry are: topical anaesthesia, electronic dental anaesthesia, vibrating devices, jet-injectors, iontophoresis, and computerized control local anaesthesia delivery systems (Angelo and Polyvios, 2018).

Local anaesthesia can be an anxiety inducing or a fearful experience. Management of pain during the injection of Local anaesthesia is one of the most important steps in performing a dental treatment. Most of the painful dental treatments begin with Local anesthesia, so it is important to control the pain at this step (Ramezani et al., 2017).

Pain in LA can occur due to mechanical trauma at the site of injection or due to rapid expansion of the tissue into which the anaesthetic solution is injected. Various methods like topical anaesthetics, slow infiltration, Transcutaneous electric nerve stimulation (TENS) and vibration can be used to reduce the pain (Ungor et al., 2014).

Topical local anaesthesia is given for various intraoral procedures like toothache, superficial mucosal lesions. They act by blocking the terminal fibres of sensory nerve endings, thus they control painful stimulation during needle insertion (Agarwal et al., 2017). Several indices can be used to measure the level of pain experienced during anesthetic injections. Level of anxiety should be determined before any intervention. Furthermore, many variables are involved in pain expression, and errors can occur in pain measurements. However, a VAS is a reliable tool for estimating levels of pain, assuming that it is correctly designed and the patients are thoroughly briefed about it (Price et al., 1983).

Vibration technique has been used for many years to reduce the pain (Smith et al., 2004; Nanitsos et al., 2009). It is one of the several nonpharmacological techniques used to reduce pain. Vibration was previously applied using a hand-held massager or a vibrating cotton swab. Generally vibration devices create vibrations that significantly decrease pain during needle insertion and the anesthetic injection in infiltration anesthesia of the maxilla and IANB of the mandible (Ghorbanzadeh et al., 2019). As the vibration of the hand-held massager cannot be monitored throughout, there may be variations in frequency and pressure applied from subject to subject over time (Reed, 2001; Johnson and Primosch, 2003; Nasehi et al., 2015).

Some of the newer local anesthetic delivery systems aimed at easing the fear of the needle take advantage of the gate control theory of pain management, which suggests that pain can be reduced by simultaneous activation of nerve fibers using vibration (Nusstein and Beck, 2003; Kuwahara and Ogawa, 2016). However, that pain reduction due to non-noxious touch or vibration can result from tactile-induced pain inhibition within the cerebral cortex itself and that the inhibition occurs without any contribution at the spinal level, including descending inhibitory actions on spinal neurons (Chaudhry et al., 2015; Ahmad and Mohmand, 2018).

We have numerous highly cited publications on well designed clinical trials and lab studies(Govindaraju, Neelakantan and Gutmann, 2017; Azeem and Sureshbabu, 2018; Jenarthanan and Subbarao, 2018; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Teja, Ramesh and Priya, 2018; Janani and Sandhya, 2019; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Poorni, Srinivasan and Nivedhitha, 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique and Nivedhitha, 2019; Siddique et al., 2019; Siddique, Nivedhitha and Jacob, 2019). This has provided the

right platforms for us to pursue the current study. The aim of the present study was to assess the application of vibrating device instead of topical anesthetic gel during injection of Local anesthesia.

MATERIAL AND METHODS

A preliminary study was done among 10 patients who visited the outpatient department at Saveetha Dental College. Patients were subjected to local anaesthetic injections after one of the following mucosal preparations. Three infiltration injections were given for each patient in three different quadrants between first and the second premolars. During the first injection direct infiltration was given without the application of topical anesthesia, then while injecting the second injection 20% benzocaine topical anesthesia was applied for 2 minutes and with application of vibrating stimulus the third infiltration was given.

Local anesthesia administration: Infiltration was administered as injections for the maxilla and mandible. After each administration of local anaesthetic, patients were given a visual analogue scale where they gave a score on the injection discomfort. (Figure 1)

Figure 1: Visual Analogue Scale

Figure 2: Application of vibration to the labial surface.

Figure 3: Waterpik Vibrator

Statistical analysis: The data was exported to SPSS windows version 20 (IBM) for data checking. Data was sorted and represented in frequencies. Descriptive statistics and Pearson chi square test were performed on the tabulated values with the level of significance set at <0.05. The outcome was represented in bar graphs.

RESULTS AND DISCUSSION

Graph 1 shows the pain score on Visual Analogue Scale where pain was severe in Infiltration without topical anaesthesia with a mean score of 6.80 whereas in infiltration with topical anesthesia and infiltration with vibration the mean score was observed as 2.40 and 2.70.

Graph 2 shows that on application of topical anaesthesia majority of the subjects had mild pain (60%), while only 20 % had moderate and severe pain. On direct Infiltration 60% of the subjects had moderate pain while only 20% of the subjects had mild and severe pain. On vibration stimulus all the subjects had moderate pain (100%).

Graph 1: This graph shows the mean pain score comparison of all the 3 groups on Visual Analogue Scale. Infiltration without topical anesthesia (orange colour) has a mean pain score of 6.8 (Moderate pain), infiltration with topical anaesthesia (Yellow colour) has a mean pain score of 2.4 (Mild pain) and infiltration with vibration (Violet colour) with a mean pain score of 2.7 (mild pain). Infiltration without topic anaesthesia was observed to have more mean pain scores when compared with the other two groups.
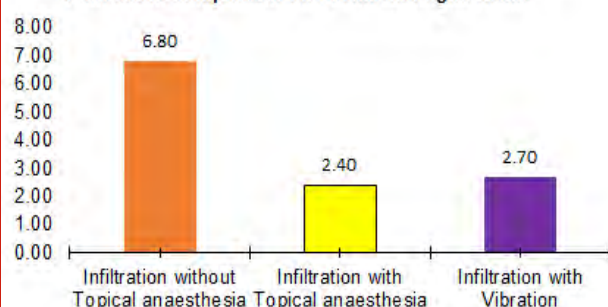
Dental anxiety and fear are the most frequent reasons preventing patients from dental visits and are usually scared of local anesthesia injections (Quarnstrom and Libed, 1994; Nanitsos et al., 2009; Suzuki et al., 2016; Ramezani et al., 2017). Hence, pain and anxiety control during local anesthetic injections is of significant clinical importance. Topical anesthetics numb the injection surface and provide pain relief on needle insertion, although there are other factors which should be controlled (Nanitsos et al., 2009).

Local anesthesia was given for a complete pain control. Although this method reduces the pain during needle insertion, total elimination of injection pain relies on causes like the amount, type, and injection speed of anesthesia plus the experience of the clinician. In addition, local anesthetics have narrow potential to enter deep into tissue. These might reduce the discomfort during insertion of the needle through the surface however, they are not as effective when the needle passes through deeper layers (Quarnstrom and Libed, 1994; Bonjar, 2011).

Graph 2: This graph shows association between the techniques of Local Anaesthesia and Pain perception using Visual Analogue Scale. The X axis shows the techniques of Local Anaesthesia and the Y axis shows the pain perception on Visual Analogue Scale site in patients undergoing local anaesthesia.From this graph it is evident that "Infiltration with topical anesthesia" showed mild pain (Blue) when compared with the other groups. When infiltration was given along with the vibration the pain experienced by the patients was moderate (Red). It was observed that pain was severe (Green) when infiltration was done without topical anaesthesia and vibration. Pearson chi-square test was done (Table 1), P = 0.001 (<0.05 - indicating statistically significant).
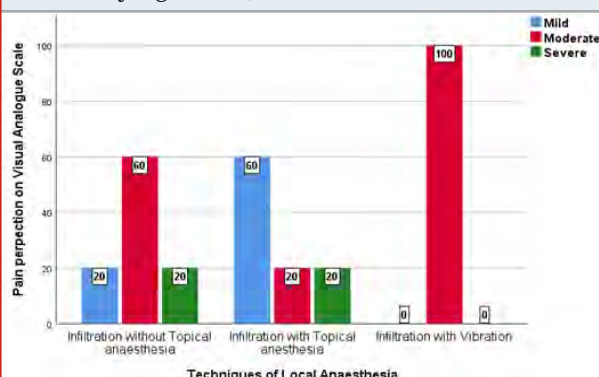
Table 1. Shows the Chi-Square test results for association between the techniques of Local Anaesthesia and Pain perception using Visual Analogue Scale.

	Chi-Square Test		
	Value	df	Asymptotic significance (2-sided)
Pearson Chi-Square	20.000a	18	.001
Likelihood Ratio	19.005	18	.000
N of Valid Cases	10		

Our results are similar to a study done by Saijo et al. (1995) who examined injection pain together with vibration of the site using VibraJect. They could not find significant differences between control and treatment groups (Saijo et al., 2005). However According to a study by Jayanthi et al., reported that the mean pain score during infiltration anesthesia of the maxilla and IANB of the mandible in children who received injections using DentalVibe was significantly lower than that in the control group (Jayanthi et al., 2015).Transmission

of vibration signals through thick A-beta fibers versus pain signals through C fibers will make the sensory area of the brain release inhibitory neurotransmitters these and inhibit the activation of projection neurons within dorsal horn of spinal cord, leading to gate closure over pain stimuli. This is the reason vibration is used to reduce pain during many painful medical and dental procedures (Yenisey, 2009; Ungor et al., 2014).

Further studies are required on the efficacy of vibrations for pain control. For example, certain frequencies of the device may have a particularly high efficacy for pain control, a possibility that should be investigated in future studies. Furthermore, future studies should also investigate the role of related factors such as dental fear and anxiety, previous painful experiences, and the presence of dental pathologies(Ghorbanzadeh et al., 2019).

CONCLUSION

Within the limitations of this study it can be concluded that the Infiltration with topical application was better than Infiltration with vibration stimulus. Further studies with a larger sample size has to be done to confirm that vibration is effective during the injection of Local Anaesthesia.

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Perceptions Towards Cross-Infection Control Measures – A cross sectional study among Dental Outpatients in Chennai

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ABSTRACT

Dental care and dental profession is more prone for risk of infections. Most of them are not aware that they may be a carrier of infection, it may happen that the dentist meets a patient, in whom an earlier infection can be proven by serology, but the patient is not aware of it and the clinical signs and symptoms are missing, as well. In order to prevent the cross infection the dentist has to ensure the hygienic protection of both the patients and the health-care workers. Infection control measures have to be known by the dental care professional and have to be kept informed to the patient by the dental personnel. Hence the aim of this study is to assess the perception of dental outpatients toward cross infection control measures in Chennai. A cross-sectional descriptive study of a convenient sample of patients visiting the dental hospital. A structured, close-ended, self-administered online questionnaire was distributed among 155 patients. The questionnaire consisted of questions related to attitude, awareness, and perception of patients toward infection control measures. Data analysis included frequency distribution tables. The results of this study revealed that there were more female respondents (56%) than the males (44%) and the most commonly seen age group among the respondents was 17-35 years (48%). It was also found that 82% of the respondents believed that the usage of gloves and masks by the dentist was very important and 71% of them stated that they would refuse to get treatment from a dentist who is not wearing gloves and a mask. Majority of the outpatients were more aware about the importance of gloves, masks, goggles in the prevention of cross infection. Excellent sterilization facilities should be established in dental practices to ensure patient safety.

KEY WORDS: DISINFECTION; GLOVES; INFECTION; MASKS; STERILISATION.

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INTRODUCTION

The oral cavity is a unique environment which provides an ideal medium for bacterial growth. Microorganisms present in the oral cavity may be transmitted from person to person through aerosol, water contamination or surface contact (Prasanth et al., 2010). Procedures that have been performed with the use of dental handpieces cause aerosol formation which are commonly contaminated with blood, bacteria, fungi and viruses (Szymanska, 2007). Air-water syringes and turbines may disperse the saliva and microorganisms contained in the patient's mouth, thus contaminating surrounding air and surfaces (Castiglia et al., 2008).

Infection control practices are an important aspect in clinical dentistry as there is a huge increase in the prevalence of infectious diseases among the dental patients. The patients visiting dental clinics for their dental and oral health care may be healthy or suffering from various infectious diseases and many times, the patients may be carriers of infectious diseases that cannot be easily detected clinically (Deogade et al., 2016). Dental health care professionals (DHCPs) are at risk of infections caused by various microorganisms such as Mycobacterium tuberculosis, hepatitis B and hepatitis C viruses, staphylococci, streptococci, herpes simplex virus types 1, human immunodeficiency virus (HIV), mumps, influenza, and rubella (Singh et al., 2011).

Transmission of dental infection can occur through infected air droplets, blood, saliva, and instruments contaminated with secretions (Ibrahim et al., 2017). Infection control and occupational safety recommendations for oral health professionals in India was drafted in 2007 and giving an overview of the dental infection safety and control in India, it stated that the level of infection control in India is still in the early infant stage and way behind the United States and European countries (Abichandani and Nadiger, 2012).

Dental professionals' infection control practices depend on various factors such as knowledge and educational background, availability of required materials, access to required materials, costs, sociodemographic factors (Dagher et al., 2017). Routine use of barrier techniques such as gloves, masks, spectacles has been reported to be important in preventing the three routes of transmission (dentist to patient, patient to dentist, patient to patient) in dental clinics (Baseer et al., 2013). Wearing eye protection is another important consideration, since it protects the operator from aerosols, debris and potentially infective particles (Ebrahimi et al., 2012). Effective infection control is utmost important for providing high-quality dental care for patients and a safe working environment for those who work in dental healthcare facilities (Bommireddy et al., 2016).

To the best of the knowledge, there is no report in recent literature about people's perception towards cross-infection in Chennai. Increasing awareness of cross infection issues in dentistry among the general public will probably be an additional driving force in changing behaviour of dentists and reducing infective hazards (Monarca, 2000). We have successfully completed numerous epidemiological studies for the betterment of our community (Khatri et al., 2019; Manchery et al., 2019; Prabakar et al., 2018a, 2018b, 2018c; Shenoy et al., 2019; Vishnu Prasad et al., 2018). In this research we are studying/analyzing the perception of dental outpatients toward cross infection control measures. Thus the aim of this study is to assess the perception of dental outpatients toward cross infection control measures in Chennai.

MATERIAL AND METHODS

This study was conducted among patients attending a private dental college and hospital in Chennai. This study was approved by the institutional ethical committee. The inclusion criteria for the study were all patients attending for the dental needs in the out-patient department of a private dental institute. Those who were willing to participate for the study were included. Exclusion criteria were patients who were not willing to participate in the study and patients who had dental emergencies which needed immediate treatment.

An online questionnaire survey was created using Google forms. Study was done for a period of two weeks and the questionnaire was given to the randomly selected outpatients. The questionnaire contained 19 questions which included the patient's proforma and questions regarding different perceptions towards the cross infection control measures of a dental clinic. The validity of the questionnaire was purely based on content validity based on logical reasoning. The responses were collected during a one week period and the data were tabulated.

Figure 1: Bar graph representing the distribution of the sample size based on the age of the patients. X axis represents the age of the patients and Y axis represents the number of patients. From the graph, it is evident that a maximum of 48% of the patients were between 17-35 years, 35% of them were between 36-55 years and only 17% were more than 55 years old.
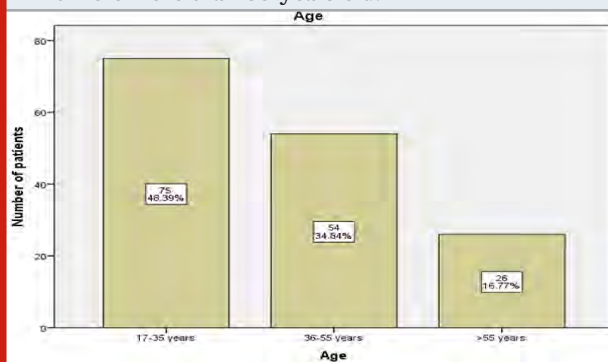
Statistical analysis: The tabulated data was imported to SPSS software by IBM for statistical analysis. Frequency of the number of questions answered was recorded. Chi square test was used to detect the significance (p

value less than 0.05 was considered to be statistically significant).

Figure 2: Bar graph representing the distribution of the sample size based on the gender of the patients. X axis represents the gender of the patients and Y axis represents the number of patients. Purple colour denotes males and yellow colour denotes females. From the graph, it is evident that the maximum number of the patients were females (56%) and the remaining were males (44%). Hence the maximum number of patients taking up this survey were females.

Figure 3: Bar graph representing the distribution of the sample size based on the educational qualification of the patients. X axis represents the educational qualification of the patients and Y axis represents the number of patients. From the graph, it is evident that the maximum number of the patients were undergraduates (67%), 20% of them completed school and 13% of them were postgraduates. Hence the maximum number of patients taking up this survey were undergraduates.
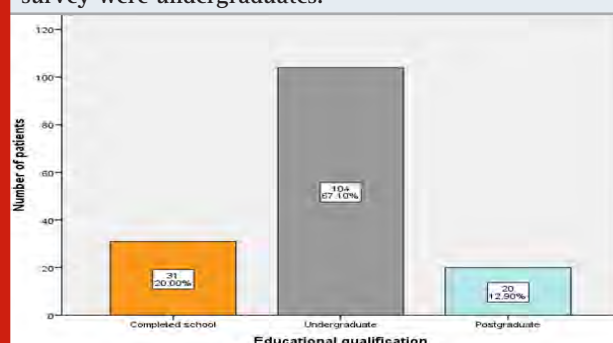
RESULTS AND DISCUSSION

About 155 patients took up this survey whose average age was 27 years [Figure 1]. About 87% of the participants were females and 68% were males [Figure 2]. 67% of the participants were undergraduates, 20% of them completed school and 13% of them were postgraduates [Figure 3]. 63% of the total participants were unemployed and 37% were employed [Figure 4]. It was found that 76% of the patients have visited a dental clinic in the past whereas 24% of them visited a dental clinic for the first time. A majority of 91% patients believed that a dentist

Figure 4: Bar graph representing the distribution of the sample size based on the employment status of the patients. X axis represents the employment status of the patients and Y axis represents the number of patients. From the graph, it is evident that the maximum number of the patients were unemployed (63%) whereas only 37% of them were employed.
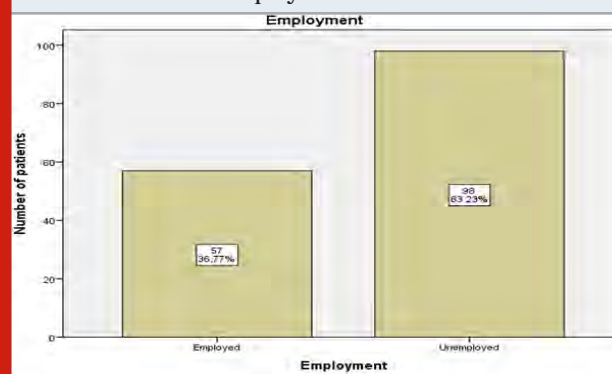
Figure 5: Bar graph representing the percentage of different responses for the question "Do you believe dentists should wear gloves while treating patients?". X axis represents the responses and Y axis represents the number of responses. Blue represents yes response and green represents no response. Higher percentage of respondents (91%) accepted that a dentist should always wear gloves while treating a patient.

should wear gloves while treating patients [Figure 5]. About 85% of the patients also believed that a dentist should wear a face mask while treating patients [Figure 6]. 67% of the patients agreed that a dentist should wear eye goggles while treating patients while 33% of them believed that it was not necessary for a dentist to wear eye goggles while treating patients [Figure 7].

About 82% of the patients believed that the usage of preventive measures like gloves and mask was very important, while 10% of them thought that it was not important for dentists to use preventive measures like gloves and masks [Figure 8]. 77.4% of the patients agreed that dentists can not treat more than one patient with the same pair of gloves [Figure 9]. 71% of the patients refused to receive treatment from a dentist who is not wearing gloves and face mask [Figure 10]. 44.5% of the patients refused to receive treatment from a dentist who

is not immunized against Hepatitis B whereas 36% of them were not aware of Hepatitis B infection [Figure 11]. 65.8% of the patients thought they can catch infection during a dental treatment while 17% of the patients had no idea about cross infection during a dental treatment [Figure 12]. 62% of the patients were aware of the different sterilization methods used in dental clinics whereas 38% of them were not aware of the different methods of sterilization [Figure 13].

Figure 6: Bar graph representing the percentage of different responses for the question "Do you believe dentists should wear face masks while treating patients?". X axis represents the responses and Y axis represents the number of responses. Blue represents yes response and green represents no response. Higher percentage of respondents (85%) accepted that a dentist should always wear a mask while treating a patient.
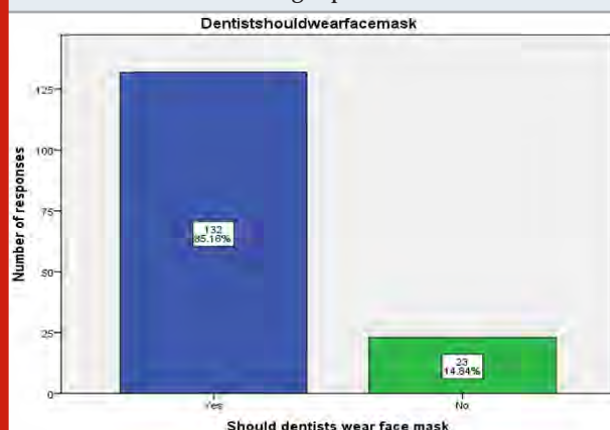
Figure 7: Bar graph representing the percentage of different responses for the question "Do you believe dentists should wear eye goggles while treating patients?". X axis represents the responses and Y axis represents the number of responses. Blue represents yes response and green represents no response. Higher percentage of respondents (67%) accepted that a dentist should always wear eye goggles while treating a patient.
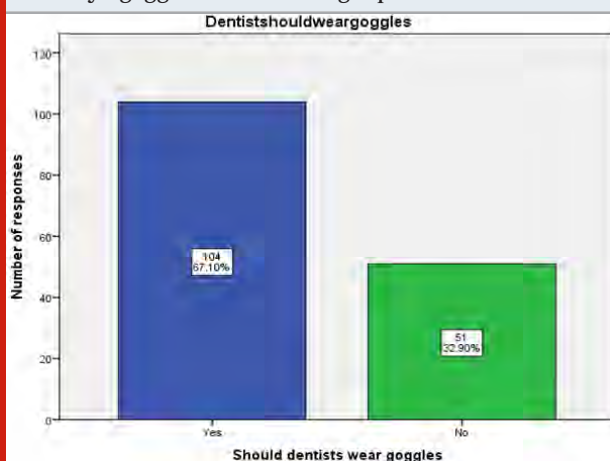
Figure 8: Bar graph representing the percentage of different responses for the question "According to you, how important is the usage of preventive measures like gloves and mask in a dental clinic?". X axis represents the responses and Y axis represents the number of responses. Higher percentage of respondents (82%) believed that the usage of gloves and masks by the dentist is very important whereas 10% of the patients believed it was not so important.

Figure 9: Bar graph representing the percentage of different responses for the question "Can a dentist treat more than one patient with the same pair of gloves?". X axis represents the responses and Y axis represents the number of responses. Blue represents yes response and green represents no response. Higher percentage of respondents (77%) denied that a dentist can treat more than one patient with the same pair of gloves.
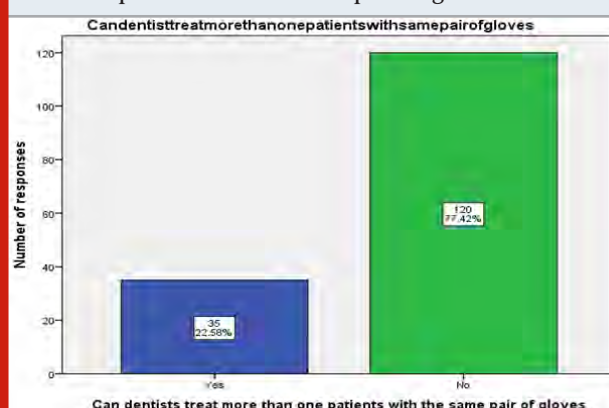
A majority of 69% of the patients believed that disinfection of dental chair, clinic and dental office is also required apart from just the sterilization of the instruments [Figure 14]. 69% of the patients were aware of the biomedical waste management system whereas 31% of them were not aware [Figure 15]. When the patients were asked about the ways through which cross infection can occur, 41% of them chose saliva, 37% of them chose blood, 13.5% of them chose other means and 9% of them had no idea about the different ways through which cross infection could occur [Figure 16]. About 72% of the patients were satisfied with the control

measures taken at the dental clinic whereas 23% of them were not satisfied [Figure 17].

Figure 10: Bar graph representing the percentage of different responses for the question "Would you refuse to receive treatment from a dentist who is not wearing gloves and face mask?". X axis represents the responses and Y axis represents the number of responses. Blue represents yes response and green represents no response. Higher percentage of respondents (71%) stated that they would refuse to get treatment from a dentist who is not wearing gloves and a mask.
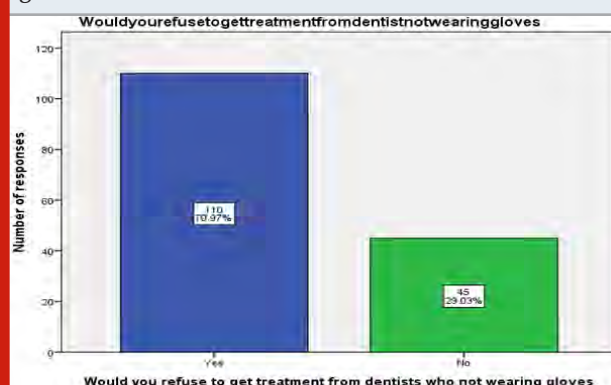
Figure 11: Bar graph representing the percentage of different responses for the question "Would you refuse to receive treatment from a dentist who is not immunized against Hepatitis B?". X axis represents the responses and Y axis represents the number of responses. Higher percentage of respondents (44.5%) accepted that they would refuse to get treatment from a dentist who is not immunized against Hepatitis B whereas 36% of the respondents had no idea about the Hepatitis infection.

On analysing association, it was found that male patients (44 %) preferred not getting treatment from dentists who were not wearing gloves or masks, while the majority of females (29%) denied it. This was found to be statistically significant (Chi square test; p value=0.001-significant) [Figure 18]. It was also found that 42% of undergraduates and the patients who had completed school (20%) were aware of the different sterilization methods used in the dental clinic. This was found to be statistically significant (Chi square test; p value=0.001-significant) [Figure 19].

Patients who were undergraduates believed that cross infection spreads through blood (37%), saliva (21%) and any other means (10%). 20% of those who had completed school believed that cross infection spreads through saliva only which was also found to be statistically significant (Chi square test; p value=0.001-significant) [Figure 20].

Figure 12: Bar graph representing the percentage of different responses for the question "Do you think you can catch infection during a dental treatment?". X axis represents the responses and Y axis represents the number of responses. Blue represents yes response, green represents no response and black represents no idea. Higher percentage of respondents (66%) believed that they can catch an infection during a dental treatment whereas 17% of them had no idea about it.

Figure 13: Bar graph representing the percentage of different responses for the question "Are you aware of the different sterilization methods used in dental clinics?". X axis represents the responses and Y axis represents the number of responses. Blue represents yes response and green represents no response. Higher percentage of respondents (62%) were aware of the different sterilization methods used in a dental clinic.
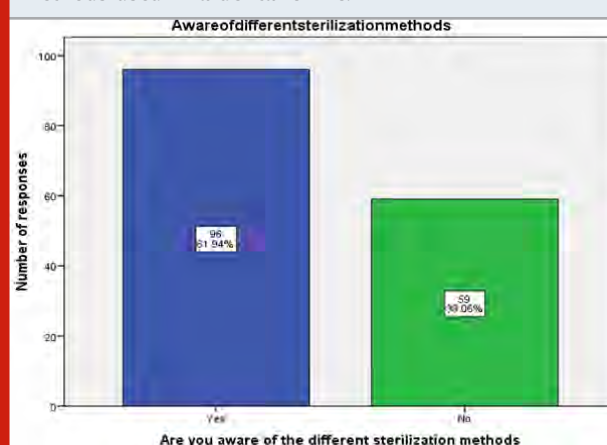
Maximum number of patients who were undergraduates (49%) and those who had completed school (20%) were aware of the biomedical waste management system whereas few undergraduates (18%) and postgraduates

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(13%) were not aware of this system. This difference was statistically significant (Chi-square test; p-value = 0.001- significant) Majority of patients who were undergraduates (24.5%) and those who had completed school (20%) refused to get treatment from dentists not immunized against hepatitis B whereas 23% of undergraduate patients and 13% of the postgraduate patients had no idea about this infection. This was found to be statistically significant (Chi-square test; p-value = 0.001- significant). 64.5% of patients who were undergraduates and those who had completed school (20%) believed that a dentist cannot treat more than one patient with the same pair of gloves. This difference was statistically significant (Chi-square test; p-value = 0.001- significant) [Figure 21]. 51% of patients who were undergraduates and 20% of patients who had completed school refused to get treatment from dentists not wearing gloves and face masks. This difference was statistically significant (Chi-square test; p-value = 0.001- significant).

Figure 14: Bar graph representing the percentage of different responses for the question "Apart from instrument sterilization, is disinfection of dental chair, clinic, dental office required?". X axis represents the responses and Y axis represents the number of responses. Blue represents yes response, green represents no response and black represents no idea. Higher percentage of respondents (69%) believed that the disinfection of dental chairs and clinics was required whereas 20% of the respondents had no idea about it.
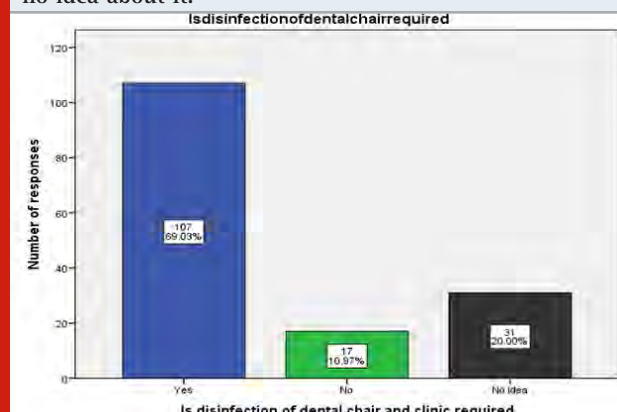
The concentration of bacterial aerosols appears to be highest during certain dental procedures that use high speed drill or procedures like ultrasonic scaling (Leggat and Kedjarune, 2001). The release of microorganisms into aerosols increases the microbial burden in the air and can lead to the contamination of all surfaces in a dental clinic. Because of the frequent aerosol generating procedures in dental practice, these aerosols can function as an important mode for infection transmission in dental clinics (Zemouri et al., 2020). The problem when studying cross-transmission is that it occurs everywhere, though transmission of pathogenic microorganisms does not necessarily result in an infectious disease of the host (Volgenant and de Soet, 2018). Microbial aerosols in the dental clinic may have different origins such as from

the dental procedure, the dental staff or patients, but also from outside sources i.e. air, soil, and dust. Such aerosols can transfer microorganisms to the dental staff or patients (Kimmerle et al., 2012).

Figure 15: Bar graph representing the percentage of different responses for the question "Are you aware that clinical waste should be disposed through the Biomedical waste management system?". X axis represents the responses and Y axis represents the number of responses. Blue represents yes response and green represents no response. Higher percentage of respondents (69%) were aware of the biomedical waste management system followed to dispose of medical waste.
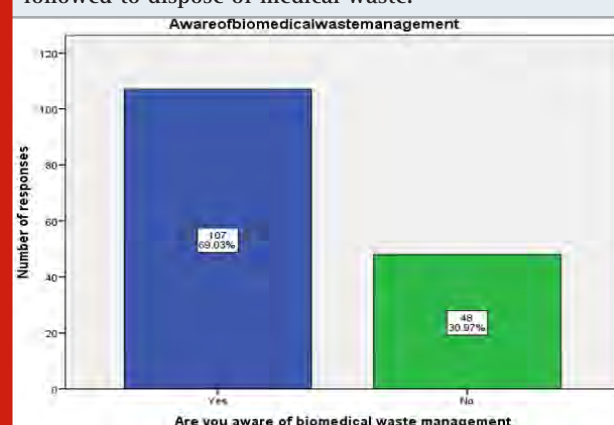
Figure 16: Bar graph representing the percentage of different responses for the question "What are all the ways cross infection can occur from one person to another in a dental setup?. X axis represents the responses and Y axis represents the number of responses. Higher percentage of respondents (41%) thought that cross infection occurs through saliva, 37% of them chose blood, and 9% of the respondents had no idea about the means through which cross infection might occur.
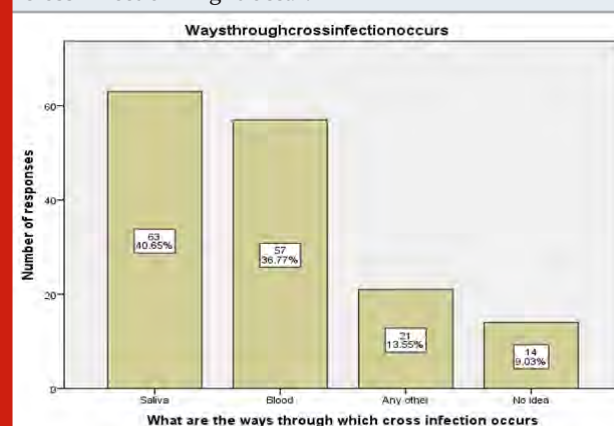
Sterilisation is a procedure that destroys pathogenic and nonpathogenic living organisms in a vegetative form or spore present on the surface of the material. An item or product that is free of living microorganisms is defined as sterile (Laneve et al., 2019). It is essential to ensure that all the microorganisms are killed during the sterilization

process. Thus, the quality control is a significant part of the sterilization procedure (Sheth et al., 2017). Hence dentists and their staff should treat every patient as a potential risk, and implement all barrier techniques, including routine glove and mask use (Burke, 1990).

Figure 17: Bar graph representing the percentage of different responses for the question "Are you satisfied with the control measures taken for cross infection among patients?". X axis represents the responses and Y axis represents the number of responses. Blue represents yes response and green represents no response. Higher percentage of respondents (71%) were satisfied with the control measures taken in the dental clinic during their visit.
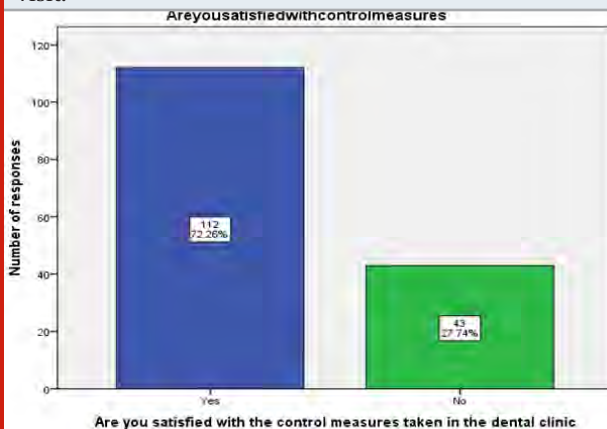
Figure 18: Bar graph representing the association based on gender of patients with the responses for the question "Would you refuse to receive treatment from a dentist who is not wearing gloves and face mask?". (X-axis represents the responses to the question and Y-axis represents the number of responses). All the male participants (100 %) preferred not getting treatment from dentists who are not wearing gloves or masks, while only 48.28% of female participants denied getting treated from dentists who were not wearing gloves, suggesting males were more aware about the importance of gloves in infection control and this was statistically significant (Chi-square test; p-value = 0.001- significant)
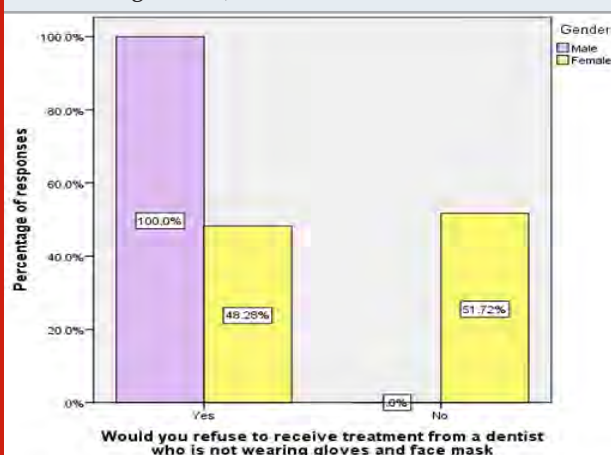
Figure 19: Bar graph representing the association based on educational qualification of patients with the responses for the question "Are you aware of the different sterilization methods used in dental clinics?". (X-axis represents the responses to the question and Y-axis represents the number of responses). All the patients who had completed schooling (100%) were aware of the different sterilization methods used in dental clinic whereas only 62.5% of the patients who were undergraduates were aware of the different sterilisation methods, proving that patients who had only completed schooling were more aware about the sterilisation methods and this was statistically significant (Chi-square test; p-value = 0.001- significant).
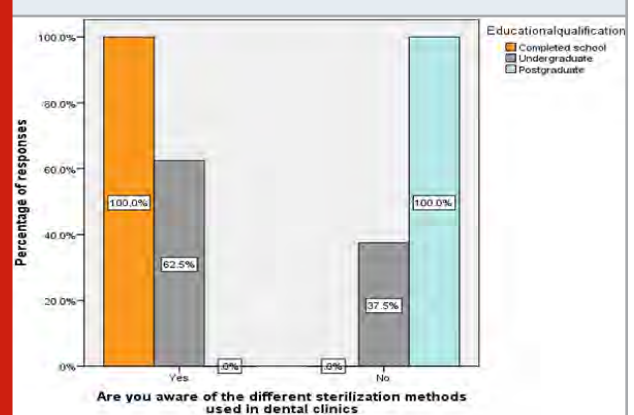
Figure 20: Bar graph representing the association based on educational qualification of patients with the responses for the question "What are all the ways cross infection can occur from one person to another in a dental setup?". (X-axis represents the responses to the question and Y-axis represents the number of responses). All the patients who had completed schooling (100%) believed that cross infection might occur through saliva, whereas a maximum of 55% of the patients who were undergraduates believed that cross infection might occur through blood. This difference was found to be statistically significant (Chi-square test; p-value = 0.001- significant).
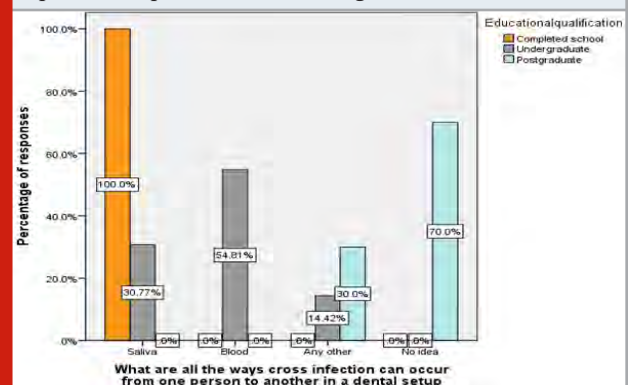
In this present study we found that the majority of the patients were females (56%) and remaining were males (44%). This is supported by a previous study which states the majority of the patients were females (62%)

(Deogade et al., 2016). We also found that the majority of 91% of the patients believed that a dentist should wear protective gloves while treating patients. This is in concordance with studies done by Otuyemi et al and Sofola et al which state that the maximum number of patients (89% and 99% respectively) regarded the use of gloves as necessary during treatment (Otuyemi et al., 2001) (Sofola et al., 2005). Our study also revealed that 85% of the patients believed that dentists should wear face masks while treating a patient. This is in concordance with a study where the majority of patients (72.4%) agreed that dentists should routinely wear face masks (Mousa et al., 1997).

Figure 21: Bar graph representing the association based on educational qualification of patients with the responses for the question "Can a dentist treat more than one patient with the same pair of gloves?". (X-axis represents the responses to the question and Y-axis represents the number of responses). All the patients who had completed schooling (100%) accepted that a dentist can treat more than one patient with the same pair of gloves whereas a maximum of 96% of the undergraduate patients and 100% of the postgraduate patients stated that a dentist cannot treat more than one patient with the same pair of gloves. This was found to be statistically significant (Chi-square test; p-value = 0.001- significant).
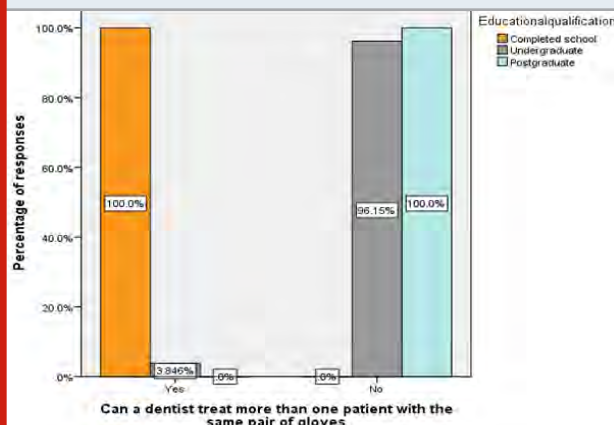
Another study by Samaranayake et al stated that the practice of wearing a face mask by the dentist was overwhelmingly approved by the survey population (Samaranayake and McDonald, 1990). In our study we also found that 82% of the total survey population agreed that a dentist should wear both mask and gloves while treating a patient. This is supported by a study done by Bowden et al stated that 50% of the participants believed that a dentist should routinely wear both gloves and mask while doing a procedure (Bowden et al., 1989). In this present study it was found that 67% of the participants agreed that use of eye goggles by the dentist was necessary. This result is contradicted by a study which states that only 31% of the total respondents believed that dentists should always wear goggles when treating patients.

To date, there have been no population-based reports of public perceptions of dental cross-infection control in Chennai. This study aimed to clarify issues and provide data on public perceptions of cross-infection control in dentistry in Chennai. A limitation of this study was that it was a unicentred study and to ascertain the results of this study and to increase the level of significance, the sample size and the geographic area of coverage should be extended to more dental institutions in Chennai. When properly used, disinfection and sterilization can ensure the safe use of invasive and noninvasive dental devices. The method of disinfection and sterilization depends on the intended use of the dental device.

CONCLUSION

Within the limit of the study , it was found that the majority of the patients agreed that it was important for dentists to wear protective measures like gloves and masks while treating a patient, showing a high level of awareness about the risk of cross infection among this population.

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Incidence of C Shaped Canal In Mandibular Second Molar – A Cbct Study

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ABSTRACT

The aim of this study is to evaluate the prevalence of C-shaped root canals in mandibular second molars using cone beam computed tomography. In endodontics, root canal treatment of a tooth requires proper knowledge of the variable anatomy of the root canal . One such anatomic variation is the C-shaped root canal system which is commonly seen in mandibular second molars. Cone beam computed tomography is used to analyse the presence of C shaped canals in the mandibular second molar. A total of 50 cone beam computed tomography scans of both the arches were obtained from the radiology lab of Saveetha dental college and 100 mandibular second molars were assessed. The data was tabulated and assessed for statistical significance using the SPSS software. The Incidence of C shaped canals in mandibular second molars was found to be 3.0% . Incidence of C-shaped canals was more in tooth number 37 (2.0%) than in tooth number 47 (1.0%). This was found to be statistically not significant according to chi square test (p=0.558, statistically not significant). Recognition of a C-shaped canal prior to root canal treatment is very important in order to prevent any complications during root canal treatment.

KEY WORDS: C-SHAPED CANAL; CONE BEAM COMPUTED TOMOGRAPHY; MANDIBULAR SECOND MOLARS.

INTRODUCTION

In endodontics, root canal treatment of a tooth requires proper knowledge of the variable anatomy of the root canal . One such anatomic variation is the C-shaped root canal system which is commonly seen in mandibular second molars but have also been observed in mandibular premolars, maxillary first molars, and maxillary and mandibular third molars (Baisden et al., 1992; Demirbuga

et al., 2013; Yu et al., 2012). Roots with C-shaped canals have a square or conical configuration (de Azevedo et al., 2019; Jerome, 1994; Manning, 1990) .

C shaped canals have been found to have a high prevalence in mandibular second molars (Weine et al., 1988).Various research is conducted to determine the incidence of C shaped canals in mandibular second molars. The incidence of C shaped canals can differ in different populations. Higher incidence of C-shaped anatomy were seen in Lebanese population compared to the other West Asian population groups (Al-Fouzan, 2002; Al-Qudah and Awawdeh, 2009; Haddad et al., 1999; Rahimi et al., 2008) .The complex nature of the canal configuration proves to be a challenge with respect to obturation and possibly the prognosis during root canal therapy (Chai and Thong, 2004; Melton et al., 1991) . Recognition of a C-shaped canal before treatment can be very effective in management, which will prevent

irreparable damage to the tooth (de Azevedo et al., 2019; Weine, 1998).

Ever since the identification of the C-shaped canal anatomy, various causes have been postulated to explain its formation,one of the most accepted theories is failure of fusion of Hertwig's epithelial sheath for the formation of the C-shaped canal configuration (Orban and Mueller, 1929) . The irregular fusion of the Hertwig's epithelial sheath may be due to trauma, such as radiation or chemical interference, but it is more likely to be of genetic origin (Fischischweiger and Clausnitzer, 1988; Manning, 1990) . Intra oral periapical radiographs basically do not give an accurate image of the presence or absence of such complex morphology due to superimposition of adjacent anatomic structures. So, in most cases cone beam computed tomography is used to analyse the presence of C shaped canals in the mandibular second molar. C shaped canals can be of different types.

We have numerous highly cited publications on well designed clinical trials and lab studies (Azeem and Sureshbabu, 2018; Govindaraju et al., 2017; Janani and Sandhya, 2019; Jenarthanan and Subbarao, 2018; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Poorni et al., 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique, Nivedhitha, et al., 2019; Siddique, Sureshbabu, et al., 2019; Siddique and Nivedhitha, 2019; Teja et al., 2018). This has provided the right platforms for us to pursue the current study. Our aim is to evaluate the incidence of C-shaped root canals in the mandibular second molar using cone beam computed tomography.

MATERIAL AND METHODS

A total of 50 cone beam computed tomography scans of both the arches were obtained from the radiology lab of Saveetha dental college and 100 mandibular second molars were assessed for presence of C shaped canals .Cone beam computed tomography (CBCT) scans were considered because Intra oral periapical (IOPA) radiographs do not give an accurate image of the presence or absence of such morphology due to superimposition of adjacent anatomic structures. The data was tabulated and assessed for statistical significance using the SPSS software 20.0. Descriptive statistics and comparison of variables were done. Chi square test was used to detect the significance between tooth number and presence or absence of C shaped canals where P value less than 0.05 was considered to be statistically significant.

RESULTS AND DISCUSSION

C-shaped root canals are an important variation seen in routine endodontic practice. The crown morphology of teeth does not show special features that can help in the diagnosis of teeth with C-shaped canal. The clinical recognition of C-shaped canals is mainly based on the

anatomy of the floor of the pulp chamber (Xu et al., 1996) .

Figure 1: CBCT image showing C shaped canal in 37 .

Figure 2: CBCT image showing C shaped canal in 37.

CBCT helps to prevent problems of overlap which is common in two dimensional views (Bóveda et al., 1999; Sour et al., 2012). Thus, it acts as an important diagnostic aid in detecting C shaped canals. CBCT helps in better understanding of the anatomy of the root canal (Matherne et al., 2008), aids in root canal preparation (Estrela et al., 2008) and vertical fracture detection (Hassan et al., 2009). During root canal treatment in the

mandibular second molar with C shaped canals use of an apex locator helps to prevent furcation perforation (Melton et al., 1991; Weine et al., 1988). Figures 1, Figure 2 and Figure 3 shows the CBCT images depicting C shaped canal in mandibular second molars.

Figure 3: CBCT image showing C shaped canal in 47.
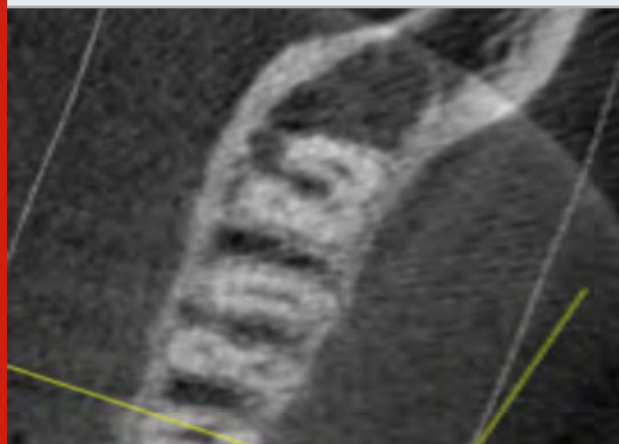
Figure 4: Bar graph depicting presence or absence of C shaped canals in mandibular second molar. X axis denotes the presence and absence of C shaped canals and Y axis denotes the number of teeth. Blue colour depicts the presence of C shaped canals (3.0%) and Green colour depicts the absence of C shaped canals (97.0%).The incidence of C shaped canals in the mandibular second molar was found to be 3%.
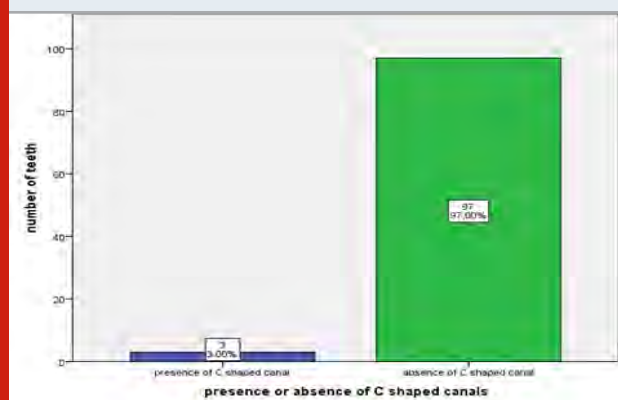
Only 3 out of 100 mandibular second molars have C shaped canals. Thus, the incidence of C shaped canals in the mandibular second molar was 3.0% (Figure 4). Similar evidence was seen in study by Tassoker, et al. among 444 teeth only 47 teeth had C-shaped canals, thus incidence of c shaped canals was 10.6% (Tassoker and Sener, 2018). Incidence of C shaped canals in the mandibular second molars 37 and 47 were compared and it was found that incidence of C-shaped canals were more in tooth number 37 (2.0%) than in tooth number 47 (1.0%). However this value was statistically not significant (Figure 5). According to Chi square test ,p= 0.558 ,statistically not significant (p<0.05,statistically significant).

Higher incidence of C-shaped canals were seen in Lebanese population (19.1%) compared to the other West Asian population groups (Al-Fouzan, 2002; Al-Qudah and Awawdeh, 2009; Haddad et al., 1999; Rahimi et al., 2008). According to a study done by Weine, C shaped canals have been found to have a high prevalence in mandibular second molars with a percentage ranging between 2.7%-45.5% (Weine et al., 1988). According to a study done by Saeed Rahimi,et al,. 7.2% mandibular second molars had C-shaped canals (Rahimi et al., 2008)

Figure 5: Bar graph depicts the comparison of tooth number and presence or absence of C shaped canals. X axis denotes the tooth number 37 and tooth number 47 and Y axis denotes the number of teeth. Blue colour depicts the presence of C shaped canal and green colour depicts the absence of C shaped canal. Incidence of C shaped canals in tooth number 37 was 2% and incidence of C shaped canals in tooth number 47 was 1%. This was found to be statistically not significant. (Chi square test,P=0.558 >0.05).
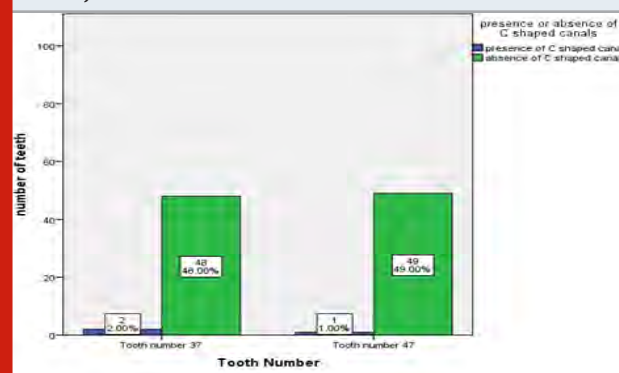
The success of a root canal treatment completely depends on the proper identification of the anatomic variations present in the teeth. The knowledge of presence of C shaped canals helps in performing root canal treatment without any complications. Thus, This study aims in finding the incidence of C-shaped root canals in mandibular second molars using cone beam computed tomography.

CONCLUSION

According to this study there is 3.0% occurence of C shaped canals in the mandibular second molar. Although the incidence of C shaped canals differ in different populations, diagnosing these cases at an early treatment stage provides success to endodontic treatment. CBCT must be used for diagnosis as conventional radiographic examination does not provide information about C shaped canals.

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Awareness on Oral Hygiene Measures Among Pregnant Women -A Cross Sectional Survey

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ABSTRACT

Dental care during pregnancy is extremely important. From keeping up with daily oral hygiene, to monitoring changes in the young mouth, the more in-tune you are with your oral health the healthier your baby will be. During pregnancy, there is a change in the hormone levels which makes the oral cavity more vulnerable to microorganisms and plaque, both of which gingivitis during pregnancy. This can put you at greater risk for tooth decay and gum disease. The need to maintain good oral hygiene status among pregnant women is very important for proper pregnancy outcomes.Maintenance of oral health during pregnancy has been recognised as an important public health issue worldwide. Therefore, it is of utmost importance to create awareness among pregnant women regarding oral hygieneA survey was conducted for 50 pregnant women, from Poonamallee Govt. Hospital, Kilpauk Govt. Hospital, a questionnaire was given to them which took into account of their age and for how many months they are undergoing pregnancy, did they undergone any dental treatment before or not, do they have any prevailing teeth problems or not and what all nutritional supplements are they taking, are they facing any gum related problems or not after becoming pregnant. Responses were obtained and analysis was done in the Statistical Product and service solutions (SPSS) software. After the survey was conducted it was seen that 56% of the patients were undergoing through the 3rd trimester of pregnancy. 62% of the patients brushed twice a day. 76% of the patients did not undergo any dental treatment pre pregnancy. Only 28% have a problem of bad breath. 84% of them were having gum related problems after becoming pregnant.So from this survey, we can conclude that gum related problems are very common after becoming pregnant, especially in the 2nd trimester and most of them do not visit dentists for regular check up.

KEY WORDS: PERIODONTITIS; OESTROGEN; INFLAMMATION; PREGNANCY; TRIMESTER.

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INTRODUCTION

Pregnant women are more susceptible to periodontal diseases due to hormonal changes which happen during pregnancy. A few studies have shown that poor oral hygiene during pregnancy may be associated with adverse pregnancy outcomes, such as premature birth and low birth weight. Prevention of oral and dental problems during pregnancy is possible through having pregnant women expressing appropriate knowledge, attitude and perception(Christensen, Jeppe-Jensen and Petersen, 2003).Pregnancy is a unique period in a woman's life and is characterised by various physiological changes, which may affect the oral health. Women's life cycle changes present challenges to the oral health care profession.

Hormonal changes influence the periodontal and oral tissue to respond to various local factors creating various diagnostic and therapeutic dilemmas(Barak et al., 2003)(Al Habashneh et al., 2005)(Muralidharan et al., 2019)(Thomas, Middleton and Crowther, 2008). Pregnancy gingivitis and periodontitis is the most common oral condition observed among pregnant women(Fakheran, Saied-Moallemi and Khademi, no date). During pregnancy, there is an increased level of hormones oestrogen and progesterone. These hormones have been found to affect periodontal disease progress and wound healing. Both these hormones lead to gingival vascularisation and decreased immune response. Some studies reveal, during pregnancy, there is an increase in some types of microorganisms (Provetella species) which utilise the steroidal hormones of pregnancy for their growth and development.

These increase the bleeding tendency of the gums and worsen gingival inflammation. As a result, pregnant women have severe gingival inflammation even with low plaque levels(George et al., 2013).Various attempts should be made to focus on pregnant women's dental health, as studies have shown that women attend health care centres more often during their pregnancy; therefore, the primary goal of a dentist should be to evaluate the mother's oral health during this crucial period in order to improve the wellbeing of the infant(Anandakumar and Sankari, 2016)(Mokeem, Molla and Al-Jewair, 2004). It is very essential to take care of oral hygiene during pregnancy.

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017a; Ganapathy, Kannan and Venugopalan, 2017a; Jain, 2017a, 2017c; Ranganathan, Ganapathy and Jain, 2017a; Ariga et al., 2018a; Gupta, Ariga and Deogade, 2018a; Anbu et al., 2019a; Ashok and Ganapathy, 2019a; Duraisamy et al., 2019a; Varghese, Ramesh and Veeraiyan, 2019a)('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017b; Ganapathy, Kannan and Venugopalan, 2017b;

Jain, 2017b, 2017d; Ranganathan, Ganapathy and Jain, 2017b; Ariga et al., 2018b; Gupta, Ariga and Deogade, 2018b; Anbu et al., 2019b; Ashok and Ganapathy, 2019b; Duraisamy et al., 2019b; Varghese, Ramesh and Veeraiyan, 2019b), this vast research experience has inspired us to research about this study to create awareness about the importance of oral hygiene during pregnancy

MATERIAL AND METHODS

A survey was undertaken with 50 pregnant women from Poonamallee Govt. Hospital and Kilpauk Govt. Hospital of Chennai from june 2019 to march 2020. Inclusion criteria was all the 50 pregnant women were pregnant for the second time and approached personally and asked their consent for participating in this survey, following which they were asked to take the survey in an online survey platform which consisted of a set of 7 questions, it took into account everyone's age and which trimester they are going through, are they having any gum inflammation or not after pregnancy and are they having any problem of bad breath or not, what all nutritional supplements are they taking, whether they brush their teeth twice a day or not, do they visit dentist for regular checkups or not. Each pregnant patient was given a mobile phone to answer for the survey questions. The results were analyzed through pie-charts, after importing them to excel. Questionnaire as follows :

1. You belonged to which trimester of pregnancy?
2. How many times do you brush your teeth in a day?
3. Have you ever underwent dental treatment before?
4. Is there a presence of bad breath?
5. Do you have prevailing Dental problems?
6. Do you go for a regular dental check up?
7. Do you have gum related problems after pregnancy?

Figure 1: It was seen that 56% of them were between 16-25 years old, 36% of them were between 26-30 years and 8% were between 31-40 years. 32% of them were undergoing the 1st trimester denoted by blue, 56% of them were undergoing the 2nd trimester denoted by red and 12% were going through the 3rd trimester denoted by green.
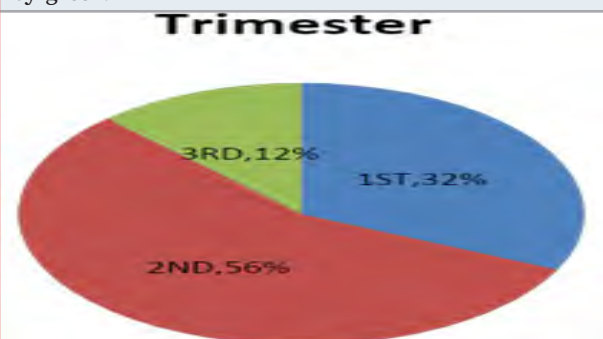
RESULTS AND DISCUSSION

The data obtained were statistically analysed using pie charts.

Other studies have shown the same group of participants (Silk et al., 2008)(Jeffcoat et al., 2001).

Figure 2: It was seen that 26% of them brush at least once a day denoted by blue, 62% of them brush twice a day denoted by red and 12% of them brush more than twice a day denoted by green.

Though higher values are reported from other studies (López, Smith and Gutierrez, 2002; Barak et al., 2003; Christensen, Jeppe-Jensen and Petersen, 2003; Alwaeli and Al-Jundi, 2005; von Arx and Lozanoff, 2016)

Figure 3: It was seen that 24% of them went through dental treatment before pregnancy denoted by blue, 76% of them did not undergo any dental treatment before pregnancy denoted by red.

In contrast to this finding of our study, approximately half in one of the study and 58.4% in another study who reported having dental problems went to a dentist for treatment(Gaffield et al., 2001)(Gaffield et al., 2001; Ranasinghe et al., 2017).

These findings are in agreement with previous studies(Amin and ElSalhy, 2014; Vamos et al., 2015; Kumar et al., 2017; Musskopf et al., 2018).

It is contradictory, to the findings of previous study where most of the pregnant women had dental problems(Rateitschak, 1967; Coonrod et al., 2008; Migliorini et al., 2014)

It shows how ignorant they are about their oral hygiene status. Other studies have also been associated with these ignorance and lower oral care during pregnancy (Azofeifa et al., 2014) (Timothé et al., 2005). This could be due to low socioeconomic status and educational status among pregnant patients in that geographical area.

Figure 4: It was seen that 28% of them are having a problem with bad breath denoted by blue, 72 % of them are not having any bad breath denoted by red.
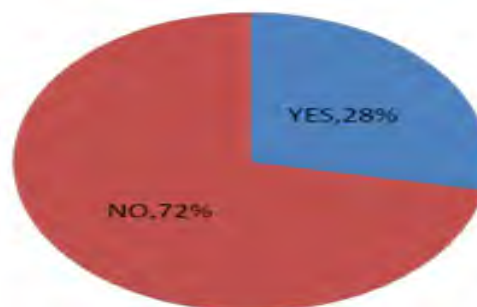
Figure 5: It was seen that 12% of them are having prevailing tooth problems denoted by blue and 88% of them are not having any tooth problems denoted by red.
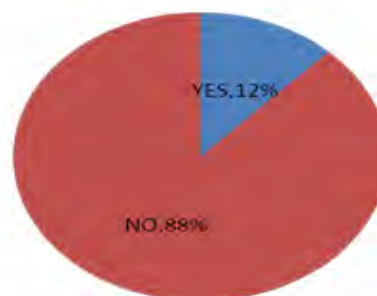
Figure 6: Only 4% of them do visit dentist for a regular dental check-up denoted by blue, 96% of them do not go for any regular dental checkups denoted by red.
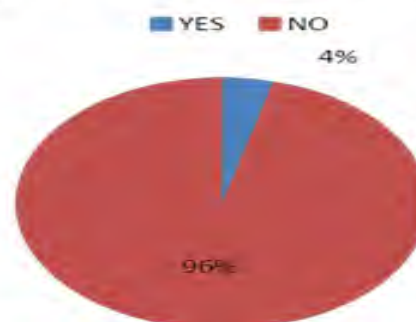
Figure 7: 84% of them are having swollen gums after pregnancy denoted by blue, 16% of them don't have any gum related problems after pregnancy denoted by red, it shows that gum swelling and other problems are very common in pregnant women.

Gum related problems after pregnancy?
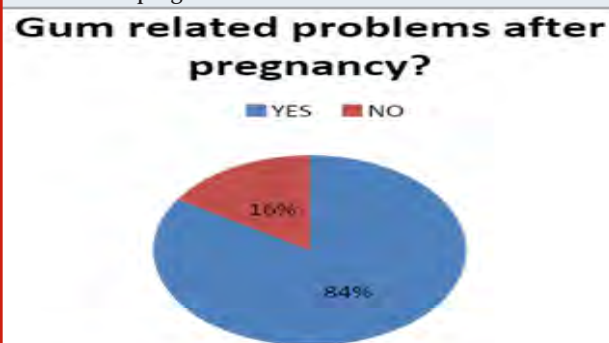
Previously, in a study involving 2009–11 data from the Pregnancy Risk Assessment Monitoring System (PRAMS) in Hawaii, it was seen that half of the study population had their teeth regularly cleaned before pregnancy compared with only one-fourth of the study population during pregnancy(Mattheus et al., 2016). In a study, 23 to 35% of pregnant women went to the dentist during pregnancy, 12 to 25% suffered from oral health issues, and, of those with a problem, only 45 to 55% received care (Gaffield et al., 2001). The study further found that maximum women thought poor oral health during pregnancy was normal. In a study involving 2004–08 data ,26% of the study population reported that they needed dental care during their pregnancy, but only 58.4% of them sought care(Ranasinghe et al., 2017).

It was seen that gum problems are very regular during pregnancy, most of them do not go to dentists for their dental check ups regularly [12, 13, 14, 15].Previous studies done also state that gum problems presents most commonly towards the end of the first trimester of pregnancy and becomes normal mostly after delivery, occurring in approximately 0.2% to 9.6% of pregnancies. (Lin et al., 2007; Rezazadeh et al., 2014)

Limitations: The limitations of this study was, no association has been done between systemic health and pregnancy, small sample size and also no association has been done between age and pregnancy.

Future Scope: Future scope can be a further study which takes into account a large population from various ethnicities, finding out associations between age and pregnancy, systemic health and pregnancy.

CONCLUSION

Within the limitations of the study it can be concluded that maintaining good oral hygiene among pregnant women is necessary for healthy delivery of the child. Gum related problems occur mostly during pregnancy, proper care should be taken during pregnancy and one should visit dentists for proper dental care during pregnancy.

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Dental Communication

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Antimicrobial Activity of Denture Adhesives Against Lactobacillus, Streptococcus mutans, Candida albicans

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ABSTRACT

Denture Stomatitis is a common issue in denture wearers. It is mainly due to its continued use. Once when the patient finds it uncomfortable discontinue the usage. Prevention of mucositis or stomatitis is very important in the denture wearers. It can be prevented by maintaining proper oral hygiene. But in immunocompromised state it is very difficult to maintain especially in old age patients. Denture adhesives are normally used by the denture wearers to have the denture firmly fixed in the mouth. This can be used to prevent the formation of denture stomatitis in the patients. Two types of materials are used by the patients, gel form and powder form adhesives. This study is done to find out the antimicrobial activity of the denture adhesives against the common organisms associated with Denture stomatitis. The antimicrobial effect of the denture adhesive is tested with 3 organisms, *C.albicans, S. mutans* and *Lactobacillus*. The anti microbial activity was tested by agar well diffusion method. The media used are, SDA agar and TSA. Wells were cut with a sterile steel tube. TSA was used for Lactobacilli and S. mutans and SDA was used for *C.albicans*. On each plate 3 wells were cut and the adhesives were filled in it. The adhesives were mixed in sterile Petri dishes and allowed to expand. Thus it was transferred to the well after coating the agar surface with the organism. Then the plates were incubated at 37 degree C for 12 hrs and examined for the zone of inhibition around the well. The zone was measured with a scale and tabulated. The results were obtained as for powder the zone of inhibition in *Lactobacillus* was 11 mm , zone of inhibition for powder in *C.albicans* was 14 mm and the zone of inhibition for powder in S.mutans was 10.5 mm which showed a better anti microbial activity for denture adhesive in powder form whereas for gel form the zone of inhibition was not seen. In this study with the 2 products tests, powder has more antimicrobial activity than gel and found to be active against *Lactobacillus* , *Candida albicans* and for *Streptococcus mutans*.

KEY WORDS: DENTURE STOMATITIS, DENTURE ADHESIVE, LACTOBACILLUS , CANDIDA ALBICANS, STREPTOCOCCUS MUTANS.

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INTRODUCTION

In the fast moving world, most people are worried about aesthetics. In dentition, the doctors provide at most care to the patients to give better treatment and to achieve their satisfaction. This level of aesthetics especially in dentistry provides the patients the confidence to face the world (Manipal et al., 2014). Thus the denture usage by the patients has increased much. As an irony we know that every has an adverse effect, denture wearers also face a common problem known as denture stomatitis (Reichart, 2000). Denture Stomatitis is a common issue in denture wearers. It is mainly due to the continued use of the dentures. The Denture stomatitis is a chronic disease that is given by a localised or generalised inflammation of the oral mucosa beneath the dentures (Gendreau and Loewy, 2011).

Although this disease has a high frequency level in recent times, the patients who feel the burning, itching, and pain sensation are comparatively less and the disorder is only primarily diagnosed by the presence of the inflammation condition in the mucosal tissue (BUDTZ-JöRGENSEN, 1974). This disorder is mainly caused by the microorganisms commonly found in the oral cavity which includes *Lactobacillus, Streptococcus mutans, Candida albicans.* The denture adhesives are the ideal cream or paste that are used over the dentures to provide grip for the dentures to hold through. These denture adhesives provide a neutral or slightly basic pH, cytotoxicity and bonding strength to the oral mucosa (Zhao et al., 2004; Ashwin and Muralidharan, 2015).

The denture adhesives is thus most commonly prescribed by the dentist as it renders additional retention, comfort and mastication facility for the dentures and inhibits the accumulation of food debris in the space between the dentures (Kumar et al., 2015). However this denture adhesives should not be used in a patient where the denture is completely ill-fitting and under such conditions more denture adhesives will be suggested to provide retention, which is not advised. Thus the usage of denture adhesives is provided to patients with correct doses and proportion for optimum results. These denture adhesives are available in powder, cream, or liquid form. It was first discovered in 1913 and developed in the 1920s and 30s (Shamsolketabi and Nili, 2018). Denture adhesives also provide a confidence for the patients to face the external world especially during the public occasions (Slaughter, Katz and Grasso, 1999; Shahana and Muralidharan, 2016).

Hence the denture adhesive activity on antibacterial property after placing in the oral cavity against the oral pathogens and preventing its harmful effect are measured to know its activity against bacterial species according to the previous research (Imazato et al., 2003),(Selvakumar and Np, 2017). And moreover if the denture adhesives provide biocompatibility and have Anti-Candida action, even used for a short period of time render a great effect in treating denture stomatitis and providing a better

treatment measure (Bates et al., 2017). Thus the denture adhesives are materials that produce enormous results in dentistry and now in this study, its effect on the oral pathogens are tested and its antimicrobial activity is measured.

Figure 1: Denture adhesives used.

MATERIAL AND METHODS

In this study, the denture adhesive which is of powder and paste form was taken. The denture adhesives used in this study were Fixon (powder), Denofit (gel) (Figure 1). The powder was taken in sterile petri dishes, and 5 ml of distilled water was added. It is then mixed nicely with a sterile stick and held for 5 hours. The mix is kept separately so that it is not contaminated. In the same way the paste form of denture adhesive is also placed in a separate sterile petri plate and kept separately to prevent it from contamination. These plates were isolated because of swelling action of the denture adhesives. Well diffusion method: The anti microbial activity was tested by agar well diffusion method. The media used are SDA agar and TSA. Wells were cut with a sterile steel tube. TSA was used for *Lactobacilli* and *S. mutans* and SDA was used for *C.albicans*. On each plate 3 wells were cut and the adhesives were filled in it. The adhesives were mixed in sterile Petri plates and allowed to expand. Thus it was transferred to the well after coating the agar surface with the organism (figure 2). Then the plates were incubated at 37 degree C for 12 hrs and examined for the zone of inhibition around the well. The zone was measured with a scale and tabulated.

Figure 2: Denture adhesive transferred to petri plates.
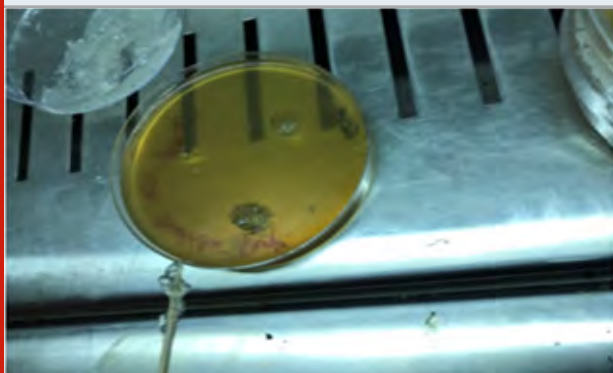
Figure 3: Antimicrobial activity of denture adhesive powder against *Lactobacillus*.

Figure 4: Antimicrobial activity of denture adhesive powder against *C. albicans*.

Figure 5: Antimicrobial activity of denture adhesive powder against *S.mutans*
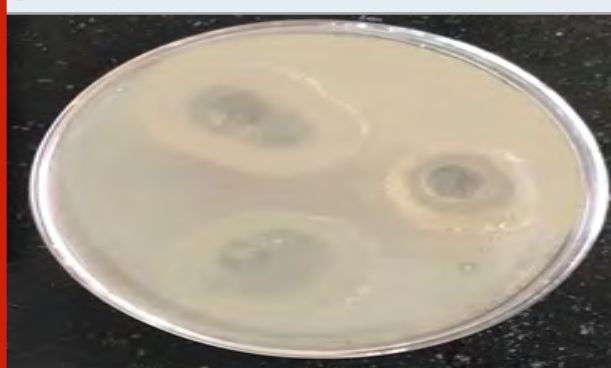
RESULTS AND DISCUSSION

The obtained results for the antimicrobial activity are shown in the table 1, bar graph 1 and in figure 3, 4 and 5. Thus the tabulated results (table 1) for the denture adhesive obtained as for powder the zone of inhibition in *Lactobacillus* was 11 mm, zone of inhibition of powder in *Candida albicans* was 14 mm and the zone of inhibition for *Streptococcus mutans* was 10.5 mm which showed a better antimicrobial activity whereas for gels the zone of inhibition was not seen (bar graph 1). Thus in study we observe that the denture adhesive of powder form shows a better antimicrobial property than the paste form.

Table 1. Represents the microorganisms and the corresponding mean valve of antimicrobial activity in mm of denture adhesives.

	POWDER(mm)	GEL(mm)
S.Mutans	10.5	0
Lactobacilli	11	0
C.Albicans	14	0

Bar graph 1: This bar graph represents the correlation between the micro organisms and their respective zone of inhibition for powder and gel forms of denture adhesives. Blue colour denotes the effect of powder form and red colour denotes the effect of gel form. X-axis represents the microorganisms tested and Y-axis represents the zone of inhibition measured in mm. As there is no antimicrobial activity seen with gel, red bar is not represented
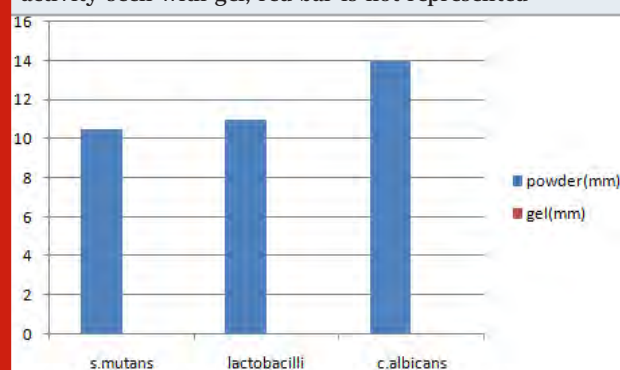
The human oral cavity contains various natural surroundings, including the teeth, gingival sulcus, tongue, hard and delicate palates, and tonsils, and acts the tract which associate the outside and the stomach related tract and respiratory tract of human body, which gives the fitting space to the colonization of microorganisms (Dodwad, 2011). The microorganisms found in the human oral pit have been alluded to as the oral microflora, oral microbiota, or oral microbiome (Dewhirst et al., 2010). Oral diseases may mess wellbeing up in immunocompromised hosts. Agent microorganisms in astute contaminations of

the oral cavity are Staphylococcus aureus, Pseudomonas aeruginosa, and Candida albicans (Ding and Schloss, 2014). The denture adhesives are the retentive materials which are commonly used for providing retention in denture wearers (Shay, 1991,Nam et al., 2016). The antimicrobial property of these denture adhesives were analysed in both powder and gel forms.The denture adhesives involved in this study were Fixon (powder), Denofit (gel) (Figure 1). Thus the antimicrobial property comparison between the gel and the powder forms provided that the powder form had a higher antimicrobial property against the oral microorganisms than the gel form of denture adhesives.

CONCLUSION

In this study with the two products tested, powder has more antimicrobial activity than gel and found to be active against *Lactobacillus, Candida albicans* and for *Streptococcus mutans*. Powders can be recommended for patients who develop stomatitis.

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Awareness of Cyclic Loading Testing Machine Among Undergraduate Students – A Cross Sectional Survey

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ABSTRACT

Cyclic loading testing machine is important to test the strength of core build up material under cyclic loading. The presence of tensile stress in specimens after the load has been loaded . It has been stated that under repeated load the tensile stresses vary in a cyclic manner that may result in fatigue cracks in subsurface areas. The aim of the study was to find awareness of cyclic loading testing machines among undergraduate (UG) students of a Dental College. The survey was conducted among 100 undergraduate students of Dental College and Hospital. A questionnaire consisting of 11 questions regarding cyclic loading testing machines was framed and shared using a link created by google forms to UG students of Dental College. Then the data were collected, results were finally tabulated and imported using SPSS. The results showed that 3rd year (25.0%), 4th year (10.7%), Intern (9.8%) of them had higher awareness about cyclic loading testing machines than 1st year and 2nd year undergraduate dental students. Association was done between the year of the study participants and the knowledge and awareness on cyclic loading testing machines, it was found to be statistically significant since p value <0.05. Within the limitations of the study, we can conclude that 3rd year (25.0%), 4th year (10.7%) and Interns (9.8%) had higher awareness about cyclic loading testing machines than 1st year and 2nd year undergraduate dental students. Therefore for the 1st and 2nd year undergraduate dental students group discussion and seminar can be conducted in order to create awareness on cyclic loading testing machines.

KEY WORDS: CYCLIC LOADING; TESTING MACHINE; COMPRESSIVE STRESS; LOAD; STRENGTH..

INTRODUCTION

The Tensile compression cyclic loading is a complex behavior deformation under cyclic loading. In the tensile compression cyclic loading process most of the metal will tend to appear in the Bauschinger Effect [1]. The curve of stress-strain under the cyclic loading can be directly obtained by tensile-compression cyclic loading test [2]. All-ceramic dental restorations is widely applied in the prosthodontics due to the properties like aesthetic,inert properties and biocompatible [3]. The Dynamic fatigue testing will provide an efficient means for estimating the materials long-term mechanical properties under a constant ratio of cyclic stress. Mechanical degradation in toughness and flexural stress has been realized in different dental ceramics [4], [5].

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The dental ceramics that has flaws and defects in it can act as a localized stress concentrators, even-though the stress which has been created by less mastication loads that doesn't even exceed their characteristic strength, these type of stresses can lead to subcritical crack growth, which may finally lead to substantial reduction in strength and failure in catastrophic potential [6], [7]. The definition for the fracture toughness is the critical stress intensity factor at which a given flaw starts growing, and it indicates the intrinsic capacity of a material to resist rapid crack propagation and consequent catastrophic failure [8]. The significant increase in flexible strength is shown in CAD/CAM ceramic but it doesn't satisfy the strength of fracture resistance after cyclic loading. Fatigue is responsible for all mechanical failures which is estimated to be 90% [9]. The load bearing capacities of all-ceramic crowns would reduce after combined with cyclic stress and moist and thermal cycling [10],[11].

Newly, the quasi-static fracture tests have shown that the ageing of the cement is due to moisture that can also lead to decrease in load-bearing capacities of crowns made of all-ceramic [12]. Reference of various literature compared the type of cement retentiveness used in implant dentistry along with the different types of restorations in prosthetic, abutments and different conditions in compressive loading, and different simulating intraoral conditions [13], [14]. In contrast, there are very few references that compares the retentiveness before and after the cyclic compressive loading which will be similar to mastication and this will decide whether the final retention of these various types of cement after a long duration of mastication is sufficient to support the retrievability and simultaneous the presence of restoration in the place [15]. There are studies reported that the various materials will exhibit different types of responses while subjected to cyclic loading some materials tend to become more stronger and ductile, whereas others tend to become weaker and more brittle [16].

Previously our department has published extensive research on various aspects of prosthetic dentistry [17–27], this vast research experience has inspired us to research about awareness of cyclic loading testing machine among undergraduate students of a Dental College

MATERIAL AND METHODS

This was a cross sectional questionnaire based study, which was done in the month of December 2019 among Undergraduate students of Saveetha Dental College. The present study was an online based survey. The participants were from 1st, 2nd, 3rd, 4th and Intern year of BDS. The study was approved by the Institutional Review Board. The predesigned validated questionnaire was used to analyse the awareness of cyclic loading testing machines among undergraduate students of a dental college. Validated and structured questionnaires containing 11 questions were framed and it was distributed among dental students through an online

link from google form. It consists of two parts: section I demographic data of the participants which includes students' year of study were obtained from the responses and further analysis. and section II awareness of cyclic loading testing machines.

The sample size was 100 undergraduate dental students and the sampling method used was a simple random sampling method and only the completed surveys were included for analysis. In order to minimise bias all variables were included (Randomisation) and no sorting process was done. Participants in this study were voluntary. Independent variables were demographics such as year of the study of participants. Dependent variables were types of cyclic loading testing machine, function, principles. Data collected was verified by 2 reviewers. Internal validity was a pretested questionnaire and external validity was Homogenisation, replication of experiment and cross verification with existing studies.

The Data analysis was done using Statistical Product and Service Solutions (SPSS) software 20.0 and the statistics used for analysis was Descriptive statistics and comparison of variables were done using chi square test where $p < 0.05$, statistically significant. Type of analysis used was association and the results were tabulated in excel sheet and transferred to SPSS software to analyse and represented in the bar graph.

RESULTS AND DISCUSSION

The study sample contains 100 undergraduate students of a dental college, from 1st, 2nd, 3rd, 4th and Intern. In that majority of them participated from 3rd year (42.0%). Previous studies done regarding awareness of cyclic loading testing machines among dental students were sparse. And studies regarding the testing of various materials on cyclic loading testing machines were available.

The 3rd year students are more aware of cyclic loading testing machines followed by 4th year and Interns (Figure 1). Patterson et al. [28] in their study they tested cyclic loading on 4 mesh. And successful analysis was done using the DIC(Digital Image correlation) testing was only achieved for the two meshes Mersilene and Marlex showed the lowest levels of modulus that changed during the 200 cycles. Whereas Gynemesh and Bard Soft deformation was too large.

The 3rd year (22.09%), followed by Interns (12.79%) and 4th year (10.47%) know that application of cyclic loads to metal or alloys in aggressive environments often result in reduction of normal expected fatigue lives (Figure 2). And Guo Y et al. [29] in their study discovered two modes of failure through analysing the fracture morphology, the curves of stress-strain under the uniaxial compressive and cyclic loading, the maximum stress effect and the characteristics of fatigue damage evolution. Overall the results showed the effect of cyclic loading is clear.

Figure 1: Bar graph shows the association between the year of the study of the participants and awareness about cyclic loading testing machines. X axis represents the year of the study of participants and Y axis represents the percentage of undergraduate students aware about cyclic loading testing machines. Chi-square test was done and association was found to be statistically significant. Pearson's Chi-square value:35.242, DF:4, p value: 0.000(<0.05) hence statistically significant, proving that 3rd year undergraduate students have better awareness than other years of undergraduate students.

Figure 2: Bar graph shows the association between years of the study of the participants and awareness about cyclic loading testing machines. X axis represents the year of the study of participants and Y axis represents the percentage of undergraduate students who know that application of cyclic loads to metal or alloys in aggressive environments often result in reduction of normal expected fatigue lives. Chi-square test was done and association was found to be statistically significant. Pearson's Chi-square value:26.807, DF:4, p value: 0.000(<0.05) hence statistically significant, proving that 3rd year (22.09%), followed by Interns (12.79%) and 4th year (10.47%) undergraduate students have better knowledge compared to 1st and 2nd year of undergraduate students.

Majority of 3rd year (24.55%), followed by 4th year and Intern (10.0%) were aware that axial dynamic cyclic loading testing machines are used to test endurance and life of materials and product design (Figure 3). McAlorum et al. [30] in their study they calculated the model value of ≈70 MPa at that point. This was below the estimated endurance limit of the steel, σe = 125 MPa. And there is possible to decrease the stress at that contact point by introducing a soft material such as rubber.

Figure 3: Bar graph shows the association between years of the study of the participants and awareness about cyclic loading testing machines. X axis represents the year of the study of participants and Y axis represents the percentage of undergraduate students who are aware that axial dynamic cyclic load testing machines are used to test the endurance and life of materials and product design. Chi-square test was done and association was found to be statistically significant. Pearson's Chi-square value:32.125, DF:4, p value: 0.000(<0.05) hence statistically significant, proving that 3rd year (24.55%), followed by 4th year (10.0%) and Interns (10.0%) undergraduate students have better awareness than 1st and 2nd year of undergraduate students.
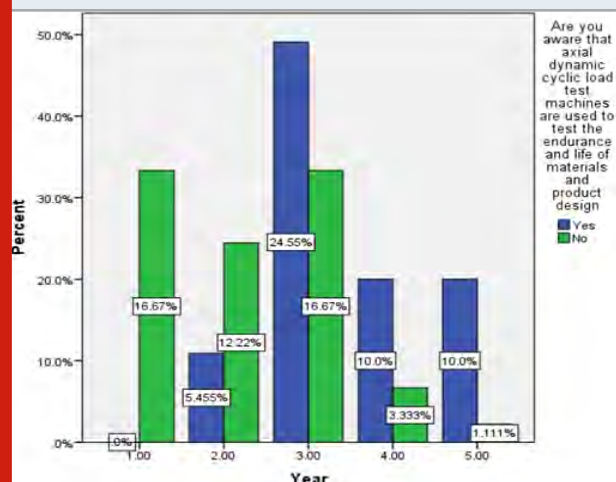
The 3rd year (16.0%) of them choose a simple cyclic loading testing machine that is used most commonly followed by (13.1%) axial dynamic cyclic loading testing machine (Figure 4). Liu et al. [31] in there study stated that on beginning of initial axial cyclic loading, the samples was elastic, and when the number of cycles increased, the samples changed from elastic to elastic plastic and the sample attained irreversible deformation that includes axial, volumetric and lateral strains and the magnitudes increased.

Most 3rd year (24.17%) undergraduate students are aware that cyclic loading testing machines are used in various departments like endodontic,prosthodontics (Figure 5). Wang et al. [32] in their experimental study approach in order to evaluate the effects of fatigue loading on the fracture toughness and load-bearing capacities of various materials like IPSe.max Press and zirconia dental ceramics. The different mechanical properties after the

cyclic loading was observed in the two types of dental specimens. And found that there was no significant influence by fatigue loading on the material properties (E,H) or KIC for zirconia. But they observed lithium disilicate core degradation due to anisotropic behaviour mechanical

Figure 4: Bar graph shows the association between years of the study of the participants and awareness about cyclic loading testing machines. X axis represents the year of the study of participants and Y axis represents the percentage of the type of cyclic loading testing machine used the most. Chi-square test was done and association was found to be statistically not significant. Pearson's Chi-square value:15.082, DF:8, p value: 0.058(<0.05) hence statistically not significant.
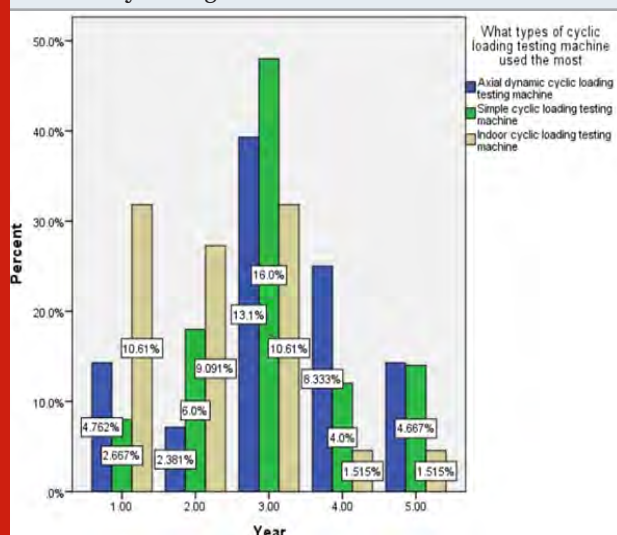
Majority of the 3rd year (25.44%) undergraduate students agreed that cyclic compressive load decreases the retentive strength of cement (Figure 6). Alvarez et al. [33] in their study found that the cyclic compressive load decreases the retention strength of the various cement types like resin composite and resin modified glass ionomer cement types recorded the least percentage of retention loss whereas resin urethane based cement the highest.

The (24.17%) 3rd year undergraduate students agreed that functional load applied on the anterior portion of the prosthesis can change the fit between prosthetic superstructure and implant supported abutment (Figure 7). Hecker et.al [34] in their study about the fit between the prosthetic superstructure and the implant-supported abutment gets altered when the functional loading applied on the anterior portion of the prosthesis.

Majority of them (22.39%) 3rd years agreed that cyclic loading testing machines play an important role in dentistry (Figure 8). Choi et al. [35] in there study found a significant difference in fracture resistance between the lithium disilicate pressed on zirconia (4943.87 ± 1243.70 N) and monolithic lithium disilicate (2872.61 ± 658.78 N) groups. And also between the groups of

monolithic lithium disilicate and monolithic zirconia (4948.02 ± 974.51 N) (P<.05). There was no significant difference between lithium disilicate pressed on zirconia and monolithic zirconia groups found (P>.05). In relation to fracture pattern, there were three cases of veneer chipping and two interfacial fractures in lithium disilicate pressed on zirconia group, and in all the specimens of monolithic lithium disilicate and monolithic zirconia groups complete fracture was found.

Figure 5: Bar graph shows the association between years of the study of the participants and awareness about cyclic loading testing machines. X axis represents the year of the study of participants and Y axis represents the percentage of undergraduate students who are aware that cyclic loading testing machines are used in various departments like endodontics, prosthodontics. Chi-square test was done and association was found to be statistically significant. Pearson's Chi-square value:14.371, DF:4, p value: 0.006(<0.05) hence statistically significant, proving that 3rd year (24.17%), followed by 4th year (8.333%) and Intern (8.333%) undergraduate students have better awareness compared to 1st and 2nd year of undergraduate students.

Majority (25.0%) was aware of cyclic loading testing machine principle whereas (18.55%) was not aware of cyclic loading testing machine principle (Figure 9). Whereas in the Mayer et al. [36] study stated about the ultrasonic equipment working principle. The measure of displacement amplitude at one end of the specimen is proportional to the strain amplitude in the centre. Hence that can be used for test generator control purposes.

Majority of 3rd year (26.6%) are aware that Servo-hydraulic testing machines are available in various sizes for testing both small and large loads (Figure 10). Lieb et al. [37] in there study stated that the servo-hydraulic actuators based around a universal testing machine will provide a flexible, low-cost of biaxial testing facility and it can also be used to examine the direct influence of biaxial stress on deformation and propagation of crack, specifically in high cycle fatigue. And Lee et al.[38] in their study they demonstrated the design of a structural fatigue testing machine capable of both bending and

torsional loading. In that a hydraulic system was incorporated in order to apply loading and to fix the test specimen.
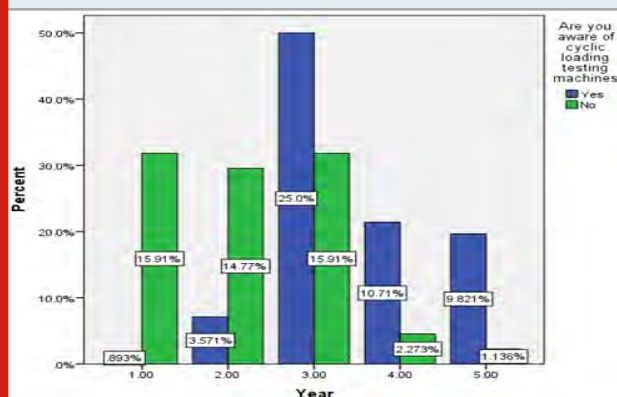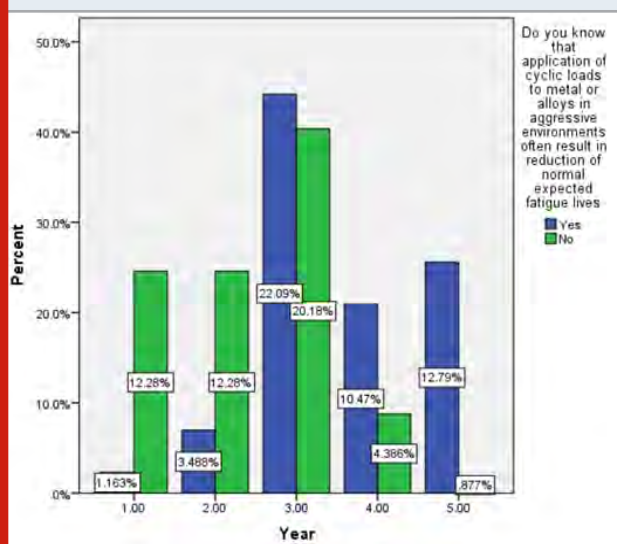
Figure 6: Bar graph shows the association between years of the study of the participants and awareness about cyclic loading testing machines. X axis represents the year of the study of participants and Y axis represents the percentage of undergraduate students who are aware that cyclic loading testing machines are used in various departments like endodontics, prosthodontics. Chi-square test was done and association was found to be statistically significant. Pearson's Chi-square value:14.371, DF:4, p value: 0.006(<0.05) hence statistically significant, proving that 3rd year (24.17%), followed by 4th year (8.333%) and Intern (8.333%) undergraduate students have better awareness compared to 1st and 2nd year of undergraduate students.


Figure 7: Bar graph shows the association between years of the study of the participants and awareness about cyclic loading testing machines. X axis represents the year of the study of participants and Y axis represents the percentage of undergraduate students that agree functional load applied on to anterior portion of the prosthesis can change the fit between prosthetic superstructure and implant supported abutment. Chi-square test was done and association was found to be statistically significant. Pearson's Chi-square value:22.782, DF:4, p value: 0.000(<0.05) hence statistically significant, proving that 3rd year (24.17%), followed by 4th year (9.167%) and Intern (9.167%) undergraduate students have better awareness compared to 1st and 2nd year of undergraduate students.
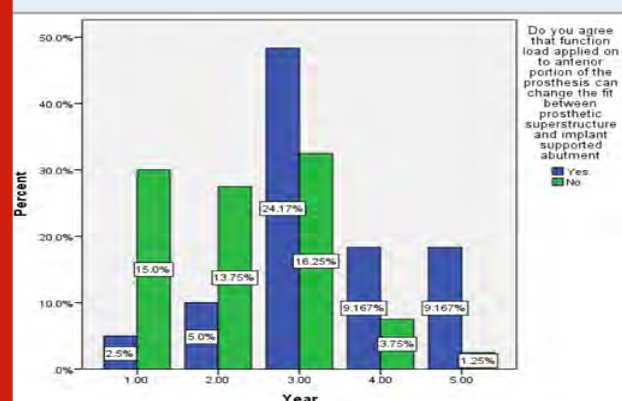

Figure 8: Bar graph shows the association between years of the study of the participants and awareness about cyclic loading testing machines. X axis represents the year of the study of participants and Y axis represents the percentage of undergraduate students that agree that cyclic loading testing machines plays an important role in dentistry. Chi-square test was done and association was found to be statistically significant. Pearson's Chi-square value:9.259, DF:4, p value: 0.055(<0.05) hence statistically significant, proving that 3rd year (22.39%), followed by Intern (8.209%) and 4th year undergraduate students have better knowledge compared to 1st and 2nd year of undergraduate students.
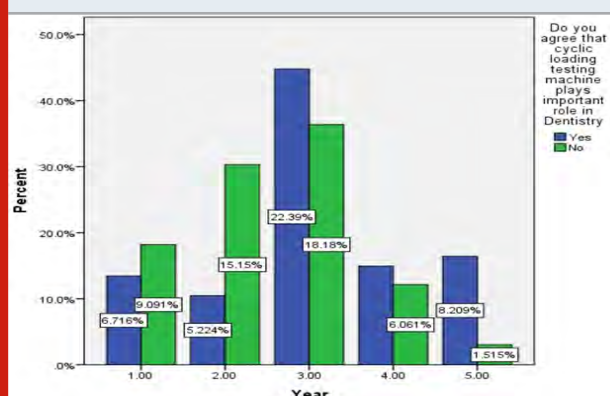
Figure 9: Bar graph shows the association between years of the study of the participants and awareness about cyclic loading testing machines. X axis represents the year of the study of participants and Y axis represents the percentage of undergraduate students who are aware of cyclic loading testing machine principles. Chi-square test was done and association was found to be statistically significant. Pearson's Chi-square value:25.951, DF:4, p value: 0.000(<0.05) hence statistically significant, proving that 3rd year (25.0%), followed by Interns (13.16%) and 4th year (9.211%) undergraduate students have better awareness compared to 1st and 2nd year of undergraduate students.
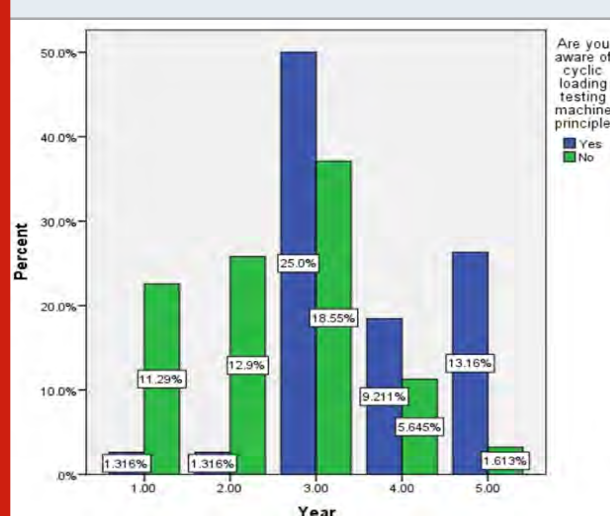
Figure 10: Bar graph shows the association between years of the study of the participants and awareness about cyclic loading testing machines. X axis represents the year of the study of participants and Y axis represents the percentage of undergraduate students who are aware that Servo- hydraulic testing machines are available in various sizes for testing both small and large loads. Chi-square test was done and association was found to be statistically significant. Pearson's Chi-square value:16.850,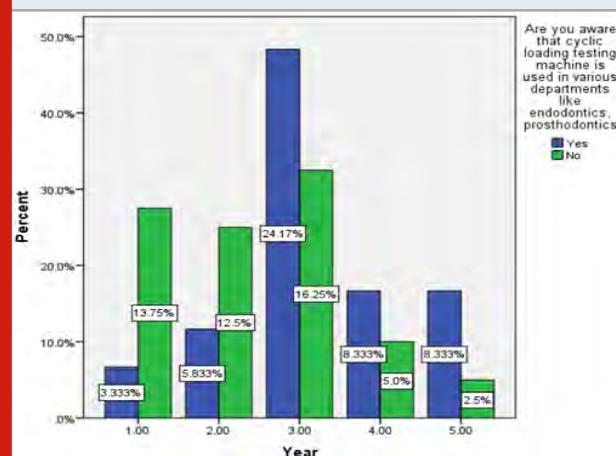 DF:4, p value: 0.002(<0.05) hence statistically significant, proving that 3rd year (26.6%), followed by 4th year (9.574%) and Intern (7.447%) undergraduate students have better awareness compared to 1st and 2nd year of undergraduate students.
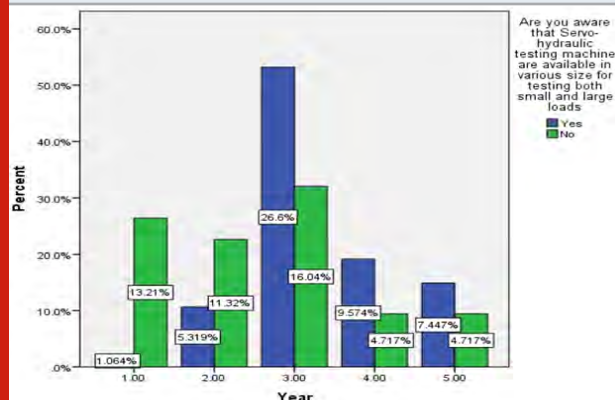
Limitations: There are certain limitations in our survey. There is a small sample size used for our survey which cannot be generated for a large population. And the survey doesn't represent the ethnic group and population.

Future Scope: The survey should be done in a larger population. Multicentered surveys should be done including other criterias.

CONCLUSION

Within the limitations of the study, we can concluded that 3rd year (25.0%), 4th year (10.7%), Intern (9.8%) of them had higher awareness about cyclic loading testing machines than 1st year and 2nd year undergraduate dental students. Therefore for them group discussion and seminar can be conducted in order to create awareness on cyclic loading testing machines.

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Estimation of Demineralisation Activity of Soft Drinks on Extracted Teeth – in vitro Study

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ABSTRACT

We consume a variety of soft drinks in our day to day life, the pH of these soft drinks and chemicals used in these soft drinks as preservatives can have an impact on the teeth, saliva and the other components of oral mucosa.To analyse the demineralisation effect of soft drinks on extracted teeth. Extracted teeth were rinsed and sterilised. The teeth were then subjected to the hot air oven, their weight measured in an electrical balance and ten teeth were put in each soft drink of the same quantity. Water was used as a control and ten teeth were added in the test tube containing water. Then their weight was analysed again after stipulated hours and the difference in weights noted and results interpreted.The analysis showed that there was a reduction in the weight of the teeth which was subjected to soft drinks. This could be due to the eroding effect of the chemicals i.e.,. acids and sugars present in the soft drinks which reduced the mineral content of the teeth, especially the calcium and hydroxyapatite. In this study it was found that both carbonated and non carbonated drinks have an eroding effect on the tooth structure which can be seen as a difference in their dry weights, before and after exposure.

KEY WORDS: DEMINERALISATION ;EROSION; EXTRACTED TEETH ; PH ; SOFT DRINKS; SUGARS..

INTRODUCTION

Dental erosion is defined as an irreversible loss of the dental structure on exposure to chemicals and without the involvement of microorganisms. This process is a result of the action of acids whose pH is lower than 4.5 (Al-Majed, Maguire and Murray, 2002). Enamel is the hardest substance in the body, and it protects the coronal pulp of the teeth. However, it is susceptible to demineralisation by acids. Acids are produced when certain bacteria colonise the tooth surface and metabolise carbohydrates. If the above condition accelerates, it eventually leads to the development of carious lesions in the enamel and dentin. Another source of acid is dietary intake of the individuals. Many foods and beverages contain acids that also would lead to demineralisation of the enamel (Attin et al., 2003).

Soft drinks contain several acids and sugars which are potentially both acidogenic and cariogenic (Attin et al., 2005; Bozec et al., 2005). These acids which are produced by soft drinks along with gastric acid can elicit heavy fumes travelling from the stomach through the oesophagus to the mouth which can mineralised tooth structures. These beverages create a devastating impact on a patient's health by causing degradation of the mineralised tooth structures, increasing tooth sensitivity and inducing changes in appearance of teeth and their

colour. The pattern of erosion changes depending upon the frequency of dental tissue which is being exposed to acidic fumes (Larsen and Nyvad, 1999).

Infective damage or tooth caries occurs as a consequence of demineralisation caused by the bacteria organised in a special ecological formation: oral biofilm – dental plaque. In certain conditions, the so-called cariogenic bacteria (specific species of streptococci) dominate on the tooth surface (Barbour et al., 2005, 2006). They can create organic acids but simultaneously can survive in acidic conditions. They suppress neutral or useful bacteria. For acidogenic biofilms to form and exert a cariogenic effect, the presence of sugar is necessary (Sayegh et al., 2002). Degradation of enamel is a complex phenomenon, but erosion appears to be the predominating factor at low pH levels (Johansson et al., 1996; Wang et al., 2010). This study aims to analyse the demineralisation effect of soft drinks on enamel in an in vitro condition by comparing the weight of hard tissue before and after exposure to a known concentration of soft drinks.

MATERIAL AND METHODS

Extracted teeth were sealed in the apical region, rinsed with water and placed in a hot air oven at 50 degree celsius for 30 mins. They were weighed and exposed to known concentrations of soft drinks for 15mins, 1 hour, 90mins subsequently.

The soft drinks selected were as follows :
Soft drinks:
• Carbonated products
• Non carbonated products

Carbonated:
1. C1
2. C2
3. C3

Non carbonated:
1. N1
2. N2
3. N3

Water used as control.

This study was performed with 10 dried extracted teeth samples in each group. The teeth samples were weighed and were subjected to exposure to C1,C2,C3,N1,N2,N3 and water in separate test tubes. Then the weights of the teeth present in each test tube was assessed subsequently after exposure for 15mins, then placed back in the test tube and again weighed after 60mins, then placed back into their respective test tubes and then finally assessed for the difference in weight if any at the end of 90mins. The differences in weights were noted down and the data was tabulated and represented graphically.

RESULTS AND DISCUSSION

Of the carbonated drinks, C2 showed the greatest demineralisation effect as the teeth subjected to C2 showed significant loss of weight after subject to exposure for 1.5 hours. Of the non carbonated drinks, N3 shows the maximum demineralising effect (table 1)

Erosion is a non carious tooth surface lesion, in which there is continuous loss of enamel and dentin that is

SOFT DRINKS	C1 (n=10)	C2 (n=10)	C3 (n=10)	N1 (n=10)	N2 (n=10)	N3 (n=10)	WATER (n=10)
BEFORE EXPOSURE (MEAN)	5.02g	6.45g	5.31g	5.21g	4.32g	4.75g	11.57g
After 15mins (MEAN)	5.02g	6.45g	5.31g	5.21g	4.32g	4.75g	11.57g
After 60mins (MEAN)	4.98g	5.95g	5.28g	5.16g	4.29g	4.68g	11.57g
After 90mins (MEAN)	4.87g	5.63g	5.21g	5.11g	4.23g	4.63g	11.57g

Table 1. Depicting the mean weight difference on exposure to various soft drinks as observed in this study.

chemically etched away from the tooth surface by acid/ or chelation without bacterial involvement (Jarvinen, Rytomaa and Heinonen, 1991)

From the study it was observed that out of the various carbonated drinks in which teeth were immersed, C2 showed the maximum loss of weight followed by C1 and then C3. Among the non carbonated drinks teeth immersed in N2 shows the maximum change in weight

followed by N1 and N3. Water was considered as a control in this study due to its neutral pH.

The erosion of calcium content of enamel present in the hydroxyapatite structure is due to the acids and sugars present in these soft drinks. The difference between the results in carbonated drinks versus non carbonated drinks reveals that carbonated drinks have carbon gas and increase sugar content for the 'fizz' feeling while non

carbonated drinks also possess acids and sugars which have a potential to slowly erode the enamel surface.

The eroding activity can differ from one individual to another. This is due to the frequency of consumption of soft drinks by the individual, the amount of time the drink is retained in an individual's oral cavity, their general lifestyle and dietary habits, personal habits, systemic conditions.

Figure 1: Bar chart depicting the difference in weights of the teeth on exposure to various soft drinks at various time intervals as observed in this study
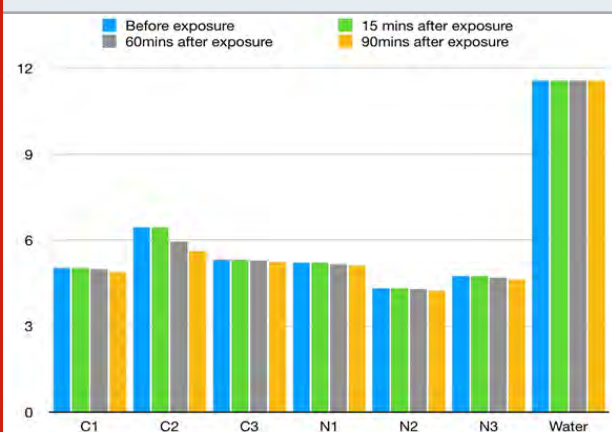
The decrease in weight with increase in time indicates that the increase in exposure to beverages and fruits which contains high levels of citric, phosphoric acids, dietary sugars can pave the way to formation of the biofilm and subsequently the dental plaque. This leads to accumulation of the oral microorganisms which can cause dental caries in them.

The inherent acids and sugars have both acidogenic and cariogenic potential, resulting in dental caries and potential enamel erosion. Continuously sipping soda creates an acid bath for teeth (Luo et al., 2005). This softened several areas of the teeth which is ideal for bacteria to enter and facilitate dental caries formation. As well, the sugar content of the soda is converted to acid by the cariogenic bacterias. Among children, dental erosions are mainly caused by excessive consumption of erosive soft drinks. Growing evidence suggests that there is considerable increase in consumption of potentially erosive drinks among children in the last decade.(Lussi and Jaeggi, 2008). Reports have also been published regarding significant associations between soft drink consumption and dental erosion (Tahmassebi et al., 2006).

Soft drinks with high calcium contents have significantly lower erosive potential while Low pH value and high citric acid content may cause more surface loss. As the erosive time elongates, the titratable acidity to pH 7 may be a predictor of erosive potential for acidic soft drinks. The erosive potential of the soft drinks may be predicted based on the types of acid content, pH value, titratable

acidity, and ion concentration (Aas et al., 2005, 2008)

Literature reveals that there exists a positive relationship between caries, dental erosion and the consumption of soft drinks (Badra et al., 2005; Hemingway et al., 2006; Barbour and Shellis, 2007; Lutovac et al., 2017). Accordingly, the clinical manifestations and diagnosis of diseases caused by soft drinks should be regarded as a combination of erosion and caries, and clinicians should pay more attention to it.

CONCLUSION

In this study it was found that both carbonated and non carbonated drinks have an eroding effect on the tooth structure which can be seen as a difference in their weights, before and after exposure. Hence consumption of soft drinks will have eroding activities.

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Knowledge and Awareness of Serial Extraction Among Undergraduate Students

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ABSTRACT

Serial extraction is defined as the extraction of teeth within the dental arch, to allow space to be available for the remaining teeth. The effect of such an extraction can have a positive and a negative reaction towards the remaining dentition. According to TM. Grabier, serial extractions are a guided, progressive removal of deciduous teeth preceding the time that they would normally shed.A questionnaire composed of 10 structured questions with multiple choices were distributed via an online survey platform - Survey Planet. Total of 100 responses were recorded and analysed.The results obtained were tabulated and represented in the form of graphs. Most of them are aware about serial extraction, there are some who are still unclear about the concept and facts.

KEY WORDS: SERIAL EXTRACTION, DENTAL ARCH, GUIDED, ORTHODONTICS, CORRECTIVE STAGE.

INTRODUCTION

The fundamental aspect of orthodontics is to correct the alignment of the teeth for better form and function of the dentition(Kocyigit et al., 2019). In order to achieve that, various studies have been done to ensure that there can be more than one way of addressing each problem in terms of malocclusion(Meador, 1982; Jayade, 2016). They include, crowding, spacing, increased overjet, increased overbite, decreased overjet, decreased overbite, maxillary protrusion, mandibular protrusion, maxillary retrusion, mandibular retrusion, etc('Malocclusions, Dental', 2012; Bs, Phulari and Naik, 2017).

Out of the many ways to correct the aforementioned anomalies, the method of which this article highlights is serial extraction which falls under the corrective stage of orthodontics(Kumar, 2007; 'Serial Extraction', 2010). Serial extraction is defined as the extraction of teeth within the dental arch, to allow space to be available for the remaining teeth(Salzmann, 1966). The effect of such an extraction can have a positive and a negative reaction towards the remaining dentition(Ringenberg, 1964). According to Yoshihara, serial extractions are a guided, progressive removal of deciduous teeth preceding the time that they would normally shed, or to be more precise, the fundamental phenomena of adaptability and adjustment(Bfd and Bfd, 1976; Yoshihara et al., 2000).

In terms of adaptability, providing room in the jaw span to harmonize the previously defective tooth system with the normal muscle and bone systems is clearly a

justification for serial extractions(Joondeph and Riedel, 1976; Yoshihara et al., 2000). For example, a deciduous first molar is extracted to allow room for the permanent premolars to erupt(Hinrichsen, 1961). In accordance with adjustment and previous scenario, if the length of the arch is inefficient, with the help of the previously attained diagnostic information the first premolars are extracted to allow the distal migration of the canine into its anatomical position(Wagner and Berg, 2000; O'Shaughnessy et al., 2011).

The advantage of a serial extraction based treatment is to anticipate and minimise the development of a completely matured deformity in a set of permanent dentition(Lian and Karlsen, 2004). Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the knowledge and awareness of serial extractions among undergraduates. In the light of the subject, this study is aimed to evaluate the knowledge and awareness of serial extractions among undergraduates and to assess how well the undergraduate students are equipped with theoretical procedures.

Figure 1: The questionnaire that was designed to conduct this survey via Survey Planet.

MATERIAL AND METHODS

This is a KAP survey based on an online setting. A questionnaire consisting of 10 questions were put up online via SURVEY PLANET. The questionnaire was distributed via a web link that was obtained from the website among undergraduates through whatsapp. The

data was updated on the website every time someone attempted the questionnaire. The results obtained were then made into pie charts and the data was tabulated based on percentile value.

Graph 1: Shows the number of responses for question 1
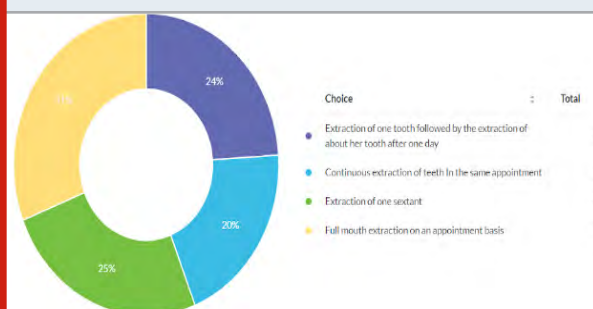
Graph 2: Shows the number of responses for question 2
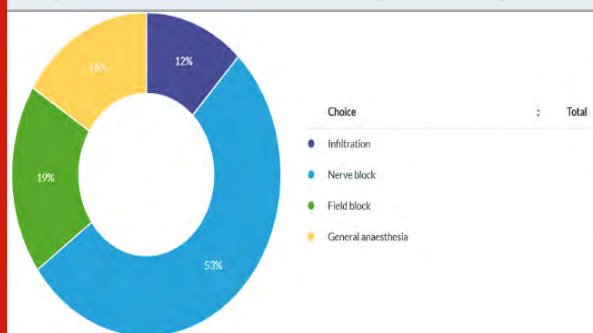
RESULTS

The results obtained were tabulated and represented by using a pie chart.

Graph 3: Shows the number of responses for question 3
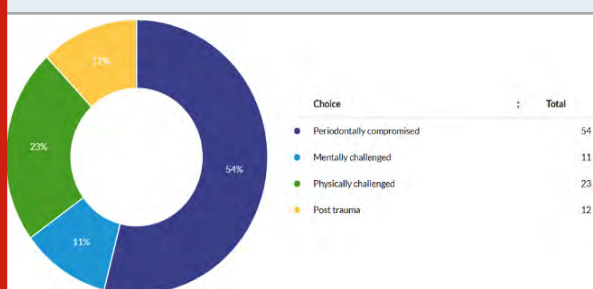
RESULTS AND DISCUSSION

Based on the results obtained, the following deductions were made. The first question required the students to define what serial extractions are. Graph 1 shows 31% of the students are aware of its definition while 69% of the students were not. Graph 2 shows 51% of the students opted that serial extractions be done in the corrective stage of a dental procedure while 49% chose otherwise. Question 3 required the students evaluate which patient is more prone to serial extraction as a line of treatment. Based on graph 3, 36% of the students thought that

patients undergoing prosthetic treatment are more prone to that line of treatment.

Graph 4 shows that 54 % of the students opted that the deciduous molar should be the first tooth that should be extracted during a serial extraction, while 46% of the other students were torn between permanent incisors, deciduous incisors, and permanent molars. Graph 5 shows 47.7% of the students agreed that the main advantage of serial extractions is to improve arch space, 14.2% of them agreed that it provides space, while 38.1% agreed that both the options were apt.

Graph 4: Shows the number of responses for question 4

Choice	Total
Full mouth extraction	45
Partial extraction	38
Single Extraction	17
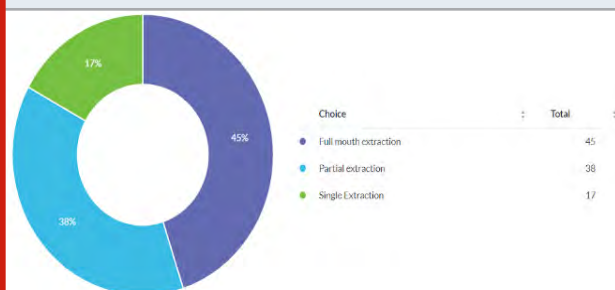
Graph 5: Shows the number of responses for question 5

Choice	Total
Mandibular anteriors	23
Maxillary anteriors	36
Mandibular posteriors	27
Maxillary posteriors	14
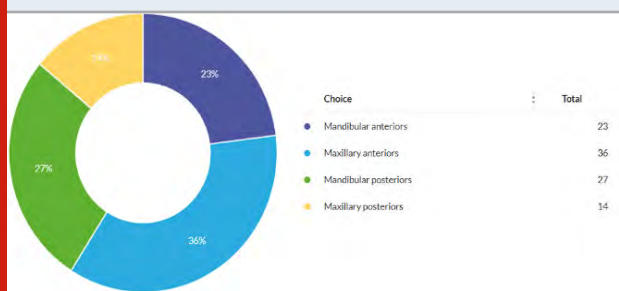
Question 6 asked if serial extractions should be recommended for patients with prosthetic teeth and 45% of the students agreed while 38% disagreed. In question 7, the students were asked if they would recommend serial extractions as a line of treatment for their pediatric patients. 47.7% of them said yes while only 14.2% said no. Graph 8 shows that 51.3% of the students agreed that serial extractions can be included in the treatment plan for patients with midline diastema while only 20% disagreed.

Graph 6: Shows the number of responses for question 6

Choice	Rating	Total
1 - Cvs disorders	28	28
2 - Systemic disorders	94	47
3 - Diabetics	75	25
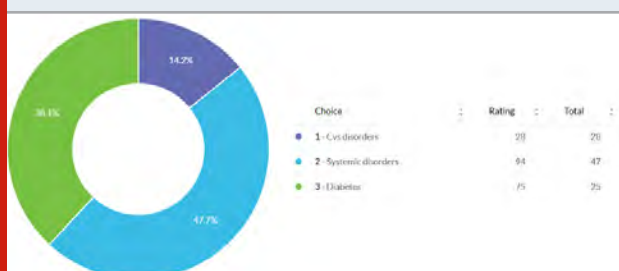
Graph 7: Shows the number of responses for question 7

Choice	Total
Buccal	34
Alveolar	41
Labial	15
Lingual	10
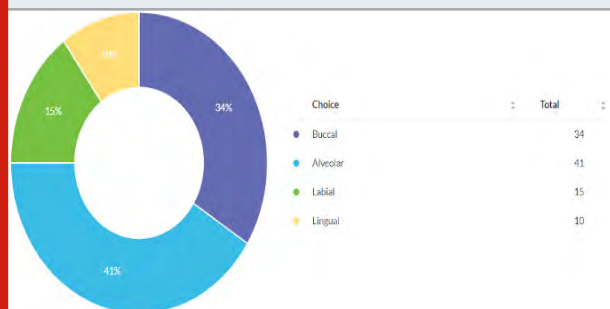
Graph 8: Shows the number of responses for question(8

Choice	Total
preserve the bone	15
allow replacement of the teeth	35
preseve the bone and allow replacement of the teeth	38
Allow regrowth	12
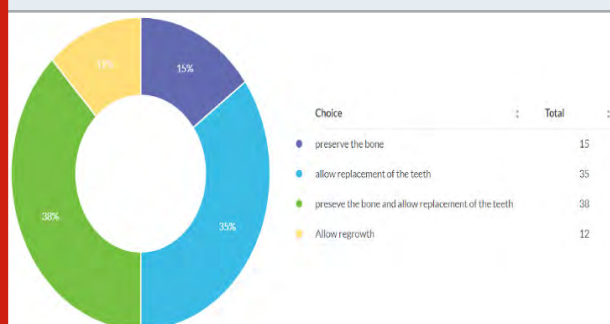
Question 9 was a question of true or false between two statements about the benefits of serial extractions. Graph 9 shows 35.5% of the students agreed on statement 2, 33.1% agreed on statement 1, 23.4% on both while 8.1% of them disagreed on both statements. Question 10 was a true or false question about whether or not serial extractions were apt for patients with more than one ankylosed teeth. Based on graph 10, 60% of the students chose false while 40% chose true as an option. Serial Extraction, also known as the guidance of eruption, is an age-old procedure done to correct crowded arches and is usually done during the mixed dentition period(B.f.d and B., 1978). In other words, it is the planned and sequential extraction of certain deciduous teeth followed by the removal of specific permanent teeth in order to encourage the spontaneous correction of irregularities present(Bfd and Bfd, 1976).

Graph 9: Shows the number of responses for question 9

Choice	Total
True	40
False	60
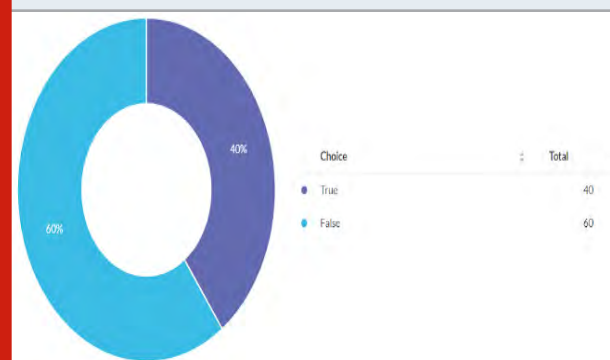
The patients who are most likely to be advised for serial extraction would be children going through a mixed dentition period with severe dental malocclusion and/ or crowding(Hinrichsen, 1961). As this procedure is an interruptive procedure done by the extraction of premolars and canines to better the arch shape and size, this procedure limits the types of patients to only dental orthopaedic treatment(Kaán, Kaán and Károlyházy, 2001).

Graph 10: Shows the number of responses for question 10
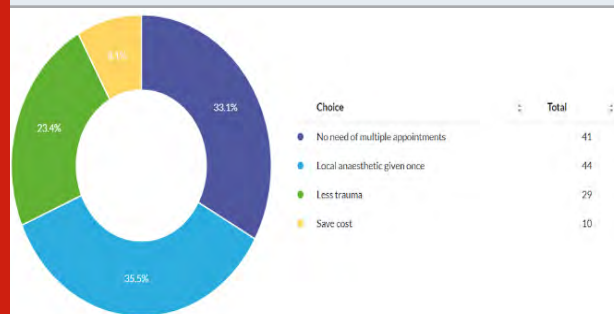
The first tooth to be extracted during a serial extraction treatment is the deciduous molar. All the deciduous predecessors of the molars are wider mesiodistally compared to the premolars of the second dentition('Serial Extraction', 2010). Therefore, if the second molar is lost, a significant drifting together of the adjacent teeth can begin before the permanent tooth provides a direct mechanical resistance, due to its size, shape and position(B.f.d and B., 1978). In cases of diastema, serial extraction should not be performed before the diastema is corrected. Diastema can either be between the central incisors or due to crowded erupting laterals(Bs, Phulari and Modley, 2017).

One of the many advantages of serial extraction include, a more stable and aesthetically pleasing result, teeth will erupt over the alveolus and through -keratinized tissue, rather than being displaced buccally or lingually(Marques et al., 2011). The cost of orthodontic treatment at a later stage will also be avoided. The health of the investing tissues is also preserved with less potential for iatrogenic damage like root resorption and enamel decalcification(Degering, 1965). The line of treatment for ankylosed teeth is orthodontic surgery(Pace, Murray and Sandler, 2010). Other treatments like, restorative or prosthetic would help the patient look pleasing(Graber, 1971). However, the patient would not feel comfortable.

CONCLUSION

In a nutshell, this survey has shun some light on the subject and although it is clear that most of them are aware about serial extraction, there are some who are still unclear about the concept and facts. More conferences, case presentation and activities regarding serial extraction, might help the undergraduates develop interest in this field and hopefully gain a little more knowledge about serial extractions.

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Knowledge, Awareness and Practice Regarding Piezoelectric Surgery Among Dental Students

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ABSTRACT

Piezoelectric surgery implies a minimally invasive method that decreases the risk of harm to surrounding soft tissues and significant structures such as nerves, vessels, and mucosa. The main aim of the present study is to assess the knowledge, awareness, and practice of dental students based on the usage of piezoelectric surgery. The objective of the study was to perform the knowledge, awareness, and practice of dental students based on the choice and the technique of piezoelectric surgery. A sample size of 100 dental practitioners who perform surgical procedures was considered as participants. A questionnaire comprising 10 questions on the incidence, technique, and major aspects of piezoelectric surgery was given. The subjects were made to fill the questionnaire through an online portal. The recordings were made individually by the investigator and results were analyzed. All the data was arranged in a tabulated form and analyzed. The results inferred from the study show that 68% of the participants were aware of the term piezoelectric surgery, 75% believe it was originally developed for the atraumatic cutting of bone, most of them were aware of the advantages and uses of piezoelectric surgery, 52% were aware of Er: YAG laser is used in this technique. From the study, we can conclude that there is sufficient knowledge amongst the dental practitioners regarding choice and the technique of piezoelectric surgery

KEY WORDS: AWARENESS; DIFFICULTY; PIEZOELECTRIC; TECHNIQUES.

INTRODUCTION

Piezoelectric surgery implies a minimally invasive method that decreases the risk of harm to surrounding soft tissues

and significant structures such as nerves, vessels, and mucosa. It also decreases harm to osteocytes and allows good survival of bony cells when harvesting of bone (Labanca et al., 2008). Piezoelectric surgery was initially used by oral and maxillofacial surgeons for osteotomies, though lately it is applied for specific uses in neurosurgery and orthopedics as well (Vercellotti, 2000).

In 1880, piezoelectricity was discovered by Jacques and Curie. In 1953, in the scope of dentistry, ultrasonics set itself chiefly in periodontology and endodontics when Catuna first published the cutting effects of high-frequency sound waves towards the dental hard tissue (González-García et al., 2009).

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Piezoelectric devices usually consist of a handpiece and footswitch that are connected to the main power unit. This has a holder for the handpiece and contains irrigation fluids that create an adjustable jet pump removing debris from the cutting area and maintains a blood-free operating area because of cavitation of the irrigation solution giving greater visibility particularly in complex anatomical areas by dispersing coolant fluid as an aerosol (Rahnama et al., 2013) (Wallace et al., 2007). The piezoelectric system is based on the fact that certain crystalline structures such as quartz will be subject to a change in shape when placed within an electric field (Chiriac et al., 2005).

Piezoelectric equipment can be used for endodontic surgery, periodontology and implantology, scaling subgingival plaque, osteotomy and osteoplasty procedures to create the positive physiologic architecture of bone support of the involved teeth, harvesting bone blocks and bone grafting, sinus lift procedure, ridge augmentation, and ridge expansion, tooth extraction, cystectomy, maxillofacial surgery, surgical orthodontic surgery, otological surgery, neurosurgery, orthopedic, and hand surgery (Horton et al., 1975).

The advantages of the piezosurgery for augmentative purposes, sinus floor elevation carries a way the lower risk of perforation or injury to the mucous membrane since soft tissues cannot be damaged with this method (Seshan et al., 2009) (Robiony et al., 2004). The most convincing characteristics of piezoelectric bone surgery are low surgical trauma, exceptional control during surgery, and quick healing response of tissues (Schaeren et al., 2008). Clinical researches have shown the specificity and hence the technique applied with piezoelectric surgery makes it likely to advantageously utilize differences in hard and soft tissue anatomy. This not only increases treatment efficacy but it also improves postoperative recovery and healing (Vercellotti et al., 2005) (Aro et al., 1981).

Figure 1: Pie chart showing responses to the question, 'Are you aware of the term piezoelectric surgery?'. Majority of respondents reported as yes they are aware of term piezoelectric surgery (68%).

Previously our department has published extensive research on various aspects of prosthetic dentistry (Anbu et al., 2019; Ariga et al., 2018; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Ganapathy et al., 2017; Gupta et al., 2018; Jain, 2017a, 2017b; Ranganathan et al., 2017; Varghese et al., 2019; World Journal of Dentistry, 2017), this vast research experience has inspired us to research about the knowledge, awareness, and practice of dental students based on the choice and the technique of piezoelectric surgery.

Figure 2: Pie chart showing responses to the question, 'Piezosurgery device was originally developed for the atraumatic cutting of bone by way of ultrasonic vibrations?'. Majority of respondents reported as yes they are aware of atraumatic cutting of bone (75%).
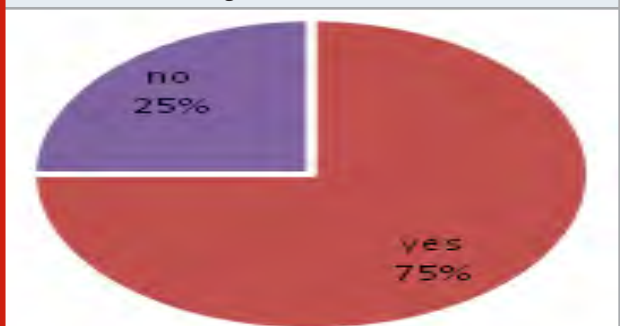
Figure 3: Bar chart showing responses to the question, 'Advantages of piezoelectric technique include?'. Majority of respondents reported all of the above- precise and selective cuttings, avoidance of thermal damage and preservation of soft-tissue structures (45%).
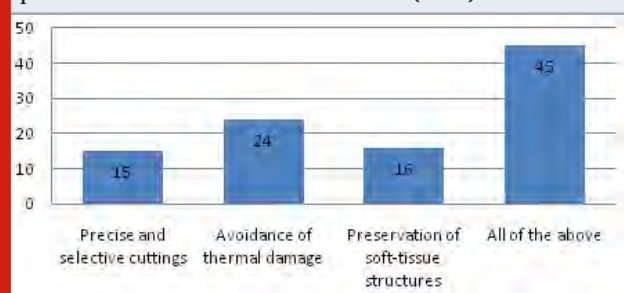
MATERIAL AND METHODS

A cross-sectional survey was conducted among dentists in a private dental college, Chennai. A structured, self administrable questionnaire consisting of ten multiple choice questions (MCQs) encompassing major aspects of piezoelectric surgery conducted through an online survey was prepared and shared among dentists, and dental students. The survey included the techniques and treatment methods, type of laser, materials, complications were distributed. The dentists were permitted to choose more than one answer, if they desired. The convenient sample size of 100 dental students and practitioners was decided and data was collected by questionnaire. The responses were tabulated and statistically analyzed.

Questionnaire:
1) Are you aware of the term piezoelectric surgery?
A. Yes
B. No
2) Piezosurgery device was originally developed for the atraumatic cutting of bone by way of ultrasonic vibrations?
A. Yes
B. No
3) Advantages of piezoelectric technique include?
A. Precise and selective cuttings
B. Avoidance of thermal damage
C. Preservation of soft-tissue structures
D. All of the above
4) Approaches are more efficient in reducing postoperative complications compared to the conventional surgeries.
A. Agree
B. Disagree
5) Piezo surgery is used for the following treatments?
A. Harvesting bone blocks and bone grafting
B. Bone osteotomy or corticotomy
C. Tooth extraction
D. Sinus lift procedure
E. Cystectomy
F. All of the above
6) Lasers which are commonly used in piezoelectric surgery?
A. Er:YAG (2940 nm)
B. Er,Cr:YSGG (2780 nm)
7) Application of mechanical stress on the piezoelectric material leads to generation of electricity. This is known as?
A. Direct piezo effect
B. Inverse piezo effect
8) Application of electricity on the piezoelectric marterial leads to physical deformation and thus causes generation of mechanical force. This is known as?
A. Direct piezo effect
B. Inverse piezo effect
9) Insert tips of Gold colour are used to treat
A. Bone
B. Soft tissues
10) Insert tips of stainless steel are used to treat
A. Bone
B. Soft tissues

RESULTS AND DISCUSSION

The survey was taken up by 100 people who included the dental students and dentists. The results obtained were tabulated, and bar charts were prepared to analyze the result. Among the participants of this study we observed that, figure 1 shows the majority of respondents reported as yes they are aware of term piezoelectric surgery (68%). Figure 2 shows the majority of respondents reported as yes they are aware of atraumatic cutting of bone (75%). Figure 3 shows the majority of respondents reported all of the above- precise and selective cuttings, avoidance of thermal damage and preservation of soft-tissue structures (45%). Figure 4 shows the majority of respondents agreed to this question (89%). Figure 5 shows the majority of respondents reported all of the above- harvesting

bone blocks and bone grafting, bone osteotomy or corticotomy, tooth extraction, sinus lift procedure and cystectomy (30%).

Figure 4: Bar chart showing responses to the question, 'Approaches are more efficient in reducing postoperative complications compared to the conventional surgeries?'. Majority of respondents agreed to this question (89%).
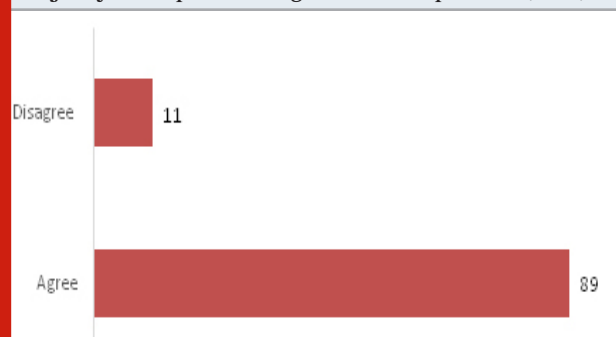
Figure 5: Bar chart showing responses to the question, 'Piezo surgery is used for the following treatments?'. Majority of respondents reported all of the above- harvesting bone blocks and bone grafting, bone osteotomy or corticotomy, tooth extraction, sinus lift procedure and cystectomy (30%).
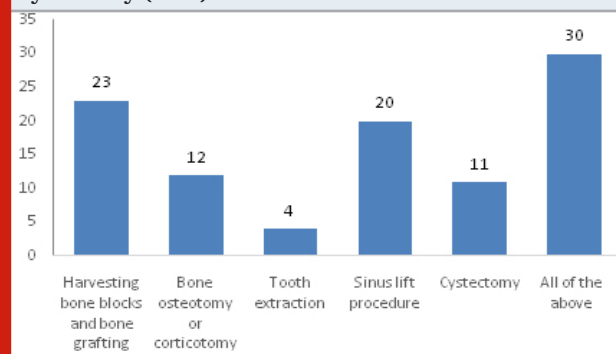
Figure 6 shows the majority of respondents reported Er:YAG (2940 nm) as the most commonly used laser (52%). Figure 7 shows the majority of respondents reported the direct piezo effect (60%). Figure 8 shows the majority of respondents reported an indirect piezo effect (65%). Figure 9 shows the majority of respondents reported gold tips are used for treatment of bone (63%). Figure 10 shows the majority of respondents reported stainless steel tips are used for treatment of soft tissues (59%).

Based on the above results, 68% of the participants were aware of the term piezoelectric surgery which is gaining popularity in the field of dentistry in recent years. Regarding the atraumatic cutting of bone, 75% of the population was aware of it. In a study conducted by Wallace et al, it was suggested for the utilization of piezoelectric surgery, rather than rotary diamond burs, for lateral window preparation and hence reduction in

intraoperative complications (Wallace et al., 2012) (Lee et al., 2007).

Figure 6: Bar chart showing responses to the question, 'Lasers which are commonly used in piezoelectric surgery? '. Majority of respondents reported Er:YAG (2940 nm) as the most commonly used laser (52%).
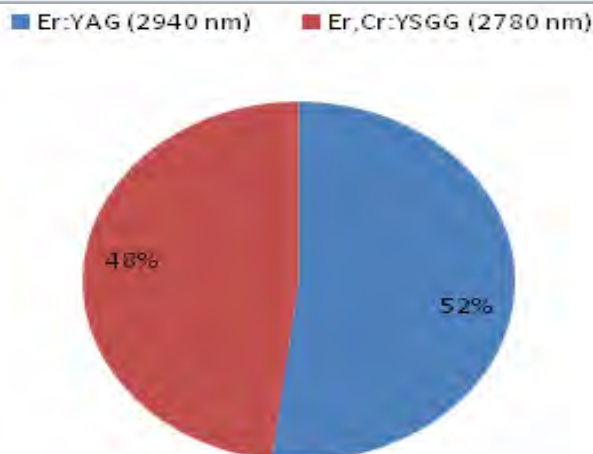
Figure 7: Bar chart showing responses to the question, 'Application of mechanical stress on the piezoelectric material leads to generation of electricity. This is known as? '. Majority of respondents reported the direct piezo effect (60%).
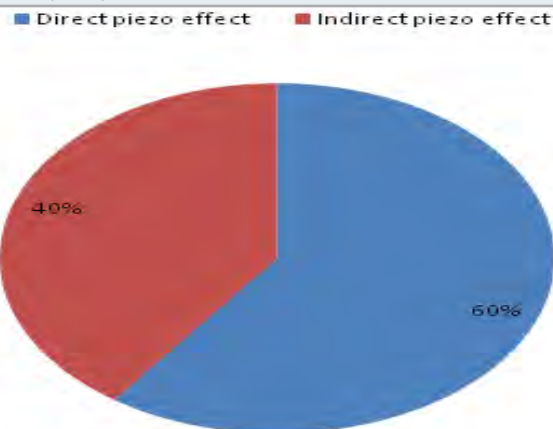
Advantages of piezoelectric surgery include avoidance of thermal damage, precise and selective cutting, and preservation of soft tissue structures and were opted by 45% of the participants which is in accordance with a study done by Thomas et al in 2017 (Thomas et al., 2017). In this study, 89% of the population believed that postoperative complication are reduced by the usage of this technique. In a study done by Shirota et al, the effectiveness of piezoelectric surgery in reducing surgical complications after bilateral sagittal split osteotomy was shown (Shirota et al., 2014).

Piezosurgery is used for the following treatments-Harvesting bone blocks and bone grafting, Bone osteotomy or corticotomy, Tooth extraction, Sinus lift

procedure, Cystectomy which 30% of the population selected for all of the above treatments. The use of Piezoelectric osteotomy in craniofacial surgery was suggested in a study done by Gleizal et al (Gleizal et al., 2007). Lasers that are commonly used in piezoelectric surgery are Er: YAG (2940 nm) opted by 52% followed by Er, Cr: YSGG (2780 nm) opted by 48%. The use of Er: YAG laser for impacted third molar surgery was shown in a study done by Keyhan SO et al in December 2019 (Keyhan et al., 2019). Application of mechanical stress on the piezoelectric material leads to the generation of electricity and this is known as the direct piezo effect, opted by 60% of the participants. Application of electricity on the piezoelectric material leads to physical deformation and thus causes the generation of mechanical force and this is known as the indirect piezo effect (65%). The relationship between direct and converse piezoelectric effect in a nanoscale electromechanical contact was reviewed by Kalinin et al (Kalinin and Gruverman, 2007).

Figure 8: Bar chart showing responses to the question, 'Application of electricity on the piezoelectric material leads to physical deformation and thus causes generation of mechanical force. This is known as? '. Majority of respondents reported an indirect piezo effect (65%).
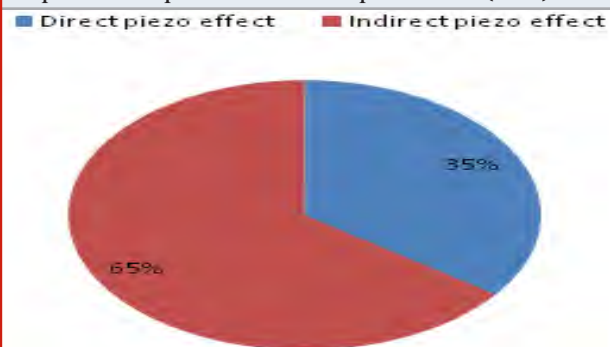
Figure 9: Bar chart showing responses to the question, ' Insert tips of Gold colour are used to treat? '. Majority of respondents reported gold tips are used for treatment of bone (63%).
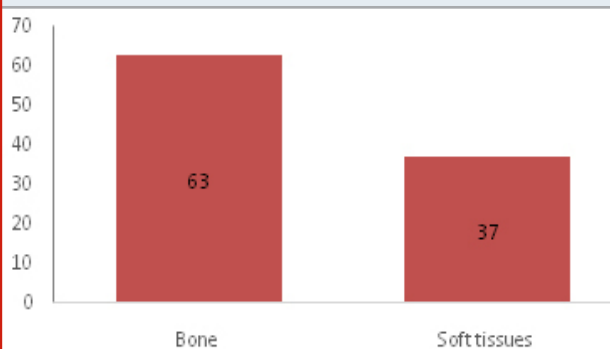
Insert tips of gold are used to treat bone (63%). Insert tips of stainless steel are used to treat soft tissues (59%). Most of the periodontal and oral surgical procedures require bone cutting. Although the traditional method of bone surgery provides better predictability and ease

of application, they have several drawbacks such as a high heat generation, damage to the cells, necrosis of the tissues. To overcome these factors the piezoelectric surgery has been introduced which causes micrometric and selective cutting creates a clear-cutting field and excellent tissue healing (Chandra et al., 2017). As a result, periodontal and implant surgical techniques can be performed with greater ease and safety. The better clinical results are due to its positive effects on the first phases of bony healing; it induces an earlier increase in bone morphogenetic proteins, controls the inflammatory process (Vignesh and Thamariselvan, 2016). With the advancement in the field of dentistry, an implant-supported prosthesis is no more a big challenge and hence piezoelectric surgery has paved the way for direct sinus lift with immediate implant placement Maxillary sinus lift with an accompanying bone graft serves as a simple, widely used procedure (Vidhya and Nesappan, 2016).

Figure 10: Bar chart showing responses to the question, 'Insert tips of stainless steel are used to treat? '. Majority of respondents reported stainless steel tips are used for treatment of soft tissues (59%).
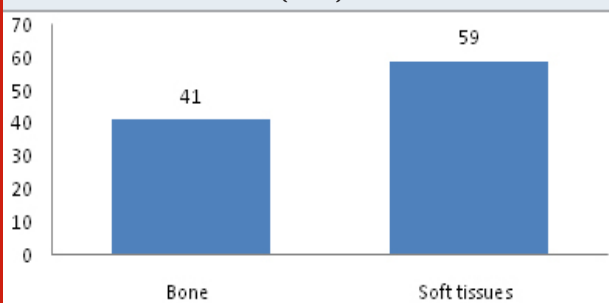
CONCLUSION

As per the data, though the knowledge, awareness and practice among the dental practitioners regarding the piezoelectric surgery is adequate, there is a need for an update regarding the correct and prudent application of these critically important perspectives in dentistry for providing better treatment without any complications.

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Conflicts of Interest: The authors declare no conflicts of interest.

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The Knowledge of Aminoglycosides Among Health Science Students

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ABSTRACT

Aminoglycosides are potent bactericidal antibiotics that act by inhibiting protein synthesis by binding to 30S ribosomes. It is clinically effective against numerous infections. However, antimicrobial resistance is alarming and becoming a major concern in a public health care system. A survey was conducted among health science students including medicine, dentistry and pharmacy students in private hospitals and dental hospitals to assess their knowledge regarding aminoglycosides. A total of 150 responses were obtained through an online Google form application and the results were analyzed using the SPSS statistical software. Based on their knowledge of aminoglycosides, 65% of the participants actually knew about the mechanism of action of aminoglycosides which was bactericidal which was not statistically significant ($p>0.05$). Streptomycin, amikacin and neomycin were chosen as a group of aminoglycosides by participants in dentistry (29.5%), medicine (36.6%) and pharmacy (33.9%) which was not statistically significant ($p>0.05$). 52.7% of the participants answered that nephrotoxicity and ototoxicity were the adverse effects of aminoglycosides. Most of the participants answered that the combination of aminoglycosides with beta-lactam antibiotics often used in treating staphylococcus aureus infections and bacterial endocarditis (28.7%). In conclusion, the awareness and knowledge among medical field students regarding aminoglycosides were at a satisfactory level. Most of the students knew about the basic knowledge of aminoglycosides even though it is rarely prescribed by medical, dental and pharmacy students during the practical courses

KEY WORDS: AMINOGLYCOSIDES; ANTIMICROBIAL RESISTANCE; HEALTH SCIENCE; STREPTOMYCIN.

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INTRODUCTION

Antimicrobial resistance is a major public health concern that threatens the medical professional in treating infectious diseases (Wha68, 2015). The World Health Organization (WHO) predicted that nearly 10 million people all around the world will die due to antimicrobial resistance (O'Neill, 2014). There are several reasons behind the emergence of antimicrobial resistance and one of them is due to misuse or overuse of antibiotics (van de Sande-Bruinsma et al., 2008; Laxminarayan and Heymann, 2012). It was found that the inappropriate and over-prescription of antibiotics are prevalent worldwide (Organization and Others, 2013). The most commonly affected countries are developing countries because of their fragile regulation systems and inadequate human capacity (Mao et al., 2015).

The inappropriate use of antibiotics not only results in bacterial strain becoming resistant, but it also leads to the progression of various adverse effects and financial burdens (Gyssens, 2001). It is a tough task to treat infectious diseases which are already resistant to the antibiotics as it is difficult to reverse the resistance (Wolff, 1993). Medical professionals play an important role to decline the emergence of antimicrobial resistance in such a way that they need to follow guidelines in prescribing antibiotics and engaging the patients to follow the instructions while taking antibiotics (Fluent et al., 2016). The most commonly used antibiotics are aminoglycosides, penicillin, fluoroquinolones, macrolides, tetracyclines and cephalosporins (Sharma et al., 2019).

Aminoglycosides are a potent bactericidal antibiotic that act through the inhibition of protein synthesis (Krause et al., 2016). However, there was a shift in the systemic use of aminoglycosides in the 1980s due to the availability of less toxic and broader coverage of antibiotics such as third-generation cephalosporins, carbapenems and fluoroquinolones (Krause et al., 2016). Due to increasing resistance to aminoglycosides, new drugs were developed such as arbekacin and plazomicin (Krause et al., 2016). These drugs were designed to overcome the antimicrobial resistance by aminoglycosides and maintain potency against multidrug-resistant pathogens (Krause et al., 2016).

There were several studies reported on the knowledge of antibiotic resistance and prescriptions among medical students (Wasserman et al., 2017; Weier, Thursky and Zaidi, 2017; Haque et al., 2019), dental students (Radeva, Marinova-Takorova and Radev, 2019; Struzycka et al., 2019) and pharmacy students (Ahmad, Muhammad U. Khan, et al., 2015; Ahmad, Muhammad Umair Khan, et al., 2015). A reported that students' knowledge regarding antibiotic resistance and the prescription was good but the attitude towards antibiotics was poor (Ahmad, Muhammad Umair Khan, et al., 2015). Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the knowledge of aminoglycosides among medical, dental and pharmacy students.

MATERIAL AND METHODS

Study setting: This cross-sectional study was conducted in December 2019 among medical, dental and pharmacy undergraduate students in private dental hospitals in Chennai, India. A total of 150 students participated in this study.

Study Subjects: A total of 150 students participated in this study out of which medical students (33.3%%), dental students (34%) and pharmacy students (32.7%).

Methodology: Questions about knowledge, attitude and practice regarding aminoglycosides were prepared and prevalidated. The survey was conducted through an online survey using Google Form application. Health science students including medical, dental and pharmacy students were included in the study. Incomplete surveys were excluded in the study. The responses of the participants were recorded and analyzed.

Statistical Analysis: Data were entered in Excel and analyzed using SPSS software version 20.0. Descriptive analysis such as frequency distribution and Chi-square test were done and a significant level of less than 0.05 was set to be statistically significant.

Figure 1: Bar chart showing the comparison based on the field of study to the question, "mechanism of action of aminoglycosides". X-axis represents the field of study and Y-axis represents the number of participants with their responses.(purple-bactericidal and yellow-bacteriostatic). Higher number of participants from pharmacy (22.7%) answered bactericidal, followed by medicine (21.3%) and dentistry (20.7%) courses. There is no significant difference between the field of study. (Chi-square test value: 0.824a, p-value: 0.662 (p>0.05) - not significant.
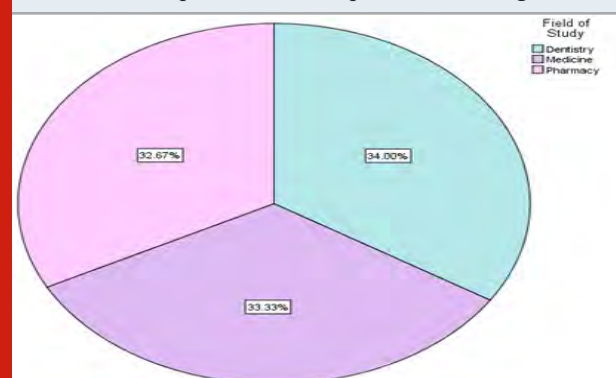
RESULTS AND DISCUSSION

A total of 150 students participated in the study out of which medical students (34%), dental students (33.3%) and pharmacy students (32.7%) as shown in Figure 1. Several questions were prepared to assess the knowledge of aminoglycosides among the participants.

Based on their knowledge of pharmacology, a higher number of pharmacy students (35.1%) answered bactericidal as the mechanism of action of aminoglycosides followed by medical students (33%) and dental students (32%) which was not statistically significant (p>0.05) as shown in Figure 2. Aminoglycosides act by inhibiting protein synthesis through binding on the A site of 30S ribosome (Kotra, Haddad and Mobashery, 2000). All aminoglycosides are bactericidal even though the exact mechanism varies based on the chemical structure (Davis, 1987).

Figure 2: Bar chart showing the comparison based on the field of study to the question, "group of aminoglycosides". X-axis represents the field of study and Y-axis represents the number of participants with their responses. (green-erythromycin, azithromycin, yellow-penicillin, amoxicillin, purple-streptomycin, amikacin and neomycin, blue-tetracycline, doxycycline). Higher number of participants from medicine (27.3%) answered streptomycin, amikacin and neomycin followed by pharmacy (25.3%) and dentistry (22%) courses. There is no significant difference between the field of study. (Chi-square test value: 7.444a, p-value: 0.282 (p>0.05) - not significant).
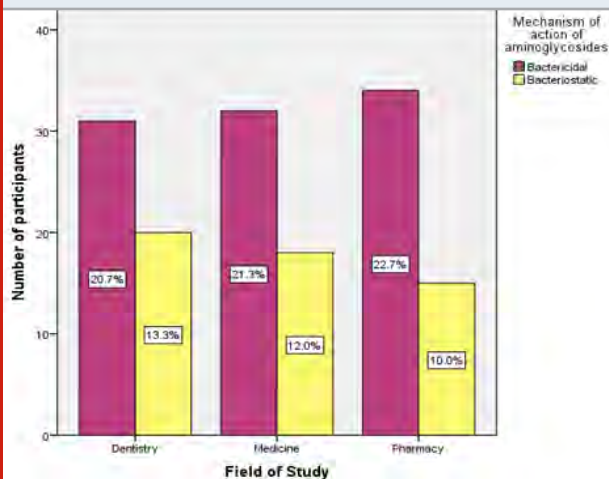
When asked about the group of drugs classified under aminoglycosides, a higher number of medical students (36.6%) answered streptomycin, amikacin and neomycin followed by pharmacy students (33.9%) and dental students (29.9%) which was not statistically significant (p>0.05) as shown in Figure 3. The first aminoglycosides introduced in clinical use was streptomycin in 1944. Several other drugs were introduced over the intervening years such as neomycin, kanamycin, gentamicin, netilmicin, tobramycin and amikacin (Krause et al., 2016).

Overall, most of the participants (75%) knew the drugs in the group of aminoglycosides.

Figure 3: Bar chart showing the comparison based on the field of study to the question, "aminoglycosides should not be mixed with other drugs in the same syringe/infusion bottle". X-axis represents the field of study and Y-axis represents the number of participants with their responses. (blue-yes, red-no). Higher number of participants from dentistry (27.3%) answered yes followed by medicine (24.7%) and pharmacy (21.3%) courses. There is no significant difference between the field of study. (Chi-square test value: 2.925a, p-value: 0.282 (p>0.05) - not significant).
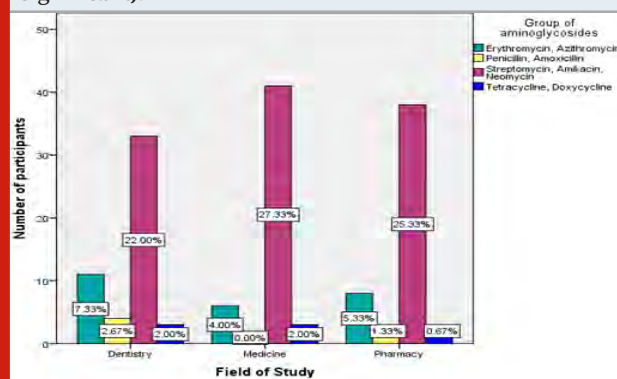
Figure 4: Bar chart showing the comparison based on the field of study to the question, "aminoglycosides can cross the placenta and may enter the foetal blood or amniotic fluid". X-axis represents the field of study and Y-axis represents the number of participants with their responses. (blue-yes, purple-no). Higher number of participants from medicine (28%) answered yes followed by dentistry (27.3%) and pharmacy (26.7%) courses. There is no significant difference between the field of study. (Chi-square test value: 0.299a, p-value: 0.892 (p>0.05) - not significant).
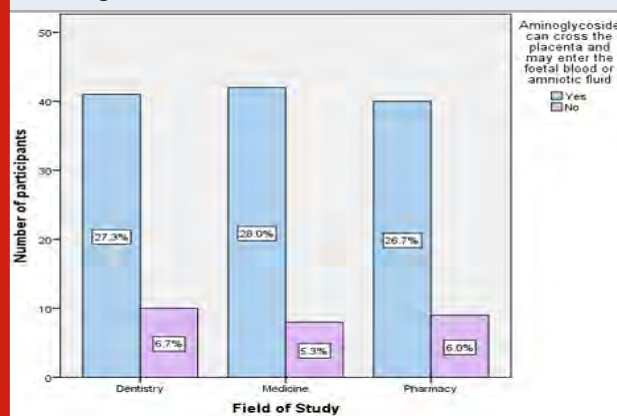
Based on their knowledge of drug interaction with antibiotics, a higher number of dental students (37.3%) answered that aminoglycosides should not be mixed

with other drugs in the same syringe or infusion bottle followed by medical students (33.6%) and pharmacy students (29.1%) which was not statistically significant as shown in Figure 4. A combination of aminoglycosides with beta-lactam antibiotics showed a synergistic interaction against gram-negative bacteria (Mohapatra et al., 2018). However, due to the physical properties of aminoglycosides such as highly polar in nature, it is incompatible to combine aminoglycosides and beta-lactam antibiotics in a syringe (Mohapatra et al., 2018). Therefore, precautions must be taken to avoid mixing aminoglycosides with other drugs.

When asked about whether aminoglycosides can cross the placenta and pass through fetal blood and amniotic fluid, a higher number of medical students (34.1%) agreed with the statement followed by dental students (33.3%) and pharmacy students (32.5%) which was not statistically significant (p>0.05) as shown in Figure 5. First trimester is crucial for pregnant mothers as organogenesis takes place, thus it is essential to avoid drug exposure (Malm et al., 2003). Aminoglycosides can cross the placenta and their concentration in the amniotic fluid ranges from 30% to 60% of the average maternal concentration in blood (Yoshioka, Monma and Matsuda, 1972). A study reported that the administration of aminoglycosides caused severe intrauterine otological damage (Robinson and Cambon, 1964). Therefore, aminoglycosides should be avoided by pregnant mothers as it may harm both the mothers and the baby.

Figure 6: Pie chart showing the responses to the question, "condition where combination of aminoglycosides with beta-lactam antibiotics is often used". Majority of the participants answered bacterial endocarditis, staphylococcus aureus infections (28.7%).
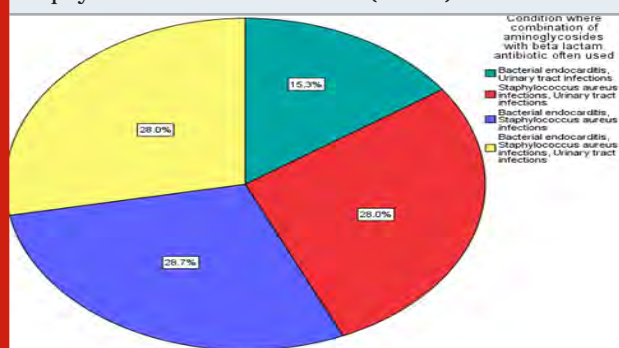
Besides that, based on Figure 6, most of the participants answered that the combination of aminoglycosides with beta-lactam antibiotics often used in treating staphylococcus aureus infections and bacterial endocarditis (28.7%). In staphylococcus aureus infections, the combination enhances the bactericidal activity which prevents the resistant staphylococci to persist, whereas monotherapy causes relapse once the antibiotic discontinued (Gilbert, 1995). Meanwhile, in bacterial endocarditis, combination therapy is used synergistically to facilitate aminoglycosides penetration into the cell (Gonzalez and Spencer, 1998).

Figure 7: Pie chart showing the responses to the question, "adverse effects of aminoglycosides". Most of the participants answered nephrotoxicity and ototoxicity (52.7%).
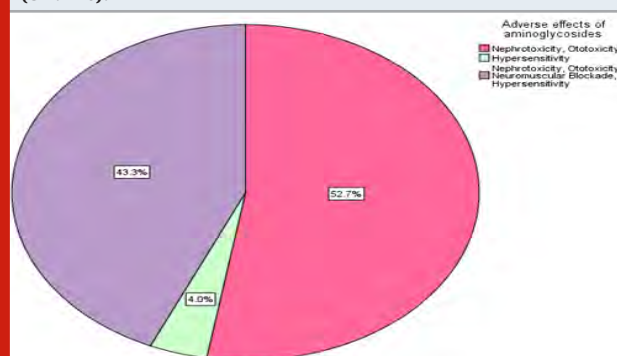
When asked about the adverse effects of aminoglycosides, most of the participants answered nephrotoxicity and ototoxicity (52.7%) followed by nephrotoxicity, ototoxicity, neuromuscular blockade and hypersensitivity (43.4%) and hypersensitivity only (4%) a shown in Figure 7. The most common adverse effects associated with aminoglycosides are nephrotoxicity and ototoxicity and rarely, neuromuscular blockade and hypersensitivity (Gonzalez and Spencer, 1998). In order to minimize toxicities, the medical professionals should follow clinical guidelines. They should only prescribe aminoglycosides when their unique potency is needed such as infection in critically ill patients, nosocomial infections or infections with organisms resistant to less toxic therapies (Montie and Patamasucon, 1995).

Although aminoglycosides are rarely prescribed by the medical field students, the knowledge of various types of antibiotics are essential. Antibiotics are used to treat various infections and a proper clinical guidelines should be followed to avoid the development of antimicrobial resistance. Both physicians and patients should be aware about the prescriptions. For medical field students, various programmes and curricular activity can be done to develop their skills and confidence in prescribing medicine especially antibiotics. They can refer to the lecturers and join any webinar focusing on the topic antibiotics.

The limitations of our study were less number of participants from various private dental hospitals. Responder's bias may present as the surveys were done anonymously. A study with a larger number of participants can be conducted in a future.

Figure 1: Pie chart showing the responses to the question, "field of study". The participants were from dentistry (34%), medicine (33.3%) and pharmacy (32.7%) courses.

CONCLUSION

Within the limitations of study, it can be observed that most of the participants knew about the basic knowledge

in pharmacology of aminoglycosides. Aminoglycosides are rarely prescribed among medical field students. However, the knowledge regarding aminoglycosides was at a satisfactory level but it was statistically not significant. Prescribing medicine is an essential skill not only of medicine but also dental and pharmacy students. Various programmes should be imposed by the university in order to develop confidence and skills in prescribing medicine especially antibiotics.

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Platelet Rich Fibrin in Periodontal Practice- A Review

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ABSTRACT

Autologous platelet concentrates have become a rage in the field of regenerative medicine encompassing numerous specialties like orthopedics, maxillofacial and cosmetic surgery, sports medicine and dentistry. The use of these platelet concentrates ranging from fibrin glues to the currently used platelet-rich fibrin (PRF) has exponentially increased and it has brought about a radical change in the stimulation and acceleration of regenerative tissue processes. This review highlights the use of platelet rich fibrin in the field of periodontics and tissue repair. It brings to light the various applications of PRF procured from in vitro, animal and human clinical trials

KEY WORDS: PLATELET RICH CONCENTRATES; PLATELET RICH FIBRIN; PERIODONTICS; REGENERATION; TISSUE REPAIR.

INTRODUCTION

The activated form of a plasmatic molecule called fibrinogen is known as fibrin. This soluble fibrillary molecule is massively present both in plasma and in the platelet granules and plays a pivotal role in platelet aggregation during haemostasis. The biochemical process involves the transformation of it into a biologic glue capable of consolidating the initial platelet cluster, thus constituting a protective wall along vascular breaches during coagulation. Fibrinogen remains the final substrate in all coagulation reactions. Fibrinogen is a soluble protein and it gets transformed into insoluble fibrin by the enzyme known as thrombin. The resultant polymerized fibrin gel constitutes the first cicatricial matrix of the injured site. Fibrin adhesives, even though controversial, were commonly used due to its healing properties i.e., potential to accelerate healing and reduce the formation of postoperative hematoma.

Platelets contribute to homeostasis by preventing blood loss at sites of vascular injury, and they contain a large number of growth factors and cytokines that have a key role in bone regeneration and soft-tissue maturation. In the past years, an improved understanding of the physiological role of platelets in the wound healing and after tissue injury has led to the idea of using platelets as therapeutic tools. Indeed, after fibrin glue was introduced in the early 1990s as a biomaterial with haemostatic and adhesive properties, the strategic modification of the fibrin to include platelets was reported. The source of the new preparation, known as platelet-rich plasma (PRP), consists of a limited volume of plasma enriched in platelets, which is obtained from the patient.

Once the platelet concentrate is activated by way of thrombin generation with calcium, a three-dimensional and bio compatible fibrin scaffold is formed, and a myriad of growth factors and proteins are released, progressively,

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to the local environment, contributing to the accelerated postoperative wound healing and tissue repair.

Previously our department has published extensive research on various aspects of prosthetic dentistry (Anbu et al., 2019; Ariga et al., 2018; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Ganapathy et al., 2017; Gupta et al., 2018; Jain, 2017a, 2017b; Ranganathan et al., 2017; Varghese et al., 2019), this vast research experience has inspired us to review platelet rich fibrin in periodontal practice.

Preparation of Prf for Clinical Use: Platelets are formed by a peripheral area, which corresponds to a phospholipid membrane, a series of microtubules, and a very extensive canalicular system connecting the surface to the cytoplasm. Glycogen granules, mitochondria, lysosomes, peroxisomes, and various types of inclusions, including alpha and dense granules, can be identified within the cytoplasm.

Blood samples from non-smoking, healthy male donors and PRF clots are collected and prepared immediately or after storage for 1–2 days. Fibrin fibers are examined by scanning electron microscopy. Bioactivity was assessed by means of a bioassay system involving the human periosteal cells, whereas PDGF-BB concentrations were determined using an enzyme-linked immunosorbent assay. PRF is prepared by a process known as differential centrifugation. In differential centrifugation, acceleration force is adjusted to sediment certain cellular constituents based on different specific gravity(Harris and Hillyer, 2007). There are many ways of preparing PRF. It can be prepared by the PRF method or by the buffy-coat method(Man et al., 2001).

Clinical Use of Prf in Periodontics Practice: PRF comprises of an autologous leukocyte-platelet-rich fibrin matrix (Choukroun et al., 2006a) composed of a tetra molecular structure, with cytokines, platelets, cytokines, and stem cells within it, which acts as a biodegradable scaffold (Li et al., 2013)that favors the development of microvascularization and is able to guide epithelial cell migration to its surface (Chang and Zhao, 2011). In surgical interventions, PRF could serve as a resorbable membrane for guided bone regeneration (GBR), preventing the migration of non-desirable cells into bone defect and providing a space that allows the immigration of osteogenic and angiogenic cells and permits the underlying blood clot to mineralize.PRF may act as a biologic adhesive to hold the particles together, facilitating the manipulation of the bone grafts.

PRF membrane has exhibited favorable clinical results in the treatment of periodontal infrabony defects (Chang and Zhao, 2011), protecting open wounds from oral environment when the suture cannot bind the mucosal margins (Simonpieri et al., 2012), and accelerating hard and soft tissue healing . Some clinical studies used PRF membrane as a sole grafting material to achieve maxillary sinus floor augmentation, presenting promising results.

Choukroun et al. (Choukroun et al., 2006b) conducted a study in which they wanted to see the potential of using PRF in conjunction with freeze-dried bone allograft with (FDBA) to enhance bone regeneration in a maxillary sinus lift procedure. The results showed a decreased healing time prior to implant placement. It can be utilized in various procedures such as management of intrabony defects, gingival recession, furcation defects, extraction socket preservation, and accelerated healing of wounds.

In Vitro Studies: PRF is enriched with platelets, growth factors and cytokines increasing the healing potential of both hard and soft tissue(Hotter, 1984). There are only scant references in the literature about the biologic properties of PRF when compared to the other platelet concentrates. The literature predominantly contains animal and human studies of the experimental use of PRF and only limited in vitro studies have been carried out on the effects of PRF on cell proliferation. Despite the lack of scientifically proven clinical benefits, PRF is considered as a healing biomaterial and is commonly used in implant and plastic periodontal surgery procedures to enhance bone regeneration and soft-tissue wound healing (Dohan et al., 2006). According to Choukron et al. PRF was initially used in implant surgery to enhance the healing properties of the bone(Miron and Choukroun, 2017).

Animal Studies: PRF is a highly complex architecture of strong fibrin matrix as a resorbable membrane with growth factors released after at least 1 week. Therefore, PRF can act as a reservoir of many growth factors that are known to play a crucial role in hard and soft tissue repair processes. Previously, it has been reported that PRF has a strong positive effect on the pro- liferation of gingival fibroblasts, periodontal ligament fi- broblasts, and osteoblasts, but retards epithelial cell proliferation in vitro.This cell-type-specific manner makes PRF beneficial to periodontal regeneration. Additionally, activation of phosphorylated extracellular signal-regulated protein kinase, osteoprotegerin, and alkaline phosphatase expression by PRF suggests the pivots for new periodontal attachment formation.Furthermore, antimi- crobial effects of PRF have also been described. The regeneration potential capacity and antibacterial effects of PRF may be useful in periodontal surgery.

DISCUSSION

The regeneration of the lost periodontal structures is the ultimate aim of the periodontal therapy to restore the health function and esthetic of periodontium.The breakthrough in vitro study that introduced PRF in medical field a conducted by Choukroun et al (Choukroun et al., 2006a) highlighted improved neovascularization, wound closing with accelerated tissue remodeling in the absence of infectious events.

Some advantages are reported in the literature related to the use of PRF are its preparation is a simplified and efficient technique, with centrifugation in a single step, free and openly accessible for all clinicians.It

is obtained by autologous blood sample. Minimized blood manipulation.It does not require the addition of external thrombin because polymerization is a completely natural process, without any risk of suffering from an immunological reactionIt has a natural fibrin framework with growth factors within that may keep their activity for a relatively longer period and stimulate tissue regeneration effectively.It can be used solely or in combination with bone grafts, depending on the purpose. Increases the healing rate of the grafted bone .It is an economical and quick option compared with recombinant growth factors when used in conjunction with bone grafts. When used as a membrane, it averts a donor site surgical procedure and results in a reduction in patient discomfort during the early wound-healing period.

PRF may present some disadvantages like the final amount available is low because it is autologous blood. The success of the PRF protocol depends directly on the handling, mainly, related to blood collection time and its transference for the centrifuge. Need of using a glass-coated tube to achieve clot polymerization. Possible refusal of treatment by the puncture required for blood collection.Only needs a minimal experience of clinician for PRF manipulation.

CONCLUSION

Though PRF belongs to a new generation of platelet concentrates, the biological fuction of fibrin molecules is enough in itself to account for significant cicatricial capacity of the PRF. The slow polymerization mode confers a PRF membrane as a particularly favorable physiologic architecture to support the healing process. However, it is now necessary to look further into platelet and inflammatory features of this biomaterial. Only a perfect understanding of its components and their significance will enable us to comprehend the clinical results obtained and subsequently extend the fields of therapeutic application of this protocol.

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Knowledge Attitude and Practice on Halitosis Among Dental Students and its Management

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ABSTRACT

Halitosis originates from an oral or a non-oral source. It is formed by volatile compounds that are formed due to pathological and non-pathological reasons. Oral malodours is very common in society and it was stated that more than 50% of the general population have halitosis. Poor oral hygiene, periodontal disease, tongue coat, food impaction, unclean dentures, faulty restorations, oral carcinomas, and throat infections contributed to 90% of the factors for halitosis. A survey was conducted amongst the undergraduate students in a University hospital. A total of 95 responses were obtained from the students. Results were analysed and compared using the SPSS Statistical Software by doing both the frequency tests and correlation tests. This study showed that 48.42 % of the participants found that halitosis was very common throughout their clinical practices. Based on their knowledge of the main reason for halitosis, 47.37 % of the students agreed that poor oral hygiene was the main factor. 42.11% participants were aware that volatile compounds contribute to halitosis. In regard to their clinical practice, 42.11% of their methods of preventing halitosis are by practising good oral hygiene. Overall, 86.32 % of the participants agreed that more knowledge about halitosis and its effective management is necessary in the future.

KEY WORDS: HALITOSIS, GINGIVITIS, PERIODONTITIS, ORAL MALODOUR, VOLATILE MOLECULES.

INTRODUCTION

Halitosis or oral malodours is used to define any disagreeable bad or unpleasant odour originating from the mouth air and breathing. Halitosis comes from a latin word raised from halitus which is breathed air and the osis that is the pathologic alteration (Hine, 1957). Other terms which are commonly used to define and characterize the halitosis are foetor oris, oral malodour, mouth odour, bad breath and bad mouth odour (Sanz, Roldán and Herrera, 2001) (Cortelli, Barbosa and Westphal, 2008) (Bogdasarian, 1986). Halitosis is an undesirable condition that becomes a common complaint among both genders and in all index age groups. It not only causes social and psychological drawbacks but also may influence an individual's relation with surrounding people (Tonzetich, 1977).

Halitosis is a common problem in society and approximately more than 50% of the general population is experiencing halitosis (Nachnani, 2011). Halitosis is produced by volatile molecules that may be due to pathological and non-pathological contributors, originating from

an oral or a non-oral source. Sulfur compounds, aromatic compounds, nitrogen-containing compounds, amines, short-chain fatty acids, alcohols or phenyl compounds, aliphatic compounds, and ketones are those volatile compounds responsible for oral malodour (Goldberg et al., 1994) (Loesche and Kazor, 2002) (Amano et al., 2002). Furthermore, there are some bacteria that are responsible for halitosis as they produce hydrogen sulfide and methyl mercaptan from serum. The bacteria includes Fusobacterium nucleatum, Fusobacterium periodonticum, Prevotella intermedia, Prevotella loescheii, Treponema denticola and etc (Persson et al., 1990).

90% cases of halitosis originated from oral cavity. The temperature of the oral cavity reaches up to 37 C and may be changing between 34 and 37 C while humidity may reach up to 96% in oral exhalations(Nodelman, Ben-Jebria and Ultman, 1998)(Nodelman, Ben-Jebria and Ultman, 1998; Zehentbauer, Krick and Reineccius, 2000). These conditions favour a suitable environment for bacterial growth. Over 500 bacterial species (Miyazaki et al., 1995) found in the oral cavity are able to produce odorous compounds that induce halitosis. Poor oral hygiene plays an important role in these conditions as it multiplies halitosis causative bacteria and worsen oral malodour. They are Gr-negative species and proteolytic obligate anaerobes (Tyrrell et al., 2003)(Morita and Wang, 2001) and commonly retained in tongue coating and periodontal pockets (Tonzetich, 1977). Halitosis may be induced in healthy individuals that have no history of halitosis and periodontal disease due to retention of bacteria on the tongue surface (Wåler, 1997). These bacteria produce odorous compounds when degrading organic substrates such as glucose, mucins, peptides, and proteins present in saliva, crevicular fluid, oral soft tissues, and retained debris (Tonzetich, 1977) (McNamara, Alexander and Lee, 1972)(Persson, Claesson and Carlsson, 1989).

Accumulation of food debris and dental bacterial plaque on the teeth and tongue in poor oral hygiene individuals can cause caries and periodontal diseases like gingivitis and periodontitis that lead to oral malodor ('Oral Complications of Cancer and its Management', 2010) (Takeuchi et al., 2010)). In addition, halitosis may occur in untreated deep carious lesions that form a retention area for food debris and dental bacterial plaque. Flow of saliva may influence the human breath. In reduced salivary flow or xerostomia, the intensity of sulfur compounds is increased. Saliva involves buffering or cleaning and maintaining the bacteria at an optimum level in the oral cavity (Nachnani, 1997). Decrease of salivary flow may impact negative effects on self-cleaning of the mouth and inadequate cleaning of the mouth lead to halitosis (Debaty and Rompen, 2002). Medications such as antidepressants, antipsychotics, diuretic, and antihypertensive reduce salivary flow in addition to salivary gland diseases (e.g., diabetes, Sjorgen's syndrome), chemotherapy, or radiotherapy

(Kleinberg, Wolff and Codipilly, 2002)(Koshimune et al., 2003).

About 8% of the halitosis cases originate from an extraoral source and the incidence is rarely seen. Causes of this type of halitosis include respiratory system problems, gastrointestinal disease, hepatic disease, hematological or endocrine system disorders and metabolic conditions (Aylıkcı and Colak, 2013). Besides, halitosis may occur in individuals consuming garlic, onions, and spiced foods. Same effect may happen in patients administering drugs such as alcohol, tobacco, betel, solvent abuse, chloral hydrate, nitrites and nitrates, dimethyl sulfoxide, disulphiram, somecytotoxics, phenothiazines, amphetamines, suplatast tosilate, and paraldehyde (Ciçek et al., 2003)(Lu, 1982).

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test: An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about various methods practiced and general knowledge of halitosis among dental students. The main purpose of this study being that by determining the frequently practiced methods in management of halitosis, a better insight on the degree of understanding and its effects on the patient's satisfaction can be obtained.

MATERIAL AND METHODS

Study Setting: This cross-sectional study was done among undergraduate students (includes third years, final years, interns) of Saveetha Dental College and Hospitals. A total of 95 students participated in this study. Study Subjects A total of 95 students participated in this study of which 33.68% (32) were third years, 13.68% (13) were final years and the remaining 52.63% (50) were interns.

Methodology: A survey was conducted through an online standard questionnaire with 10 multiple choice questions sent via a Google Form application. The questionnaire consisted of questions about the knowledge, awareness and practices regarding halitosis in patients experienced by these students throughout clinical practices. Adequate time was provided to fill the questionnaire. The responses of the students were recorded, analysed, checked for completeness and were taken up for assessment.

Statistical Analysis: After data was collected and coded, the statistical analysis was done using IBM SPSS Statistical Software package (Version 23.0). All the frequency tests were carried out and the Chi-square test was done at a significance level.

RESULTS AND DISCUSSION

A total of 99 students participated in the study, 33.68% (32) were third years, 13.68% (13) were final years and the remaining 52.63% (50) were interns as shown in Graph 1. Assessment on their personal experience of the occurrence of patients with halitosis gave the following results, 46 (48.42%) agreed that it was very common, 39 (41.05%) have admitted that it was rare and only 10 (10.53%) has never encountered such an experience as displayed in Graph 2. When inquired about the main reason of halitosis in those patients, 45 (47.37%) accepted that it was due to poor oral hygiene, 30 (31.58%) believed it was because of food impaction, 13 (13.68%) agreed it was periodontal disease, 4 (4.21%) said it was tongue coating and 3 (3.16%) chose other reasons as the main factor contributing halitosis (Graph 3). In Graph 4, analysis of their awareness on halitosis mainly due to volatile compounds gave the following results, 55 (57.89%) did not aware at all and 40(42.11%) had awareness on this.

Figure 1: Pie chart showing responses to the question among undergraduates based on their year of study. 52.63% of the respondents were interns. 13.68% of the respondents were final year undergraduate students. 33.68% of the respondents were third years.
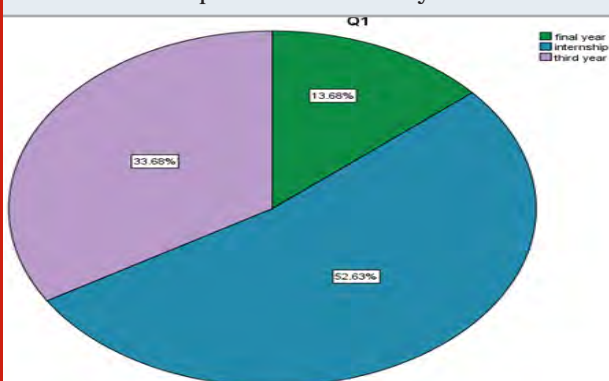
Graph 2: Pie chart showing responses to the question, "Based on your experience, have you encountered patients with halitosis?". 48.42% of the respondents commonly encountered halitosis among dental patients. 41.05% of the respondents stated that the halitosis is rare and 10.53% of the respondents never encountered halitosis during clinical procedures.
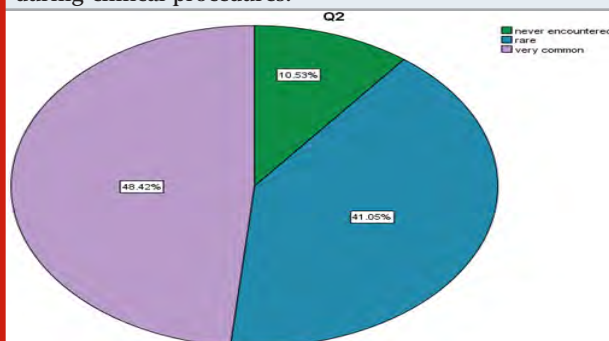
Graph 3: Pie chart showing responses to the question "What do you think is the main reason for halitosis?". 31.58% of the respondents stated that the halitosis is due to food impaction, 13.68% because of periodontal disease, 47.37% poor oral hygiene and 4.21% due to tongue coating.
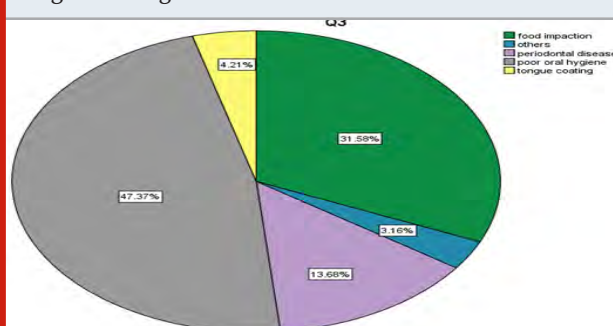
Graph 4: Pie chart showing responses to the question "Do you aware that halitosis is mainly due to volatile compounds?". 57.89% of the respondents had awareness of the reason while 42.11% of the respondents were not aware.
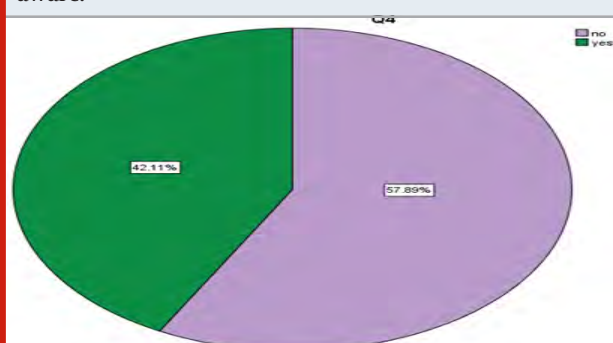
Graph 5: Pie chart showing responses to the question "Do you aware that factors of halitosis can be oral and non-oral causes?". 58.95% of the respondents were aware while 41.05% of the respondents had no awareness of the factors.
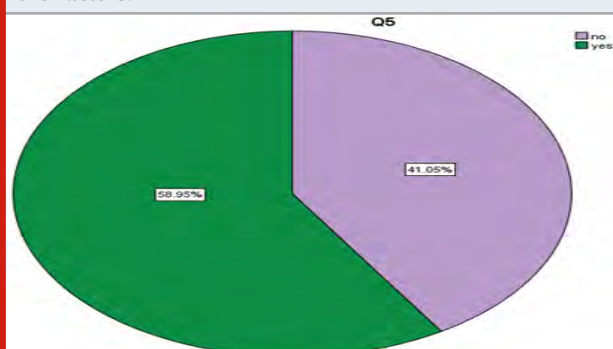
Based on graph 5, 56 (58.95%) respondents agreed that factors of halitosis can be oral and non-oral causes while 39 (41.05%) had no knowledge on this. 54 (56.84%) respondents did not know aware that Gr negative species and proteolytic obligate anaerobes that mainly

retained in tongue coating and periodontal pockets can cause halitosis and about 41 (43.16%) were aware halitosis occurred because of these bacteria (Graph 6). As presented in Graph 7, 60 (63.16%) of the respondents were not aware while 35 (38.64%) of the respondents had awareness that gingival inflammation may lead to halitosis.

oral hygiene can terminate oral malodour, 28 (29.74%) chose antiseptic mouthwash as a solution to get rid halitosis, 22 (23.16%) believed scaling and root planning can reduce the bad odour while 3 (3.16%) agreed with tongue cleaning and only 2 (2.11%) suggested renewal of old restorations as a method of reducing or eliminating foetor oris.

Graph 6: Pie chart showing responses to the question "Do you aware that Gr negative species and proteolytic obligate anaerobes mainly retained in tongue coating and periodontal pockets can cause halitosis?". 56.84% of the respondents were aware while 43.16% of the respondents had no awareness these bacteria can cause halitosis.

Graph 8: Pie chart showing responses to the question "Do you aware that halitosis may be due to untreated deep carious lesions that create the retention area for food debris and dental bacterial plaque?". 74.74% of the respondents were aware while 25.26% of the respondents had no awareness.
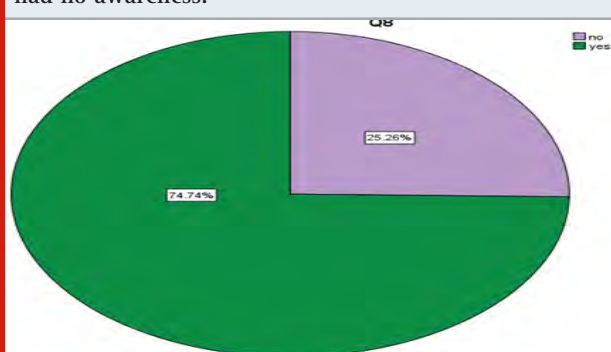
Graph 7: Pie chart showing responses to the question "Do you aware that inflammation of gingival and periodontal tissues causes oral malodor?". 63.16% of the respondents were aware while 38.64% of the respondents had no awareness that gingival inflammation may lead to halitosis.
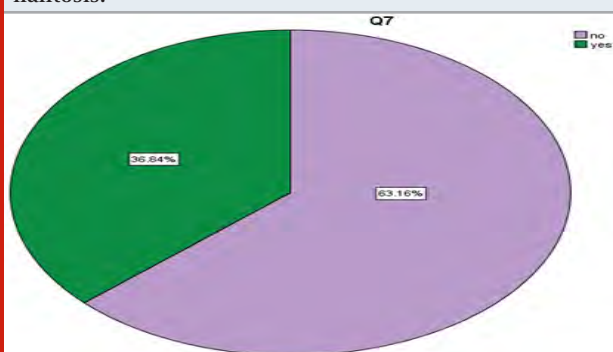
Graph 9: Pie chart showing responses to the question "Do you aware that halitosis occurs when there is salivary flow reduction that affects inadequate cleaning of the mouth?". 65.26% of the respondents were aware while 34.74% of the respondents did not know that reduced salivary flow causes halitosis.
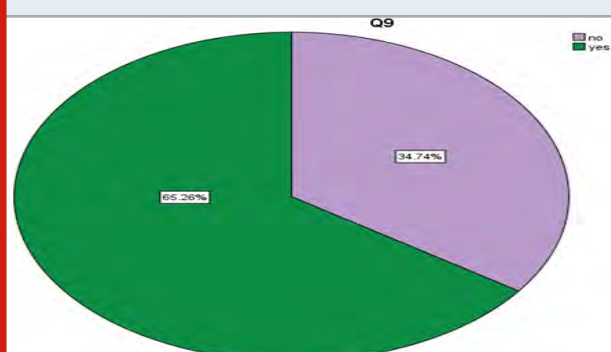
As shown in Graph 8, 71(74.74%) of the respondents were aware while 19(25.26%) of the respondents had no awareness of the possibility of untreated deep carious lesions that create the retention area for food debris and dental bacterial plaque can cause oral malodour. Based on graph 9, 62 (65.26%) of the respondents believed that reduced salivary flow may influence bad odour as it affects the cleaning of the mouth while 33 (34.74%) did not know that reduced salivary flow can cause halitosis. In graph 10, 91 (95.79%) agreed that dietary habits such as intake of garlic, onions, spiced foods cause unpleasant odours. On the other hand, only 4 (4.21%) did not aware that types of dietary products will affect the patients' mouth odour. Graph 11 shows 40 (42.11%) agreed good

This cross-sectional study was used to assess the knowledge, awareness and practices in halitosis and its management among students of Saveetha Dental College. Majority of the participants have admitted that halitosis was a very common occurrence during their clinical practice. This finding is not a rare finding as nearly more than 50% of the general population have halitosis as reported by Nachani et al. (Nachnani, 2011). Most of the respondents in the current study are aware that retention Gr negative species and proteolytic obligate anaerobes on tongue lead to oral malodour. Nachani et al. recognized that oral malodor is caused mainly by facultative bacteria on the tongue that produce volatile organic compounds (Nachnani, 2011). Based on this

study, majority agreed that most causes of halitosis originated from the oral cavity. This is supported by the research done by Scully et al. and Kasap et al. in which 90% of the patients with halitosis originated from oral cavity while only 9% of the cases reported due to non-oral reasons. 1% cases reported the incidence due to diet and drugs (Scully, Porter and Greenman, 1994)(Kasap, Zeybel and Yüceyar, 2009).

spiced food may influence the breath odor. This study is justified by study done by Lu et al 1982 (Lu, 1982). Based on this study, most respondents believed that good oral hygiene plays an important role in preventing oral malodour. Similar to the assessment done by Nachani et al, it highlighted the importance of active practices of using proper oral hygiene products that can decrease the amount of halitosis significantly for an individual (Nachnani, 2011).

Graph 10: Pie chart showing responses to the question "Do you aware that dietary products such as garlic, onions, spiced foods cause unpleasant odours?". 95.79% of the respondents agreed while 4.21% of the respondents had no awareness that dietary habits influence breath odour.

Graph 12: Pie chart showing the responses to the question "Is more knowledge on halitosis and its management necessary?". 86.32 % of the respondents confirmed that they need more knowledge of halitosis and its effective prevention. 13.68% respondents stated that they are well aware about halitosis and its management.
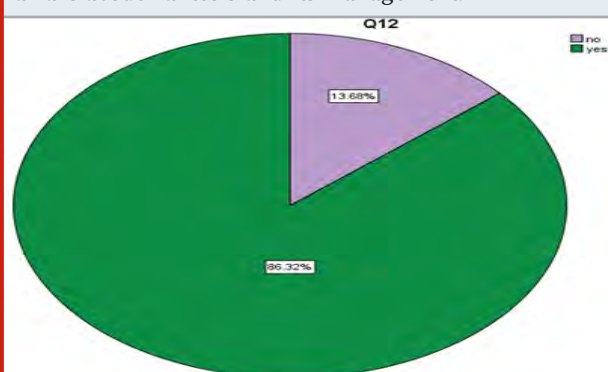
CONCLUSION

The knowledge and awareness about halitosis and its management among the dental students was moderate. Halitosis can be treated if its etiology can be detected properly. As halitosis gives negative effects on an individual's social life, early preventive management as well as treatment should be implemented at the earliest to avoid distressing effects on people with halitosis and thus improve the quality of life.

Graph 11: Pie chart showing the responses to the question "In your opinion, what is the best way to reduce or eliminate halitosis?". 29.74% of the respondents stated that antiseptic mouthwash is the best solution, 42.11% of the respondents chose good oral hygiene, 23.16% agreed with scaling and root planing, 2.11% chose renewal of old restorations and 3.16% chose tongue cleaning.

As reported by Davies et al., gingival inflammation and various forms of periodontitis can increase unpleasant breath odor ('Oral Complications of Cancer and its Management', 2010)(31). Reduction in salivary flow is believed to be one of the main reasons of halitosis. This statement was obtained from this study and can be justified by study done by Alamoudi et al. 2004 where he reported that inadequate cleansing of the mouth due to reduction of salivary flow causes halitosis (Alamoudi et al., 2004). Based on Babacan et al. 2011, food or plaque retention areas result in the release of volatile compounds and cause halitosis (Babacan et al., 2011). Present study believed that dietary products such as garlic, onions and

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Age Determination Using Orthopantomograph– A Review

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ABSTRACT

Age is one of the important factors in assessing the identity of a person. Age can be estimated in different methods like, using chronological age, skeletal age and dental age. The use of radiographs for age estimation is characteristic of techniques that involve observation of the morphologically distinct stages of mineralization. The age estimation is based on the degree of formation of root and crown structures, and the developmental stages of teeth. Several methods have been developed to estimate age based on dental tissue and tooth morphology, like morphologic, radiographic, histological and biochemical methods. Some of these methods are especially developed to estimate the age at death as they require sectioning, while others may also be used in clinical situations. Majority of the cases concerning age estimation are performed on living people. Since 1896, an year after the discovery of radiation, Xrays are used in forensic sciences,to demonstrate the presence of lead bullets inside the head of a victim. Dental radiography has been used for age estimation since 1982.Dental findings assessed by radiography are an important source of information in forensic odontological age determination. Age estimation up to puberty can be performed by development process, dental radiographs (intraoral periapical radiographs, bitewing radiographs, orthopantomographs) or by a combined radiographic technique of the third molar tooth staging development and hand wrist and cervical vertebrae radiographs. But, after third molar development, it becomes increasingly difficult to assess age accurately. Only the aging process and regressive changes of teeth are helpful at adult age.

KEY WORDS: ORTHOPANTOMOGRAPHS, TOOTH MORPHOLOGY, BITEWING RADIOGRAPHS.

INTRODUCTION

Age is one of the important factors in assessing the identity of a person. Age can be estimated in different methods like, using chronological age, skeletal age and dental age.(Willems, Moulin-Romsee and Solheim, 2002) Estimation of the age of children at death is currently based on the fusion of bone at secondary ossification centers and the development and eruption status of the teeth. However determination of the age of adults is more complex. (González-Colmenares et al., 2007)Therefore, in that manner, forensic odontology plays a small but significant role.(Raj et al., 2016) The identification of dental remains is of primary importance as teeth are the most durable and resilient parts of the body and, with their physiologic variations and effects of therapy,(Paewinsky, Pfeiffer and Brinkmann, 2005) they resist the influence of many factors and their rate of disintegration is very low.

Compared to bone mineralization, tooth mineralization stages are much less affected by variation in endocrine and nutritional status, and developing teeth therefore

provide a more certain indication of chronological age. (Raj et al., 2016) Tooth formation is often used to study maturity and predict age. Within clinical dentistry, this information aids in diagnosis and treatment planning. In forensic odontology and archaeology, age estimation methods can help in the identification of age at death of a deceased child and also give important information with regard to past populations. Age estimation is also proving valuable when birth data is lacking or doubted in the management of immigration to help determine physiological age.(Bosmans et al., 2005) They are sometimes the only body part available for study and this makes teeth very suitable for dental age estimation. (Mittal et al., 2016)Saunders a dentist, was the first to publish information regarding dental implication in age assessment by presenting a pamphlet entitled "Teeth A Test of Age" to the English parliament in 1837. While quoting the results from his study on 1000 children, he pointed out the value of dentition in age estimation. (Erbudak et al., 2012).

From 1896, xrays have been used in the forensic radiology, to demonstrate the presence of lead bullets inside the head of a victim. Dental radiography has been used in age estimation from 1982.(Chesne et al., 2000). Dental findings assessed by radiography are an important source of information in forensic odontological age determination.(Maber, Liversidge and Hector, 2006) Several methods have been developed to estimate age based on dental tissue and tooth morphology, like morphologic, radiographic, histological and biochemical methods. Some of these methods are especially developed to estimate the age at death as they require sectioning, while others may also be used in clinical situations.

Majority of the cases concerning age estimation are performed on living people. Morphological and radiographic methods are useful in living individuals at adolescent and adult age, whereas histological and biochemical methods are useful in dead victims (Liversidge, Lyons and Hector, 2003)The use of radiographs for age estimation is characteristic of techniques that involve observation of the morphologically distinct stages of mineralization. Such determinations are also based on the degree of formation of root and crown structures, the stage of eruption and the intermixture of primary and adult dentitions.(Santana, Bethard and Moore, 2017)

As far as dental age estimation is concerned, tooth development is a complex process that takes place from early fetal life to approximately 20 years of age. Both developmental and regressive changes to the tooth can be related to chronological age.(Tunc and Koyuturk, 2008) Age estimation up to puberty can be performed by development process, dental radiographs (intraoral periapical radiographs, bitewing radiographs, orthopantomographs) or by a combined radiographic technique of the third molar tooth staging development and hand wrist and cervical vertebrae radiographs. (Bagherpour et al., 2010) But, after third molar development, it becomes increasingly difficult to assess

age accurately. Only the aging process and regressive changes of teeth are helpful at adult age.

Our recent research portfolio in numerous articles in reputed journals(Santosh R. Patil et al., 2018; S. R. Patil et al., 2018; Subramaniam and Muthukrishnan, 2019; Vadivel et al., 2019; Patil et al., 2020). Based on this experience we planned to pursue a review of age estimation using OPG

MATERIAL AND METHODS

This review article compared the different studies on age determination by orthopantomograph and concludes if the method is useful or not. Various articles about age estimation using orthopantomographs were selected and For all the included studies, the information relating to the medico legal importance of age estimation requirements for odontological age estimation and criteria for radiological age determination, phases of age estimation, various dental development surveys or methods used, rationale and advantages of radiological method was extracted.

DISCUSSION

The radiological methods of age estimation carries unique advantages over the other histological methods. The other methods of age estimation require extraction and preparation of microscopic sections, hence these methods therefore cannot be used in living individuals and in cases where it is not acceptable to extract teeth for religious or scientific reasons.(Kvaal et al., 1995) Besides, they are quite expensive and require some sophisticated laboratory. The radiographic methods, are quick, economic and non-invasive in age estimation. Additionally, it can be applied for identifying the age in dead as well as living persons and in all communities(Kolltveit, Solheim and Kvaal, 1998)Age estimation is relatively difficult in pre-natal and neonatal phases compared with the post-natal phase. Though histological examination of tooth germs will be able to decide the age earlier in the prenatal phase, it will be an invasive and time-consuming procedure.

From the prenatal dental development of the fetus until the eruption of the first tooth into the oral cavity post-nasally, the radiological examination of the jaw bones for the developing tooth germs will be the mainstay for the age assessment Similarly, in the post-natal phase, between the ages of 2.5 and 6 years, there is no clinical evidence available to determine the age, so radiography will play a major role in assessing the jaw bones for developing permanent dentition(Solheim, 1993) The best precision and accuracy for radiographic age estimation is achieved when individual growth is rapid and man teeth are under development. After the age of 14 years, estimation becomes difficult since most of the dentition is completely developed.(Erbudak et al., 2012) Age estimation plays an important role in forensic medicine, clinical dentistry, pediatric endocrinology, and

archaeology. Age estimation is of wider importance in forensic medicine, not only for the purpose of identifying deceased victims but also in connection with crimes and accidents. In addition, chronological age is important in most societies for school attendance, employment, social benefits, and marriage. (Kim, Kho and Lee, 2000)

In adulthood, teeth undergo time-related changes representing biological aging, and many studies have shown that several features of aging can be used for age determination . Gustafson developed the first dental method of age estimation in adults based on six criteria: attrition, secondary dentine in the pulp, cementum annulations, root resorption, periodontal recession, and root translucency.(Kim, Kho and Lee, 2000) The methods used in OPG can be applied to living persons. Furthermore, OPGs also provide information regarding individuals' identity and other age-related features such as enamel attrition, secondary dentine in the pulp, root resorption, cementum annulations, and periodontal recession. (Hongwei and Jingtao, 1989)Tooth improvement is a continuous process, but determining the end point of tooth development is very difficult. Thus, the calculation of a mean age for each phase is difficult; further research is needed to determine the apex closure stage of teeth.Measurement using dental radiographs is a non-invasive technique which might be clinically important in living individuals for estimating the age of adults, both living and dead, in archaeological studies and in forensic work, but the method should be tested on an independent sample.(Solheim, 1992)

To minimize the influence of intra-and inter examiner variations, well-defined criteria and careful calibration among examiners are essential for age estimation. (Solheim, 1989) Even though the coronal pulp might be affected by external factors the root pulp remains safe, the scoring systems gave OPGs a strong correlation between age and the amount of secondary dentin for the coronal and for measurements in the root area. (Eckert and Garland, 1984) Age estimations based on measurements of the amount of secondary dentin present seem to be relatively reliable. Methods of age estimation in adults are concerned, and in view of the relative accuracy of the age estimations performed, one should keep in mind that the standard deviations of such age estimations are, in general, about 10 to 12 years. (Matschke, Makrigeorgi-Butera and Stavrou, 2003) Age estimation was made using criteria such as the presence of primary teeth in the mouth, mixed dentition period, presence of third molar teeth in the mouth, maturation stage of third molar teeth, enamel attrition level of teeth, width of root canal and pulp cavity, and level of alveolar bone resorption. However, no measurements were made. (Willems et al., 2001).

Both independent dentists examined the OPGs at the same time. Exact age was not estimated in any study. Bosmans et al, using OPGs in a study, selected 6 teeth and performed age estimation using criteria such as maximum tooth length, pulp length, and root and

pulp width.(Sehrawat and Singh, 2017) They classified the study population, whose ages ranged from 29 to 70 years, into decades with time intervals of 9 years. The age estimations were reported to be convenient to the decades of chronological ages, based on a single dentist's evaluation. The methods in this study can be applied to living persons. Furthermore, OPGs also provide information regarding individuals' identity and other age-related features such as enamel attrition, secondary dentine in the pulp, root resorption, cementum annulations, and periodontal recession. the age groups were determined and age estimation must be made in accordance with these groups.In some studies,, considering the necessity of identification and accurate age estimation of cases in daily practice of forensic medicine (age estimation for marriage, penal trials, and legal actions), and in the identification of disaster victims, a subjective age estimation method was implemented by evaluating OPGs.(Schmeling et al., 2007).

Tooth improvement is a continuous process, but determining the end point of tooth development is very difficult. Thus, the calculation of a mean age for each phase is difficult; further research is needed to determine the apex closure stage of teeth.(Olze et al., 2006) Measurement using dental radiographs is a non-invasive technique for estimating the age of adults, both living and dead, in archaeological studies and in forensic work, but the method should be tested on an independent sample(Schmeling et al., 2004) A scoring system for age estimation should be developed to ensure good reliability. To minimize the influence of The criteria used in our study were a compilation derived from the literature; however, the manner of evaluation in this study was different. The authors were inspired by previous studies related to the subject in order to take a further step. OPGs were evaluated considering the age groups of the study population, which is concordant with the previous studies performing evaluation according to decades. (Sehrawat and Singh, 2017).

In parallel to the literature, the author should suggest the use of skeletal measurements in addition to dental methods, for accurate age estimation. Despite the variations related to the practitioners, in this study, there were no significant differences in age estimation between both two participant practitioners.(Mörnstad, Staaf and Welander, 1994) Age estimation through the evaluation of OPGs was the most reliable results for the first decade of life due to eruption of teeth. However, the method showed unreliable results for the fourth decade.The reliability of age estimation reduced in older age groups.(Mörnstad, Pfeiffer and Teivens, 1994) The possible reasons might be the reduction of the criteria and signs for the age estimation of OPGs in older persons and the variability of the oral health status of patients in older age groups.Age estimation with OPGs can be used to make a significant percentage of forecasts in areas such as forensic medicine and forensic dentistry, especially in young patients.

CONCLUSION

Despite the variations related to the practitioners, in this study, there were no significant differences in age estimation between both two participant practitioners. The age estimation by radiographs was highly reliable in the first decade due to eruption of teeth. However, the method showed unreliable results for the fourth decades. The reliability of age estimation reduced in older age groups. The possible reasons might be the reduction of the criteria and signs for the age estimation of OPGs in older persons and the variability of the oral health status of patients in older age groups.

Age estimation with OPGs can be used to make a significant percentage of forecasts in areas such as forensic medicine and forensic dentistry, especially in young patients. In order to achieve accurate and reliable age estimation, in addition to millimetric measurements of the teeth, skeletal measurements and examinations should be performed.

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Knowledge of Dental Ethics and Jurisprudence Among Endodontists In Chennai, India: A Cross-Sectional Questionnaire Study

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ABSTRACT

Ethics is a discipline that weighs the ideal human character and behavior in circumstances where the distinction should be made between what is right and wrong. Dental jurisprudence is put forth by each state's legislature. It describes the legal limitations and regulations related to the practice of dentistry. The aim of the present study was to understand the knowledge of dental ethics and jurisprudence among endodontists in Chennai, India. A cross-sectional questionnaire survey was conducted. A pilot study was conducted to validate the questionnaire. A specially designed questionnaire consisting of 21 close-ended questions. On assessing the results, it is seen that the majority of the endodontists are very much aware about the history and facts regarding ethics, jurisprudence. 45% of the endodontists are aware that the dentist act of India was started in the year 1948. It is seen that 54% are aware that the code of ethics was given by DCI. They are also aware about the different principles of ethics. Almost 82% endodontists are aware about the consent criteria and when it stands invalid. 73% know that consent is for both the doctor and patient well-being. The study concludes that the majority of dental practitioners are aware of dental ethics but their knowledge on jurisprudence and COPRA needs to be increased.

KEY WORDS: CONSENT, CONSUMER PROTECTION ACT, DENTAL PROFESSION, ETHICS, JURISPRUDENCE.

INTRODUCTION

Dentistry as a profession has come a long way in recent years. It has grown from the stage of undifferentiated profession to the stage of advanced professionalism. During this period, dentistry has witnessed a number of changes and accepted new concepts. One of the most important characteristics of the profession is following a Code of Ethics. Ethics is defined as a part of philosophy that deals with moral conduct and judgment. It is the philosophy of human conduct, a way of stating and evaluating principles by which problems of behavior can be solved(Kesavan et al., 2016).

Dental jurisprudence is put forth by each state's legislature. It describes the legal limitations and regulations related to the practice of dentistry, dental hygiene, and dental assisting (Peter, 2003). Dental ethics was laid by the members of the dental profession as a moral obligation to maintain a professional conduct. In 1976, Dental Council of India (DCI) laid the dentists (Code of Ethics) regulations. It was later revised in the year 2014. It is the duty of every registered dentist to read these regulations,

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understand his responsibilities, and abide by the same (Kesavan et al., 2016). Ethics and morals are the basic ingredients of integrity, which then moulds character. Integrity is the commonality found in the professions of law, medicine, and dentistry and can be the determining factors for the degree of success of endodontists in the thin field of dentistry.

As endodontists it is extremely essential to understand and be aware of the ethics and jurisprudence in the field of dentistry. An endodontist should have acquaintance with the main provisions of these acts. He should know the responsibilities and precautions to be taken to avoid untoward happenings, including legal problems. He should also be familiar with his legal liabilities and the meaning of some terms used (Ahuja, 2019)(N et al., 2014; Ahuja, 2019). Therefore, the present study is a humble effort to evaluate the knowledge of dental ethics and jurisprudence among endodontists in Chennai so that training modules can be designed for safer and more effective delivery of dental care.

We have numerous highly cited publications on well designed clinical trials and lab studies (Govindaraju, Neelakantan and Gutmann, 2017; Azeem and Sureshbabu, 2018; Jenarthanan and Subbarao, 2018; Manohar and Sharma, 2018; Nandakumar and Nasim, 2018; Teja, Ramesh and Priya, 2018; Janani and Sandhya, 2019; Khandelwal and Palanivelu, 2019; Malli Sureshbabu et al., 2019; Poorni, Srinivasan and Nivedhitha, 2019; Rajakeerthi and Ms, 2019; Rajendran et al., 2019; Ramarao and Sathyanarayanan, 2019; Siddique and Nivedhitha, 2019; Siddique et al., 2019; Siddique, Nivedhitha and Jacob, 2019). This has provided the right platforms for us to pursue the current study. The aim of the present study is to understand the knowledge of dental ethics and jurisprudence among endodontists in Chennai, India.

MATERIAL AND METHODS

A cross-sectional questionnaire survey was conducted to assess the knowledge of dental ethics and jurisprudence among endodontists in Chennai city. The source of data was primary. A pilot study was conducted to validate the questionnaire and to get the required sample size. The questionnaire was pilot tested on a small group of fifty participants which included twenty nine postgraduates and twenty one endodontist practitioners, who were requested to complete it and to indicate any question that they found unclear. The results were tabulated based on the responses and evaluated.

Inclusion criteria: The participants should be a practising dentist. The clinic of the participants should be located in Chennai city The participants may be attached to a dental college either as a faculty or as a postgraduate student.

Table 1. Distribution of the answers given by the participants to the questions on knowledge of dental ethics and jurisprudence among endodontists.

QUESTIONS / OPTIONS	ANSWER DISTRIBUTION (%)
1. When was the dentist act given:	
A. 1948	(45.5%) ☐
B. 1956	(18.2%)
C. 1954	(18.2%)
D. Don't know.	(18.2%)
2. The dentists (code of ethics) regulation was given by:	
A. Indian Council of Medical Research	(13.6%)
B. Dental Council of India	(54.4%)☐
C. Indian Dental Association	(18.2%)
D. Don't know.	(13.6%)
3. The dentists (code of ethics) regulation first came into force in:	
A. 1948	(22.7%)
B. 1956	(22.7%)
C. 1976	(22.7%)☐
D. Don't know.	(13.6%)
4. The dentists (code of ethics) regulation was revised in the year:	

A.	200	(13.6%)
B.	2015	(4.5%)
C.	2014	(45.5%)☐
D.	Don't know.	(35.4%)

5. There are _____ principles of ethics:

A.	3	(4.6%)
B.	5	(31.8%)☐
C.	6	(40.9%)
D.	Don't know.	(22.7%)

6. One of the following is not a principle of ethics:

A.	Veracity or truthfulness.	(11.2%)
B.	Confidentiality.	(9.1%)
C.	Punctuality.	(72.7%)☐
D.	Don't know.	(7%)

7. Every dental surgeon should maintain his each patient's records for a minimum of:

A.	3 years.	(42.9%)☐
B.	5 years	(38.1%)
C.	. 2 years.	(19%)

8. It is unethical for a dental surgeon to refuse a treatment because the patient is HIV positive or suffering from any other contagious disease:

A.	True	(76.2%)☐
B.	False.	(34.2%)
C.	Don't know.	(9.5%)

9. Consent is invalid when:

A.	Given under 12-18 years of age	(81.8%)☐
B.	Given over 18 years of age	(4.6%)
C.	Don't know.	(13.6%)

10. What are consent forms for:

A.	To protect the doctor	(22.7%)
B.	To protect the patient	(9.3%)
C.	Both	(68%) ☐

11. Before starting the treatment do you inform the patient of all the treatment options available:

| A. | Yes | (90.5%)☐ |
| B. | No | (9.2%) |

12. Most common cause of endodontic treatment failures:

A.   Instrument separation   (9.1%)
B.   Canal blockage   (36.4%)☐
C.   Perforation.   (54.5%)

13. Main factor affecting failure of endodontic therapy:

A.   Poor diagnosis.   (9.1%)
B.   Radiographic misinterpretation. (9.1%)
C.   Improper treatment.   (9.1%)
D.   All of the above   (72.7%)☐

14. Causes of root perforations :

A.   Weak, poor files   (27.3%)
B.   Vigorous instrumentation   (45.5%)☐
C.   Canal blockage.   (27.3%)

15. Do you give a detailed explanation of the procedure and explain the complications associated with local anaesthesia?

A.   Yes.   (61.8%)☐
B.   No.   (38.2%)

16. Do you encounter complications during or after injections?

A.   Yes.   (66.7%)☐
B.   No.   (33.3%)

17.Most common type of complications encountered by dentists:

A.   Syncope   (32.4%)
B.   Hematoma.   (16.2%)
C.   Anaphylaxis   (16.2%)
D.   Failure of anesthesia   (35.1)☐

18.Are you aware of COPRA(Consumer Protection Act)1986?

A.   Yes   (71.4%)☐
B.   No   (28.6%)

19. Is dental insurance mandatory in India ?

A.   Yes.   (22.7%)
B.   No.   (36.4%)☐
C.   Don't know.   (40.9%)

20. What is the compensation paid to the patient for wrong dental procedure?

A.	Rs 1000-50000.	(14.3%)
B.	Rs 50000-100000	(47.6%)☐
C.	More than Rs 1,00,000.	(38.1%)

21. Practice in a Medical and dental field is a risky and complicated profession ?

A.	Yes	(84%)☐
B.	No	(16%)

Exclusion criteria: Dental practitioners who were not available to take the survey The clinic located outside Chennai city Dentists who were not willing to participate. Dentists who were not studying or practising endodontics. The study was conducted from December 2019 to January 2020 which included a specially designed questionnaire consisting of 21 close-ended questions. Sample size for the survey was 50. The first few questions consisted of the questions related to Knowledge of dental ethics and jurisprudence. The remaining section consisted of questions related to the complications faced during their practice in the clinic. The data obtained was analysed by descriptive and inferential statistics using SPSS.

RESULTS AND DISCUSSION

A total of 50 responses were obtained. 58% responses were from the postgraduates and 42% of the respondents were practitioners.On assessing the results from Table 1, it is seen that the majority of the endodontists were very much aware about the history and facts regarding ethics, jurisprudence. 45.5% endodontists were aware that the dentist act was given in the year 1948 and 54.4% knew that the dentist code of ethics was given by the Dental council of India. There was a mixed response regarding the year in which the dentist code of ethics came into force, and only 22.7% were right in choosing the year 1976. 45.5% of them knew that dentists code of Ethics was revised in the year 2014 whereas 36.7% weren't sure about the date. There are 5 principles of ethics and only 31.8% knew the right answer while 40.9% thought there are 6 principles. 72.7% endodontists knew about the 5 principles of ethics. It is mandatory for a dentist to maintain his patients records and 42% endodontists were aware that records should be maintained for a minimum of 3 years. 76.2% believed that it is unethical to refuse treatment for a patient suffering from any contagious disease. Consent was considered invalid when given under the age of 12-18 years, 81.8% chose the right answer. 77.3% endodontists are well aware that consent forms are for both the doctor and the patient. 90.5% knew that it is mandatory to inform the patient about the treatment and inform them about the various treatment options.

According to the endodontists, the most common cause of endodontic treatment failure was perforation 55%, canal blockage 36.4% and instrument separation 9.1%. 72.2% of them chose that the main factor affecting failure of endodontic therapy was poor diagnosis, radiographic misinterpretation and improper treatment. 45.5% chose vigour instrumentation as the common cause of root perforation followed by weak poor files and canal blockage 27.3%. Almost 81.8% of the practitioners explained about the procedures and complications associated with local anaesthesia. It is seen that 66.8% of them encountered complications during or after injections. Types of complications encountered by dentists were failure of anaesthesia 35.1%, syncope 32.4%, anaphylaxis and hematoma 32.4%. 71.4% of the endodontists were aware about the Consumer Protection act, 1986 [COPRA]. 40.9% did not know if dental insurance was mandatory or not in India .

Figure 1: The bar graph represents the association between the perception of risk in the medical and dentistry fields and the response of postgraduates (blue) and practitioners (red). X axis represents the response of participants regarding the risk in the field of dentistry; Y axis represents the number of participants. (Pearson's Chi square test, p value-0.001, p value <0.05, statistically significant. Majority of the postgraduates (48%) and practitioners (36%) considered that the medical and dental field is a risky and complicated profession in terms of medico legal aspect.
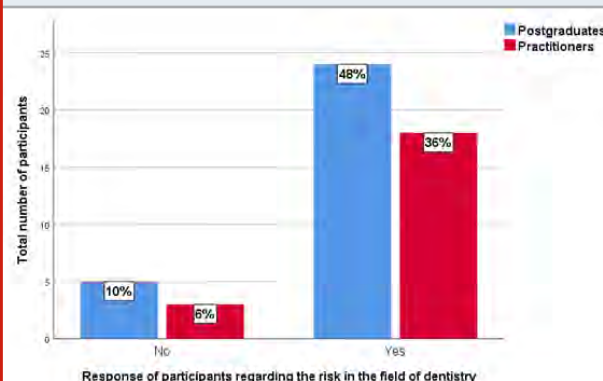
Almost 47.6% said that the compensation paid to the patient for wrong dental treatment procedure was Rs 5000-10000 and 38.1% said that it was Rs. 1000-5000, however these values could change depending on the type of treatment that was done and the complications encountered. A large percentage of 84% endodontists believe that the medical and dental field was a risky and complicated profession. Figure 1 shows association between the risk in the field of dentistry and the response of postgraduates and practitioners. The analysis shows that 48% postgraduates and 36% practitioners agreed with a yes, for the presence of various risks in dentistry.

Dentistry is an art and science where new technology provides better treatment and convenience to both the patient and the dentist. Endodontics has emerged as a promising dental specialty to preserve the natural tooth to their function and esthetics and to avoid the need for extraction in many cases (Story, 2015). Previously, the doctor–patient relationship was considered as a trustworthy relationship. This relationship has deteriorated when the medical profession has been covered under the ambit of Consumer Protection Act (CPA) after its enactment in 1986. In CPA, patients were considered as consumers and doctors as health service providers. Due to the enactment of CPA, doctors have to become more vigilant and provide good ethical treatment to patients. On the other hand, frivolous complaints are filed against doctors regarding negligence by some deceitful patients for monetary benefits out of the case. Ultimately, there is continuous degradation of the doctor–patient relationship in the modern times(Yadwad and Gouda, 2005). Dentists have a profound responsibility and follow codes of conduct to act in the best interest of the patient. It is a patient's right that they might accept or reject the advice from the dentist. The vital concern of every patient is that they should be treated as a human being, i.e., as the unique and individual person. Any circumstances causing lack of duty amount to negligence and may give a chance to a patient to proceed in the court of law. The dentist must be aware of the legal provisions regarding negligence and CPA (Story, 2015)(Chaturvedi, 2007; Story, 2015)(Yadwad and Gouda, 2005).

A clinician performs various endodontic procedures like pulpotomy, pulpectomy, regenerative procedures, and post and core restorations. During such procedures, mistakes or errors could occur at any stage and the treatment might go wrong (Ramugade and Sagale, 2018). For every therapeutic, medicinal, or surgical procedure, consent of the patient is mandatory in eyes of the law for major (18 years and above) as well as the minor. For minor patients, i.e., below 18 years of age, consent of parents is a must. When written consent is not obtained, the patient may put an allegation on the dentist of negligence, trespassing his/her privacy, or breach of morality and decency (Khare and Saxena, 2018; Ramugade and Sagale, 2018). Proper diagnosis is very important for initiating any treatment. Sometimes, the

diagnosis is ambiguous, and in an emergency situation, treatment has to be started. For proper endodontic diagnosis, case history and various vitality tests play a major role. Referred pain may also lead to wrong diagnosis in some cases(Koyess and Fares, 2006) .Treating the wrong tooth without proper diagnosis or valid written consent is considered as neglect (Koyess and Fares, 2006; Kaufmann, 2014). The consent should be obtained for any radiography mentioning the nature of radiation, dose, and risk and benefits of scanning (Wright, 2012).

Prescribing antibiotic prophylactically for infection control at the operated site or distant site is the dentist's responsibility. The dentist must evaluate all local and general factors which may increase the infection risk. There is no recommendation to prescribe antibiotics randomly. Antibiotics can be indicated to manage local infections or to prevent severe infection in the near future (Pippi, 2011). Failure to record the case details, not prescribing or medicating high-risk patients accordingly, is considered as negligence when found to be life-threatening (Robinson and Tambyah, 2017). For procedures involving endodontic therapy, radiographic documentation is mandatory. Multi-angulated radiographs help in the best analysis of the tooth and root canal anatomy. Role of a specialist endodontist must be considered, especially when the patient demands, for the management of difficult cases, calcified canals, retreatment cases, teeth requiring post and core, endodontic surgery cases, or mentally and medically compromised patients (Caplan, Reams and Weintraub, 1999). When the dentist does any work beyond his/her qualification, skills, or expertise, and if any mishap occurred, he/she will be held liable for the act of negligence (Anju et al., 2020). The basic principle of endodontics is isolation, and the best method to do is by rubber dam application. In endodontics, it is considered as a standard of care. Thus avoid complications and life-threatening emergency, it is better to adopt the practice of applying rubber dam regularly in every case(Venkataraghavan et al., 2011; Chaudhry, 2013; Reddy et al., 2014; Yadav et al., 2015; Anju et al., 2020)

In clinical situations, the operator must obtain the informed consent of the patient mentioning all possible complications such as file breakage or perforation. Instrument separation in the root canal or beyond apex during the treatment would be considered as the procedural error or mishap in the literature; however, hiding the present mishap situation from the patient amounts to negligence (Premnath and John, 2015). A dentist must be well trained in diagnosis to justify the chosen treatment plan, well trained to explain the prognosis of the diseased tooth, well equipped to perform procedures with good infection control, skilled enough to avoid endodontic mishaps. A good clinician with an ethical practice will not only safeguard oneself but also deliver the best possible treatment to the patients seeking oral health.

CONCLUSION

The present study indicates that the knowledge of dental ethics and jurisprudence among the endodontists of Chennai was mediocre. We have to address this issue in a practical and meaningful manner. Endodontists should be more aware about the ethics in their field and always keep in mind the safety of themselves and their patients.

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Morphometric Analysis of Pterygomaxillary Fissure

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ABSTRACT

Pterygomaxillary fissure is located in the medial aspect of infra temporal fossa.It connects the infra temporal fossa with the pterygopalatine fossa, and transmits the terminal part of the internal maxillary artery.It is created via the deviation of the maxilla through the pterygoid process of the sphenoid bone.The main aim of the study is to measure the pterygomaxillary fissure height, width and distance from articular tubercle, zygomatic temporal suture, zygomatic bone.30 unsexed dry human skulls were taken from the Department of Anatomy, Saveetha Dental College and Hospital. Digital vernier caliper was used for measuring the length and width of pterygomaxillary fissure and its distance from anatomical landmarks.The average height of pterygomaxillary fissure was 1.7cms, width was 0.3cms, distance from articular tubercle to upper border [A-B] was 4.1cms, zygomatic temporal suture [A-C] was 3.7cms, zygomatic bone [A-D] was 3.7cms respectively.Our study has tried to locate the position of pterygomaxillary fissure from the three anatomical landmarks, this data may be full for surgeons in planning their surgery in the infratemporal region

KEY WORDS: PTERYGOMAXILLARY FISSURE,ARTICULAR TUBERCLE,ZYGOMATIC TEMPORAL SUTURE,ZYGOMATIC BONE.

INTRODUCTION

Pterygomaxillary fissure is located in the medial aspect of infra temporal fossa and it is formed by divergence of maxilla from the pterygoid process of sphenoid bone (Eckerdal, 1991). It connects infratemporal fossa with pterygopalatine fossa (Dingman and Conley, 1970). It contains three borders anterior:posterior wall of maxillary sinus, superior: pterygoid process, inferior: pterygoid plate. The third part of maxillary artery pass through pterygomaxillary fissure from infratemporal to pterygopalatine fossa.posterior superior alveolar nerve pass through pterygomaxillary fissure,maxillary nerve continuous as infraorbital nerve(Tashi et al., 2016). Pterygomaxillary fissure along with nasal cavity form pterygomaxillary fossa. it is a small, clinically inaccessible, fat-filled space. It has connections between oral cavity, nasal cavity, nasopharynx, orbit, masticator space, and the middle cranial fossa, these connections with various deep spaces of head and neck acts as a passage for the spread of various inflammatory and neoplastic diseases (Erdogan, Unur and Baykara, 2003).

Most of the surgical procedures that have been used for the removal of lesions involving this area were extensive transcranial or transfacial approaches(Cavallo et al., 2005). In Lent zen study cone beam tomography image of population in pterygomaxillary fissure he classified the fissure into four types.Type 1 fissure present in mostly present in older male.Type 2 and 4 fissure are narrow and seen in younger patient.narrow fissure less than 2mm

cause limit in insertion of neurostimulator implants in pterygomaxillary fissure (Lentzen et al., 2020).

Very few research was done on pterygomaxillary fissure, most of research work is on pterygomaxillary junction and pterygopalatine fossa (Shadlinskiy et al., 2017), since most of the research does not locate the measurement of pterygomaxillary fissure. So in our study we tried to locate the position of the pterygomaxillary fissure.

Previously our department has published extensive research on various aspects of dentistry (Begum et al, 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to do research about morphometric analyse the length and breadth of pterygomaxillary fissure and to find the distance from anatomical landmarks.

MATERIAL AND METHODS

30 unsexed dry human skulls were taken from the Department of Anatomy, Saveetha Dental College and Hospital. Digital vernier caliper was used to measure the length and width in upper end of pterygomaxillary fissure and distance between upper part of fissure to articular tubercle(A-B), zygomatico temporal suture (A-C) and lower part of zygoma (A-D) was measured (Figure 1) on right and left side of skull. All the data was measured and analysed statistically.

RESULTS AND DISCUSSION

The height of pterygomaxillary fissure in the right side was in the range between 1.2cm to 2.1 cm average value is 1.7 cm. The width of the pterygomaxillary fissure in the upper end is in range between 0.1 to 0.4 cm. The distance from upper border of pterygomaxillary fissure to articulations tubercle [A-B] was in range between 3.6 to 4.6cm. The distance from upper part of pterygomaxillary fissure to zygomatic temporal suture [A-C] was in range between 3.1 to 4.3cm.The distance from upper part of pterygomaxillary fissure to base of zygomatic bone [A-D] was in range 3.4 to 4.3cm.[Table 1]. The height of pterygomaxillary fissure in the left side was in the range between 1.3 cm to 2.3 cm average value is 1.7 cm.

The width of the pterygomaxillary fissure in the upper end is in range between 02 to 0.3 cm. The distance from the upper border of pterygomaxillary fissure to articulations tubercle [A-B] was in range between 3.8 to 4.5cm. The distance from upper part of pterygomaxillary fissure to zygomatic temporal suture [A-C] was in range between 3.4 to 4.4cm.The distance from upper part of pterygomaxillary fissure to base of zygomatic bone [A-D] was in range 3.4 to 4.2cm.[Table 2]. In statistical analysis our study found that there is no significant difference in measurement between right and left side of pterygomaxillary fissure but there were differences from individual to individuals.

The width of pterygomaxillary fissure was 0.3cm which is similar to study done by stajcic et al, which was less than 0.2 cm (Stajcic et al., 2010) . Our study found that there was a significant difference in size of pterygomaxillary fissure among individuals. This was similar to another study in the pterygomaxillary region, It was due to Gender, age and dental status are critical factors that affect bone density in this region (Janfaza and Montgomery, 2011). In study of Wandee Apinhasmit he located the the position of maxillary artery in pterygomaxillary fissure.

Table 1. Various measurements of Pterygomaxillary fissure Right side in cms					
	Height	Width	Distance from articular tubercle (AB)	Distance from zygomatic temporal suture (AC)	Distance from base of zygoma (AD)
Minimum	1.2	0.1	3.6	3.1	3.4
Maximum	2.1	0.4	4.6	4.3	4.3
Average	1.7+0.25	0.3+0.07	4.1+0.26	3.7+0.30	3.7+0.20

Tablke 2. Various measurements of Pterygomaxillary fissure Left side in cms					
	Height	Width	Distance from articular tubercle (AB)	Distance from zygomatic temporal suture (AC)	Distance from base of zygoma (AD)
Minimum	1.3	0.2	3.8	3.4	3.4
Maximum	2.3	0.3	4.5	4.4	4.2
Average	1.7+ 0.21	0.3+ 0.08	4.0+ 0.19	3.8+ 0.24	3.7+ 0.20

The maxillary artery enter the pterygomaxillary fossa at distance 2.3mm above pterygomaxillary junction.This distance was longer in male than females (Methathrathip et al., 2005). Icen and Orthan study shows that the length and width of pterygomaxillary fissure was larger in male than females, the length was 17.7 mm which is similar to our study (Icen et al., 2020) . In Vardimon study in response to pterygomaxillary fissure to class 3 inter maxillary magnetic machine the lowermost pterygomaxillary fissure point was displaced inferiorly and anteriorly(Vardimon et al., 1994).

Figure 1: Pterygomaxillary fissure location from anatomical landmarks, A-pterygo maxillary fissure, B-articular tubercle, C - zygomaticotemporal suture, D- lower part of zygoma.
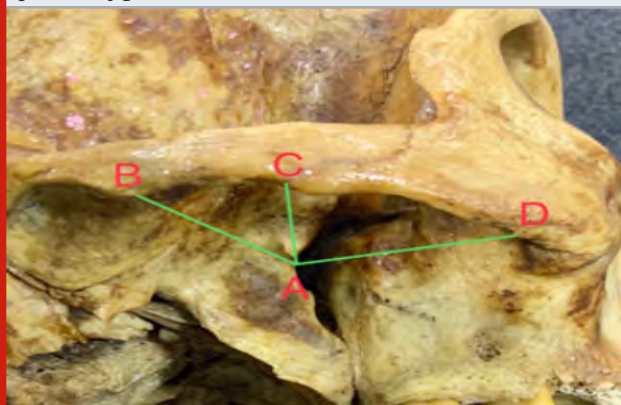
CONCLUSION

Since most of the research does not locate pterygomaxillary fissure from standard anatomical landmarks.our study has tried to locate the position of pterygomaxillary fissure from the three anatomical landmarks. This data may be useful for surgeons in planning their surgery in the infra temporal region.

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Conflict of Interest: The author declares that there is no conflict of interest in the present study

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Evaluation of Anxiety of Dental Treatments Among Dental Students: A Questionnaire Based Survey

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ABSTRACT

Dental anxiety can be described as a feeling of fear of seeking dental treatment which is often reported worldwide and globally observed in every generation of population. This psychological feeling becomes a challenging factor encountered by most dental practitioners. Dental anxiety can lead to negative attitude from seeking dental treatment, especially in dental patients with prolonged periods of dental problems. Dental anxiety is developed through a period of time and therefore dental anxiety is likely to be related with multifactorial etiologies. Majority of dental and medical students reported with high levels of stress and anxiety and may experience adverse effects. The aim of this study is to determine the frequency of dental anxiety to perform dental procedures among dental students. This cross-sectional study was conducted from June 2019-March 2020 among dental students of Saveetha Dental College. Study questionnaire was conducted through Google Form application using the modified Moss and McManus (Moss and McManus, 1992) clinical anxiety questionnaire. It contained 13 questions from the original document in relation to the specific perceived sources of anxiety. The collected data was validated, tabulated and analysed with Statistical Package for Social Sciences for Windows, version 23.0 (SPSS Inc., Chicago, IL, USA) and results were obtained. Descriptive statistics (frequency distribution, percentage and mean value) and inferential statistics (chi-square test) were done. In the present study, majority of the students rated deficiencies and error during treatment as more anxiety provoking situations as compared to act of treatment situations. According to male students, the top clinical anxiety provoking situations were accidental pulpal exposure and extracting the wrong tooth. Females voted most for fracturing teeth and extracting the wrong tooth. Accidental pulpal exposure, fracturing teeth and using high speed hand piece significantly elevates anxiety levels in dental students

KEY WORDS: ANXIETY; FEAR; DENTAL STUDENTS; DENTAL TREATMENT; STRESS.

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INTRODUCTION

Dental anxiety can be described as a feeling of fear that prevents an individual from receiving dental treatment. It is often reported worldwide and globally observed in every generation of population. The prevalence of dental anxiety among the general population reported is between 3.9 and 11% (Vermaire et al., 2016). This psychological feeling becomes a challenging factor encountered by most dental practitioners. Dental anxiety can lead to negative attitude from seeking dental treatment, especially in dental patients with prolonged periods of dental problems. Consequently, it is considered as one of the reasons for dental neglect (Eli, 1993). Anxious and frightened dental patients will suffer themselves from dental diseases and complications because they simply cancel or delay their visit to dental clinics (Pohjola et al., 2009) ; (Kesim et al., 2012). The delay of dental treatment results in various irreversible diseases. Hence, people with dental anxiety are more unlikely to be able to maintain a good quality of life, in regards to their oral health status (Armfield, Stewart and Spencer, 2007).

Dental anxiety is not usually developed instantly at a time. Not every patient that had a painful and bitter experience of dental treatment will suffer dental anxiety. It is developed through a period of time and therefore dental anxiety is likely to be related with multifactorial etiologies. Previous studies reported three reliable factors of causing dental fear. The first contribution is the pattern of dental avoidance and probable anxiety, second is related to the specific dental stimuli and procedures and last factor is related to the psychological surrounding arousal during dental treatment (Kleinknecht et al., 1984). Specific stimuli include sight of needles during local anaesthetic injections, sharp dental instruments, characteristic smell of a dental clinic, noises from dental drills. There are three phenomena that are concerned with the development of dental fear; instinctive, dependent on maturation and development through social experiences (Hall and Edmondson, 1983).

Medicine and dentistry are viewed as stressful professions. Majority of dental and medical students reported with high levels of stress and anxiety and may experience adverse effects. Study on anxiety of clinical medical students reported by Moss and McManus showed half of the participants had moderate to severe anxiety states (Moss and McManus, 1992). According to Davidovich et al, a higher number of dental students elicited anxiety and stress during dental treatment when compared to experienced dentists (Davidovich et al., 2015). An online questionnaire conducted in University of Otago had revealed a high prevalence of detrimental emotions among fourth year dental and medical students. These findings of adverse mental stability reported by students is alarming and needs to be addressed. It is evident that most of the undergraduate students elicited stress and anxiety due to academic and emotional disturbances (Qamar, Khan and Bashir Kiani, 2015).

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the assessment of anxiety of dental treatments among dental students. The aim of this study is to determine the frequency of dental anxiety to perform dental procedures among dental students. It is very difficult to attend to patients when the dental care providers are under dental anxiety, therefore compromising the patients care.

MATERIAL AND METHODS

Study design and setting: This cross-sectional study was conducted in Saveetha Dental College and Hospital, Saveetha university, Chennai, to assess dental anxiety of dental treatment among undergraduate students (third years, final years and interns). The approval for this university setting study was obtained from the institutional review board.

Study subjects: A total of 140 students had participated in the study, among which 30 (21.43%) were third years, 25 (17.86%) were final years and the remaining 85 (60.71%) were interns.

Questionnaire survey: Study questionnaire was conducted through Google Form application using the modified Moss and McManus (Moss and McManus, 1992) clinical anxiety questionnaire. It contained 13 questions from the original document in relation to the specific perceived sources of anxiety. Each question was assessed using a 4-point Likert scale from "not anxious," "slightly anxious," "fairly anxious" to "very anxious." For the purpose of analysis, responses were scored 1 for not anxious, 2 for slightly anxious, 3 for fairly anxious, and 4 for very anxious.

Statistical analysis: The collected data was validated, tabulated and analysed with Statistical Package for Social Sciences for Windows, version 23.0 (SPSS Inc., Chicago, IL, USA) and results were obtained. Descriptive statistics (frequency distribution, percentage and mean value) and inferential statistics (chi-square test) were done. P value < 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Of the 140 respondents, 30 (21.43%) were third years, 25 (17.86%) were final years and the remaining 85 (60.71%) were interns. [Figure 1]. A total of 57 (40.71%) and 83 (59.29%) of the dental students were males and females respectively. [Figure 2]. Female students rated all situations related to act of dental treatments as more anxiety provoking than the male students; Treating

children (2.52 vs. 2.31), coping with uncooperative patients (2.50 vs. 2.19), administering local anesthesia (2.78 vs. 2.42), using high speed hand piece (2.97 vs. 2.35) and poor radiograph taking (2.60 vs 2.40). Using extraction forceps and doing root canal treatment in molars were the two top anxiety provoking situations among male students when compared to female students. [Figure 3].

to be anxious when accidentally exposed pulp tissue. Meanwhile, female students were more highly anxious about fracturing a tooth and extracting a wrong tooth when compared to male students. [Figure 4]. There was a statistically significant difference in mean score for using high speed hand piece with the female respondents scoring higher (p value = 0.000). There was a statistically significant difference between both sexes with respect to fracturing a tooth (p value = 0.02) and accidental pulpal exposure (p value = 0.004). [Table 1].

Figure 1 : Bar graph shows number of respondents based on year of study. X axis represents the year of study. Y axis represents the number of respondents. 30 (21.43%) of the respondents were third years, 25 (17.86%) were final years and the remaining 85 (60.71%) were interns.
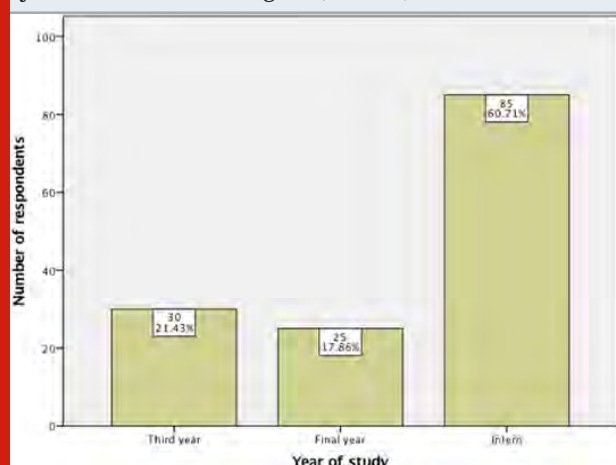
Figure 2 : Bar graph shows number of respondents based on gender of study population. X axis represents gender. Y axis represents the number of respondents. Males (blue) and females (green). 83 (59.29%) of the respondents were females and 57 (40.71%) were male respondents.

Figure 3 : Bar graph shows frequency of dental anxiety based on act of treatment related situations. X axis represents the act of treatment related situations. Y axis represents the frequency of dental anxiety based on mean value. Males (blue) and females (green). Among these treatments, females were more anxious than males for all of the procedures (treating children, coping with uncooperative patients, administering local anesthesia, using high speed hand piece, poor radiograph taking) except the use of extraction forceps and root canal treatment in molars.
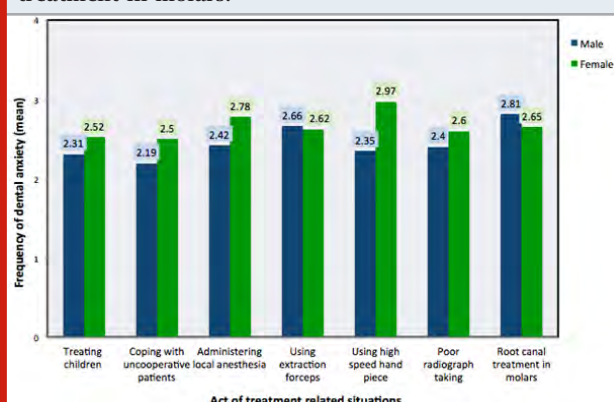
Figure 4 : Bar graph shows frequency of dental anxiety based on deficiencies and error related situations. X axis represents the deficiencies and error related situations. Y axis represents the frequency of dental anxiety based on mean value. Males (blue) and females (green). Among these treatments, females were more anxious than males for all of the procedures (fracturing a tooth, extracting wrong tooth, inadvertently hurting patients and fear of patients satisfaction with denture) except iatrogenic gingival trauma and accidental pulp exposure.

Assessment of deficiencies and error related situations among the participants revealed the following rating of males versus females on the anxiety provoking situations; Iatrogenic gingival trauma (2.63 vs. 2.44), inadvertently hurting patients (2.43 vs. 2.55), fear of patient's satisfaction with denture (2.52 vs. 2.56). Strikingly, male students expressed a greater tendency

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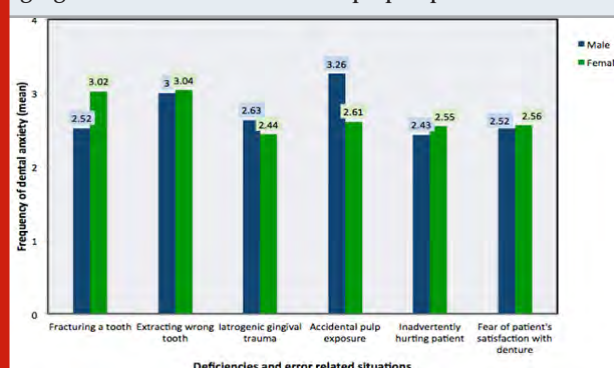
This cross-sectional study was to evaluate and assess the anxiety levels to dental procedures among students of Saveetha Dental College. Majority of the students rated deficiencies and error during treatment as more anxiety provoking situations as compared to act of treatment situations. According to male students, the top clinical anxiety provoking situations were accidental pulpal exposure and extracting the wrong tooth. Females voted most for fracturing teeth and extracting the wrong tooth. This study revealed that even dental students can suffer dental phobia during their course. This finding is similar to a study in Brazil, which found that 27.5% of dental students experienced dental anxiety after encountering clinical practices (Serra-Negra et al., 2012). Similarly in Pakistan, a study revealed that dental students were afraid to perform dental treatments during their initial years of training (Bari, 2019). Stanford et al had compared the level of dental fear among students of dentistry, psychology and biology, among which dental students were least who elicited dental fear (Serra-Negra et al., 2012).

Table 1. Shows the gender differences in anxiety provoking clinical situations among dental students

Anxiety Provoking Situations	Male (mean value)	Female (mean value)	P value
Act of treatment related situations			
Treating children	2.31	2.52	0.589
Coping with uncooperative patients	2.19	2.5	0.285
Administering local anesthesia	2.42	2.78	0.156
Using extraction forceps	2.66	2.62	0.287
Using high speed hand piece	2.35	2.97	0.000
Poor radiograph taking	2.4	2.6	0.522
Root canal treatment in molars	2.81	2.65	0.24
Deficiencies and error related situations			
Fracturing a tooth	2.52	3.02	0.02
Extracting wrong tooth	3	3.04	0.961
Iatrogenic gingival trauma	2.63	2.44	0.251
Accidental pulp exposure	3.26	2.61	0.004
Inadvertently hurting patient	2.43	2.55	0.884
Fear of patient's satisfaction with denture	2.52	2.56	0.761

In general, this present study reported that females had a greater phobia of dental treatments when compared to male students, corroborating with a study carried out by Ali et al (Ali et al., 2015). This trend could be attributed to the high number of male participants in the study. In addition to this, males frequently hide their emotion and keep their guard up. It is also evident that the female population tends to be more reactive towards specific stimuli such as needle prick, therefore accounts for more increase of anxiety than males. Nevertheless, females are

relevantly said to commonly have traits of anxious and jealous (Lippa, 2010).

The results of this current study showed that, overall, the most feared dental procedure reported was fear of fracturing a tooth, extracting the wrong tooth and accidental pulpal exposure. Similar results have been demonstrated in a previous study where dental extractions was rated as the most scariest procedure, as perceived by Pakistani dental students (Ali et al., 2015) Fracturing a tooth during extraction may happen because of inadequate apical thrust or it could be associated with lack of confidence to do proper extraction forces. The prevalence of extracting wrong teeth among dental students in Otago was reported to be 13% (Kieser and Herbison, 2000) and it is considered as a medical error with medico-legal complications (Lee, Curley and Smith, 2007).

The noted higher anxiety score among female students than male students in act of treatment related situations such as treating children, coping with uncooperative patients, administering local anesthesia, using high speed hand piece and inadvertently hurting patients may explained to why females pay to more attention to details thereby lessening their committal of medical error than males. This is in concordance with another similar study that reported the majority of females were associated with high levels of anxiety in relation to act of treatment related situations such as treating children and arresting post-operative bleeding. Both sexes in this study expressed more tendencies to be anxious when accidentally caused pulp exposure during dental procedures. Obarisiagbon et al also reported the same in his study, which can be explained by the poor prognosis when simple dental care has to change into endodontic procedure. High clinical anxiety provocation with use of the high speed hand piece may be contributory. Endodontic treatment is technique sensitive with limitation of mouth opening for prolonged periods and saliva as fluids. This gives clues to why students have low confidence and inexperience to do endodontic treatments (Obarisiagbon et al., 2013).

Our study was limited to a small sample size distribution within representation from one dental institution. Other shortcomings of this study include the prominence difference between both sexes of dental students in the study, which may affect the statistical analysis. There is a need for future studies with extensive larger scale-study with richer clinical data in order to obtain more accuracy of the findings in association of different community-based investigations. The prevalence of anxiety among dental students in this study demonstrates early recognition and management strategies must be addressed among students to ensure positive influence in their clinical practice.

CONCLUSION

Within the limitations of this study, we can conclude that the majority of the students rated deficiencies

and error during treatment as more anxiety provoking situations as compared to act of treatment situations. According to male students, the top clinical anxiety provoking situations were accidental pulpal exposure and extracting the wrong tooth. Females voted most for fracturing teeth and extracting the wrong tooth. Accidental pulpal exposure, fracturing teeth and using high speed hand piece significantly elevates anxiety levels in dental students.

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Knowledge, Attitude and Practice Among Dental Students on Amelogenesis Imperfecta

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ABSTRACT

The study aims at assessing the awareness of amelogenesis imperfecta among dental students of a private dental college. Amelogenesis imperfecta is a genetic disorder which affects both primary and permanent teeth. It occurs due to the defective formation of enamel.The study had a sample size/respondents of 100 dental students. An online survey with a pretested and validated questionnaire consisting of 10 questions testing awareness of amelogenesis imperfecta. The Questions regarding reason for AI,occurrence, types, clinical features, differential diagnosis and treatment were framed and shared with 100 dental students and their answers were recorded. Data was entered in Microsoft Excel sheets. The results were demonstrated in the form of pie charts. It is found from this study that there is moderate knowledge on amelogenesis imperfecta amongst dental students. It is essential to create awareness of amelogenesis imperfecta to diagnose it with clarity and to suggest treatment for Amelogenesis Imperfecta accordingly

KEY WORDS: AWARENESS, AMELOGENESIS IMPERFECTA, DENTAL.

INTRODUCTION

Amelogenesis imperfecta is a rare genetic disease affecting enamel.Both primary and permanent teeth are affected(Toupenay et al., 2018).The prevalence varies from 1:700 to 1:14 000, according to the populations studied. Clinical features of patients with AI varies according to the type of AI involved. AI has been classified and categorised based on clinical, radiographic, and histologic appearance of the enamel defect and the mode of inheritance of the trait. AI has been categorized as hypoplastic (autosomal dominant/autosomal recessive/x-linked dominant), hypocalcified (autosomal dominant/ autosomal recessive), hypomaturation types (autosomal recessive/x-linked recessive/autosomal dominant) and hypoplastic-hypomaturation type(Mehta, Shah and Thakkar, 2013.

Hypoplastic AIH (type I) consists of quantitative alteration of enamel with localized or generalized reduced thickness. Teeth are yellow to light brown, the surface is rough with pits or larger area defects(Toupenay et al., 2018). Radiographically, hypoplastic type is characterised by the presence of thin radiopaque layer of enamel with normal radiodensity. Hypocalcified type of amelogenesis imperfecta is the most common type and is characterized by normal size and shape of crown. It is caused due to the defects of matrix structure and mineralisation. It

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consists of softer enamel which wears down rapidly and can be removed by a prophylaxis instrument, teeth are dark brown colored. Radiographically, hypocalcified type is characterised with normal thickness of enamel but radiodensity of enamel is less than that of dentin.

Hypomaturation form of amelogenesis imperfecta is characterized by normal thickness of enamel but softer than normal but harder than hypocalcified type and may crack away from the crown, mottled-colored cloudy white/yellow/brown/snow capped. Radiographically, enamel radiodensity is similar to that of dentin. Histologically, in hypomaturation type, alterations in enamel rod and rod sheath structures had been noted in various studies(Mehta, Shah and Thakkar, 2013).In hypoplastic hypomaturation with taurodontism, the enamel is thin, mottled yellow to brown, and pitted. Molar teeth exhibit taurodontism and other teeth have enlarged pulp chambers.Diagnosis is based on the family history, pedigree plotting and meticulous clinical observation(Crawford, Aldred and Bloch-Zupan, 2007). Differential diagnosis includes fluorosis, dentinogenesis imperfecta. Preventive and restorative treatment as well as considerations for esthetic issues is very important since the crown are yellow from exposure of dentin due to enamel loss.

The main objectives of treatment is pain relief, preserving patient's remaining dentition, and to treat and preserve the patient's occlusal vertical height.Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the knowledge,attitude and practice on amelogenesis imperfecta, a survey has been conducted.

MATERIAL AND METHODS

The study was conducted in a private dental institution in Chennai. The study setting was carried out in a University setting with approval of the Institutional review board.

Inclusion criteria and Exclusion criteria: Undergraduate third year students, final year students and Interns were included in the study. Post graduate students and dental practitioners were excluded from the study.

Data Collection: A pre-tested questionnaire with 10 questions was formulated for the collection of information. The questionnaire was simple and brief. The self made questions were developed. The questionnaire included self made questions to assess about the knowledge, practise and awareness among the dental students regarding reason for AI,occurrence, types, clinical features, differential diagnosis and treatment

were framed.The questionnaire was shared with 100 dental students and their answers were recorded. Data was entered in Microsoft Excel sheets. The results were demonstrated in the form of pie charts.

RESULTS AND DISCUSSION

40% of male students and 60% of female students participated in this study. 90% of students are aware that amelogenesis imperfecta results due to defective enamel formation while 10% of students are not aware about the reason for amelogenesis imperfecta (Figure 1). Dental enamel is a highly mineralised tissue. 95% of its volume is occupied by hydroxyapatite crystals. Ameloblasts control its formation through the interaction of organic matrix molecules and various enzymes. Organic matrix molecules are enamelin, amelogenin, ameloblastin, tuftelin, amelotin, dentine sialophosphoprotein and enzymes are kallikrein and matrix metalloproteinase (Crawford, Aldred and Bloch-Zupan, 2007).During organogenesis, the enamel transitions from a soft and pliable tissue to its final form, which is almost entirely devoid of protein (Paine et al., 2001). The final composition of enamel is a result of the unique molecular and cellular activities which occurs during its genesis. Deviation from this process may lead to amelogenesis imperfecta(Chaudhary et al., 2009). Hence the defective formation of enamel causes AI.

Figure 1: Pie chart depicts the students response on the reason for amelogenesis imperfecta. 90% of students aware (blue) that amelogenesis imperfecta results due to defective enamel formation while 10% of students are not aware(green) about the reason for amelogenesis imperfecta.
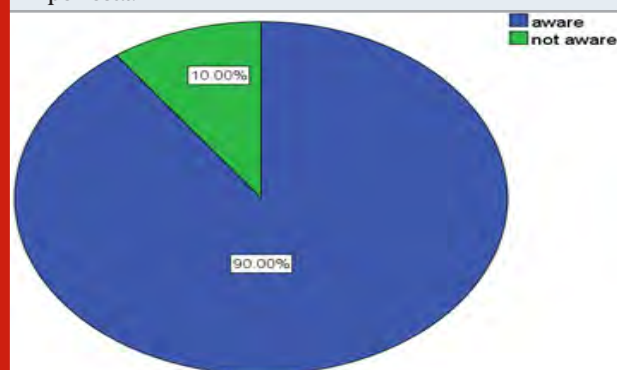
30% of students are aware that amelogenesis imperfecta occurs both in primary and permanent dentition. 60% of students felt that AI occurs only in permanent dentition whereas 10% felt AI occurs in primary dentition (Figure2). 70% of students aware of the types of amelogenesis imperfecta whereas 30% of students are not aware on types of AI(Figure 3).Witkop and Sauk listed the varieties of AI, divided according to a reduced amount of enamel (hypoplasia), deficient calcification (hypocalcification), or imperfect maturation of the enamel (hypomaturation) (Weinmann, Svoboda and Woods, 1945).

60% of students aware of clinical features of amelogenesis imperfecta whereas 40% of students are not aware of clinical features of AI (Figure 4). Hypoplastic AIH (type I) consists of quantitative alteration of enamel with localized or generalized reduced thickness. Yellow to light brown coloured teeth. The surface of the teeth is rough with pits or larger area defects. Severe hypoplastic phenotype leads to morphological anomalies seen on radiographic examinations. No pain is associated with this type of amelogenesis imperfecta, although some slight thermal sensitivity may sometimes be reported(Wright et al., 1992).

Figure 2: Pie chart depicts the students response on the occurrence of amelogenesis imperfecta.Only 30% of students are aware that amelogenesis imperfecta occurs both in primary and permanent dentition.
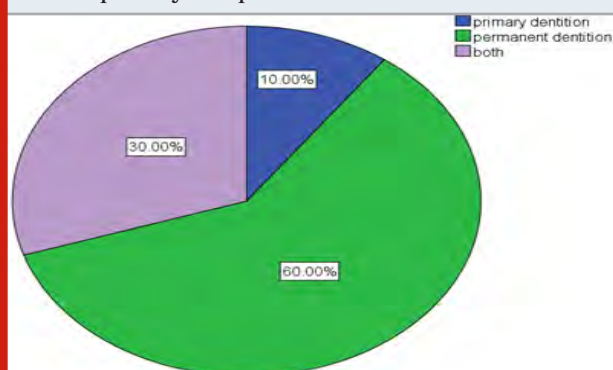
Figure 3: Pie chart depicts the students response on the type of amelogenesis imperfecta. 70% of students aware(blue) of types of amelogenesis imperfecta whereas 30% of students are not aware(green) of types of AI.
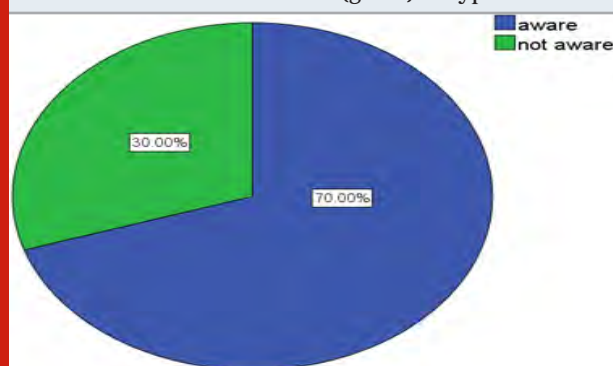
Hypomature AIH (type II) occurs due to the defect in degradation of matrix protein. In enamel, proteins must undergo degradation to achieve final crystal growth. In type II, enamel appears white or brown, without translucency. Hardness during probing and thickness of the enamel layer are normal. However, enamel breakdown often occurs. On radiographs, enamel opacity is decreased especially near the enamel dentin junction. This type of AIH is the mildest form and frequently undiagnosed. Aesthetics is the first cause of consultation(El-Sayed et al., 2011).

Figure 4: Pie chart depicts the students response on the clinical features of amelogenesis imperfecta.60% of students aware(blue) of clinical features of amelogenesis imperfecta whereas 40% of students are not aware(green) of clinical features of AI.
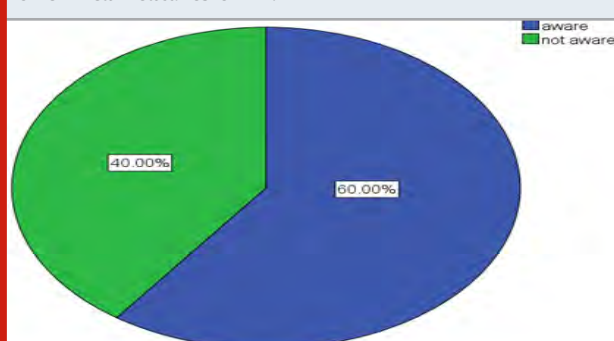
Figure 5: Pie chart depicts the students response on the treatment of amelogenesis imperfecta.Only 10% of students are aware that all(full veneer crowns,prosthodontic treatment, orthodontic,periodontal) are the management of amelogenesis imperfecta.
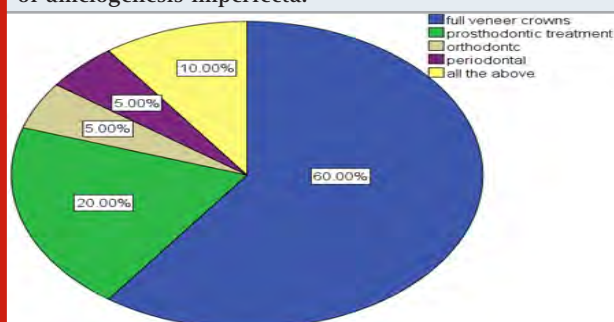
Hypomineralized AIH (type III) is the most severe form of Amelogenesis Imperfecta. Mineral content of enamel is reduced causing pain during mastication and brushing. Teeth are very sensitive to temperature and brushing. Enamel is dark yellow or brown. Radiographically, enamel and dentin have the same radiodensity.Anxiety has often been reported in these patients due to permanent dental pain(McDonald et al., 2012).

Figure 6: Pie chart depicts the students response on the factors affecting the treatment of amelogenesis imperfecta. Only 10% of students are aware that all(type,age,severity of AI) were the factors affecting the treatment of amelogenesis imperfecta
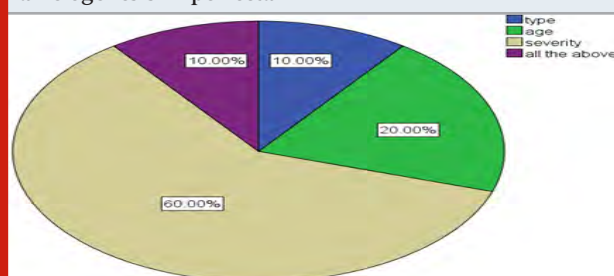
60% of students felt that only full veneer crown is the treatment of choice.20% of students felt that restorative is the treatment of choice. 5% of students felt that orthodontic and periodontal therapy is the treatment of choice.Only 10% felt that all (periodontal,orthodontic,restorative,full veneer crowns) are treatment for AI (Figure 5). All periodontal,orthodontic,restorative and full veneer crowns are the treatment options.The gingival condition and oral hygiene among patients with AI were reported to be poor. Periodontal status in AI and without AI patients did not differ, but AI patients who are hypomineralized type tend to have high scores in periodontal parameters. The overall results showed that the restorations performed well, and that all the patients had positive reactions to prosthodontic treatment. Patients with AI need orthodontic treatment due to dental and/or skeletal problems. Root canal therapy is indicated when pulp exposures are caused by severe attrition or tooth reduction(Chen et al., 2013).

Figure 7: Pie chart depicts the students response on the differential diagnosis of amelogenesis imperfecta.60% aware(blue) of differential diagnosis of AI.40 % of students were not aware(green).
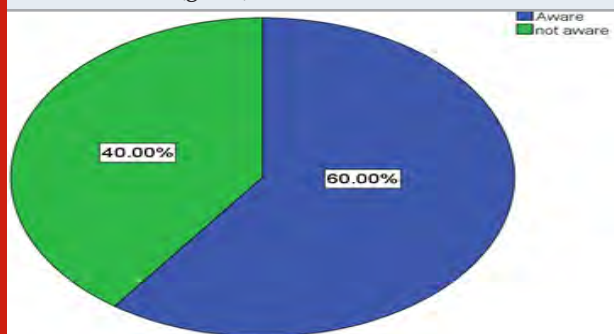
10% of students felt that type of AI influences treatment, 20% felt that age influences treatment,60 % felt that severity of AI influences treatment, 10% of students felt that all(type,age, severity) influences treatment(Figure 6). Treatment of AI varies according to the type of Amelogenesis imperfecta, age and severity of AI. 60% aware of differential diagnosis of AI. 40 % of students were not aware(Figure 7).The commonest differential diagnosis of amelogenesis imperfecta is dental fluorosis.Other differential diagnosis is dentinogenesis imperfecta.

CONCLUSION

Majority of students have moderate knowledge on AI.Hence it is essential to create awareness on amelogenesis imperfecta to diagnose it with clarity and to suggest treatment for Amelogenesis Imperfecta accordingly.Diagnosis of amelogenesis imperfecta is significant for proper treatment planning since each type requires different management.

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Morphological and Morphometrical Analysis of Condylar Process of the Mandible and its Surgical Relevance

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ABSTRACT

Mandible, known to be the lower jaw bone is the strongest and the largest bone in the human face, forming the lower jaw consists of ramus which has a horseshoe shaped body and two processes – the coronoid and condylar processes. The condyloid process consists of a neck surmounted by an oval head with an articular facet in the process. The aim of the study is to morphologically and morphometrically analyze the condylar process of the human mandible. 55 unsexed mandibles were taken from the Department of Anatomy, Saveetha Dental College. The length and width of the condylar processes of the taken mandibles were measured with the help of vernier caliper. After measuring the dimensions [length and width] the shapes of the condylar processes were observed along with it. The data were statistically analyzed by unpaired t test derived from the SPSS software. The left mandibular condyle was greater in mesio-distal diameter when compared to the right mandibular condyle. On considering the antero-posterior diameter, the right mandibular condyle was greater in the diameter. And most of the condyles observed were plane shaped rather than round and pointed ones. These analyses can help the surgeons to plan treatments for fractures in TMJ regions and other parts of the mandible too.

KEY WORDS: CONDYLAR PROCESS, CORONOID PROCESS, MANDIBULAR MORPHOMETRY, SHAPES OF CONDYLAR PROCESS, VERNIER CALIPER.

INTRODUCTION

The mandible is the only movable bone found in the face region. The mandible being the lower jaw articulates with the upper jaw (or) maxilla in the viscero-cranium via the teeth when the mouth is closed(d'Aquino et al., 2009). It

also articulates with the neuro-cranium via the temporal bone forming the TMJ [Temporo-mandibular joint] . The mandible is one of the largest and strongest bones in the face region. TMJ is a freely movable joint, found between the condyle of the mandible and squamous portion of the temporal bone at the base of the skull(Misch, Qu and Bidez, 1999). The condyle is very important as the expression of the mandibular growth is provided by the mandibular condyle. The ramus of the mandible consists of the condylar process and the coronoid process. The condylar process is highly calcified when compared to the coronoid process. The condyle is represented by a hammer shaped head region and a narrow neck(Choudhari and Thenmozhi, 2016).

Mandibular condyle bears all types of mechanical forces exerted on it by the temporo mandibular joint. The elongation of the ramus is mainly concerned by the condylar cartilage(Priya and Parthasarathy, 2019). Clinically, dimensions of condylar processes are essential to plan out surgeries in TMJ regions and other mandibular regions too. Some rare conditions called osteochondroma occur in the mandibular condyle, where enlargement of the condylar process occurs progressively leading to temporo- mandibular dysfunction. Osteochondroma appears to be a lesion originating from the cortex of the bone(Sharen and Sangeetha, 2019).

Many research works are based on the whole of the mandible which includes works like age changes in the mandible(Vignesh, Babu and Mohanraj, 2018) . Radio graphical studies were done on mandibular fractures and sexed mandibles were also studied (Manson and Lucas, 1962). As the mandible is the strongest and hardest bone in the face, fractures associated studies are not that prevalent. Various foramen and ramus of the mandible were researched fields(Trost, Trouilloud and Malka, 2009). Diameter, shape, and other anatomy applied to coronoid was detailed in many research works than for the condylar process(Ellis and Throckmorton, 2005). Very few works were on condylar processes, most of these works were done radio graphically and not on dry mandibles, they were done tomo-graphically(Markic et al., 2015).

The Condylar process did not grasp the attention of many research workers(Mohan Choontharu et al., 2018). In the condyles, the ossifications were studied including the timeline and they were tabulated. Sex wise condyle separation was also done in this basis(Malik, 2016). With a rich case bank established over 3 decades we have been able to publish extensively in our domain (Abdul Wahab et al., 2017; Eapen, Baig and Avinash, 2017; Patil et al., 2017; Jain and Nazar, 2018; J et al., 2018; Marimuthu et al., 2018; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019; Senthil Kumar et al., 2019; Sweta, Abhinav and Ramesh, 2019). Based on this inspiration we aim to analyse the condylar process of the mandible morphometrically.

Very few works are done on condylar processes, these works were mostly on sex differentiation(Kadhim and Fatah, 2016) and determination. Most of these works were on living individuals accomplished on radio graphically(Katagiri, Nakazawa and Kishino, 2008). In this study, dry human mandibles are used to assess dimensions and shapes morphologically as well as morphometrically. This study determines the length and width of the condylar processes and different shapes of the condylar processes were also determined in it.

MATERIAL AND METHODS

Unsexed dry human mandibles of fifty five in number were taken from the Department of Anatomy, Saveetha Dental College, Chennai. The dimensions [width and breadth] of the condylar processes of the mandibles were measured with the help of a digital vernier caliper along with the shape of the condylar heads. The longer side was marked as the length which is the mesio-distal diameter of the condyle and the shorter one is width which is the antero-posterior diameter.

LENGTH: Mesio-distal diameter of the mandibular condyle is the diameter which joins the mesial side with the distal side and is considered to be the length of the condylar process of the mandible.

BREADTH: Antero-posterior diameter of the mandibular condyle is the diameter which joins the anterior side with the posterior side and is considered to be the breadth of the condylar process of the mandible.

VERNIER CALIPER: Gives accurate measurements for dual graduation markings. Accurate up to 0.01cm.

SHAPE: The shapes of the condylar processes were also observed along with the dimensions of the condyle.

Statistical Analysis Used: After collection of data – length and breadth of the mandibular condyle, they were analyzed statistically using unpaired t test through software named as SPSS.

UNPAIRED T TEST: It is a statistical procedure which is used to compare the averages [or] means of two independent groups.

SPSS: Used to analyze various databases descriptively as well as statistically.

RESULTS AND DISCUSSION

Dimensions:
1. Length [Mesio-distal diameter]:

Table 1. This table represents the Mesio-distal diameters [range] of the right and left condyles along with its average P-value - 0.023; statistically significant at $P < 0.05$.

SIDES	LENGTH RANGE	LENGTH AVERAGE
LEFT	1.79 - 2.29 cm	2.01 ± 0.13
RIGHT	1.74 -2.30 cm	1.95 ± 0.10

2. Breadth [Antero-posterior diameter]:

Table 2. This table represents the antero-posterior diameter [range]of the right and left condyles along with its average P-value – 1; not statistically significant at $P < 0.05$.

SIDES	BREADTH RANGE	BREADTH AVERAGE
LEFT	0.72 - 0.99 cm	0.85 ± 0.08 cm
RIGHT	0.74 - 1.01 cm	0.84 ± 0.08 cm

Figure 1: This bar graph represents the length and the breadth in right and left mandibular condyles.
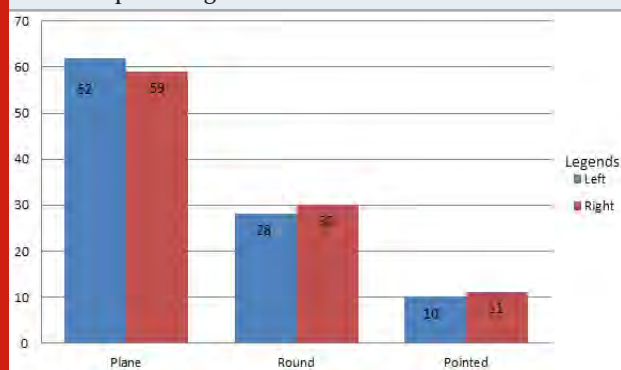
Shapes:

Table 3. This table represents the prevalence of shapes that occur in the mandibular condyles

SHAPES	RIGHT	LEFT
PLANE	59%	62%
ROUND	30%	28%
POINTED	11%	10%

Figure 2: This bar graph represents the prevalent shapes that occur in the right and left mandibular condyles in terms of percentage

From the obtained results it is clear that most of the left mandibular condyles mesio-distally [length] lie in the range between 1.79 and 2.29 cm, Average is found to be 2.01 cm. While in the right mandibular condyle the range lies between 1.74 and 2.30 cm, Average is found to be 1.95 cm. P value was found to be 0.023 (>0.05), so it is statistically significant . The average length of the mandibular condyle on the left side seems to be longer than on the right side [Table 1]. When the antero-posterior diameter [breadth] is assessed [Table 2], the range for the left condyle lies between 0.72 and 0.99 cm, where its average is found to be 0.85 cm. The range lies between 0.74 – 1.01 cm for the right condyle and its average is found to be 0.84 cm. P value was found to be 1(>0.05), so it is not statistically significant.

In the observed mandibles the left condyle appeared to be greater in diameter [antero-posteriorly] than the right condylar process of the mandible. [fig 1] bar graphs compare both length and AP diameter of mandibular condyles on both the left and right side.

On considering the shapes [Table 3] of the condylar processes; plane, rounded and pointed were the shapes that were prevalently found in them. Of these, on the right condyle almost 59% were of plane shaped followed by round, which is around 30% and pointed which is 11% of the observed mandibular condyles. On the left condylar processes of the mandibles, the prevalence were 62%, 28%, 10% for the plane, rounded and pointed respectively. From these results it is clear that plane shaped mandibular condyles are commonly occurring ones in most cases and pointed type is the least observed shape [fig 2].

Many researchers have done research on the whole of the mandible, their morphology and age changes. Most of the research works by Sharen and Mohan et al, were done on the coronoid process of the mandible. Landmarks for gender variation along with morphometry of the coronoid process was done in a study, this study was done on 15 dry mandibles but were sexed ones (Kausar et al., 2020). Of the few studies done on the condylar process, study done by Ganugapanta et al., was a notable one, it was accomplished using CBCT [Cone Beam Computed Tomography], but the analyses were not accurate because of hindrances caused by various types of ligaments that adjoin the mandibular condyle(Ganugapanta et al., 2017). Another relevant study was done on 15 dry mandibles, but only shapes of condyles were assessed, they did not include the dimensions of the condylar processes of the mandible, plane shaped heads were found in more than 75% of the observed mandibles(Sahithi et al., 2016).

Cephalometric study of the condyles were done which includes, the articulating positions of the condylar process, they were done using cephalograms. Forensic based studies were also done on condyles, with the help of sex determination the condyles are used in resolving unidentified crimes. In a study done by Matsumato et al., the dimensions were analyzed in a CBCT manner, that study declared that the right condyle is greater in antero-posterior diameter than the left condyle of the mandible which is relevant to our current study, but the dimensions were not accurate(Matsumato, 2012). In another study the shapes of the condyle were studied, in which 25 mandibles were assessed and all 25 were found to be plane shaped mandibles(Goymen and Gulec, 2017).

Previous study results were declared the same as the current study because 59% of the left condyles were found to be plane and 62% of the right condyles were found to be plane. In a study done in India for the shape of the condyles for the patients with TMJ dysfunctions found that plane shaped condyles are found among most of the Indians(Tutamayi and Al-Kamali, 2014). In a study done on Condylar process of the mandible,

morphometrically with the help of vernier caliper on dry mandibles, south Indian population based mandibles were analyzed, reported that the mesio-distal diameters of the mandibles are greater than their antero-posterior diameter whose results are relevant to this study(Sharen and Sangeetha, 2019).

Almost every researcher has done their research on either dimensions or the shapes of the condyles, but this study successfully combines both dimensions as well as the shapes of the mandibular condyles. As it is done on dry mandibles with digital vernier caliper, the values are mostly accurate when compared to other studies. The sample size is limited due to the availability of the mandibles. All mandibles were Indian based ones, so variation in the dimensions and shapes are very rare. Different shapes remain undiscovered. The dimensions vary based on geographic locations which includes varied food habits. The study should be done for more number of mandibles. The mandibles from other continents should also be studied for the betterment of the results and its variations. Importance should be given for the condylar process as well.

CONCLUSION

The morphometrical analysis of the condylar process of the mandible is helpful in many TMJ dysfunctional cases. It also helps the surgeons to plan out surgeries in those areas. This knowledge will also help in other clinical procedures associated with the mandibles. It is a growing field, if importance is given to this field; it may be helpful in the identification of the unknown remains as well.

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Awareness on Different Dental Implant Components Among General Dental Practitioners

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ABSTRACT

The use of dental implants for the replacement of missing teeth has been increased by leaps and bounds ever since the concept of osseointegration has been identified and undertaken. Recent publicity about the advantages of implant dentistry has generated considerable interest among dental professionals and the general public population. A dental implant kit has various surgical and prosthetic components that aids the practitioner during each phase of implant selection to placement. Thus the aim of the current study is to assess the awareness of different surgical and prosthetic components available in a dental implant kit and also to assess knowledge on recent updates on dental implants among general dental practitioners. The present study was a cross sectional questionnaire study that was carried out to assess the knowledge on different dental implant components among general dental practitioners. A total of 120 subjects participated in the study. The study involved completion of a predesigned questionnaire that had questions on precision osteotomy drills, dense bone drills, impression coping, straight and engaging abutments. The responses were tabulated in excel and were subjected to statistical analysis in SPSS by IBM. From the statistical analysis it is clear that almost 70% of the respondents are aware of different dental components and techniques, yet only two third of them use it during their regular practice. For example, With regard to use of precision osteotomy drills, almost 85% of practitioners think they are useful yet only 69.1% of dental practitioners use them during the course of treatment. The overall awareness on different dental implant components among dentists were appreciable. Further CDE programmes can be conducted to bring awareness on key dental implant surgical or prosthetic components among dental practitioners.

KEY WORDS: DENTAL IMPLANTS, PRECISION OSTEOTOMY, PARALLELING PINS, ENGAGING ABUTMENTS, IMPRESSION COPING.

INTRODUCTION

Implant dentistry has evolved into the mainstream of restorative practices everywhere in the world.(Misch,

2001) The two significant phases are a surgical phase and a prosthodontic phase. For hundreds of years, there have been ways to exchange the crown but not the root but root replacement is now possible. Endosseous dental implants are alternative tooth roots and implant-supported prostheses are considered the simplest substitute for missing teeth.(Hatim, Al-Rawee and Tawfeeq, 2006) The use of dental implants for restorations has revolutionized patient care and has given solutions for those clinical conditions, wherein conventional prosthodontics has not given satisfactory outcomes.(Lindh et al., 1998).

Within the early years of implantology, dental implants were targeted at replacing the completely edentulous

foundations. However, with the increased awareness of dental implants concerning its function and esthetics, more and more patients are choosing implant treatment even for the replacement of one missing tooth.(Lee et al., 2005) A typical dental implant includes the implant body which is a part of the implant designed to be surgically placed into the bone. Root form implants are the common implant body form, with a screw design aimed to strongly fix the implant to the bone. The abutment is the part of the implant that serves to support and/or retain the suprastructure.(Misch, 1999)

Implantology has shifted from a "surgically driven approach" to a "prosthetically driven approach", because pertinent implant positioning is important in achieving long-term esthetic and functional success. (Abou-Rabii, 2017) In the meantime computer-guided implant surgery has been developed for over 20 years. This digital technology is now commonly recommended because it can reduce inaccuracy in terms of implant positioning.(Vercruyssen et al., 2015) Today, two forms of guided implant surgery systems are developed: static and dynamic navigation. The static approach (static guided implant surgery) refers to the utilization of a surgical guide (drilling template) in implant surgery. The surgical guide can confine the direction and depth of the implant bed preparation and implant placement so a virtually planned implant position may be transferred to the implant site.(Pyo et al., 2019) Currently, the static system is more popular, because dynamic navigation needs additional expense and space for the equipment. (Lin et al., 2020)

The first step in ensuring the passive fit of an implant is to create an accurate impression and to transfer the 3-dimensional positions of implants into the laboratory models.(Wee, 2000) Due to the aesthetic and anatomical limitations, it is not always possible to position the implants parallel to each other. It has been stated that in the event of having 4 to 6 implants, the impressions made up of parallel implants show higher accuracy than those made from angulated implants.(Sorrentino et al., 2010; Akalin, Ozkan and Ekerim, 2013; Ozan and Hamis, 2019) In the case where multiple implants are available and an angular difference of quite 15° exists between implants or impression copings, the utilization of open-tray (direct) impression technique and splinting of impression copings are recommended.(Lee et al., 2008) (Kurtulmus-Yilmaz et al., 2014).

The foremost preferred impression materials in implant dentistry are polyether and vinyl poly-siloxane.(Baig, 2014) The impression material utilized in the open-tray impression technique must show sufficient rigidity to maintain the position of the impression coping and forestall it from being displaced during removal. Splinting the impression copings is suggested so as to increase the accuracy of impression and avoid the distortion of impression material, particularly while fastening the implant analogs to their respective copings.(Mojon et al., 1990; Vigolo, Majzoub and Cordioli, 2003)

There are thus, a variety of techniques and technologies improved recently to aid through the surgical flow of implant placement. Also there are various surgical and prosthetic components in an implant dental kit that aids in the above mentioned process. A thorough knowledge on all the dental implant components available is necessary to avoid implant failures and further intra and post operative complications and to achieve better patients compliance. Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the knowledge that general dental practitioners have on various dental implant components. Thus, the objective of the current study is to assess the knowledge, attitude and practice on different surgical and prosthetic dental implant components among general dental practitioners.

MATERIAL AND METHODS

The present study was a cross sectional questionnaire study that was carried out to assess the knowledge on different dental implant components among general dental practitioners. A total of 120 subjects participated in the study. The survey period extended for a period of 20 days in April 2019. The study involved completion of a predesigned questionnaire that had questions on precision osteotomy drills, multiple implants, paralleling pins, dense bone drills, cover screw, impression coping, engaging, non-engaging, straight and universal abutments.

Eligibility criteria
Inclusion criteria: General dental practitioners who had had an experience of placing dental implants were included for the study.

Exclusion criteria: Dental practitioners with no experience of placing implants previously were excluded from the study.

Structure of the questionnaire: The study involved completion of a predesigned questionnaire containing 2 sections. Section I includes, demographic characteristics like name, age, gender and year of experience of the participants. Section two had questions on precision osteotomy drills, multiple implants, paralleling pins, dense bone drills, cover screw, impression coping, engaging, non-engaging, straight and universal abutments. A total of 15 questionnaires, which had been designed based on the primary objective of the study, were used. The questionnaire was prepared in English . The participants were asked to put the responses in a questionnaire. The

Data was Shortlisted, recorded in excel and was subjected to statistical analysis in SPSS by IBM.

RESULTS AND DISCUSSIONS

From the statistical analysis done in SPSS by IBM, it can be observed that most of the respondents have responded positively to the questions provided. Most of the dental practitioners have had a sound knowledge on various dental implant components yet, many of those aren't currently using them during general practice. With regard to use of precision osteotomy drills, almost 85% of practitioners think they are useful yet only 69.1% of dental practitioners use them during the course of treatment (Graph1, 2). Of those who use precision osteotomy drills only 39.1% of them use it for re-positioning (Graph 3). Of those who are aware of Precision osteotomy drills and its uses, 77.5% of general dental practitioners think that precision osteotomy drills are helpful in achieving a good point of entry, also 68.3% of practitioners felt that precision osteotomy drills had served while planning multiple implants (Graph 4, 5).

Graph 1: Pie chart showing the response of dental practitioners for the question 'Have you used precision osteotomy drills?'. Yes is represented in blue and no in green. It is evident from the graph that 69.1% of general dental practitioners had used precision osteotomy drills during implant placement procedures.

Graph 2: Pie chart showing the response of dental practitioners for the question 'Do you think precision osteotomy drills are helpful?'. Yes is represented in blue no in green and may be in red. It is evident from the graph that 85% of general dental practitioners feel precision osteotomy drills are helpful.

Graph 3: Pie chart showing the response of dental practitioners for the question 'Have you used precision osteotomy drills for repositioning?'. Yes is represented in blue, no in green and rarely in red. It is evident from the graph that 39% of general dental practitioners feel precision osteotomy drills are helpful during repositioning.
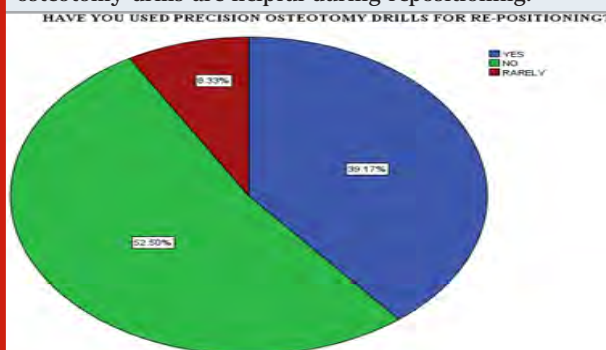
Graph 4: Pie chart showing the response of dental practitioners for the question 'Do you find precision osteotomy drills being helpful in achieving a good point of entry?'. Yes is represented in blue, no in green and not aware of in red. It is evident from the graph that 77.5% of general dental practitioners feel precision osteotomy drills are helpful in achieving a good point of entry
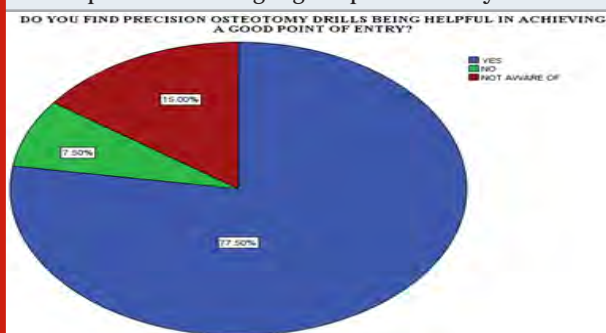
Graph 5 : Pie chart showing the response of dental practitioners for the question 'At the time of planning multiple implants had precision osteotomy drills served in any way?'. Yes is represented in blue, no in green and not aware of in red. It is evident from the graph that 68.3% of general dental practitioners feel precision osteotomy drills are helpful while planning multiple implants.
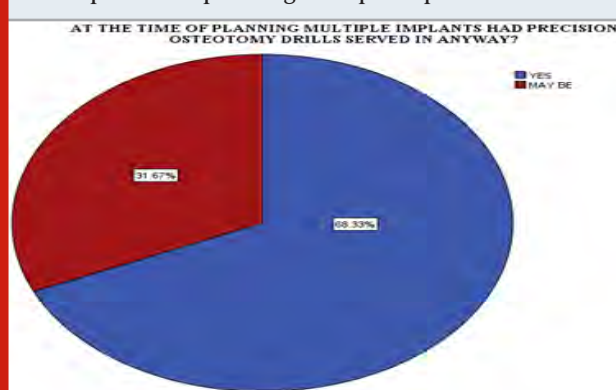
With regard to questions on paralleling pins, 54.1% of practitioners use paralleling pins in almost all the cases and 75.5% of them use paralleling pins to check parallelism between two osteotomy sites while, 41.6% of practitioners use paralleling pins during every stage of osteotomy to check osteotomy length (Graph 6, 7, 8). Also, 55% of practitioners use dense bone drills during surgical implantology (Graph 9). Of the total respondents, 91.6% of practitioners use cover screw or healing abutments immediately during stage 1 surgery (Graph 10). During stage 2 of implant procedure 84% of practitioners use impression copings (Graph 11). Of those who use impression copings, 75% of practitioners use open tray impression copings for full mouth rehabilitation cases (Graph 12). When questioned about abutment selections, 88.3% of the practitioners use straight abutments (Graph 13). Also in multiple implant cases 67.2% of practitioners had preferred engaging abutments over non-engaging abutments (Graph 14). With regard to universal abutments 83.3% of practitioners were aware of those (Graph 15).

Graph 6: Pie chart showing the response of dental practitioners when questioned about use of paralleling pins in every cases.Yes is represented in blue, no in green and rarely used in red. It is evident from the graph that 54.1% of general dental practitioners use paralleling pins in almost all cases.

DO YOU USE PARALLELING PINS IN ALMOST ALL CASES?
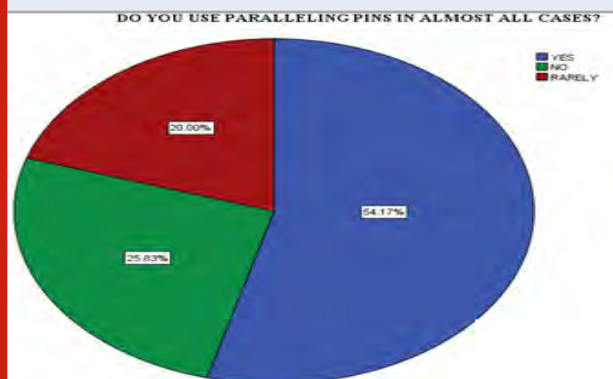
Graph 7: Pie chart showing the response of dental practitioners when questioned on checking parallelism between two implants. Yes is represented in blue, no in green and rarely used in red. It is evident from the graph that 77.5% of general dental practitioners use paralleling pins to check parallelism between two implants.

DO YOU CHECK CHECK PARALLELISM BETWEEN TWO OSTEOTOMY SITES USING PARALLELING PINS?
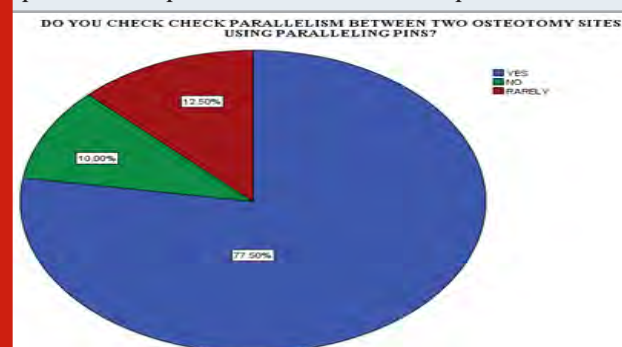
Graph 8: Pie chart showing the response of dental practitioners when questioned on usage of paralleling pins to check osteotomy length . Yes is represented in blue, no in green and rarely used in red. It is evident from the graph that 41.6% of general dental practitioners use paralleling pins to check osteotomy length.
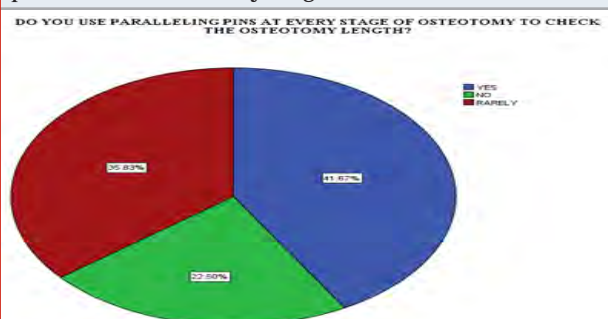
DO YOU USE PARALLELING PINS AT EVERY STAGE OF OSTEOTOMY TO CHECK THE OSTEOTOMY LENGTH?

Graph 9: Pie chart showing the response of dental practitioners when questioned on usage of dense bone drills. Yes is represented in blue and no in green. It is evident from the graph that 55% of general dental practitioners use dense bone drills during surgical implantology.
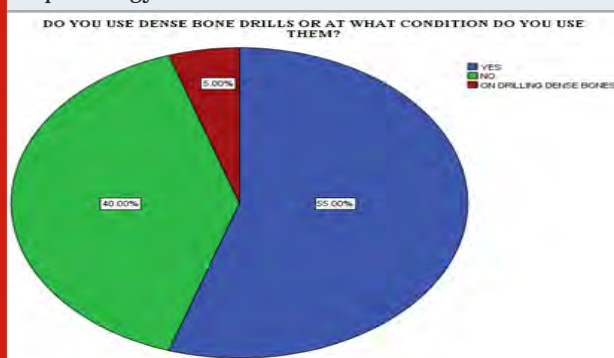

DO YOU USE DENSE BONE DRILLS OR AT WHAT CONDITION DO YOU USE THEM?

Graph 10: Pie chart showing the response of dental practitioners when questioned on usage of cover screw and healing abutments. Yes is represented in blue and no in green. It is evident from the graph that 91.6% of general dental practitioners use dense cover screw or healing abutments immediately at stage 1 surgery.
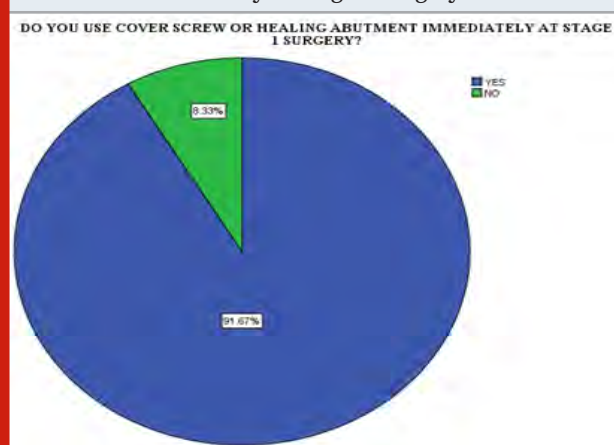
DO YOU USE COVER SCREW OR HEALING ABUTMENT IMMEDIATELY AT STAGE 1 SURGERY?

Graph 11: Pie chart showing the response of dental practitioners when questioned on usage of impression copings. Yes is represented in blue and no in green It is evident from the graph that 84.1% of general dental practitioners use impression copings at stage 2 implant procedures.

Graph 12: Pie chart showing the response of dental practitioners when questioned on usage of open tray impression copings for full mouth rehabilitation. Yes is represented in blue and no in green It is evident from the graph that 75% of general dental practitioners use open tray impression copings for full mouth rehabilitation.

Graph 13: Pie chart showing the response of dental practitioners when questioned on usage of straight abutments. Yes is represented in blue, no in green, both straight and angulated abutments in grey and screw retained abutments in red. It is evident from the graph that 88.3% of general dental practitioners use straight abutments.

Graph 14: Pie chart showing the response of dental practitioners when questioned on abutment selection during multiple implant cases. Engaging abutments are represented in blue and non engaging in green. It is evident from the graph that 67.2% of general dental practitioners prefer engaging abutments while planning multiple implant cases.
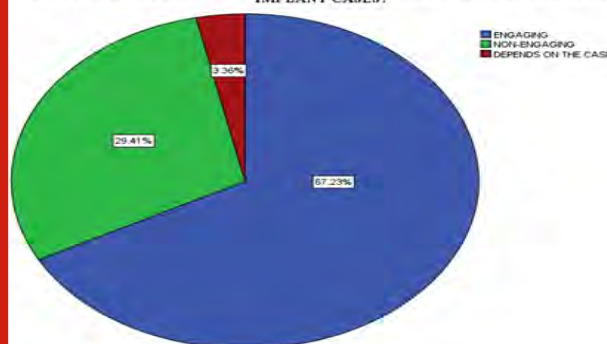
Graph 15: Pie chart showing the response of dental practitioners when questioned on universal abutments. Yes is represented in blue and no in green. It is evident from the graph that 83.3% of general dental practitioners are aware of universal abutments.

Dental implants have a high success rate for managing edentulous space despite complex cases such as maxillary sinus lift and lateral ridge augmentation.(Del Fabbro et al., 2004) With regard to the protocol followed during implant placements, firstly precision rills are used to create a purchase point and to penetrate the cortical bone, followed by this pilot drills are used that basically helps in establishing the length and direction of the implant placement. The third step is the use of a position indicator which is used to check the placement and angulation of implants. Once that is checked, intra oral periapical radiographs of the specific region is taken to stay aware of the adjacent anatomical landmarks. Succeeding this, sequential drilling is done, followed by the placement of adaptors. Finally primary stability values are checked and a waiting period of about 6 months is recommended.

Precision osteotomy drills facilitate initial soft tissue penetration and creation of an initial crestal starting point (also for flap procedure), with contrast marking

to prepare the site to the correct depth and thus aids durig implant procedures. In the current study, 85% of practitioners think precision osteotomy drills are useful of which only 77.5% of general dental practitioners think that precision osteotomy drills are helpful in achieving a good point of entry, also 68.3% of practitioners felt that precision osteotomy drills had served while planning multiple implants, yet only 69.1% of dental practitioners use them constantly during the course of treatment. Of those who use precision osteotomy drills only 39.1% of them use it for re-positioning. Also, only 52% of practitioners use pralling pins in almost all cases, two third of the respondents use them only to check parallelism and only half of them use it to check the osteotomy length. From the above statistics it can be analysed that though a appreciable percentage of dental practitioners are aware of the uses of precision osteotomy drills and paralleling pins only two-third of them tend to use those during treatment procedures. This result is similar to the one conducted by Narendra et al, in 2013 who stated that many dental doctors had basic knowledge of dental implants yet were not actively practicing dental implants.(Basutkar, 2013)

Table 1. Showing the responses in percentage made by general dental practitioners for each option given for every question in the questioner.

Sn no.	Questions	options	Responses in percentage
1.	Have you used precision osteotomy drills?	1. Yes 2. No	1. 69.1% 2. 30.8%
2.	Do you think precision osteotomy drills are helpful?	1. Yes 2. No 3. May be	1. 85% 2. 10.8% 3. 4.1%
3.	Have you used precision osteotomy drills for repositioning?	1.Yes 2. No 3. Rarely	1. 52.5% 2. 39.1 3. 8.3%
4.	Do you find precision osteotomy drills being helpful in achieving a good point of entry?	1. Yes 2. No 3. Not aware	1. 77.5% 2. 15% 3. 7.5%
5.	At the time of planning multiple implants had precision osteotomy drills served in anyway?	1. Yes 2. No 3. May be	1. 68.3% 2. 0 3. 31.6%
6.	Do you use paralleling pins in almost all cases?	1. Yes 2. No 3. Rarely	1. 54.1% 2. 25.8% 3. 20%
7.	Do you check parallelism between two osteotomy sites using paralleling pins?	1. Yes 2. No 3. Rarely	1. 77.5% 2. 10% 3. 12.5%
8.	Do you use paralleling pins at every stage of osteotomy to check the osteotomy length?	1. Yes 2. No 3. Rarely	1. 41.6% 2. 22.5% 3. 35.8%
9.	Do you use dense bone drills or at what condition do you use them?	1. Yes 2. No 3. On drilling dense bones	1 1.55% 2. 40% 3. 5%
10.	Do you use cover screw or healing abutments immediately at stage 1 surgery?	1.Yes 2.No	1.91.6% 2. 8.3%
11.	Do you use impression coping at stage 2 implant procedure?	1. Yes 2.No	1. 84.1% 2. 15.8%
12.	Do you use impression copings for full mouth rehabilitation?	1. Yes 2. No	1. 75% 2. 25%
13.	Do you use straight abutments or prefer other alternatives?	1. Yes 2. No 3.Both straight	1.83.3% 2. 4.1% 3. 3.3%

	and angulated 4. Screw retained		4. 4.1%
14.	Dp you prefer engaging or non-engaging abutments in multiple implant cases?	1.Engaging 2. Non-engaging 3. Depends on the case	1. 67.2% 2. 29.4% 3. 3.3%
15.	Are you aware of universal abutments?	1.Yes 2.No	1. 83.3% 2. 16.7%

There are several designs of standard abutments available today. They are fabricated out of titanium or zirconium alloys. An abutment may be selected with a fixed collar height 360° for posteriors or a variable collar height called an esthetic abutment, for both anteriors and bicuspids.(Sen, Nazmiye and Us, 2019) With regard to abutment selections 88.3% of practitioners use straight abutments for their implant cases, 4.2% of them use screw-retained abutments while only 3.3% of them use both straight and angulated abutments. This proves that, preference of abutments are certainly not the same with every doctor practicing dentistry. There are several choices in the decision tree that are available to the clinician regarding implant restorations. A custom or prefabricated abutment, straight or angulated, titanium or zirconium, able to be prepared or not, regular or esthetic collar, screw-type or cementable, can be used. (Sen, Nazmiye and Us, 2019)

When, restoratively, a custom abutment is required, a choice must be made between employing a closed or open tray transfer impression coping. The open tray in the hands of the novice clinician is simpler to achieve quick competency. The open tray impression coping is one that's screwed to the implant body and, to determine proper seating, it is radiographically verified. A hole is drilled through the stock plastic impression tray to permit the long screw to pass through the tray. Following which an impression is taken employing a rigid material. (Sen, Nazmiye and Us, 2019) Similarly, in the current study 75% of practitioners prefer open tray impression copings. Thus, it can be concluded that the overall knowledge on dental implants among dental practitioners can be still improved to avoid failures and complications during surgery.

With the current study as a platform, awareness on dental implant components among dental practitioners can be analysed and this will also enable dentists to gain a thorough knowledge on pros of different surgical and prosthetic components avail label. Limitations of this study include Geographic limitation as predominantly South Indian population of dentists were only considered, and was a Unicentric study with few Incomplete and unclear data. The Future scope of this study will yield a better and more accurate result when different ethnic populations are considered.

CONCLUSIONS

Within the limitations of the current study, it can be concluded that the majority of dentists are aware of different dental implant surgical or prosthetic components. The present study indicates use of paralleling pins to assess the positioning and length of the osteotomy site was lacking (57%) and was lacking information on engaging and non engaging abutments (67%). Since the protocol for implant surgery or components differs with different implant systems dentists tends to get misguided. Further CDE programmes can be conducted to raise awareness among dentists regarding the different dental implant components and key surgical components used -paralleling pins, precision osteotomy drills, abutment selection criteria to enable dental practitioners to master implant surgery.

ACKNOWLEDGEMENTS

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Morphometric Analysis of Accessory Bony Canal Near Foramen Rotundum

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ABSTRACT

Foramen rotundum is a circular aperture present in the base of the skull in the sphenoid bone, it connects the middle cranial cavity and the pterygopalatine fossa. Sometimes there may be a variation in several skulls that leads to the formation of the bony canal near the Foramen rotundum.Anatomical awareness of such variation in the middle cranial cavity fossa are important.The main aim of this study is to observe the presence or absence of accessory bony canal around foramen rotundum.32 unsexed dry cranial cavity from the Department of Anatomy,Saveetha Dental College was observed for the presence of accessory bony canal near foramen rotundum in the middle cranial cavity.The observed data was tabulated and analysed.14 accessory bony canal was observed near the Foramen rotundum in the total of 32 Skulls. Hence the occurrence was found to be 21.87%.In this study 9 accessory bony canals were observed on the left side with a percentage of 14.06% and the rest 5 was observed on the right side with a percentage of 7.81%. There is no incidence of bilateral accessory bony canal.Our study of the morphometric analysis of accessory bony canal near foramen rotundum may create an awareness for such variations in the middle cranial cavity and the orbital regions

KEY WORDS: FORAMEN ROTUNDUM,ACCESSORY BONY CANAL, PTERYGOPALATINE FOSSA, MIDDLE CRANIAL CAVITY.

INTRODUCTION

Foramen rotundum is a circular aperture present in the base of the skull in the sphenoid bone.It is a small canal which is deeply situated in the base of the middle cranial cavity. Anatomically it connects the middle cranial cavity and the pterygopalatine fossa.Size of the Foramen rotundum is negligible and hence they play a minor role in the human body.The perfect ring-shaped formation of the Foramen rotundum is observed in all cases of the foetuses after 4 months.The foramen rotundum is mostly oval shaped in fetal period and it is round shaped in general after birth.The average diameter of the Foramen rotundum is 3.5mm in the adult (Liu et al., 2016). It is a small canal and is deeply located in the base of the middle cranial cavity of the skull which represents the way of exit of the maxillary nerve, the second branch of the trigeminal nerve. Emissary vein and minute vessels may pass through it and via pterygopalatine fossa.It represents a frontier area between the endo and exocranial spaces. It's involvement which is preferentially related with tumoral pathologies profoundly modifies the prognosis of the disease (Liu and Yi, 2020).

In some cases,a bony depression with accessory osseous passages in the right side of middle cranial fossa was

observed in a dry adult human skull.This was situated below the optic canal and superior orbital fissure.The foramen rotundum and an accessory bony canaliculus were present in the medial fossa whereas the lateral fossa was blind.The bony depression was further divided into two parts, medial and lateral fossa, by an incomplete oblique bony septum.The foramen rotundum leads into the pterygopalatine fossa. Sometimes there may be a variation in several skulls that leads to the formation of the bony canal near the Foramen rotundum.An awareness of such anatomical variation in the fossa of middle cranial cavity are vital for the neurosurgeons and radiologists who interprets imaging of this area,doctors who operate in this area in this vicinity of cavernous sinus and anaesthetists who blocks the neural the neural signals transmitting through the bony canal. Accessory bony canal variations may be present which makes it to be present on the right/left side of the Foramen Rotundum. There may be a sharp pin point canal passing nearly adjacent to it (Mohebbi et al., 2017).

Many studies have reported the presence of Warwick's foramen near foramen rotundum.Search for accessory bony canal near the Foramen rotundum has not much studies. Hence there was a lacunae about accessory bony canals and structures passing through it.The location of this bony canal is inferior to the superior orbital fissure. Our research actually deals with the morphometric analysis of the bony canal and the anatomical variations pertaining to it.

Previously our department has published extensive research on various aspects of dentistry (Begum et al, 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about the morphometric analysis of accessory bony canal near foramen rotundum.The aim of this study is to identify the presence or absence of Accessory bony canal near foramen rotundum.

MATERIAL AND METHODS

32 unsexed dry cranial cavity from the Department of Anatomy, Saveetha Dental College was observed for the presence of accessory bony canal near foramen rotundum in the middle cranial cavity. The observed data was tabulated and analysed.The incidence of the accessory bony canal near foramen rotundum was observed and recorded.

RESULTS AND DISCUSSION

14 accessory bony canal was observed near the Foramen rotundum in the total of 64 Foramen's observed in each side of the 32 skulls.Hence the occurrence was found to be 21.87%.In this study 9 accessory bony canal was observed on the left side with a percentage of 14.06% and the rest 5 was observed in the right side with a

An abnormal bony depression in the right side of middle cranial fossa with accessory osseous passages was observed in a dry adult human skull.It was situated

Figure 1: Shows the presence of Accessory bony canal near foramen rotundum on the left side marked using bluish green pin.

percentage of 7.81%.There is no incidence of bilateral accessory bony canal.

The perfect ring shape of the foramen rotundum is observed during the 4th month of the fetal life. During the fetal life the foramen rotundum is oval in shape and after birth it becomes round shape.The average diameter of the foramen rotundum is 3.5mm in the adult skulls (Çalıskan et al., 2018). Davis reported the occurrence of a very rare variation of foramen rotundum in which it opens into the orbit along with a branching canal connecting middle cranial fossa with orbit.The articles tells us that this variation was detected in about 1.06% of the individuals and also it was located on the right side only in one cases it was found to be bilaterally.The variation was that a branching of a 5mm long canal from the lateral wall of the foramen rotundum that opened into the orbit. Also the article cited that the diameter of this prominent canal was between 0.5 and 0.6 but it could be as 1mm or as thin as 0.2mm ('Symmetry as measured from foramen rotundum', 1985).The accessory nervous trunk of the Maxillary nerve separately left the trigeminal ganglion on the outer side of the maxillary nerve.

The main trunk of the Maxillary nerve canal, within the greater sphenoid wing to join the infero-medial that main trunk at the entrance in the pterygopalatine fossa. It represents a frontier area between the endo and the exocranial spaces. It also has a vital involvement which was related with tumoral pathologies that profoundly modifies the prognosis of the disease and so should allow soon multiple disciplinary therapeutic discussion. It also represents the way of exit of the maxillary nerve,second branch of the trigeminal nerve (Naito, 1961). The Internal Aperture postnatally develops in width from 2.06 mm to 3.50 mm and in height from 1.8 to 2.73mm.The mean distance opposite to the median sagittal plane increases between newborn time and the adults from 10.00mm at the right side to 15.78 mm and at the left side from 10.75 to 17.62mm (Inal et al., 2015).

below the optic canal and superior orbital fissure. The foramen rotundum and an accessory bony canaliculus were present in the medial fossa whereas the lateral fossa was blind (Miguel, 1942). The bony depression was further divided into two parts ,medial and lateral fossa, by an incomplete oblique bony septum. The foramen rotundum leads into the pterygopalatine fossa. The foramen rotundum can be found and identified easily on computed tomography (C.T scan) angiography image. The diameter measured in the CT image in accordance with that in specimen. The anterior opening and posterior opening can be located by the stationary structures in the sphenoid sinus (Lodge, 1950).

The superior part of the Dorsum sellae may be a separate bone or it may be joined to the petrous portion of the temporal bone. The foramen rotundum may be double or absent (0.64%) of 157 skulls. The usual diameter of the optic canal is 5.5mm but varies from 3.5 to 6.5mm, The foramen spinosum and ovale may be continuous (Sepahdari and Mong, 2013). A very rare variation of foramen rotundum in which it opens into the orbit along with a branching canal connecting middle cranial fossa with orbit. Such type of anatomical variation was detected in about 1.06% of individuals and it was almost always located on the right side. Only in one case it could be found left-sided and in another skull it was spotted bilaterally. The prominent variation was consisted of the branching of a 5 mm long canal (length wise) from the lateral wall of the foramen rotundum that opened into the orbit. The canal was straight and directed slightly superolaterally, likely transmitted the zygomatic nerve, Maxillary nerve and part of the infraorbital nerve (Stechison and Brogan, 1994).

The Maxillary nerve provides postganglionic parasympathetic innervation to the lacrimal and salivary glands, and to the mucosal glands of the Maxilla, gums and maxillary sinuses. Maxillary nerve also provides sensory innervation to teeth of the upper jaw (maxilla) and to skin of the middle part of the face. The other characteristic feature of maxillary nerve is that it provides innervation of facial bones and then continues anteriorly to enter the orbit through the inferior orbital fissure as the infraorbital nerve. Accessory foramen have been reported in the various studies by Jelena Et al, Gupta Et al, Kodama Et al, Naufna Hafeez has reported the presence of warwicks foramen near foramen rotundum in 14% of cases. Search for Accessory bony canal around foramen rotundum has no studies (Cheng et al., 2015). Hence our observation of 14 accessory bony canals near foramen rotundum provides morphometric data about variations that may occur in this area. Limitations of this study are that only a limited number of South Indian skulls are taken into consideration and the skulls used were unsexed.

CONCLUSION

Our study of the morphometric analysis of accessory bony canal near foramen rotundum may create an awareness for such variations in the middle cranial cavity and the orbital regions for the radiologist, neuro and ophthalmic surgeons who operate in this area in the vicinity of cavernous sinus and anaesthetists, during regional block anaesthesia and the orbit that is the future scope of this study. Factors influencing the results are the Emissary vein connecting the extracranial cavity is found to pass through the accessory bony canal, also minute vessels and Meningeal artery may pass through this bony canal near the foramen rotundum.

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Morphometric Analysis of Antegonial Notch and Posterior Ramus Flexure – its Clinical Significance

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ABSTRACT

Mandible bone is the largest and the strongest bone present in the human face. It is a lower jaw bone that is present beneath the maxilla. It holds the lower teeth. Mandible bone is formed from the first pharyngeal arch during its intrauterine life. This bone provides maximum attachment of muscle of mastication and facial expression. The body of the mandible has 2 borders. Ramus of the mandible is a prominent projecting back parts of the horse shoe shaped lower jaw bone. The antegonial notch is present in the inferior border of the mandible at the junction between the ramus and body of the mandible. At the level of the molar occlusal surface there is distinct angulation of the ramus of mandible in its posterior border. This type of angulation on the posterior border is known as posterior ramus flexure. The aim of this research is to morphologically analyse the antegonial notch and posterior ramus flexure and its clinical importance. Fifty-one dry adult human mandibles of unknown sex collected from the Department of Anatomy of Saveetha Dental College. For each mandible, detailed measurements of Antegonial notch and Posterior ramus flexure were taken. There is a presence of 3 types of Antegonial notch and 3 types of Posterior ramus flexure that were discovered and measured separately in fifty-one dry adult human mandibles of unknown sex. The shape, size and the position of the antegonial notch and posterior ramus flexure can be used as one of the tools as an indicator for Sexual Dimorphism. Other researchers have found many indicators for sexual dimorphism as a tool to identify the sex, age, race, etc. There is various evidence that represent and identifies the difference between sex, age and gender and many anatomical features supports it.

KEY WORDS: ANTIGONIAL NOTCH, POSTERIOR RAMUS FLEXURE, SEXUAL DIMORPHISM, MANDIBLE MEASUREMENTS.

INTRODUCTION

Mandible bone is the largest and the strongest bone present in the human face. It is a lower jaw bone that is present beneath the maxilla. It holds the lower teeth.

Mandible bone is formed from the first pharyngeal arch during its intrauterine life. This bone provides maximum attachment to the muscle of mastication (Sella-Tunis et al., 2018). Ramus of the mandible is a prominent projecting back parts of the lower jaw bone (Raj and Ramesh, 2013). It has four sides, two surfaces, four borders and two processes. The two important processes are the coronoid and the condyloid process (Isaac and Holla, 2001). These two processes are separated by the mandibular notch. It is a deep semilunar depression. The mandibular ramus is almost vertical in adulthood but more oblique in old age (Vignesh, Babu and Mohanraj, 2018). The anterior part of the ramus can be used as the donor site for reconstruction of small bone defects in

the Oral and maxillofacial region (Radlanski, Renz and Klarkowski, 2003). The mandible has two foramen, the mandibular and mental foramen. Males generally have a stronger and larger mandible than females (Loth and Henneberg, 2001).

When describing the mandible bone, various researchers have studied the importance of various anatomical structures that are present in the mandibles. The relationship of lingula to the inferior alveolar nerve, which enters the mandibular foramen and supplies the structures of the lower jaw is of clinical significance to the dental surgeons (Nirmale et al., 2012). The spatial relationship of the mandibular canal to the posterior teeth in dried human mandible (Denio, Torabinejad and Bakland, 1992). The remodeling process of the condylar processes a clinical sense that can be looked upon as restitutions in children and adjusting or functional in adults (Hollender and Lindahl, 1974). Position of the mandibular foramen is responsible for an occasional failure of block to the inferior alveolar nerve (Nicholson, 1985). The mental foramen is an important landmark when considering placing implants in the foraminal region (Greenstein and Tarnow, 2006).

Antegonial notch and Posterior ramus flexure are such anatomical structures that are present in the mandibles. The antegonial notch is located in the inferior border of the mandible at the junction between the ramus and body of the mandible (Kolodziej et al., 2002). The actions of elevators and depressors muscles that helps in the mastication process during growth causes the distinctive antegonial notching in the mandible (Madhavan, Dhanraj and Jain, 2018) (Singer, Mamandras and Hunter, 1987). At the level of the molar occlusal surface there is distinct angulation of the ramus of mandible in its posterior border. This type of angulation on the posterior border is known as posterior ramus flexure (Hill, 2000). With a rich case bank established over 3 decades we have been able to publish extensively in our domain (Abdul Wahab et al., 2017; Eapen, Baig and Avinash, 2017; Patil et al., 2017; Jain and Nazar, 2018; J et al., 2018; Marimuthu et al., 2018; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019; Senthil Kumar et al., 2019; Sweta, Abhinav and Ramesh, 2019). Based on this inspiration the aim of this study was to morphometrically analyse the antegonial notch and posterior ramus flexure of mandible and its clinical importance.

MATERIAL AND METHODS

Fifty-one dry adult human mandibles of unknown sex collected from the Department of Anatomy of Saveetha Dental College. For each mandible, detailed measurements of Antegonial notch and Posterior ramus flexure were taken. The sides are named separately. Due to the formation of the triangular shape that these sides form, they were classified under 3 different categories.

A)   Three types of Antegonial Notch
  Type 1 → Asymmetrical posterior notch

Type 2 → Symmetrical notch
Type 3 → Asymmetrical anterior notch

B)   Three types of Posterior Ramus Flexure
  Type 1 → Posterior ramus flexure is flexed at the level of the occlusal surface of the molars.
  Type 2 → Posterior ramus flexure is straight juvenile shape.
  Type 3 → Posterior ramus flexure is flexed above the occlusal level near the neck of the condyle.

All measurements and the frequency of occurring were tabulated and statistically analyzed.

RESULTS AND DISCUSSION

Both the Antegonial notch and posterior ramus flexure is measured and the frequency of occurring is made into a tabular column.

A) For Antegonial Notch

Table 1. Frequency of individual types of Antigonial notch in mandible observed on right and left side		
	LEFT	RIGHT
TYPE 1	29 (56.86%)	24 (47.05%)
TYPE 2	18 (35.29%)	21 (41.17%)
TYPE 3	4 (7.84%)	6 (11.76%)
TOTAL	51 (100%)	51 (100%)

B) For Posterior Ramus Flexure

Table 2. Frequency of individual types of Posterior ramus flexure in mandible observed on right and left side		
	LEFT	RIGHT
TYPE 1	27 (52.94%)	25 (49.01%)
TYPE 2	5 (9.80%)	8 (15.68%)
TYPE 3	19 (37.25%)	18 (35.29 %)
TOTAL	51 (100%)	51 (100%)

The antegonial notch is present in the inferior border of the mandible at the junction between the ramus and body of the mandible, immediately anterior to its angle knowledge about anatomy of the antegonial notch may be useful for surgeons during reconstructive and plastic surgery procedures on the body of the mandible. In one of the articles, titled as Typology of the antegonial notch in the human mandible, the authors viewed 251 human caucasian, european mandible, where Type - 3 has the highest frequency whereas Type - 1 has the lowest frequency and Type - 2 occurred more or less equal to Type - 3 (Porwolik et al., 2015). In our study we found more of Type 1 type.

At the level of the molar occlusal surface there is distinct angulation of the ramus of mandible in its posterior border (Balci, Yavuz and Cagdir, 2005). This type of angulation on the posterior border is known as posterior ramus flexure. This flexure appears as a male developmental trait because it is only manifest consistently after adolescence. In females the posterior border of the ramus retained a straight shape (Loth and Henneberg, 1996). In our observation most of the posterior ramus flexure occurs at the level of occlusal surface (Type 1) followed by flexure near the neck of mandible (Type 3) and straight juvenile type was found the least (Type 3).

Other researchers have found many indicators for sexual dimorphism as a tool to identify the sex, age, race, etc (Kumar and Babu, 2016). There is various evidence that represent and identifies the difference between sex, age and gender and many anatomical features supports it (G, Gowri S R and J, 2013). Therefore, this research proves that the shape, size and the position of the antegonial notch and posterior ramus flexure can be used to classify the mandible into 3 types.

CONCLUSIONS

It can be analyzed that both the Antigonial notch and the posterior ramus flexure can be used to classify the mandible further study using sexed mandible is recommended to use these features as an indicator for the sexual dimorphism. By viewing the shape and size of the human mandible parts, i.e. the curvature of the antigonial notch and the distinct angulation, various parameters like sex, age, race, etc can be estimated.

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Osteometric Measurements of Intermastoid Distance for Gender Determination

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ABSTRACT

The mastoid process is a bony pyramidal projection from the posterior section of the temporal bone. The superior border of the mastoid process of the temporal bone articulates with the parietal bone. The posterior border articulates with the occipital bone, and the anterior border is merged with the descending portion of the squamous segment of the temporal bone. The aim of the study is to determine the gender using the measurement of intermastoid distance. This study was conducted among 30 boys and 30 girls who were studying Ist year in Saveetha dental college of age 18 to 20. The measurement of intermastoid distance was taken using the spreading caliber. The measurements were tabulated systemically. Then by using an unpaired t- test calculator, the T- value and P- value of the study is calculated. The study concludes that the gender can be determined by using the measurements of intermastoid distance.

KEY WORDS: MASTOID PROCESS, INTERMASTOID DISTANCE, SEX DETERMINATION, SPREADING CALIBER .

INTRODUCTION

The mastoid process is a bony pyramidal projection from the posterior section of the temporal bone. The superior border of the mastoid process of the temporal bone articulates with the parietal bone. The posterior border articulates with the occipital bone, and the anterior border is merged with the descending portion of the squamous segment of the temporal bone (Galdames, Matamala and Smith, 2008; Sharma, Nidugala and Avadhani, 2013). Determination of sex in fragmented remains is often a difficult task, as no isolated characteristic of any specific

bone can perfectly decide the sex of a skeleton. The maximum accuracy in sex determination is finished when the complete skeleton is available (Thejeswar and Thenmozhi, 2015; Kumar et al., 2016). But frequently fragmentary remains are available, as opposed to whole skeletons for forensic evaluation. Furthermore, a petrous part of temporal bone is proof against destruction and damage such as burning (Sumati et al., 2010; Geethika and Thenmozhi, 2016). The mastoid process is favorable for sex determination as it's one of the most protected vicinity and proof against harm because of its anatomical position at the bottom of the skull (Galdames, Matamala and Smith, 2008; Sharma, Nidugala and Avadhani, 2013; Passey et al., 2015; Dofe et al., 2020).

There are many researchers going on different anatomical features for gender determination. Jeyasingh et al, have estimated the orbital index for determination of gender (Jeyasingh and Devi, 2016). Hartomo et al, have compared the intercanine and intermolar width of the maxilla as an aid in gender determination (Hartomo et

al., 2019). Kumar et al, have done determination of sex using human mandible (Kumar and Lokanadham, 2013). Previously our department has published extensive research on various aspects of dentistry (Begum et al, 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this vast research experience has inspired us to research about determining the gender using intermastoid distance. The main objective of the present study was to collect metric data of intermastoid distance among 30 boys and 30 girls and to check whether the intermastoid distance can be used in determination of sex.

MATERIAL AND METHODS

This study was conducted among 30 boys and 30 girls who were studying Ist year Dental in Saveetha Dental College of age group 18 to 20. The study was approved by SRB of Saveetha Dental College & Hospitals and after getting informed consent the measurement of intermastoid distance was taken using the spreading caliber. The measurements of intermastoid distance which was obtained was noted for all 30 boys and 30 girls. Then the measurements were tabulated systematically. From the tabulated measurements, the lowest and highest value and the mean value was calculated. Then by using the unpaired t- test calculator the t- value and the p- value was calculated. The mean and standard deviation was found for both boys and girls separately.

RESULT AND DISCUSSION

Males: The range of the intermastoid distance of boys are 11.5- 12.7 cm
The average is 12.11 ± 0.12 cms

Females: The range of intermastoid distance of girls are 10.3 - 11.7 cm
The average is 11.01 ± 0.2 cms.

The t- value calculated 10.673
The p- value calculated was 0.00001(<0.05)
The result is significant at $p<0.05$

The result shows when statistically comparing the data between males and females, the intermastoid distance was a reliable measurement for gender determination.

Identification is the basis of individuality of a person. Skeleton is the part of the body that resist all environmental insults for maximum time and can help to determine the sex. For identification one requires standard criteria which are specifically based to the group to which the person belongs. Each mastoid parameter is discussed by comparing them with the findings of previous workers. Mastoid process has been selected because it is well preserved and the most protected part of a fragmentary skull. The present study has provided

a baseline data for sex determination of skull and also stressed the accuracy of intermastoid distance.

It has already shown that people in different regions, different races and ethnic groups vary considerably in proportion of their respective skeletal frame(Verma, 1996; Galdames, Matamala and Smith, 2008). The determination of the sex can be done by many parts of the skeletal frame. (Jeyasingh and Devi, 2016) has used an orbital index to determine gender. (Iscan, Yasar Iscan and Miller-Shaivitz, 1984) has used measurement of the tibial shaft to determine gender. (Vora et al., 2019) has determined sex using femur breadth. (Kumar and Lokanadham, 2013) has used human mandibles to determine gender. (Krüger, L'Abbé and Stull, 2017) estimated sex using the long bones of modern South Africans.

The limitation of the study is it can be done in a larger population so that we can also be taken for the people in the age group more than 25 but we have taken it among the college students.

CONCLUSION

The present study concluded that male samples with higher values than female samples. The intermastoid distance was a reliable measurement in determining the gender. So it is proved that the intermastoid distance can be used to determine the gender.

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Morphological Variations of Jugular Foramen in South Indian Dry Skull

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ABSTRACT

Jugular foramen lies between the occipital bone and the petrosal portion of the temporal bone in the posterior end of the petrosal-occipital structure, and it is long and irregularly shaped. It is the main route of venous outflow from the brain and passage for the lower three cranial nerves (9, 10, and 11) from the skull. It is anteriorly separated from the internal carotid artery opening by a crest and separated from the hypoglossal canal through a thin bony bar. The anterior portion transmits inferior petrosal sinus and the intermediate portion or neural compartment transmits glossopharyngeal, vagus and accessory nerves and its posterior portion or vascular compartment includes the internal jugular vein and the meningeal branches of the ascending pharyngeal and occipital arteries. The aim of the study was to examine the morphological features and dimensions of Jugular Foramen in human adult dry South Indian skulls. The mean length on the right was 9.73 mm and on left was 9.12 mm. The mean breadth of right and left jugular foramen are 13.07 mm and 12.28 mm respectively. From the above study it is evident that right jugular foramen is larger than that of left jugular foramen.

KEY WORDS: JUGULAR FORAMEN, AP DIAMETER, TRANSVERSE DIAMETER, SEPTUM.

INTRODUCTION

Jugular foramen is positioned between the petrosal portion of the temporal bone and occipital bone in the posterior end of the petrosal-occipital arrangement. It has a lengthy, amorphous shape (Daniels, Williams and Haughton, 1984; Ellis, 1989). It is the principal pathway of venous discharge from the brain. It is also the channel for the cranial nerves 9, 10, and 11 from the skull (Ekinci and Unur, 1997; Wysocki and Sharifi, 2006; Song et al., 2008). At the anterior it is separated from the internal carotid artery aperture by a concretion. It is also separated from the hypoglossal canal through a slim bone strut. The anterior portion carries on the inferior petrosal sinus. The glossopharyngeal, vagus and accessory nerves are transmitted by the intermediate portion or neural compartment. Lastly, its posterior portion, which is also called as the vascular compartment, includes the internal jugular vein and the meningeal branches of the ascending pharyngeal and occipital arteries (Katsuta, Rhoton and Matsushima, 1997). The glossopharyngeal, vagus and cranial part of the spinal accessory nerve goes through this and comes out of the cranial cavity. Jugular

foramen has a lot of significance in surgical point of view (Tekdemir et al., 1998; Matsushima, 2015).

In 2004, Idowu concentrated on morphometric study on 20 dry skulls that is 40 jugular foramina of adult male nigerian population (Idowu, 2004). Vijisha et al.,2013 detailed that variety in the anatomy of intracranial venous sinus may be shown by the relationship of size and state of the jugular foramen with internal jugular vein and presence or absence of prominent superior jugular bulb (Vijisha, Bilodi and Lokeshmaran, 2013). Sushant Swaroop Das et al., 2016 has concentrated on gender difference along with morphometric study (Das, Saluja and Vasudeva, 2016). Ramina R et al .,2004 focused on jugular foramen tumors, diagnosis and treatment (Ramina et al., 2005). Aggarwal et al., 2012 provided the variations in the structure of jugular foramen in the northwest Indian population (Aggarwal et al., 2012). Anson has noted the depth of jugular foramen to range from 0-14mm with most of the specimens less than 7mm (Anson, 1972).

Previous articles analysed the anatomy of jugular foramen of a north eastern adult and various inter regional whereas our study focused on adult South Indian skull. The size, height and volume vary in different racial group and sex. The study was embarked on to examine the anatomy of the jugular foramen with dimensions of both right and left and also to check the partition. With a rich case bank established over 3 decades we have been able to publish extensively in our domain (Abdul Wahab et al., 2017; Eapen, Baig and Avinash, 2017; Patil et al., 2017; Jain and Nazar, 2018; J et al., 2018; Marimuthu et al., 2018; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019; Senthil Kumar et al., 2019; Sweta, Abhinav and Ramesh, 2019). Based on this inspiration we aim to examine the morphological

features and dimensions of Jugular Foramen in human adult dry South Indian skulls.

MATERIAL AND METHODS

The examination of 30 human adult dry South Indian skulls was done in the Department of Anatomy of Saveetha Dental College and Hospital, Chennai.A digital vernier calliper was used to measure the dimensions of the following of both right and left Jugular Foramen.

- Antero-posterior diameter (mean length)
- Transverse diameter (mean breadth)
- presence(partial or complete septum)or absence of septum

The data was recorded and mean values were calculated. The right and left side differences were analyzed accordingly.

RESULTS AND DISCUSSION

The mean length on the right was 9.73 mm and on left was 9.12 mm. The mean breadth of right and left jugular foramen are 13.07 mm and 12.28 mm respectively. The right jugular foramen was found out to be larger than the left jugular foramen. This size and shape of jugular foramen are related to the size of the internal jugular vein and presence or absence of a superior bulb. 23% have complete septum, 46% is partial and in 30 % absence of septum. Variations in size, shape and compartment of jugular foramen might be a part of the ongoing evolutionary process. Knowledge of morphology ,compartment and arrangement of structures within the foramen helps in deducing position of various structures from the available data of jugular foramen depicted by the study.

Table 1. Mean breadth, length and occurrence of septum in right and left Jugular foramens

LEFT JUGULAR FORAMEN					RIGHT JUGULAR FORAMEN				
Mean length (mm)	Mean breadth (mm)	Septum			Mean length (mm)	Mean breadth (mm)	Septum		
		Absent	Present				Absent	Present	
			Partial	Complete				Partial	Complete
9.73	12.28	30%	46%	23%	9.21	13.07	26%	54%	23%

The mean length on the left was 9.73mm and right was 9.21mm. The mean breadth on the right was 13.07mm. The mean breadth of left was 12.28 mm. In left jugular

foramen, 30% of the skull doesn't contain any septum and 23% has a complete septum. In the right jugular foramen, 26% doesn't have any septum, while 54% has

partial septum and 23% has complete septum. From the above study it is evident that right jugular foramen is larger than that of left jugular foramen. This size and shape of jugular foramen is related to the size of the inter jugular vein and presence or absence of the superior bulb. From the above observation it is clear that complete septum is very rarely found and incomplete septum is the most prevalent.

A study conducted on these variations by lopes et al., states that the mean length of jugular foramen is 9.21±1.95mm and 8.65±1.57mm. It mentions the mean length diameter to be 15.82±2.67mm and15.86±2.64mm on right and left sides respectively in the southern Bracilian population (Lopes et al., 2011). As per sturrock, the right jugular foramen are larger in 69% of skulls (Sturrock, 1988) whereas Hatibogle and Anil discover that 61.6% where larger on right and 26% where larger on left (Hatiboglu and Anil, 1992). As per the studies conducted by Padget the difference in size of the internal jugular vein is visible in the human embryo as early as 23mm stage. This is probably due to the difference in pattern of development of right and left brachiocephalic veins (Padget, 1957). As per the study conducted on srilankan skulls and AP diameter was 6.92±0.7mm on the right and 7.62±0.55mm of left side respectively.

The comparison between the diameter of the left and right AP didn't show any statistical significance (Hasan et al., 2019). Patel and Singel conducted the similar study in Saurashtra region using 91 Indian skulls. As per their studies 60.4% cases had larger right jugular foramen and 15.4% cases had larger left foramen. Further to this they also found that 35.2% had equal sides on both the sides. In their studies they mentioned that jugular fossa was observed in 38.5% on the right side. It was on the left side in 14.3% cases (Patel and Singel, 2007). The studies conducted by Idowu on the Nigerian skulls reports the mean length 13.9mm on the right side and 14.11mm on the left side. They also report the mean width to be at 10.2mm on the right side and 9.2mm on the left side on the Nigerian skulls (Idowu, 2004).

CONCLUSION

Due to the evolutionary process the dissimilarities in the shape, size and compartments of Jugular foramen may exist. Understanding the construction and arrangement of the structures and the morphology within the foramen is crucial in figuring out the position of various formations, from the data available on Jugular foramen, detailed in this study. This understanding will also help the clinicians greatly in discerning the clinical presentations. It will also guide them in the progression of lesions of the jugular foramen and devising the most suitable accessions in a surgery. The inferences from this study can also enable a better understanding of the involvement or the sparing of the neurovascular formations while carrying out the lesions in the jugular foramen. The study can also be instrumental in better assimilation of the images of jugular foramen.

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Knowledge Awareness and Attitude About Needle Stick Injury Among Dental Practitioners in Chennai

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ABSTRACT

Needle-stick injury (NSI) is one of the maximum potential risks for health care people. They pose a substantial risk of occupational transmission of blood-borne pathogens. Many numbers of health care people remain susceptible to deadly viruses especially, bloodborne pathogens. Dental professionals are more prone to Needlestick injury due to their limited working area. The main cause of this injury is due to improper capping of the needle, a technique used, handling the specimens, etc. The present study was done to determine knowledge and attitude about needle stick injury among dental practitioners and the action taken by them after the incident. A self-designated 15 questions were created and it was circulated among 100 dental practitioners. The results were collected and analyzed using SPSS. An effective plan should be made for the prevention and management of injury especially among health care professionals. Among 100 responses most of the people do not follow the protocol which indicates that there is a lack of adequate knowledge. From this study, we conclude that only 50% of the study population were aware about the needle stick injury and the infections spread by Needle stick injury. Even though a majority of the females knows about the Hepatitis B vaccination and its relation to needle stick injury when compared to males but they didn't undergo vaccination properly. There is a precise scope of development in terms of reporting and prevention of needlestick accidents.A need for awareness programs among dental practitioners repeatedly has been raised

KEY WORDS: NEEDLESTICK INJURY, BLOODBORNE PATHOGENS, AWARENESS PROGRAMS, HEALTH CARE PROFESSIONALS.

INTRODUCTION

Needlestick damage (NSI) is a penetrating stab wound from a needle (or another sharp object) which may additionally result in blood-borne infections which include AIDS, Hepatitis B, and Hepatitis C(Kapila, Gupta and Chopra, 2008). The common risk for transmission after percutaneous exposure is about 0.3 %, 6–30 %, and 1.8 % for human immunodeficiency virus (HIV), hepatitis B, and hepatitis C, respectively. Over 90% of those infections arise in low-income nations and maximum are preventable(Walley, 2014).

Needlestick accidents can occur for the duration of utilization or disposal of sharps(Alrumayyan. et al., 2018). It is crucial to dispose of the sharps well, in any other case they could become involved in linen or garbage and may injure the medical examiners who come upon them unexpectedly(Agarwal, Wakhlu and Srivastava, 2016). Though many articles have been published about the prevention of this injury significant success has not been achieved (Nanda et al., 2019).

A needle stick injury is caused due to penetration by a needle or any other sharp object and it leads to transmission of bloodborne diseases, (Walley, 2014) placing those exposed at increased risk of contracting infectious diseases, such as hepatitis B (HBV), hepatitis C (HCV), and the human immunodeficiency virus (HIV) (Mahajan and Gupta, 2019). Among healthcare workers and laboratory personnel worldwide, more than 25 blood-borne virus infections have been reported to have been caused by needlestick injuries (Agarwal, Wakhlu and Srivastava, 2016).In addition to needlestick injuries, the transmission of these viruses can also occur as a result of contamination of the mucous membranes, such as those of the eyes, with blood or body fluids, but needlestick injuries make up more than 80% of all percutaneous exposure incidents in the United States (Mahajan and Gupta, 2019). Various other occupations are also at increased risk of needlestick injury, including law enforcement, laborers, tattoo artists, food preparers, and agricultural workers(Ayas et al., 2006).

The routine use of sharp instruments in dental remedy, the presence of blood and saliva, and the various bacterial vegetation inside the oral hollow space all contribute to the dangerous nature of the dental administrative center for blood-borne infections (Ayas et al., 2006; Singh et al., 2017). Preventing NSIs is an undertaking confronted in actually each medical work vicinity. In a dental environment, the burden of NSIs and SIs can be decreased when a dental professional abides through the cutting-edge and universally typical precautionary measures against NSIs(Ayas et al., 2006). Every healthcare facility ought to have an infection control application in place via a working sanatorium contamination control committee(Olubuyide and Olawuyi, 1995)

This study has been conducted to assess the knowledge, attitude, and awareness of needle stick injury among dental practitioners. The main objectives of this study were, To investigate and evaluate the extent of attention, mindset, and practices regarding Needle Stick Injury, standard precautions and injection practice among dental practitioners, To study the factors resulting Needle Stick Injury and to assess hepatitis B immunization status among the practitioners(Dafaalla, 2016).

MATERIAL AND METHODS

Sample collection: A survey was conducted among 100 dental practitioners of Chennai in the month of November 2019. Nearly 15 valid questions had been prepared and circulated among the dental practitioners and answers were recorded.

Inclusion Criteria: Selection criteria include all the dental practitioners of Chennai who are willing to participate in the study.

Exclusion Criteria: Dental practitioners who were not willing to participate were excluded from this study. Undergraduate and Postgraduate dental students are excluded from this study.

Sampling method: In the present study,the sampling method used is the Random sampling method.

Data Collection and Tabulation: The responses were entered into the excel sheets and then tabulation of the data finally and the question comparison was done. The representation of the data is through the bar graph.

Statistical Analysis: The statistical software used IBM SPSS V22.The statistical tests used were descriptive analysis and Chi Square analysis. Significant p value was set at <0.05.

RESULTS AND DISCUSSION

Dental health care employees are uncovered to bloodborne virus infections of their professionals as they are in near contact with the infected person's saliva and blood. These viruses are transmitted through NSIs. There has been various research carried out in India and across the world which displays that a huge proportion of dental practitioners are vulnerable to these viral infections(Wick, 2001).

A kind of dental strategy conveys the danger of NSIs including administration of anesthesia, intermaxillary fixation, suturing, root canal treatment, manipulation of sharps, and extractions(Thomas, 2020). Specialists told that suturing is the main cause of NSI because it aids with human extraction which is also a common infection (Alrumayyan. et al., 2018; Thomas, 2020). This is explained with the aid of the fact that students are inexperienced and there is a lack of information in following common precautions protocol by college students.

In the present study, 40% of the respondents were males and 60% of the respondents were females (Figure 1).In

the present study, 56% percent had been aware of the needle stick harm and the remaining 44% of people were not aware of needle stick injury (Figure 2)Therefore, the information about needle stick injury among dental practitioners changed into insufficient.

people do not squeeze their fingers after the injury whereas the remaining 44% of people squeeze their fingers (Figure 3). According to the protocol, we should not squeeze the finger after the injury because it increases the probability of hemolysis. In the present study, 46% of people knew the reason whereas the other 46% of the people said it dilutes the specimen with fluid and 33% of the people had no idea (Figure 4).

Figure 1: Pie chart represents that 60% are females (green) and 40% are males (cream) participated in the survey.
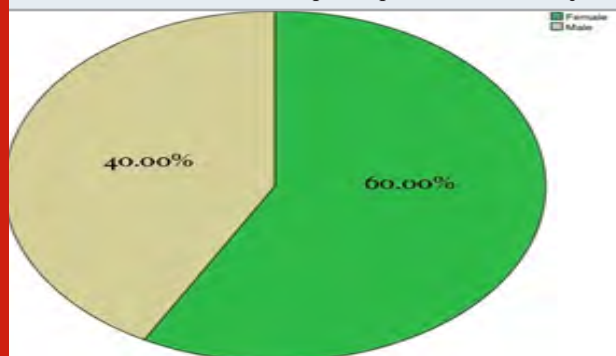
Figure 2 : Pie chart represents that 56% of the participants have been exposed to needle stick injury (cream) and 44% of the participants have not been exposed to injury (green).
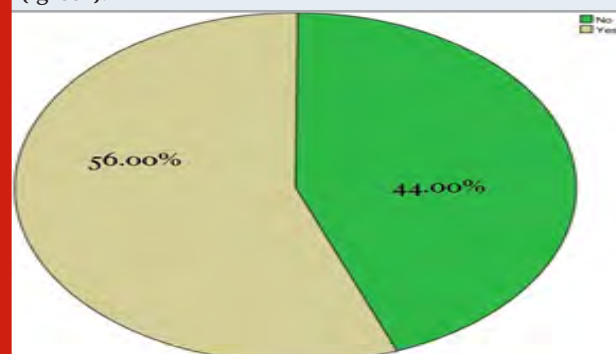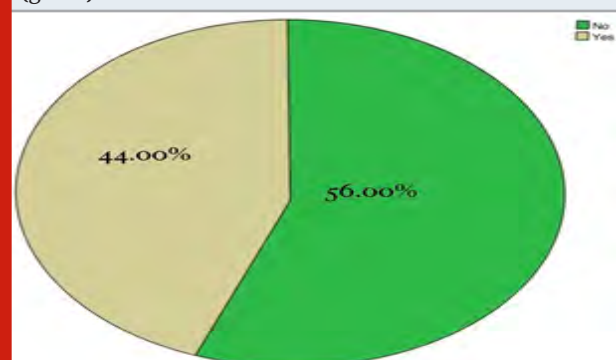

Figure 3: Pie chart represents that 44% of the participants squeeze their finger immediately after the injury (cream) and 56% of the people do not squeeze their finger (green).

Figure 4: Pie chart represents that 21% people do not squeeze their finger because it dilutes the specimen with tissue fluid (green) and 46% people says that it increases the probability of hemolysis (cream) and remaining 33% of the participants had no idea (violet).
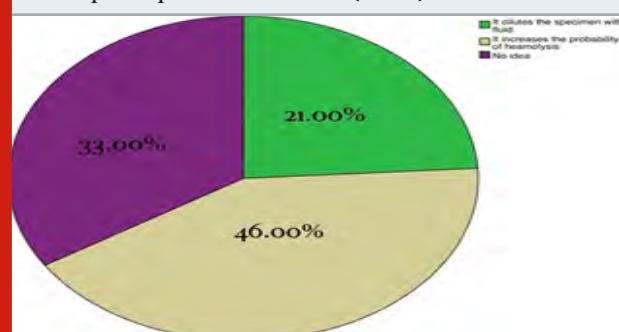

Figure 5: Pie chart represents that 46% of the participants report the incident of needle stick injury whereas the remaining (violet) 54% of the participants do not report the incident (cream).
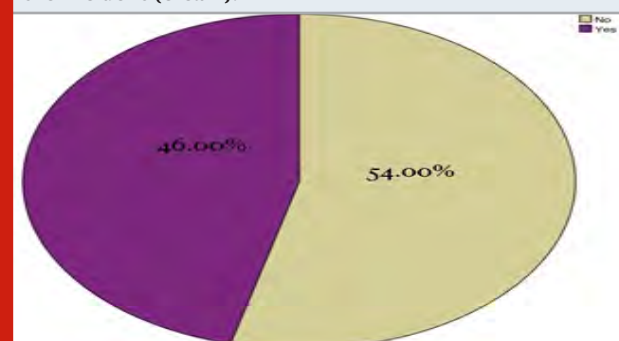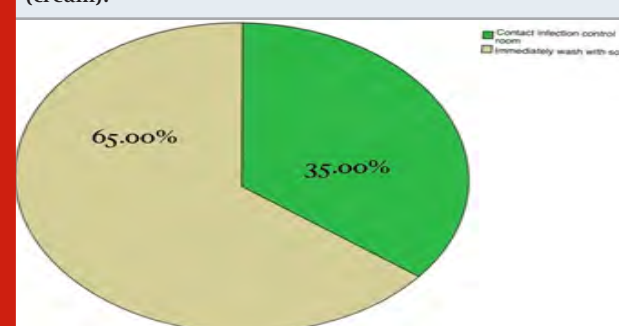

Figure 6: Pie chart represents that 35% of the participants contact the infection control room immediately after sustaining an injury (green) and 65% of the people immediately wash with soap after sustaining an injury (cream).

When the reporting status of HCWs was assessed, it was found that almost 54%of the people did not report NSI and 46% of people reported the incident (Figure 5). The present study shows that 56% of the

There is always confusion as to whom we should report after Needlestick injury (Salehi and Garner, 2010). According to AOTEA, medical doctors must be notified at first, who can also seek help from microbiologists and clinical immunologists for further consultations. In the present study 35%, people contracted the infection control room immediately after the injury and the remaining 65%people washed their hands immediately with soap (Figure 6).

The present study shows that 70% of people cap the needle before throwing it away and 30% percent of people throw the needle before capping it (Figure 7). It also shows that 61% of people used a one-handed scoop technique whereas the remaining 39% used two scooped hand techniques (Figure 8). Hence it can be said that people have some knowledge about needle stick injury but still, there is inadequate information.

Figure 7: Pie chart represents that **70%** of the participants cap the needle before throwing it away (cream) and 30% of the people do not cap the needle before throwing it away (green)
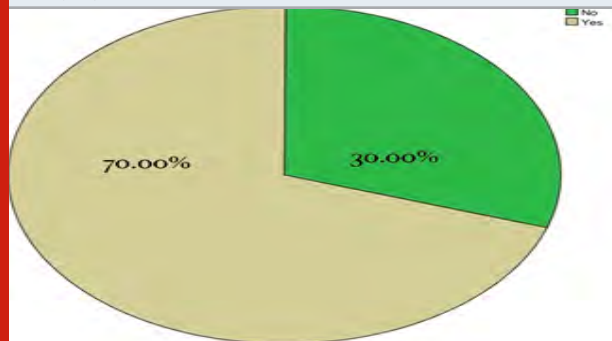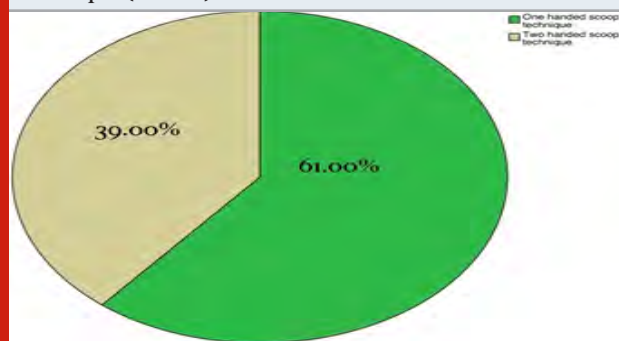

Figure 8: Pie chart represents that 61% of the participants use single handed scoop technique to cap the needle (green) and 39% of the participants use two handed scoop technique (cream)

If the source person is positive for HIV, a western blot test has been done for confirmation. In this study, only 31% of people were aware of this whereas the remaining 36% and 30% people said that HIV antibody tests and ELISA tests are done for confirmation respectively (Figure 9). Therefore it can be concluded that people should be aware of the protocol. Prevention is better than cure. The needle stick injury can also be prevented by continued education, effective training, better safety

devices, and following standard precaution. In the present study 75%, people said that students should be aware of needle stick injury during their preclinical years whereas 25% of people said that it's not necessary(Figure 11). If the source person is negative for HBV, and if he is not vaccinated HBV vaccine is provided. In the present study 56%, people knew that the HBV vaccine should be provided whereas the remaining 44% of people said that the HBIG vaccine should be provided (Figure 10).

Figure 9: Pie chart represents that 31% of the participants use western blot as confirmatory test for HIV patients (green) and 39% of the participants use HIV antibody tests (yellow) and 30% of the participants use ELISA as confirmatory test (red).
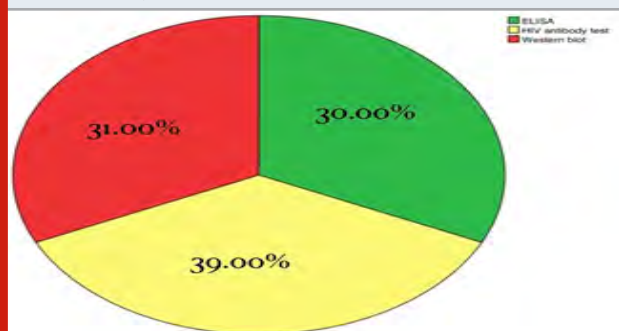

Figure 10: Pie chart represents that 44% of the participants provide HBIG vaccine to the person who has been identified as negative for HBV (green) and 56% of the participants provide HBV vaccine if the affected person is negative for HBV (cream).
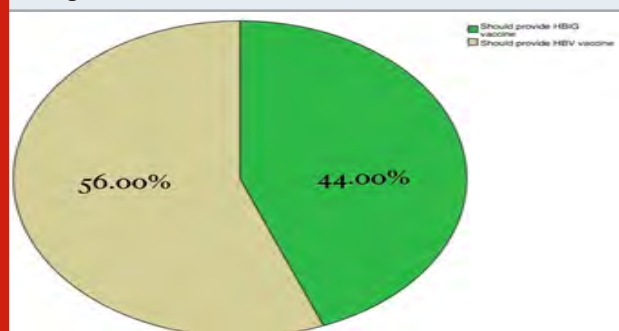

Figure 11: Pie chart represents that **75%** of the participants say that students should have knowledge about needle stick injury during their pre clinical years (cream) and 25% of the participants believe that there is no need for it (green).
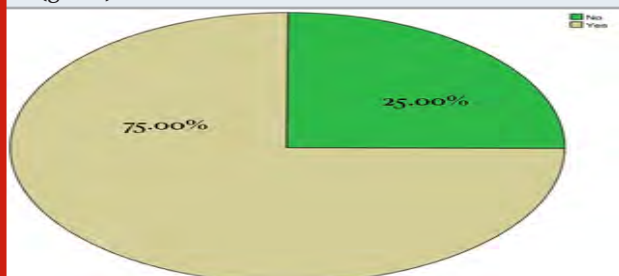
Figure 12: Bar graph represents the association between the gender and the awareness about Hepatitis B vaccine.X axis represents the gender of the participants in the survey and Y axis represents the number of people who had been vaccinated and not vaccinated for Hepatitis B vaccine. Majority of males are vaccinated(cream) for Hepatitis B than females and the difference is also significant statistically. Pearson's chi square test showing p= 0.00 (<0.05).
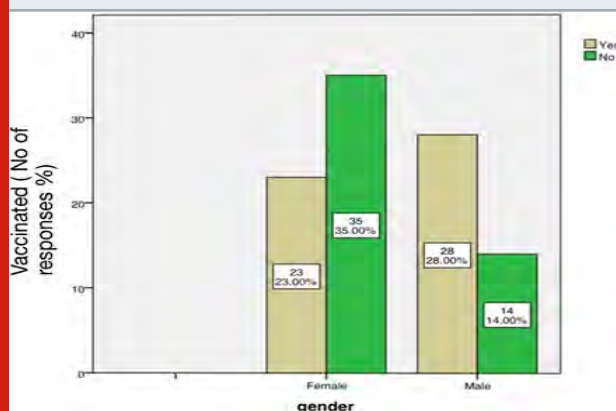

Figure 13: Bar graph represents the association between gender and checking the titre value after vaccination. X axis represents the gender of the participants in the survey and Y axis represents the number of people who check antibody titre after vaccination. Majority of the females are checked(cream) for their Hepatitis antibody titre more than the males and the difference is also significant statistically. Pearson's chi square test showing p= 0.00 (<0.05).
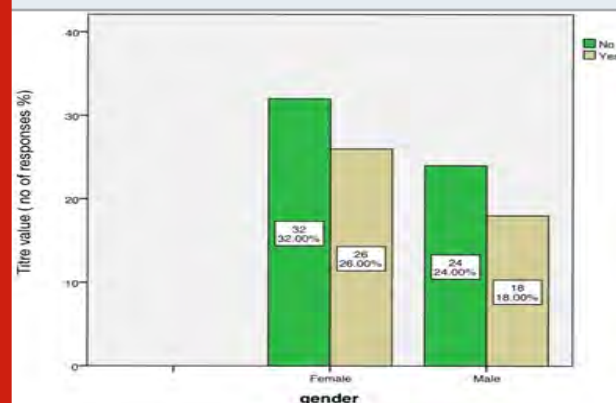
Many NSIs occur due to improper disposal of sharps e.g. unsuitable bins or on the floor and incorrect disposal of instruments by the dentists on instrumental trays(Gichki, Islam and Murad, 2015). This is reflective of a lack of knowledge and awareness among dental practitioners. An Antibody titer is used to determine whether you had previous infections and whether you need or not need certain immunization (Wick, 2001). An antibody titer test is used to measure the number of antibodies present in the blood. In the present study, only 44% of the people checked the antibody titer after vaccination whereas the remaining 56% of the people did not check

the titer value (Figure 13). Therefore it can be said that steps that should be taken after injury are inadequate. Although a significant proportion of people knew about the infections transmitted through NSI, it was found that serological status for three major viral markers (HIV, HBV, and HCV) sources was not checked. Only 51% of the people had been vaccinated for Hepatitis B whereas 49% of the people were not vaccinated (Figure 12).

Figure 14: Bar graph represents the association between gender and Diagnosis for Hepatitis B positive patients.X axis represents the gender and Y axis represents the no. of responders answered.majority of the females know that they have to check for the Hepatitis B immunisation status when they exposed to needle stick injury than the males and the difference is also significant statistically. Pearson's chi square test showing p= 0.00 (<0.05).
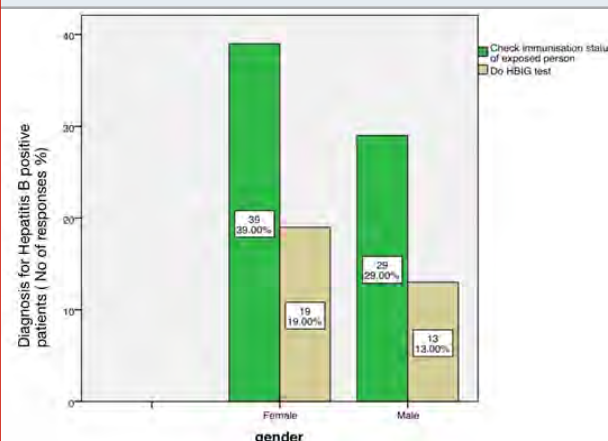

Figure 15: Bar graphs representing the association between gender and duration of HBIG vaccine have to be provided.X axis represents the gender and Y axis represents the no. of participants responded to the timings. Majority of females opt for 72 hours more than the males and the difference is also significant statistically. Pearson's chi square test showing p= 0.00 (<0.05).

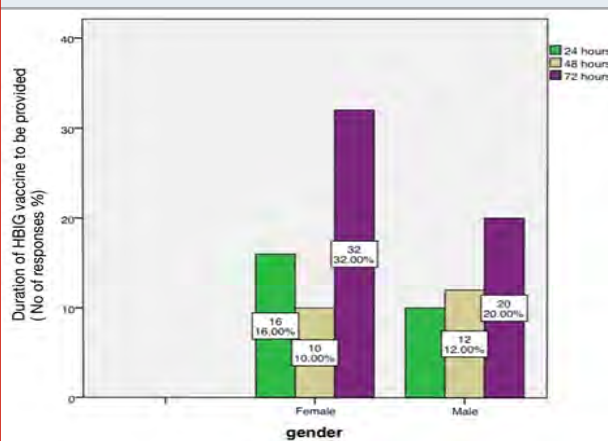After exposure to the immunization status of the infected person should be checked and access the presence of HBV and HIV by ELISA method. If the source person is

positive for hepatitis B, the immunization status of the person should be checked. In the present study 67%, people were aware of this and the remaining 33% of the people were not aware (Figure 14). If the person is positive and if he is vaccinated anti-Hbs titer should be checked. After checking the HBs titer immunoglobulin is provided within 72 hours. If the person is not vaccinated, the HBIG vaccine should be provided within 72 hours. In the present study 52%, people were aware that HBIG should be provided within 72 hours whereas 26% of people said that it should be provided after 24 hours whereas 22% of people said that it should be provided after 48 hours (Figure 15).

Induction programs ought to be held for all recruits. The concept of regular precautions needs to be explained to all health workers and steps must be taken to put into effect them(Shah et al., 2010). Appropriate disposal of sharps and avoidance of recapping and bending should form an important thing in the training.

CONCLUSION

From this study, we conclude that only 50% of the study population were aware about the needle stick injury and the infections spread by Needle stick injury. Even though a majority of the females knows about the Hepatitis B vaccination and its relation to needle stick injury when compared to males but they didn't undergo vaccination properly. There is a precise scope of development in terms of reporting and prevention of needlestick accidents. A need for awareness programs among dental practitioners repeatedly has been raised.

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Morphometric Analysis of Infraorbital Foramen in South Indian Skulls

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ABSTRACT

The maxillae are paired bones in the face which forms the roof of the oral cavity, forms the upper jaw ,and houses the teeth.The infraorbital foramen is an anatomical structure present bilaterally on the maxillary bone below the infraorbital margin which transmits infraorbital vessels and nerves.The infraorbital foramen is an opening by which the infra orbital canal giving passage to the infra orbital artery,vein and nerve and communicates with the face.The infraorbital foramen is a very important landmark for oral and maxillofacial surgery and local anaesthesia.The study of infra orbital foramen is significant in local anaesthesia procedures in maxillofacial surgeries and consequently in protection against procedural neurovascular injuries.The presence of accessory infra orbital foramen may be difficult during anesthetization of the region inter aged by infra orbital nerve.The aim is to study the morphometry of the infraorbital foramen with respect to nearby anatomical landmarks in different skulls of south indian population. Presence of accessory infraorbital foramen was very rare. Only 3 skulls had accessory infraorbital foramen. The parameters which were measured should be known to help in giving anaesthesia in a correct and proper position of a person.

KEY WORDS: : INFRAORBITAL FORAMEN; ANTERIOR NASAL SPINE; LOCAL ANAESTHESIA; ACCESSORY INFRAORBITAL FORAMEN.

INTRODUCTION

The infraorbital foramen (IOF) is situated bilaterally on the maxillary bone, down to the infraorbital border, close 1cm, but there are variations in size from 4 to 12 mm. This foramen is directed inferior medial and in it passes the nerve and vessels which have its same name (Elias et al.,

2004). It is relatively larger than the supraorbital foramen and varies in form and position.. The infraorbital nerve is a totally sensory nerve that innervates the skin of the upper cheek, mucosa of the maxillary sinus, maxillary incisor, canine and premolar teeth and adjacent gingivae, the skin and the conjunctiva of the inferior eyelid, part of the nose and the skin and the mucosa of the upper lip(Ilayperuma, Nanayakkara and Palahepitiya, 2010).

A nerve block is essential during surgical procedures around the infraorbital foramen. Therefore the location of the infraorbital foramen assumes great importance (Singh, 2011). The study of the infraorbital foramen is significant in local anesthesia procedures in maxillofacial surgeries and consequently in protection against procedural neurovascular injuries(Veeramuthu et al.,

2016). The infraorbital foramen at infancy lies very close to the infraorbital margin. Due to the lateral growth of the face as a whole, the maxilla also grows longitudinally. Hence, the distance increases with age gradually(Begum et al., 2019).

In previous studies most commonly measurements on the height and width of the IOFs and the distances from the foramen to the anterior nasal spine (ANS) (Fig. 1) and distance between IOF and Infraorbital margin (IOM) (Fig 2) were made with the aid of digital calipers with precision to 0.01 mm (de Oliveira et al., 2016). The anaesthetic complications can be avoided if the position, shape and direction of IOF is known. Mostly presence of accessory infraorbital foramina is troublesome for anaestization(Veeramuthu et al., 2016). Multiple studies have demonstrated that the dimensions and relative position of the IOF vary between the genders and among different population groups. To know the exact location of IOF various soft tissue and bony anatomical landmarks have been used. Significant variations have been reported in the literature with regard to the position of IOF in relation to the infraorbital margin (Nanayakkara et al., 2016).

Despite its clinical relevance, information available on the dimensions and relative position of the IOF in this study is limited as only a limited number of south indian skulls were used. Hence, the present study was done to analyse the presence of accessory foramina, the shape, dimensions and position of the IOF in relation to important anatomical landmarks. Previously our department has published with a rich case bank established over 3 decades we have been able to publish extensively in our domain (Abdul Wahab et al., 2017; Eapen, Baig and Avinash, 2017; Patil et al., 2017; Jain and Nazar, 2018; J et al., 2018; Marimuthu et al., 2018; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019; Senthil Kumar et al., 2019; Sweta, Abhinav and Ramesh, 2019). Based on this inspiration we aim to study the morphometry of the infraorbital foramen with respect to nearby anatomical landmarks in different skulls of south indian population.

MATERIAL AND METHODS

30 adult dry human skulls of unknown sex of south indian origin were investigated. The skulls which are damaged were excluded. The skulls were obtained from the Department of Anatomy, Saveetha Dental College, Chennai, Tamilnadu, India. All the parameters were measured in the following planes:
The maximum vertical diameter of the IOF.
The maximum horizontal diameter of the IOF.
The distance between the inferior orbital margin (IOM) and the infraorbital foramen (IOF) (Fig. 2)
The distance between the anterior nasal spine (ANS) and the infraorbital foramen (IOF) (Fig.1)
Presence of accessory foramina.

Location: The measurements related to IOF were taken with vernier calipers to measure the distance. From the

Figure 1: Distance between IOF and Anterior nasal spine

Figure 2: Distance between IOF and IOM

above measurements mean value was calculated.

The infraorbital foramen was studied in 30 adult dry human skulls and it was present in all the skulls. The location of infra orbital foramen has become mandatory for different procedures to reduce the risk in orbital surgeries. Knowledge of the position of the IOF is very useful to dentists as well as to head and neck surgeons for both diagnostic and clinical procedures. The measurements was taken using various parameters are shown in Table1.The mean distance from centre of left IOF and IOM was found to be 5.32mm, and the mean distance from the nasal spine was found to be 31.56mm, and the mean of horizontal and vertical diameter of left IOF was found to be 2.6mm and 3.11mm.The mean distance from centre right IOF and IOM was found to be 4.96mm, the mean distance from the nasal spine was found to be 31.56mm and the mean vertical and horizontal diameter of right infraorbital foramen was found to be 3.11mm and 2.6mm respectively. Most of the left and right infraorbital foramen were round in shape. Presence of accessory infraorbital foramen was very rare. Only 3 skulls had accessory infraorbital foramen.

In previous studies,it was found that the infraorbital foramina were located at an average distance of 6.33 ± 1.39 mm below the infraorbital margin(Aggarwal et

al., 2015),which varies from the present study. This can be due to the fact that the skulls taken were not south indian.In another study the mean horizontal distance was 4.9 mm(right, 4.9 mm; left, 4.9 mm). The mean vertical diameter was 5.5 mm (right, 5.3 mm; left, 5.6 mm)(Takahashi, Kakizaki and Nakano, 2011).The results vary from the present study as the skulls taken by the previous study were japanese skulls.The shape of IOF was vertically oval, horizontally oval(Varshney and Sharma, 2013),whereas mostly round in the present study.This study did not include all the soft tissue present around the infraorbital foramen when compared to previous studies(Ercikti, Apaydin and Kirici, 2017)(Hwang et al., 2013)(Chrcanovic, Abreu and Custódio, 2011)(Kazkayasi et al., 2001)

Table 1. Shows the mean vertical and horizontal diameters, of left & Right Infraorbital foramen, Mean distance between IOF and IOM and the mean distance between IOF and nasal spine.

	AVERAGE DISTANCE BETWEEN IOF & IOM inmm	AVERAGE DISTANCE BETWEEN IOF & ANTERIOR NASAL SPINE in mm	AVERAGE VERTICAL DIAMETER OF IOF in mm	AVERAGE HORIZONTAL DIAMETER OF IOF in mm	SHAPE
Left infraorbital foramen	5.32	31.8	2.88	2.59	Round
Right infraorbital foramen	4.96	31.56	3.11	2.6	Round

CONCLUSION

The parameters which were measured should be known to help in giving anaesthesia in a correct and proper position of a person.The landmarks described could be identified and effectively applied with success in various clinical scenarios, thereby decreasing the risk of failures and complications during local anaesthesia.

ACKNOWLEDGEMENTS

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Knowledge , Attitude and Practice of Dental Students Regarding Denture Adhesives - A Survey Based Analysis

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ABSTRACT

The aim of the study was to determine the knowledge, attitude and practise of dental students regarding denture adhesives. Denture adhesive improves retention, decreases tissue discomfort, prevents strangulation of mucosal blood supply, and reduces the frequency of adjustments even in a well-fitting denture.Denture wearers sometimes wear denture adhesive to enhance the retention of their prosthesis. Denture adhesive is likely to be favorable and the retention of the denture becomes better with the usage of denture adhesive.This was a questionnaire based study. The study setting was a University setting. A pre-tested questionnaire with 8 questions was formulated for the collection of information. They were distributed to 100 dental students at a private dental institution and their answers were recorded. Excel Tabulation was done. Results were represented in the form of pie charts. In this study, all the dental students were aware of the denture adhesives. 92% of them have used denture adhesives to improve the retention of the denture. Denture adhesive was more commonly used for complete dentures(88%). Majority of the students believed that patients felt happy after the usage of denture adhesives. From the present study, we can conclude that the dental students had comparatively better understanding and knowledge about the principles of denture adhesives. But the knowledge about different forms of denture adhesives and awareness about the complications that might arise after long term usage of denture adhesives were very less, so better training and work experience can help them to understand about the advancements and the significance of denture adhesives.

KEY WORDS: ADHESIVES, DENTURES, RETENTION, STABILITY.

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INTRODUCTION

Denture wearers sometimes wear denture adhesive to enhance the retention of their prosthesis. Denture adhesive is likely to be favorable and the retention of the denture becomes better with the usage of denture adhesive(Kelsey, Lang and Wang, 1997) Denture adhesive improves retention, decreases tissue discomfort, prevents strangulation of mucosal blood supply, and reduces the frequency of adjustments even in a well-fitting denture(Tarbet, Boone and Schmidt, 1980; Shay, 1991).

Adhesives provide a cushioning and lubricating effect that reduces friction and mucosal irritation(Scher, Ritchie and Flowers, 1978) The composition of denture adhesive is such as, the main ingredients of denture adhesives are classified into three groups which are Group 1 (adhesive agents), Group 2 (antimicrobial agents), and Group 3 (other agents)(Boone, 1984; Adisman, 1989).

The viscosity of the adhesive is increased by the thickness of saliva formed, thereby increasing the denture retention. Newer adhesive materials provide stronger bioadhesive and cohesive forces, hereby free carboxyl groups formed by the hydration of adhesive such as methyl cellulose, hydroxymethyl cellulose, sodium carboxymethyl cellulose, or polymethyl vinyl ether maleic anhydride and thus form electrovalent bonds that produce stickiness or bioadhesion(Duqum et al., 2012).

Furthermore, there are few requirements of an ideal denture adhesive which are, it should be biocompatible, non-toxic, and also non-irritant. It should have a neutral odor and also neutral taste with an ease for application and removal from the tissue surface of the denture. The denture adhesiveness should be able to retain for about 12–16 h(Figueiral et al., 2011).

Finally, the denture adhesive should discourage microbial property and increase the comfort, retention, and stability of the denture. The most commonly mode of application of denture adhesive is that any residual adhesive should be removed from the tissue-bearing surface of the denture (Figueiral et al., 2011; Philip, Ganapathy and Ariga, 2012) the use of adhesives in patients with compromised denture- bearing areas adds to their confidence, thereby increasing the ability to adapt to the new prosthesis.

Immediate denture gets loosened soon due to tissue healing and resorption requiring relining, rebasing, or a new denture fabrication, and comfort and function during the interim period are aided by the use of a denture adhesive. Reduced clinical findings of ulcers, tissue irritation, inflammation, and compression of the oral mucosa of denture wearers were seen with concomitant use of adhesives(Panagiotouni et al., 1995).

Xerostomia in denture wearers either drug or radiotherapy induced can be alleviated with the use of denture adhesives and stabilization of dentures in patients with hormonal changes and neuromuscular disorders such as myasthenia gravis, Parkinson's and Alzheimer's disease, and more can be achieved with denture adhesives. Prosthesis to rehabilitate gross maxillofacial defect requires denture adhesives for retention and is valuable adjuncts to the retention of radiation carriers or radiation protection prosthesis(Polyzois, 1983)

The disadvantages in the usage of denture adhesive such as allergies to denture adhesives or any of its components, gross inadequacies in retention and function, excessive bone resorption, and soft tissue shrinkage, leading to loss of vertical dimension, adhesives should not be used to retain fractured dentures or dentures with lost flanges and patients with inability to maintain proper hygiene of the denture should avoid the use of denture adhesive(Roshene, Robin and Raj, 2015; Kumaran, Sharma and Robin, 2019).

Previously our department has published extensive research on various aspects of prosthetic dentistry ('Evaluation of Corrosive Behavior of Four Nickel–chromium Alloys in Artificial Saliva by Cyclic Polarization Test:An in vitro Study', 2017; Ganapathy, Kannan and Venugopalan, 2017; Jain, 2017a, 2017b; Ranganathan, Ganapathy and Jain, 2017; Ariga et al., 2018; Gupta, Ariga and Deogade, 2018; Anbu et al., 2019; Ashok and Ganapathy, 2019; Duraisamy et al., 2019; Varghese, Ramesh and Veeraiyan, 2019), this has provided a platform for us to pursue the current study.

The aim and objective of this study was to provide information on the level of awareness among the dental students in Chennai and the current status of knowledge, attitude and practice towards the use of denture adhesives.

MATERIAL AND METHODS

The study was conducted in a private dental institution in Chennai. The study setting was carried out in a University setting with approval of the Institutional review board.

Inclusion criteria and Exclusion criteria: Undergraduate third year students, final year students and Interns were included in the study. Post graduate students and dental practitioners were excluded from the study.

Data Collection: A pre-tested questionnaire with 8 questions was formulated for the collection of information. The questionnaire was simple and brief. The self made questions were developed. The questionnaire included self made questions to assess about the knowledge, practise and awareness among the dental students regarding denture adhesives. The questionnaire was shared with 100 dental students and their answers were recorded using an online surveying tool(Google Forms). Data was entered in Microsoft Excel sheets. The results were demonstrated in the form of pie charts.

RESULTS AND DISCUSSION

The survey gathers the knowledge about denture adhesives among the dental students. This would in turn greatly benefit its use in their clinical practice in providing guidance in use for patients requiring them. Figure 1 showed that all the dental students were aware of the denture adhesives. In the study by Al Taweel.et.al, 97% of the respondents were aware about the denture adhesives (Al Taweel and Al Shehri, 2016).In the study by Fakhri.et.al, it was showed that 14%,32% and 37% of the general dentists had respectively, good, moderate and weak knowledge towards denture adhesive while 16.3% had no knowledge about this material (Fakhri et al., 2009). Denture adhesives has not yet gained worldwide dentist acceptance. This may be due to very limited knowledge about denture adhesives among dentists and also the lack of importance given to this topic either in the undergraduate curriculum or in continuing dental education programmes(Lamb, 1980; Özcan et al., 2004; Zhao et al., 2004).

practice. In the study by Al Taweel.et.al, only 52.2% of the respondents have used denture adhesives in their clinical practise. This was very less when compared to our study. In the study by Mantri.et.al, a total of 115(83%) general dental practitioners, 6(100%) prosthodontists and 22(81%) other specialist's used denture adhesives as a beneficial adjunct in their clinical practice(Mantri et al., 2014). In the study by Muneer.et.al, among a group of 96 dentists in Pakistan, 56% had never prescribed DAs to any patient and 44% had no knowledge regarding their use (Muneer, Ahmed and Kamran, 2013)

In our study, Figure 3 showed that out of the 92 patients who have used denture adhesives, 82.6% of them used denture adhesives mostly for complete dentures while the remaining 17.4% of them used it for partial dentures. Study by Kulak.et.al, reported that non retentive and unstable mandibular denture was the major problem faced by the complete denture patients(Kulak, Ozcan and Arikan, 2005).

Figure 1 : Pie chart depicts the students response on the awareness of denture adhesives. All the dental students were aware(Blue) of denture adhesives.

Figure 3: Pie chart depicts the students response on the type of prosthesis in which the denture adhesive was used. Out of the 92 patients who have used denture adhesives in their clinical practice, 82.6% of them used denture adhesives for complete dentures(Blue) while the remaining 17.4 % of them used it for partial dentures (Green).
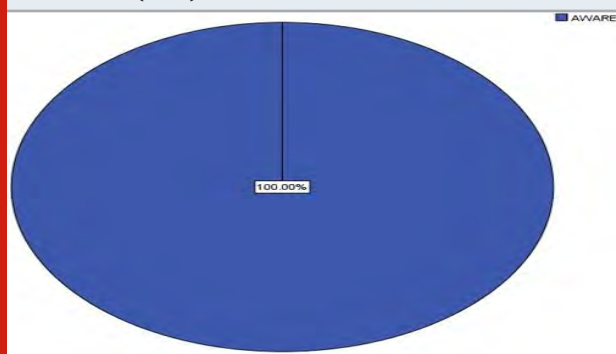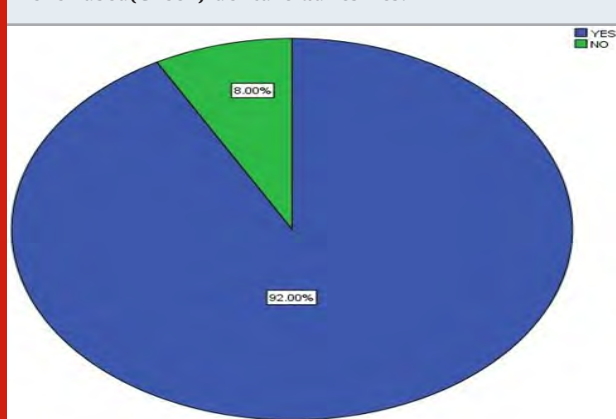

Figure 2: Pie chart depicts the students response to the use of denture adhesives in their clinical practice. 92% of the students have used(Blue) denture adhesives in their clinical practice while the remaining 8% of them have never used(Green) denture adhesives.
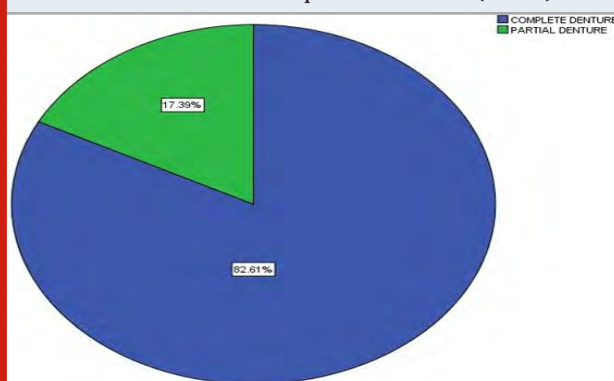

Figure 4: Pie chart depicts the students response to the awareness about different forms of denture adhesives. Only 43% of the students were aware(Blue) about the different forms of denture adhesives while the remaining 57% were completely unaware(Green) about it.

In our study, Figure 2 showed that 92% of the dental students have used denture adhesives in their clinical
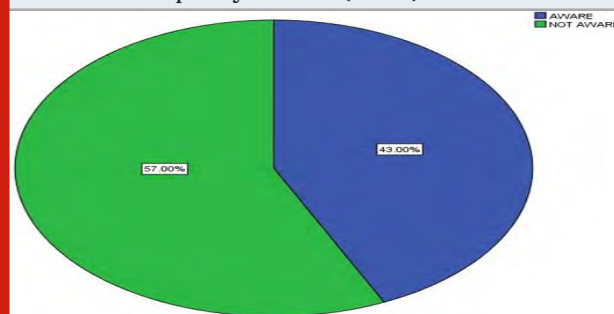
In our study, Figure 4 showed that only 43% of them were aware about the different forms of denture adhesives. Denture adhesives are available as powders, gels, strips

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and creams.study by El and Habib reported that the use of adhesive creams significantly increased the denture retention. They also reported that it was difficult to remove the paste type denture adhesives from the denture fitting surface by using mouthrinse and/or cotton gauzes (El and Habib, 2012).

In our study, Figure 5 showed that more than half of the participants (62%) did not feel that the use of denture adhesive was viewed as a poor reflection on their clinical skills. In the study by Fakhri.et.al, only 9.3% of the dentists had a positive attitude towards using this material(Fakhri et al., 2009). In the study by Al Taweel. et.al, the participants agreed that denture adhesives are useful for stabilizing trial bases during the early stages of denture fabrication(62.3%), enhancing retention during the interim period(75.4%), providing additional retention for patients with inadequate oral anatomy(75.4%) and helping patients to overcome their anxiety after the insertion of a completely new denture(68.1%)(Al Taweel and Al Shehri, 2016).

Figure 5: Pie chart depicts the students response to the feeling whether the use of denture adhesive is viewed as a poor reflection on their clinical skills. 62% of them did not feel(Blue) that the use of denture adhesive was viewed as a poor reflection on their clinical skills. 38% of the students felt less confident(Green) in their clinical skills while using denture adhesives.
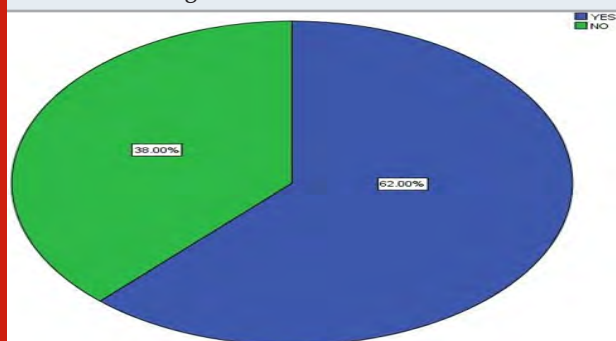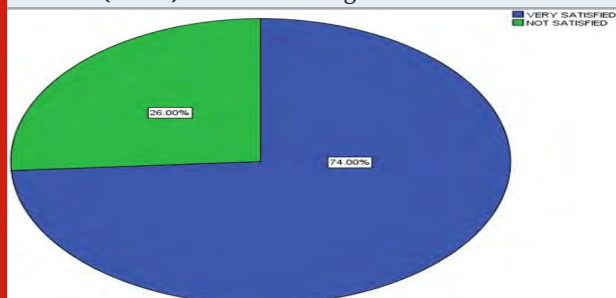

Figure 6: Pie chart depicts the students response to the patient's satisfaction after the usage of denture adhesives. 74% of the students believed that the patients were very much satisfied(Blue) after using denture adhesives while the remaining 26% of them felt that the patients were not satisfied(Green) even after using denture adhesives.

In our study, Figure 6 showed that 74% of the dental students believed that the patients felt after the usage of denture adhesives. In the study by El and Habib, it was reported that the majority of the patients were either very satisfied or fairly satisfied when they used the denture adhesives in maxillary denture. The satisfactory rate for retention in mandibular dentures was still worse when compared to maxillary dentures(El and Habib, 2012). Neill and Roberts reported that the use of denture adhesives provided satisfactory improvement in mastication performance in subjects with poor and ill fitting dentures(Neill and Roberts, 1973).

In our study, Figure 7 showed that all the participants agreed to the fact that patient education about denture adhesive was very important. In the study by Al Taweel. et.al, participants had a comparatively stronger opinion regarding the patient education on the denture adhesives and believed it to be an important part of denture service(Al Taweel and Al Shehri, 2016). Study by Mantri. et.al stated that dentists need to possess knowledge in order to educate all dentures wearing patients about the material as they are widely used in the removable prosthetic care(Mantri et al., 2014).

Figure 7: Pie chart depicts the students response on the importance of patients' education about denture adhesives. All the dental students felt that it was very important(Blue) to educate the patients about the denture adhesive material.
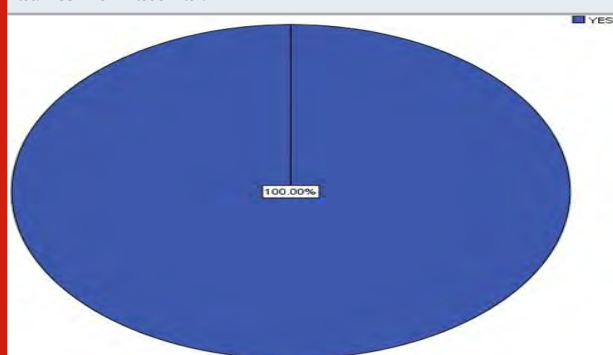
In our study, Figure 8 showed that only 54% of the dental students were aware about the complications that might arise after long term usage of denture adhesives. In the study by Mantri.et.al, 47 % of the general dental practitioners were ignorant that prolonged use of denture adhesives on ill fitting dentures would result in Residual ridge resorption(Mantri et al., 2014). Stafford.et.al indicated that denture adhesives could influence oral flora by causing an imbalance in the flora(Stafford and Russell, 1971). In the study by Al Taweel.et.al, majority of the respondents agreed that denture adhesives contribute to the development of denture stomatitis, candidiasis and imbalance in the oral flora(Al Taweel and Al Shehri, 2016). In the study by Fakhri.et.al, 65% of the dentists agreed that over usage of denture adhesives can cause denture adhesives and an imbalance in oral flora(Fakhri et al., 2009).

Figure 8: Pie chart depicts the students response to the awareness about the complication that might arise after the long term usage of denture adhesives. Only 54% of the students were aware(Blue) about the complications of denture adhesives while the remaining 46% were completely unaware(Gren) about it.
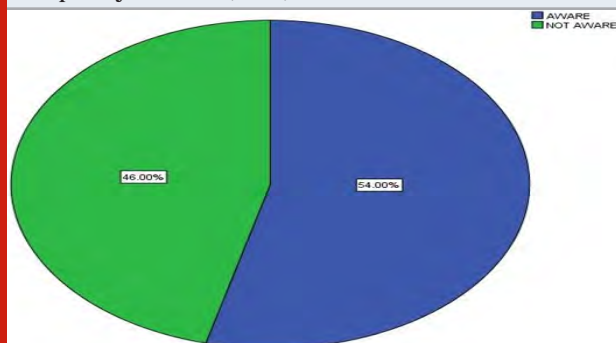
The finding from the present study adds to the consensus of the previous studies. Limitations of the study were smaller sample size so it cannot be generalised to the whole population. Further studies can be done with a larger population.

CONCLUSION

From the present study, we can conclude that the dental students had comparatively better understanding and knowledge about the principles of denture adhesives. They also gave equal importance to patient's satisfaction and patient education about denture adhesives. But the knowledge about different forms of denture adhesives and awareness about the complications that might arise after long term usage of denture adhesives were very less, so better training and work experience can help them to understand about the advancements and the significance of denture adhesives.

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Knowledge Awareness and Practice Towards Management of Space Infections Among Dental Students

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ABSTRACT

The clinical presentation of odontogenic differs from each, depending on whether it is anterior vs posterior, maxilla vs mandible or if the infection is localized or disseminated. Like all infections, the clinical signs and symptoms are pain/ tenderness, redness, and swelling. Patients with superficial dental infections present with localized pain, cellulitis, and sensitivity to tooth percussion and temperature. However, patients with deep infections or abscesses that spread along the fascial planes may present with swelling; fever; and sometimes difficulty swallowing, opening the mouth, or breathing. A questionnaire consisting of 10 questions were prepared and distributed to 100 dental practitioners. The questionnaire consisted of questions about basic knowledge on odontogenic space infections and awareness regarding its management. The data was tabulated using microsoft excel and was imported into SPSS software for statistical analysis. This survey shows that most of the students had good knowledge and awareness regarding management of space infections. Figure 1 shows 72% of the dental students were aware that streptococcus viridans were the most common microorganism to cause odontogenic infections. From figure 2 it's seen that most of the students had excellent knowledge about space infections, prescription of antibiotics and signs and symptoms of odontogenic infections. Most of the students (59% and 63%) commonly practiced eradicating the source of infection primarily without delaying it by giving antibiotics or incision drainage as seen in figure 3. From figure 4 and figure 5, 57% of the students prescribed amoxicillin and 53% of the students prescribed clindamycin for penicillin allergic patients as their first choice of drug incase of odontogenic infections. Within the limit of the study, it can be concluded that the dental students were well aware of the space infections and management of odontogenic space infections. Although, this study was done in a small sample size and further studies with large sample size would be better to generalise the results of this study

KEY WORDS: ABSCESS; AMOXICILLIN; CLINDAMYCIN; INCISION DRAINAGE; STREPTOCOCCUS VIRIDANS.

INTRODUCTION

An odontogenic infection is an infection of the alveolus, jaws, or face that arises from a tooth or it's supporting structures and is one of the most frequently occurring infections. The most common causes of odontogenic infections are dental caries, deep fillings or failed root canal treatment, pericoronitis, and periodontal disease. The infections are usually localized around a tooth and may remain localized to the section where it started, or may spread into adjacent or distant areas. The course of the infection depends on the virulence of the bacteria, host resistance factors, and the regional anatomy.

The clinical presentation of odontogenic differs from each, depending on whether it is anterior vs posterior, maxilla vs mandible or if the infection is localized or disseminated. Like all infections, the clinical signs and symptoms are pain/tenderness, redness, and swelling. Patients with superficial dental infections present with localized pain, cellulitis, and sensitivity to tooth percussion and temperature(Holmes and Pellecchia, 2016). However, patients with deep infections or abscesses that spread along the fascial planes may present with swelling; fever; and sometimes difficulty swallowing, opening the mouth, or breathing(Santosh, Viresh and Sharmada, 2014).

In the dental clinic, there are a number of conditions that can be considered as unscheduled dental emergencies like tooth pain, to a fractured or avulsed tooth, to odontogenic infections. For the dentist management of odontogenic infections can be the most concerning of these emergencies owing to its complex microbiology and potential for advancement to life threatening medical emergencies. Odontogenic infections encompass a variety of conditions ranging from localized abscesses to deep space head and neck infections(Lypka and Hammoudeh, 2011). Deep space infections can carry a high incidence of morbidity and mortality(Sato et al., 2009). It is imperative for the dental professional to have an understanding of treatment and management of such infections. Management of patients with an odontogenic infection is a comprehensive approach involving an examination and evaluation of the patient, identifying source of the infection, anatomic considerations, surgical intervention, and appropriate antimicrobial therapy.

Previously our department has conducted extensive research on various aspects of prosthetic dentistry, like in vitro studies, surveys, clinical trials and review(Ashok et al., 2014; Venugopalan et al., 2014; Ashok and Suvitha, 2016; Ganapathy et al., 2016; Selvan and Ganapathy, 2016; Subasree, Murthykumar and Others, 2016; Vijayalakshmi and Ganapathy, 2016; Ajay et al., 2017; Ganapathy, Kannan and Venugopalan, 2017; Jyothi, Robin and Ganapathy, 2017; Ranganathan, Ganapathy and Jain, 2017; Basha, Ganapathy and Venugopalan, 2018; Jain et al., 2018; Kannan and Venugopalan, 2018; Duraisamy et al., 2019). This study was conducted to assess the knowledge aware and practice towards the management of space infections among the dental students.

MATERIAL AND METHODS

A questionnaire consisting of 10 questions were prepared and distributed to 100 dental students to assess their knowledge, awareness and practice towards management of space infections among dental students. The questionnaire was prepared online using a survey planet and the link was distributed to the dental practitioners to fill the survey. The questionnaire contained questions about basic knowledge on odontogenic space infections and awareness regarding its management. The data was tabulated using microsoft excel and was imported into SPSS software for statistical analysis.

Questionnaire
1. What are the most common microorganisms in odontogenic infection?
2. Are you aware of Management of space infections?
3. Most common cause of space infection is Dental Caries / Periodontal Infections?
4. Signs of severe odontogenic infection include facial or neck swelling and tenderness, dysphagia, dyspnea, trismus
5. Would you prescribe antibiotics after a routine surgical extraction?
6. Do you think routine prescription of antibiotics when not needed increases resistance of bacteria?
7. What is your immediate management of a patient with a canine space infection, which is hard, causing swelling of the cheek and extending to the eye?
8. Management of submandibular space infection associated with fever and dehydration?
9. First choice of antibiotic for Odontogenic infections?
10. First choice of antibiotic for Odontogenic infections in the penicillin allergic patients?

RESULTS AND DISCUSSION

This survey shows that most of the students had good knowledge and awareness regarding management of space infections. Figure 1 shows 72% of the dental students were aware that streptococcus viridans were the most common microorganism to cause odontogenic infections. From figure 2 it's seen that most of the students had excellent knowledge about space infections, prescription of antibiotics and signs and symptoms of odontogenic infections. Most of the students (59% and 63%) commonly practiced eradicating the source of infection primarily without delaying it by giving antibiotics or incision drainage as seen in figure 3. From figure 4 and figure 5, 57% of the students prescribed amoxicillin and 53% of the students prescribed clindamycin for penicillin allergic patients as their first choice of drug incase of odontogenic infections.

The pyogenic oro-fascial infections are most commonly odontogenic in origin like periapical abscesses to

superficial and deep infections in the neck. If left untreated, they generally spread into the adjacent fascial spaces like masseteric, sublingual, submandibular, temporal, buccal, canine and parapharyngeal and which may lead to additional complications. Early recognition of infections and appropriate therapy is essential(Bahl et al., 2014). Most dental abscesses are caused by the host oral microflora that enters normally sterile tissues. The major isolates are streptococci and anaerobic bacteria, which are regarded as normal flora of the tooth and gingival crevice(Hardie and Bowden, 1974). In this survey the 72% of the students consented to this stating that Streptococcus viridans were major causative organisms for odontogenic infections as seen in figure 1.

Figure 1: Bar graph showing the awareness among the students regarding common microorganism in odontogenic infection. X axis represents commonest microorganisms and Y axis represents number of dental students. From this graph we can infer that most of the dental students(72%) were aware that streptococcus viridans(blue) was the most common microorganism causing odontogenic infection.
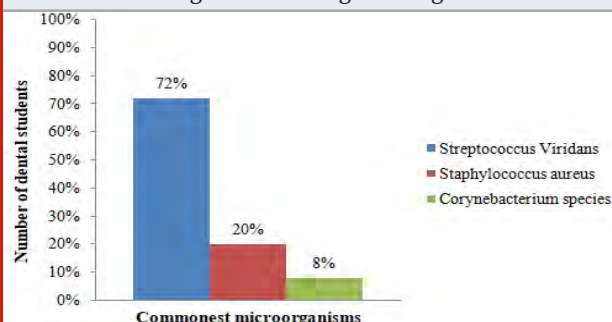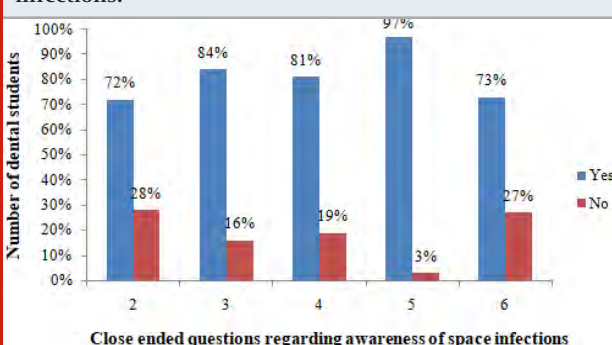

Figure 2: Bar graph showing series of questions regarding awareness of space infections among dental students. X axis represents close ended questions and y axis represents number of dental students. Blue denotes yes and red denotes no. From this graph we can infer that most of the students were having good knowledge about space infections.

From figure 2, the dental students reported that they were well aware (84%) of the causes of Odontogenic space which was by bacterial infections arising from pre-existing dental caries-such as pulpitis and apical periodontitis, pericoronitis or periodontal diseases. Other documented causes include tonsillitis, gunshot injuries,

peritonsillar or parapharyngeal abscesses, mandibular fracture, oral lacerations/piercings, or submandibular sialadenitis. Predisposing factors include recent dental treatment, systemic illnesses such as diabetes mellitus, malnutrition, alcoholism, compromised immune system such as acquired-immunodeficiency syndrome (AIDS), and organ transplantation(Kurien et al., 1997; Osunde et al., 2012). Clinical presentation of this infection may arise from toothache to limitation of mouth opening, fever, malaise, dysphagia. In their most severe form, space infections can lead to death, which usually results from an acute airway obstruction or multiorgan failure(Kurien et al., 1997).

The signs and symptoms presented by patients with severe infection due to odontogenic origin are crucial factors. Sato et al., has shown in their eight-year retrospective study that odontogenic infection cases require immediate attention either clinical or surgical therapy. The most frequent signs and symptoms found are trismus, fever, dysphagia, pain and swelling(Flynn et al., 2006; Sato et al., 2009). The patient's medical history and current medications help in assessing the patient's ability to fight infection as well as providing insight to potential drug interactions. From this survey it is seen that the dental students (81%) were well aware regarding the signs and symptoms of space infection as seen in figure 2. While we discuss the signs and symptoms, it is important for us to look into "Ludwig's Angina" as they are the most dangerous type of space infection as it is a life-threatening infection. It has 'brawny boardlike swelling' of the submandibular, sublingual and the submental region with edema and elevation of tongue leading to drooling which also causes airway obstruction(Patterson, Kelly and Strome, 1982; Kim et al., 2012). The most common cause of death in case of ludwig's angina is due to airway obstruction as it is the most life threatening complication(Candamourty et al., 2012).

The judgment on how to approach an odontogenic infection is based on the source of the infection, severity of the infection, and state of the patient's host defense mechanisms. The first and most important element in treating dental infections is the elimination of the primary source of the infection. In the case of an acute abscess, incision and drainage to remove accumulated pus (purulence) that contains bacteria is required. The incision and drainage procedure must break all the loculi within the abscess cavity and evacuate as much of the pus as possible. Following the evacuation of the purulent exudate, the use of irrigation further dilutes the bacterial population. While discussing management of these odontogenic infections this survey shows that 72% of the dental students are aware of management of space infections as seen in figure 2.

As a painkiller and as well as to eradicate the infection we prescribe patients with NSAIDs and antibiotics routinely after a surgical extraction and this was also followed by the 97% of the dental students as seen in figure 2. This can be followed for cases that do not include the deep spaces or abscesses, but when it comes to space

infections, the dentist must be well aware of the approach of the treatment of these infections. Penicillin is the drug of choice in treating space infections because it is effective against the gram-positive aerobes and intraoral anaerobes commonly found in alveolar abscesses. Both aerobic and anaerobic microorganisms are susceptible to penicillin(Sabiston and Gold, 1974). The first drug of choice in the management of odontogenic infection is Amoxicillin, which is a semi-synthetic antibiotic belonging to the penicillin group of drugs. It has broad spectrum bactericidal activity against gram-positive and gram-negative organisms.

Figure 3: Bar graph showing the awareness among the dental students regarding clinical management of space infection. X axis represents clinical management and Y axis represents the number of dental students. From this graph we can infer that 59% and 63% of the students commonly opted to remove the source of infection(Green) first without delaying it with antibiotics/ I&D.
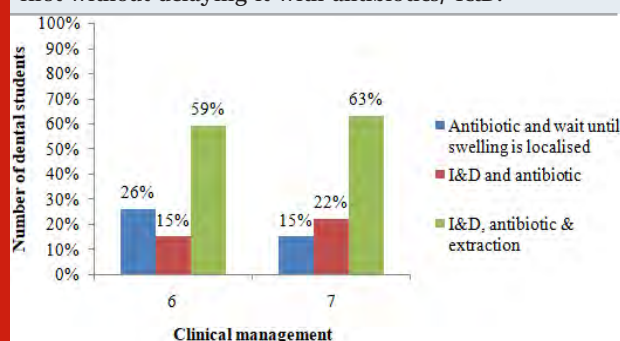

Figure 4: Bar graph showing awareness among the students regarding the first choice of antibiotics incase of odontogenic infections. X axis represents Choice of antibiotics and Y axis represents number of dental students. From this graph we can infer that 57% of the students prescribed amoxicillin(Blue) as their first choice of drug incase of odontogenic infections.
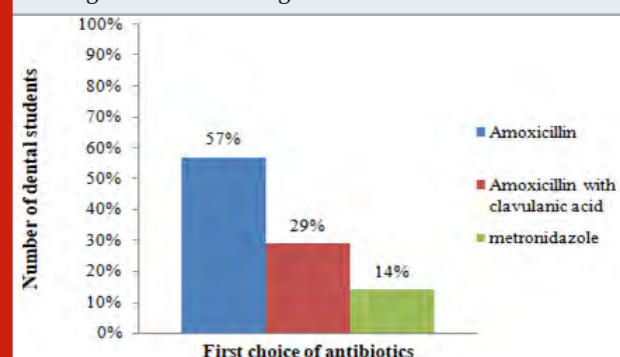

A study done by Raquel González-Martínez et al., shows that amoxicillin is the first choice of drug prescribed by the dentists(González-Martínez et al., 2012), this coincides with our survey stating that 57% of the dental students also practice the same, whereas the drug of choice for penicillin allergic patients, 53% of the dental students were aware clindamycin to be the first choice

of drug as seen in figure 4 & 5. In a study conducted by Bascones et al. and Isla et al., they performed pharmacokinetic and pharmacodynamic analysis and concluded that amoxicillin in combination with clavulanic acid, and clindamycin are adequately effective against microorganisms isolated from odontogenic infections, while spiramycin and metronidazole do not cover the bacterial spectrum bacterial of this type of infections(Bascones Martínez et al., 2004; Isla et al., 2005).

Though, most respondents (73%)(figure 2) believed that prescribing antibiotics unnecessarily increases resistance in the community, a significant number of students still prescribe antibiotics in situations when it is not necessarily indicated. This could be attributed to the student's efforts to prevent infection. However, removal of the potential source of infection is always sufficient as shown by previous studies(Bodner et al., 2012; Igoumenakis et al., 2015). This is a more global issue that has been reported in the United States, Nigeria, Czech Republic, and Japan, KSA(Masuda et al., 2012; Pipalova, Vlcek and Slezak, 2014; Akinyemi et al., 2015; Vandepitte, Ponthong and Srisarang, 2015; Al-Sebaei and Jan, 2016). Practitioners must be highly careful when prescribing amoxicillin/clavulanate, because there has already been some evidence of resistant strains of Escherichia coli and Salmonella spp. reported in several studies(Masuda et al., 2012; Akinyemi et al., 2015). In a study by Poeschl et al, the resistance rate in severe deep space head and neck infections was found to be 14% against clindamycin, 14% against macrolides, and 7% against Penicillin G(Poeschl et al., 2010).

Figure 5: Bar graph showing awareness among the students regarding the first choice of antibiotics incase of odontogenic infections in penicillin allergic patients. X axis represents Choice of antibiotics and Y axis represents number of dental students. From this graph we can infer that 53% of the students prescribed Clindamycin(Blue) as their first choice of drug incase of odontogenic infections among penicillin allergic patients.
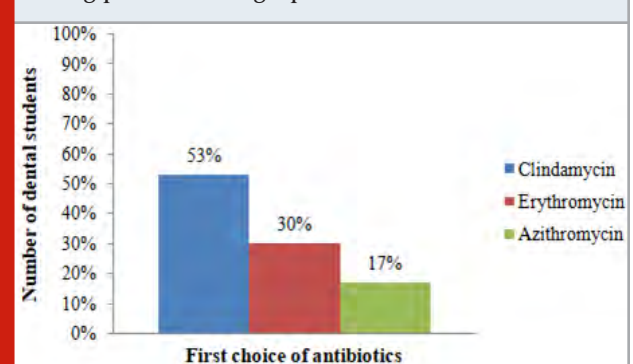
Open surgical incision and drainage are considered the mainstay of treatment for submandibular space abscesses and Ludwig's angina. It is better to treat all patients with large doses of broad-spectrum intravenous antibiotics (e.g., amoxicillin/clavulanate potassium) until culture

results identify the causative organism. In cases of large abscesses or multiple space involvement, an open surgical incision and drainage are swiftly performed. In patients with small abscesses, a watch and wait policy is applied for 48 hours; if a lack of response to medical treatment is noted clinically, the patient is treated with an open surgical drainage. Among respondents, more than half of them (59% and 63%)(figure 3) suggested eliminating the source of infection that is extraction of the tooth, then I&D and prescribe antibiotics in case of immediate management of the patient which was in contradiction to the study done by Maisa O. Al-Sebaei et al.,[23] in which their respondents had a general tendency to delay the surgical approach by prescribing antibiotics and wait for the swelling to localize.

CONCLUSION

Within the limit of the study, it can be concluded that most of the dental students were well aware of the space infections and management of odontogenic space infections. Although, this study was done in a small sample size and further studies with large sample size would be better to generalise the results of this study.

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Conflict of Interest: Nil

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Implications of Diabetes Mellitus on Minor Oral Surgical Procedures – A Questionnaire Survey Among Undergraduate Student Practitioners

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ABSTRACT

Diabetes mellitus is a common metabolic disorder in which the impaired leukocyte function and the metabolic abnormalities lead to inadequate migration of neutrophils and macrophages to the wound, along with reduced chemotaxis. Such cellular changes would predispose individuals to an increased risk of wound infection. To minimize the risk of an intraoperative emergency, clinicians need to have thorough knowledge about the disease before initiating any dental treatment. The aim of this study is to evaluate the difference in understanding between final year dental students and interns towards diabetes and its implications in oral surgical procedures. A questionnaire-based survey consisting of 15 questions was circulated via an online platform, survey planet. 100 participants who were dental students were included in the study. Responses were tabulated and Chi-square analysis was performed using SPSS software version 20.0.The results showed significant difference in approach towards diabetes between both the survey groups with p = 0.001 < 0.05. Whether continuing medical education programmes or altered teaching planner will help in better understanding and comprehensive patient management needs to be evaluated with further studies

KEY WORDS: DIABETES MELLITUS, DENTAL, EXTRACTION, COMPLICATIONS, MANAGEMENT.

INTRODUCTION

Diabetes mellitus is a chronic illness which has microvascular and macrovascular complications reported in many works of literature across the globe from a very long time (Bergman, 2007). Patients with diabetes mellitus have impaired leukocyte activation which makes them prone to many infections. In such patients surgical procedures might lead to sepsis. Oral surgical procedures ranging from simple extraction to complex fracture management may need to be done under antibiotic cover to prevent postoperative infections (Rothwell and Richard, 1984; Chakravarthy, 2013).

Based on statistics available, the majority of the world population are suffering from type 2 diabetes mellitus(DM), in which the South Asian population holds a major count. In India around ½ the population are hyperglycemic and fall under the category of prediabetic whereas ¼ are diabetic(Kidambi and Patel, 2008; Sarwono, 2008). There are certain oral findings which can be an indicator for diabetes mellitus. Periodontal disease has been reported severely in patients with type 1 and type 2 diabetes. Even though the mechanism of diabetes on the periodontal ligament is not completely understood. Chronic periodontitis may be considered as an indicator

of long standing history of diabetes mellitus(Hariharan et al., 2019). However there are various other factors that help in identifying diabetic patients apart from history taking which should be practiced by student practitioners to avoid complications. The factors include knowledge on oral indicators of diabetes mellitus, various testing parameters like fasting and random blood sugar values, glycosylated hemoglobin (HbA1c) , difficulties and management of post operative complications and the duration, type and dosage of antibiotic coverage during treatment (Adeyemi et al., 2019).

There are various studies that have provided information regarding implications and management of diabetes in a dental setup (S and Choudhury, 2012; Vesterinen et al., 2012; Jankhwala, Singh and Nayak, 2014). But there needs an in-depth understanding and focus towards this aspect among student practitioners as they have a comparatively lesser experience in treating such patients. With such a high prevalence and burden of the disease, especially in Indian subcontinent it is essential that all healthcare professionals managing these patients are well aware about the implications and the potential adverse effects of the disease. With a rich case bank established over 3 decades we have been able to publish extensively in our domain (Abdul Wahab et al., 2017a; Eapen, Baig and Avinash, 2017; Patil et al., 2017a; Jain and Nazar, 2018a; J et al., 2018a; Marimuthu et al., 2018a; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019a; Senthil Kumar et al., 2019a; Sweta, Abhinav and Ramesh, 2019a)(Abdul Wahab et al., 2017b; Eapen, Baig and Avinash, 2017; Patil et al., 2017b; Jain and Nazar, 2018b; J et al., 2018b; Marimuthu et al., 2018b; Wahab et al., 2018; Abhinav et al., 2019; Ramadorai, Ravi and Narayanan, 2019b; Senthil Kumar et al., 2019b; Sweta, Abhinav and Ramesh, 2019b). Based on this inspiration we aim to compare the knowledge about the implications of diabetes mellitus on minor oral surgical procedures and the approach towards diabetic patients among the undergraduate dental students.

MATERIAL AND METHODS

This is a questionnaire based survey study among undergraduate students. Data were collected by reviewing the response of participants. Only dental undergraduate final year and intern students were included in the survey. Specialist dentists and preclinical students were excluded. The total sample size was 150 which accounted for 76 final year students and 74 intern students. All data retrieved were compiled in an excel sheet and imported to SPSS Version 20 by IBM for statistical analysis. Chi-square test with p value < 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

The study population included 150 students of which 76 were pursuing final year and 74 were attending internship respectively and all the participants had a good hands on experience treating diabetic patients. Figure-1 representing the association of participants

and number of diabetic patients they attend to in a month. 60 % students in both the study groups treat approximately 20 diabetic patients every month. Though most participants claimed that they knew normal sugar values (Figure 2), it was evident that final year students were more precise in their values than interns who had varied opinions (Figure 3) .

Figure 1: Bar graph representing the association between participants and number of patients with diabetic mellitus handled, where X-axis is participants year of study (Final year, Intern), Y-axis: Responses for the number of diabetic patients handled (Blue-15 patients; Green-20 patients; Grey-25 patients; Violet-30 patients). There was no statistically significant difference in the number of diabetic patients handled by both the categories by Chi-square test with p = 0.736 > 0.05.
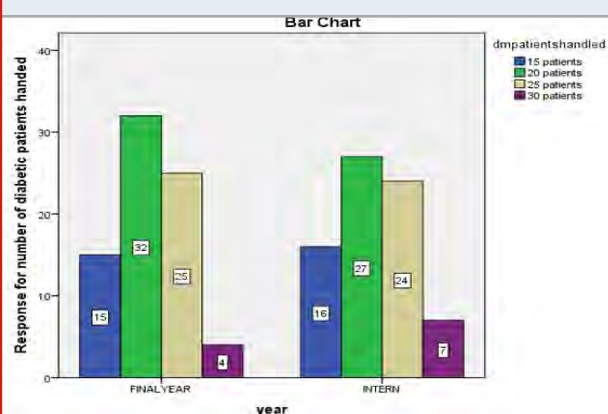

Figure-2 Bar graph representing the association between participants and response for awareness about blood sugar values,where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the awareness about blood sugar values (Blue-No; Green-Yes). There was no statistically significant difference in the knowledge about blood sugar values by both the categories by Chi-square test with p = 0.672 > 0.05.
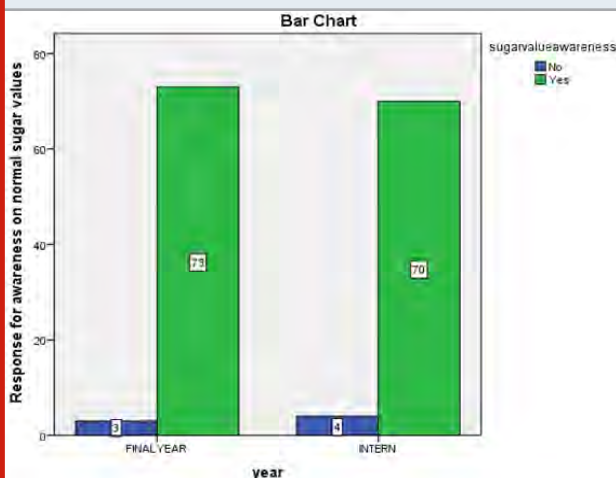
Figure 3: Bar graph representing the association between participants and response for awareness about Fbs values, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the normal Fbs value(Blue-70-90mg/dl; Green-80-110 mg/dl; Grey-90-120 mg/dl).There was statistically significant difference in the knowledge about blood sugar ranges by both the categories by Chi-square test with p = 0.001 < 0.05.
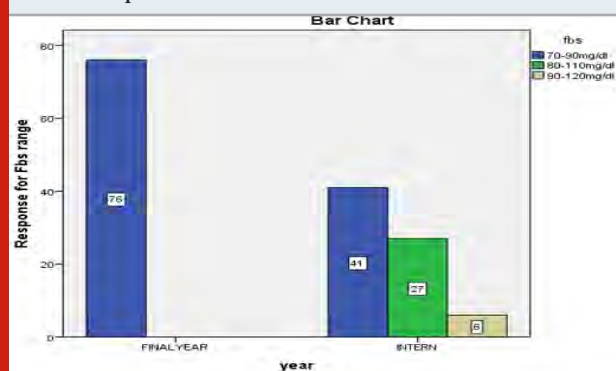
The association between participants and response to most difficult complications to be managed in diabetic showed that students from both study years thought candidiasis and ludwig's angina as common complications (Figure 4). However, the frequent secondary complication in diabetic patients following minor surgical procedures as per studies include non healing and dry socket due to dislodgement of clot especially in mandibular region due to atherosclerosis caused by long standing diabetes mellitus(DM) (Akinbami and Godspower, 2014). The same was reported when asked if they had themselves managed any post treatment complication in their diabetic patient and what was the most common complication the participants had encountered (Figure 5 & 6).

Figure-4 Bar graph representing the association between participants and response for most difficult complication of diabetes in oral surgical procedures, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the most difficult complication of diabetes in oral surgical procedures(Blue-All; Green-Candidiasis; Grey-Ludwig's angina; Violet-Mucormycosis; Yellow-Osteonecrosis).There was statistically significant difference in the knowledge about most difficult complication of diabetes in oral surgical procedures by both the categories by Chi-square test with p = 0.0301 < 0.05.
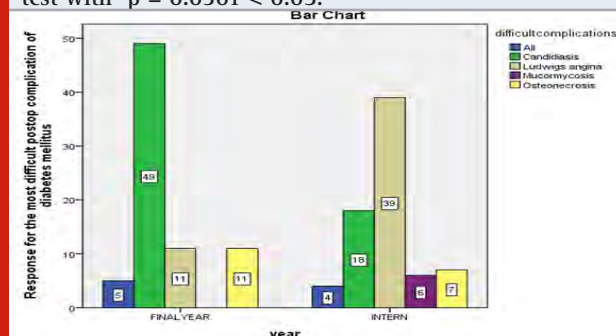

Figure 5: Bar graph representing the association between participants and response for complications handled, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the complications handled(BlueNo; Green-Yes).There was a statistically significant difference in the experience in handling complications by both the categories by Chi-square test with p = 0.018 < 0.05.
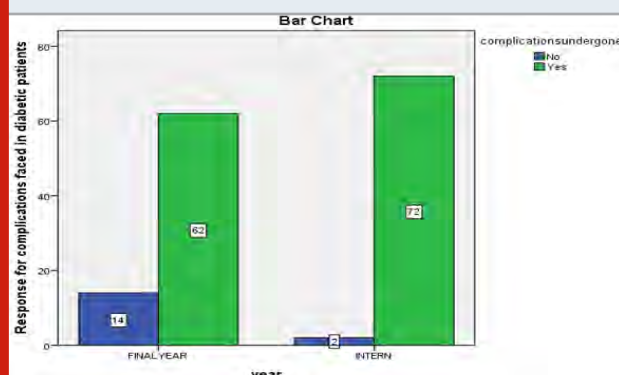

Figure 6: Bar graph representing the association between participants and response for most common complications of diabetes in oral surgical procedures, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the most common complication of diabetes in oral surgical procedures(Blue-Dry socket; Green-Non healing Socket; Grey-Osteonecrosis). There was no statistically significant difference in the experience for most common complications of diabetes in oral surgical procedures by both the categories by Chi-square test with p = 0.4701 > 0.05.
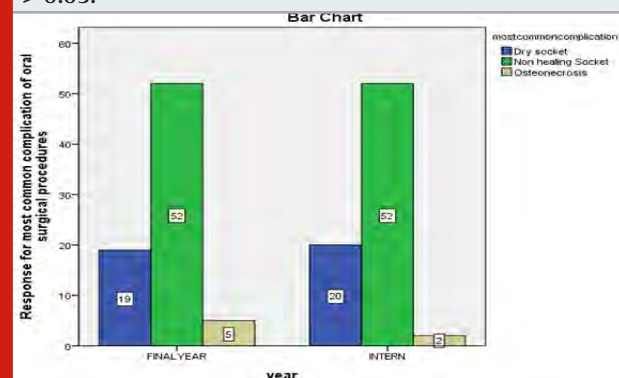
This shows the lack of correlating practical observation and knowledge to theory among students. The next set of questions was management of dental emergencies in diabetic patients and antibiotic cover for treatment. 90% of participants preferred referring patients to a hospital for physician consent. (Figure-7 & 8). Since the diabetic patients are immunocompromised the need for prophylactic antibiotics can be debatable and hence an experienced oral and maxillofacial surgeon can provide adequate care under a prophylactic coverage. Since the patient has seeked a dental treatment, it would be preferable to refer such patients to a maxillofacial surgeon when in doubt (Darré et al., 2008). Similar

studies conducted (Schaberg and Norwood, 2002; Dagogo-Jack, 2003, 2005; Fasanmade, Ogunsakin and Dagogo-Jack, 2019) also indicated identical results that many practitioners lacked complete knowledge about diabetes mellitus.
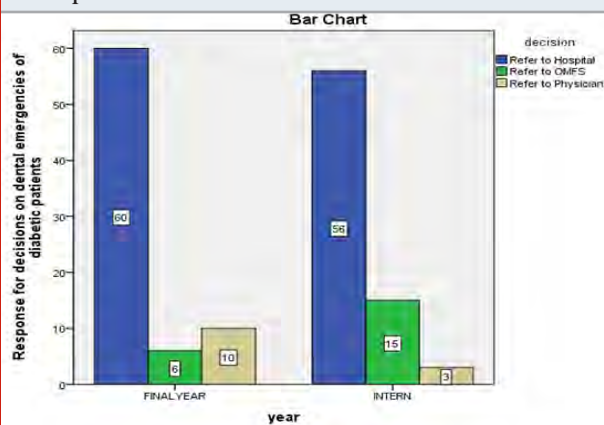
Figure 7: Bar graph representing the association between participants and response for decision in dental emergencies, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the decision in dental emergencies(Blue-Refer to Hospital; Green-Refer to OMFS; Grey-Refer to Physician).There was a statistically significant difference in the decisions made in dental emergencies by both the categories by Chi-square test with p = 0.027 < 0.05.


Figure 8: Bar graph representing the association between participants and response for decision in getting a physician consent, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the decision in getting a physician consent(Blue-No; Green-Yes).There was no statistically significant difference in the decisions for getting physician consent by both the categories by Chi-square test with p = 0.895 > 0.05.
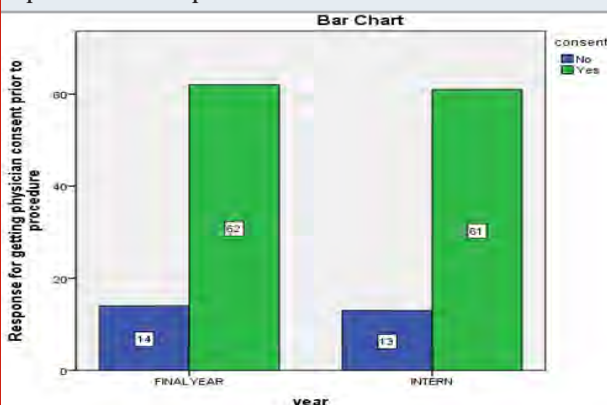
95% of participants used antibiotic coverage in all their diabetic patients for all minor surgical procedures, prophylactically and also postoperatively (Figure 9 &10).This is in accordance with studies stating the sepsis occurring even during minor oral surgical procedure due to moist environment and patients with long standing diabetes are prone to conditions like endocarditis which may be life threatening and hence prophylaxis by antibiotics is necessary(Benvenga et al., 2019).Thus majority of the participants of aware of such complications and were preferring antibiotics. Antibiotics are of different categories and are of different mechanisms of actions and there is an arguable point regarding the providing of the right group of antibiotic coverage with minimal adverse effects. The most preferred antibiotic for oral infections is the penicillin group with or without metronidazole as the indication may be (Tong and Rothwell, 2000; Ghosh, 2019). The survey result was in consensus with this evidence, wherein 70% of the participants preferred amoxicillin as the prophylactic coverage (Figure 11). But, operative care in case of diabetic patients does not stop with antibiotics as the disease by itself possesses a very vague pathophysiology.

Figure 9: Bar graph representing the association between participants and response for decision in prescribing antibiotic coverage, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the decision in prescribing antibiotic coverage(Blue-No; Green-Yes). There was no statistically significant difference in the decisions for prescribing antibiotics by both the categories by Chi-square test with p = 0.265 > 0.05.
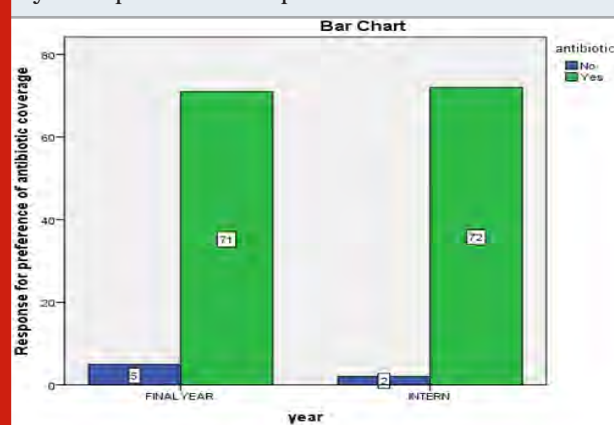
On undergoing any surgical intervention there would be release of stress adaptive hormones like catecholamines,c ortisol,glucagon which tends to lower insulin sensitivity. Henceforth it is necessary for a practitioner to ensure that the patient is under euglycemic state rather than being in hypoglycemic or hyperglycaemic state so that all these adaptive pathways are not disturbed. Patients who are under long acting forms of insulin should be switched to intermediate acting insulin about 1-2 days prior to surgical procedure. Also post operative checking for blood glucose is necessary to avoid any complications. But majority of the study population preferred going for a preoperative random blood sugar test and continuing treatment (Figure 12). Effective management of a diabetic patient begins with the dentist taking a thorough medical history and carrying out a review of systems. Dentists should collect information about the patient's recent blood glucose levels, at-home monitoring practices, frequency of HbA1C tests and their readings and the

frequency of hypo- or hyperglycemic episodes. Also, the dentist should review the current diabetes management plan, including doses and times of administration of all medications, as well as any lifestyle modifications, such as exercise or nutritional changes(Wang, 2006). Apart from this there are certain oral findings that can aid us in detecting diabetic conditions.

Figure 10: Bar graph representing the association between participants and response for duration in prescribing antibiotic coverage, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the duration in prescribing antibiotic coverage(Blue-Both; Green-Postop; Grey-Preop).There was a statistically significant difference in the decisions for duration of prescribing antibiotics by both the categories by Chi-square test with p = 0.013< 0.05.
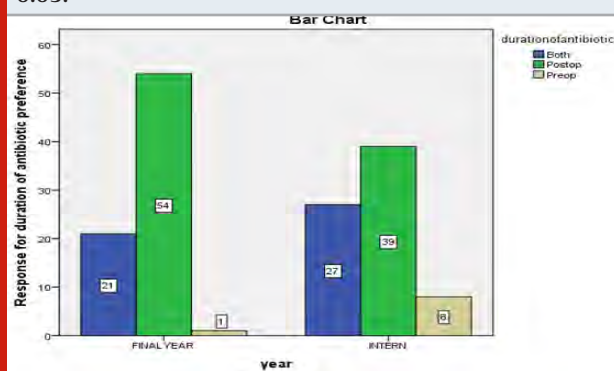

Figure-11 Bar graph representing the association between participants and response for type of antibiotic coverage prescribed, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the type of antibiotic coverage prescribed (Blue-Amox; Green-Amox+Clav.acid; Grey-Amox+Metronidazole Violet- Metronidazole). There was no statistically significant difference in the decisions for prescribing type of antibiotics by both the categories by Chi-square test with p = 0.413 > 0.05.
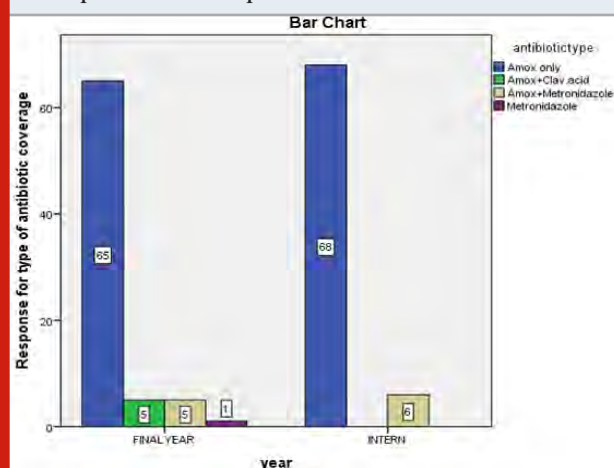
Oral manifestation of DM includes dry mouth,periodontitis,fissured tongue,burning mouth syndrome.All these features can be identified by clinical

examination. Precautionary measures can be taken to eliminate post operative risk factors. There are studies stating the relation between diabetes mellitus and dental caries. The principle behind this is that the immunocompromisation in DM causes even the natural flora of the mouth to cause caries by eroding the tooth structure and further complications add due to poor hygiene and lack of control of sugars (Bovonsantijid, 1997). There are many studies in literature showing strong association between inflammation(periodontitis) and type 2 diabetes mellitus(Loe, 1993).

Figure 12: Bar graph representing the association between participants and response for type of preop test preferred, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the type of preop test preferred(Blue-All; Green-Fbs; Grey-HbA1c; Violet-Rbs).There was no statistically significant difference in the preoperative test preferred by both the categories by Chi-square test with p = 0.215 < 0.05.
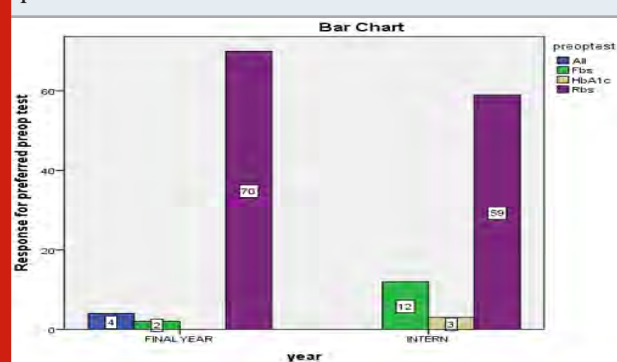

Figure-13 Bar graph representing the association between participants and response for oral finding of diabetes mellitus, where X-axis: Year of study (Final year, Intern), Y-axis: Responses for the oral finding of diabetes mellitus(Blue-All; Green-Candidiasis; Grey-Dry mouth; Violet-Periodontitis).There was a statistically significant difference in the knowledge regarding oral indicators of diabetes by both the categories by Chi-square test with p = 0.013<0.05.
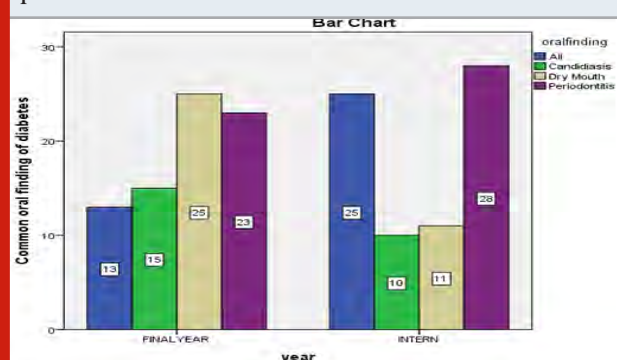
Most participants of the survey were aware of the oral indicators of diabetes mellitus (Figure 13). Oral tissue is normally protected by saliva which has slightly acidic pH.In case of diabetes there can be negative

regulation in salivary gland function and immune system which ultimately leads to change in the pH resulting in periodontal inflammation which lead to further infections(Lignalli, 2009).All these changes leads to decreased salivary production resulting in dry mouth.

CONCLUSION

From this survey, it can be concluded that dental graduate students have an overall awareness on the implications of diabetes mellitus in minor oral surgical procedures. However, there lacks an in-depth understanding and patient management approaches. Also there must be similar teaching and training protocol to be followed to avoid such differences in approach to a patient. Whether continuing medical education programmes or altered teaching planner will help in better understanding and comprehensive patient management needs to be evaluated with further studies.

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Awareness of Childhood Caries Among Parents in Andhra Pradesh

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ABSTRACT

Dental caries is the most common chronic disease of childhood, globally. Although dental caries' levels have been declining the world over, the problem of early childhood caries (ECCs) has remained unchanged in many areas of the world, especially the socially deprived.The survey is conducted among Parents in Andhra Pradesh. Self-structured questionnaires were prepared and circulated through an online portal, then the data collected, and results were tabulated. The results were collected and then analyzed through SPSS software. Descriptive statistical analysis was carried out and the chi-square test was used and the p-value was calculated.It was found that the parents knew that oral hygiene was important to general health but was unable to follow optimal oral hygiene practices. The reason for such poor maintenance and practice could be due to low educational low levels of awareness on oral hygiene practices, low economic status of the participants.There was a general lack of knowledge on methods of oral health maintenance even though the participants acknowledged that oral health was vital to general wellbeing. Routine dental camps should be conducted with clinicians demonstrating oral hygiene practices and performing check-ups

KEY WORDS: CHILDHOOD, CARIES, ORAL HYGIENE, FLUORIDE.

INTRODUCTION

Dental caries is the most common chronic disease of childhood, globally.(Silk et al., 2012) Although dental caries' levels have been declining the world over, the problem of early childhood caries (ECCs) has remained unchanged in many areas of the world, especially the socially deprived.(Bedi, Lewsey and Gilthorpe, 2000)

Dental caries affecting the primary dentition of preschool children are referred to as ECCs. ECC can be defined as "the presence of one or several decayed (non cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of six years."(Williams, Whittle and Gatrell, 2002; American Academy of Pediatric Dentistry, American Academy of Pediatrics and American Academy of Pediatric Dentistry Council on Clinical Affairs, 2005) .

ECCs is a multifactorial disease with an etiology that involves a complex interaction between biological and socioeconomic factors. It is classified as mild, moderate, and severe. In children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe ECCs (S-ECCs). From ages 3 through 5 years, 1 or more cavitated, missing (due to caries), or filled smooth surfaces

in primary maxillary anterior teeth or a decayed, missing, or filled score of ≥4 (age 3), ≥5 (age 4), or ≥6 (age 5) surfaces denote S-ECC.

ECC affects the deciduous dentition more commonly referred to as "milk" teeth. Deciduous teeth are very inappropriately referred to as "temporary teeth" when in reality they are responsible for general health, mastication, phonetics, esthetics, and self-esteem, and also psychological comfort. Deciduous teeth are an integral part of oral, general health, and affect the quality of life.(Sheiham, 2005) Deciduous teeth if infected by dental caries can cause pain and disfigurement making children uncooperative for extensive treatment, sometimes culminating the use of general anesthesia (GA). Treatment under GA in children is not without its associated risks. In addition, very few dentists are willing to do treatment in such young children due to its time-consuming nature, monetary returns and are not trained enough.(Almeida et al., 2000) (Tate et al., 2002)(Halawany et al., 2018).

Deciduous teeth and permanent teeth are explicitly related, and infection from deciduous teeth can directly pass on to permanent teeth. To maintain the permanent teeth uninfected, dental practitioners advise pulp therapy or extraction and many parents choose to get deciduous teeth extracted due to financial and time constraints. (Andreasen, Andreasen and Andersson, 2018)Deciduous teeth are also the "best natural space maintainer." Parents have responsibility for their child's oral health care. Preschool children are not capable of brushing themselves and lack the manual dexterity and the psychological maturity to understand the importance of maintaining oral health. (Wright and Kennedy, 1978) With changing lifestyles, a trend of having a single child, and increased cost of living, most of the parents are working with very little time left for performing day-to-day oral health care practices in their child's early years. Especially in preschool children, parental role is the most important aspect of maintaining good oral health.(Castilho et al., 2013)

Parents are role models for their children. Children learn habits by imitating their role models and the best way to teach them is to practice these oral hygiene practices ourselves. Dental caries is a preventable condition and if it is noticed at an early stage, children cooperate better and parents save their valuable time and money spent on dental treatments which are also inclusive of the loss of pay for multiple visits for the treatment. Hence, prevention at the root level, i.e., primordial prevention and oral health education of parents is essential as the preschool age group (2–4 years of age) is dependent on them for their oral health care needs. Later, from 2 years onward, oral health promotion strategies such as fluoridated toothpaste, etc., can be begun in cooperation with the parents. To attain these goals, one needs to assess the existing levels of knowledge, attitude, and practices bringing about the necessary changes. (Sankeshwari et al., 2012)

MATERIAL AND METHODS

This is a survey type study setting. This survey is taken among random parents of Andhra Pradesh. The sample size of this study is 100 participants. Parents are mainly included in this study. Search engines used in this study are PubMed and Elsevier accordingly. The self-structured questionnaire (mentioned below)of 10 questions has been prepared and circulated through an online survey portal link among the participants. The results were collected and then analyzed through SPSS software. Descriptive statistical analysis was carried out and the chi-square test was used and the p-value was calculated.(Sen et al., 2017; Duraisamy et al., 2019)(Ganapathy et al., 2016) (Jain, Ranganathan and Ganapathy, 2017)(Ashok and Suvitha, 2016)(Ajay et al., 2017).

Questionnaire

1. Gender?
2. Did you drink fluoridated water?
3. Are you aware that fluoride is indeed neurotoxin?
4. Can the potato chips,kurkure,lays cause decaying of teeth?
5. when does weaning initiate?
6. Is decaying of teeth transmissive?
7. According to you,What should be the diet for healthy teeth ?
8. Can night time bottle/breastfeeding causes decay of the teeth?
9. Are you aware of treatment for dental caries?

Figure 1: Pie chart represents that 49% are females (red) and 51% are males(blue) who participated in the survey.
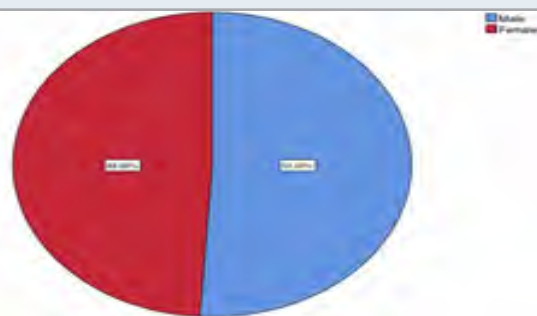

Figure 2: Pie chart represents that 69% of the participants are aware that they are consuming fluoridated water (blue), 31% of them responded that they are not consuming fluoridated water. (red)
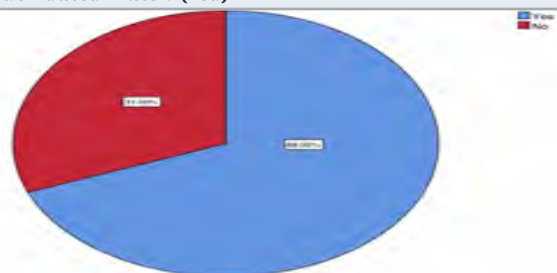
Figure 3: Pie chart represents that 75% (blue)of participants are aware that fluoride is indeed neurotoxin and 4% (red) of them are unaware.
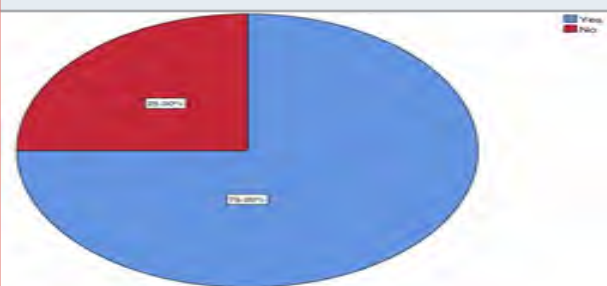
Figure 4: Pie chart represents that 75%(blue) of participants are aware that consumption of potato chips, kurkure, lays cause decaying of the teeth and 25%(red) of the participants responded that these can not be the reason for decaying teeth.

Figure 5: Pie chart represents that 44% (blue) of the participants responded that weaning initiates in infants, 33% (red) responded that weaning initiates at less than 5 years of age,17%(green) of them answered that weaning initiates at 5 years of age and 6%(orange) of them responded that weaning initiates at 10 years of age.
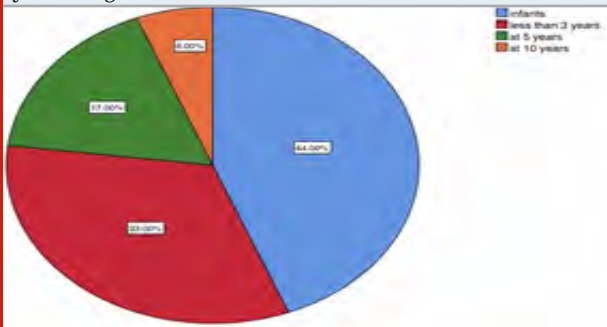
RESULTS AND DISCUSSION

The results of this survey, as per responses for the questionnaire collected from the participants. It was found that the parents knew that oral hygiene was important to general health but was unable to follow optimal oral hygiene practices. The reason for such poor maintenance and practice could be due to low educational low levels of awareness on oral hygiene practices, low economic status of the participants.FIGURE 1 49% are females and 51% are males participated in the survey.FIGURE 2 69% of the participants answered that they are consuming

fluoridated water and 31% of them responded that they are not consuming fluoridated water.FIGURE 3 75% of participants answered that they are aware of fluoride is indeed neurotoxin and 24% of them are unaware.FIGURE 4 75% of participants answered that consumption of potato chips, kurkure, lays cause decaying of the teeth and 25% of the participants responded that these can not be the reason for decaying teeth.

FIGURE 5 44% of the participants responded that weaning initiates in infants, 33% responded that weaning initiates at less than 5 years of age,17% of them answered that weaning initiates at 5 years of age and 6% of them responded that weaning initiates at 10 years of age.FIGURE 6 66% of the participants responded that decaying of teeth is transmissive and 34% of them answered that decaying is not transmissive. FIGURE 7 22% of the participants answered that protein-rich diet can be healthy for the teeth,6% of them responded that fat-rich diet is healthy,8% of them answered that carbohydrate-rich diet can be healthy for the teeth and 64% of them answered that all these are required for the healthy teeth.FIGURE 8 72% of the participants answered that night time bottle-feeding or breastfeeding can cause decay of the teeth and 28% of them responded that it cannot be the reason for decaying of the teeth.

Figure 6: Pie chart represents that 66% (blue)of the participants responded that decaying of teeth is transmissive and 34% (red) of them answered that decaying is not transmissive.
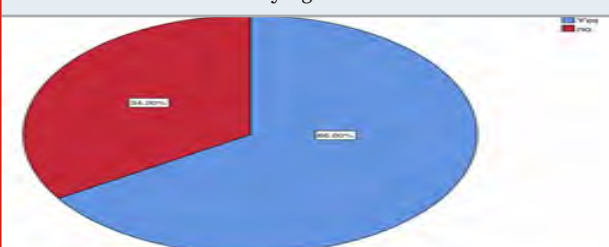
Figure 7: Pie chart represents that 22% (blue)of the participants answered that protein-rich diet can be healthy for the teeth, 6%(red) of them responded that fat-rich diet is healthy, 8%(green) of them answered that carbohydrate-rich diet can be healthy for the teeth and 64%(orange) of them answered that all these are required for the healthy teeth.
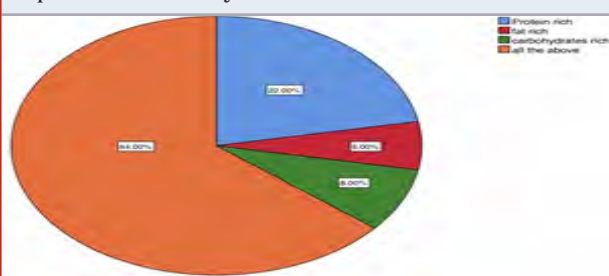
FIGURE 9 82% of the participants responded that they are aware of treatment for dental caries and 18% of them are unaware.FIGURE 10 The association between gender and healthy teeth by adding nutrients in the diet.X axis represents genders and Y-axis represents

the number of participants who responded to different dietary food for healthy teeth. Chi-square test was done and the association found to be statistically significant. Pearson's chi-square test showing p=0.001.(<0.05)hence statistically significant, proving females have better knowledge about diet healthy teeth than males. FIGURE 11 The association between gender and weaning age.X-axis represents genders and Y-axis represents the number of participants who responded to the age for weaning. Chi-square test was done and the association found to be statistically significant.

Figure 8: Pie chart represents that 72% (blue) of the participants are aware that night time bottle-feeding or breastfeeding can cause decay of the teeth and 28% (red)of them responded that it cannot be the reason for decaying of the teeth.
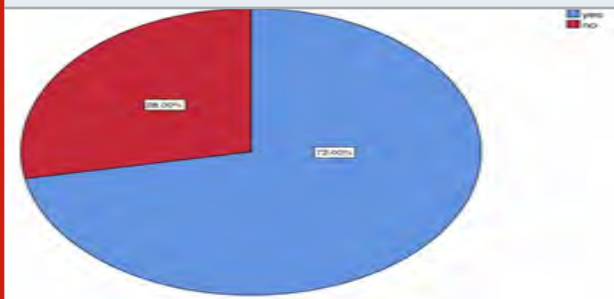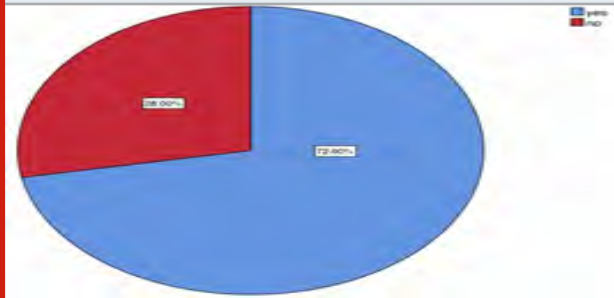

Figure 9: Pie chart represents that 82% (blue) of the participants responded that they are aware of treatment for dental caries and 18% (red)of them are unaware.

Pearson's chi-square test showing p=0.03(<0.05)hence statistically significant, proving males have better knowledge than females. FIGURE 12 The association between gender and consumption of fluoridated water.X axis represents genders and the Y-axis represents the number of participants who responded Whether consuming or not. Chi-square test was done and the association found to be statistically significant. Pearson's chi-square test showing p=0.005.(<0.05)hence statistically significant, proving males have consumed more fluoridated water than females.FIGURE 13 The association between gender and consuming junk foods can cause decaying of teeth.X-axis represents genders and Y-axis represents the number of participants who responded whether junk foods cause decaying of the tooth or not. Chi-square test was done and the association found to be statistically significant.

Pearson's chi-square test showing p=0.01.(<0.05)hence statistically significant, proving males have better

knowledge than females. FIGURE 14 The association between gender and awareness of treatment for dental caries.X axis represents genders and Y-axis represents the number of participants who responded aware and unaware. Chi-square test was done and the association found to be statistically significant. Pearson's chi-square test showing p=0.006.(>0.05)hence statistically significant, proving males have better awareness than females.

Figure 10: Bar graph represents the association between gender and healthy teeth by adding nutrients in the diet.X axis represents genders and Y-axis represents the number of participants who responded to different dietary food for healthy teeth. Chi-square test was done and the association found to be statistically significant. Pearson's chi-square test showing p=0.001.(<0.05)hence statistically significant, proving females have better knowledge about diet and healthy teeth than males. Blue represents protein-rich, red represents fat-rich, green represents carbohydrate-rich and orange represents all these nutrients in the diet.

Figure 11: Bar graph represents the association between gender and weaning age.X-axis represents genders and Y-axis represents the number of participants who responded to the age for weaning. A Chi-square test was done and the association found to be statistically significant. Pearson's chi-square test showing p=0.03(<0.05)hence statistically significant, proving males have better knowledge than females. Blue represents infants, red represents less than 3 years, green represents at 5 years and orange represents at 10 years.
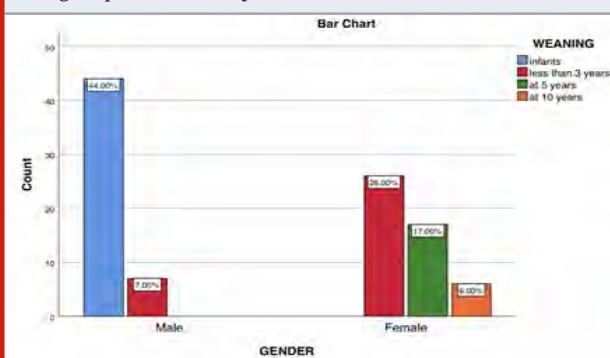
In addition, children with primary dentition affected by dental caries are prone to the development of dental caries in permanent dentition. Hence, children reinforced at an early age by their parents are motivated and trained for a lifetime.(Ariga et al., 2018)(Jyothi et al., 2017)(Selvan and Ganapathy, 2016)(Subasree, Murthykumar and Dhanraj, 2016)(Vijayalakshmi and Ganapathy, 2016)(Ganapathy, Kannan and Venugopalan, 2017)(Ashok

et al., 2014)(Venugopalan et al., 2014)(Kannan and Venugopalan, 2018)(Basha, Ganapathy and Venugopalan, 2018)Studies assessing the parent's ability to care for child's oral health reveal that parents do not have enough time, lack of knowledge in brushing, job/employment stress, and last but not the least, due to nuclear families and working parents many parents do not raise their children themselves and leave them at day-care centers or crèches.(Ashkanani and Al-Sane, 2013).

Figure 12: Bar graph represents the association between gender and consumption of fluoridated water.X axis represents genders and the Y-axis represents the number of participants who responded Whether consuming or not. Chi-square test was done and the association found to be statistically significant. Pearson's chi-square test showing p=0.005.(<0.05)hence statistically significant, proving males have consumed more fluoridated water than females. Blue represents yes, red represents no.
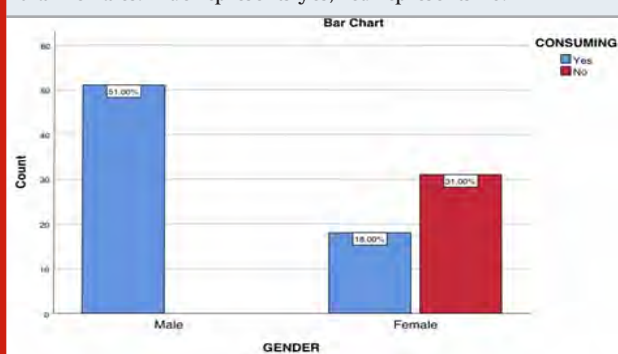

Figure 13: Bar graph represents the association between gender and consuming junk foods that can cause decaying of teeth. The X-axis represents genders and the Y-axis represents the number of participants who responded whether junk foods cause decaying of tooth or not. Chi-square test was done and the association found to be statistically significant. Pearson's chi-square test showing p=0.01.(<0.05)hence statistically significant, proving males have better knowledge than females. Blue represents yes, red represents no.
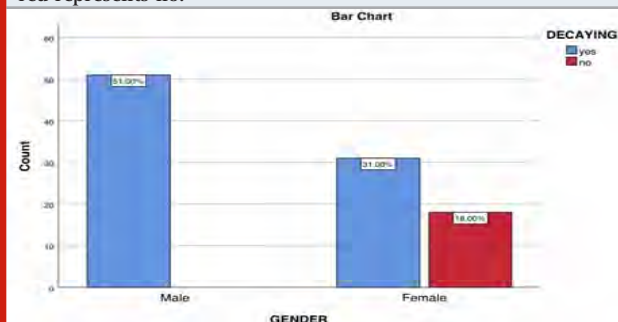

Several studies have found that good knowledge and attitude toward oral health does not necessarily produce good practices. (Alkhtib and Morawala, 2018)From this study, it is clear that awareness regarding bad practices is abundant which is indicated by the low prevalence, i.e. 18.5% approximately. This reveals an important take home message for us dentists that parents need to be trained and motivated to carry out oral hygiene practices in a proper way and efficiently. In addition, knowledge

regarding the use of fluoridated toothpaste (level of evidence for the use of fluoridated toothpaste is 1++ to 1+) and whether deciduous teeth need treatment appeared to below, i.e., 54% and 62.5%, respectively.

In addition, a general low score was found in the knowledge, attitude, and good practices in infant oral health care such as timing for a first dental visit, the ideal time to start the use of fluoridated toothpaste, need to restore deciduous teeth, ill-effects of the night time, frequent and prolonged breast/bottle feeding, harm caused by swallowing of toothpaste.(Alkhubaizi et al., 2018; Mamat, 2018) The role of bacteria in the causation of dental caries was not acknowledged by the majority of the parents which was reflected by the prevalent practice of sharing utensils and biting food into small pieces before feeding in this study. This is in accordance with studies by Mani et al. and (Naidu, Nunn and Irwin, 2015).

Figure 14: Bar graph represents the association between gender and awareness of treatment for dental caries.X axis represents genders and the Y-axis represents the number of participants who responded aware and unaware. Chi-square test was done and the association found to be statistically significant. Pearson's chi-square test showing p=0.006.(>0.05)hence statistically significant, proving males have better awareness than females. Blue represents yes, red represents no.
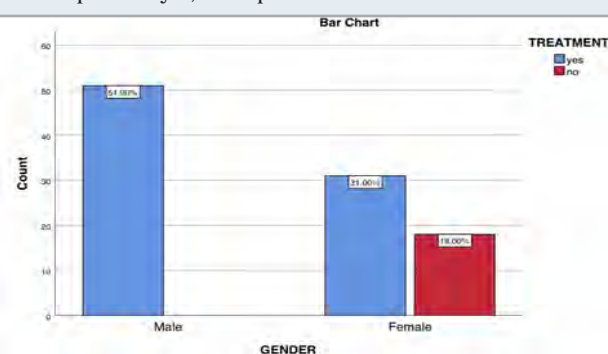
The focus should be on parents/carers to encourage to limit their practice of sharing utensils and biting food invited to carry out oral hygiene practices in proper way carers and children should be advised that foods and drinks containing sugar substitutes are available, but should be consumed in moderation. Sugar-free medicines should be used when available. Parents/carers should be encouraged to brush their child's age as soon as the first tooth appears, using a soft toothbrush and water only. Children who use a baby bottle should be advised never to put sweet drinks, including fruit juice, into the bottle and breast-feeding should not be practiced at the will of the child. Parents/carers should be advised not to let their child sleep or nap with a baby bottle or being breast-fed. (Ramesh Nagarajappa et al., 2013; R. Nagarajappa et al., 2013)Other studies also revealed that parents are aware of the fact that milk teeth are as important as permanent teeth and also affect the general health of the child. In spite of these facts being known to parents, their inability to take proper oral health care is indeed surprising, and the hurdles in practicing oral health practices along

with other reasons behind this situation can be further explored using qualitative study.

Limitation of the Study: The limitations of this study were that it was carried out in one institution only by convenience sampling or nonprobability sampling with a small sample size.

CONCLUSION

There was a general lack of knowledge on methods of oral health maintenance even though the participants acknowledged that oral health was vital to general wellbeing. Routine dental camps should be conducted with clinicians demonstrating oral hygiene practices and performing check-ups.

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