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Comparative Evaluation of Gingival, Periodontal and Plaque Status in Smokers and Smokeless Tobacco Users

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ABSTRACT

Tobacco is one of the most widely distributed and commonly used addictive substances. Tobacco can be consumed through the mouth in a variety of forms, varying from smoking to smokeless tobacco chewing on itself. It leads to various life threatening consequences like oral cancer, lung cancer, cardiovascular diseases. In the oral cavity, it mainly affects the periodontium giving rise to gingivitis and periodontitis leading to alveolar bone damage and tooth loss. The aim of this study is to compare the gingival, periodontal health and plaque status in smokers and smokeless tobacco users. A hospital based cross sectional study was conducted among 100 patients including 50 smokers and 50 smokeless tobacco users visiting the out patient department of a private Dental College. The data was obtained by questionnaire based history taking followed by the clinical examination of the relevant parameters. The result data was tabulated in excel and imported to SPSS for further analysis. Chi square tests were done for statistical analysis. There were 4%, 3% of smokers and smokeless tobacco users reported with high probing depth respectively. 15% of smokers and 12% of smokeless tobacco users reported with severe gingivitis. 11% of smokers and 16% of smokeless tobacco users reported with poor plaque index score. Smokers had poor gingival and periodontal health when compared to smokeless tobacco users had more plaque accumulation when compared with smokers. Prevention of tobacco users end support for cessation of the same could contribute to improved oral health status.

KEY WORDS: TOBACCO; SMOKING; SMOKELESS; CLINICAL; ORAL HEALTH.

INTRODUCTION

Today, around the world, tobacco is one of the most widely distributed and commonly used addictive substances(Dere et al., 2014)(Harini and Leelavathi, 2019). Tobacco is the common name of several plants belonging

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NAAS Journal Score 2020 (4.31) SJIF: 2020 (7.728) A Society of Science and Nature Publication, Bhopal India 2020. All rights reserved. Online Contents Available at: http://www.bbrc.in/ Doi: http://dx.doi.org/10.21786/bbrc/13.8/131 to the family Nicotiana. It mainly contains the highly addictive stimulant alkaloid nicotine as well as harmala alkaloids(Dere et al., 2014; Joshi and Tailor, 2016). The other chemicals found in the tobacco includes hydrogen cyanide, formaldehyde, lead, arsenic, ammonia, radioactive elements, such as uranium, Benzene, Carbon monoxide, Nitrosamines, Polycyclic aromatic hydrocarbons (PAHs) (Rani, 2003). The epidemic of tobacco use is one of the paramount threats to global health today(Petersen, 2003). Globally, around five million deaths every year are attributable to direct tobacco use, which is the largest preventable cause of death (Harsha et al., 2014)(Narain et al., 2011). In India, among people aged 30 years and over, the mortality due to tobacco use is 206 per 1, 00,000



in men and 13 per 1, 00,000 in women with proportion of deaths attributable to tobacco reaching 12% for men and 1% for women(Mathur et al., 2008).

Tobacco is been described as an important causative factor of death worldwide and also as a preventable risk factor to human health (Health, US Department of Health & Human Services: Centers for Disease Control and Prevention; National Center for Chronic Disease Prevention & Health Promotion and Office on Smoking Et Health, 2000). Tobacco is chewed, smoked, sucked, and sniffed and is the one product which is deleterious to the populaces, when it is used entirely as intended (Barbour et al., 1997). Tobacco can be consumed through the mouth in a variety of forms, varying from smoking to smokeless tobacco chewing on itself or combined with betel nut (Haas et al., 1996; Barbour et al., 1997). The few reports of tobacco smoking in different population groups report its prevalence from about 15% to over 50% among men (Ghosal et al., 1996). The common forms of tobacco smoking are cigarette, beedi, chutta and hookah, with cigarette being the most predominant form. Smoking tobacco is mostly seen in the urban population whereas in the rural areas and some parts of suburbans, people prefer smokeless tobacco(Chockalingam et al., 2013). Smokeless tobacco is used mostly in south East Asia.

In India, tobacco is smoked as a cigarette, beedi, cheroot, or in a pipe. The smokeless forms of tobacco are chewing raw tobacco leaves or pan masala, or inhaled as snuff(Giovino et al., 1995). Also one of the many smokeless tobacco forms available in India includes Gutkha, which contains areca nut, slaked lime, catechu, condiments, and powdered tobacco (Warnakulasuriya, Trivedy and Peters, 2002). As stated by the Global Adult Tobacco Survey, India, 2016–2017, the prevalence of smokeless tobacco use in India is 21.4% (Razali et al., 2005). According to the WHO study group, a smokeless tobacco user can have blood nicotine levels as high as, or even higher than, those found in tobacco smokers (Backinger, 1990). But the smoke being produced from smoking can produce more heat inside the oral cavity causing more inflammatory changes and increasing the risk when compared to that of smokeless tobacco usage (Backinger, 1990; Vineis et al., 2004). The usage of tobacco by smoking or by other forms does not have much difference in affecting the systemic condition of the user as the components are similar.

Tobacco use is a major risk factor for diseases such as cardiovascular diseases and lung cancer (Stämpfli and Anderson, 2009).

Apart from these systemic ill effects, epidemiological studies on the relationship between tobacco use and periodontal diseases have consistently shown that tobacco users are two to six times more prone to develop periodontitis than non-users (Vellappally et al., 2008) (Padavala and Leelavathi, 2019). Also it is a risk factor for oral cancer, oral mucosal lesions, periodontal disease and impaired healing after periodontal treatment, gingival recession, and coronal and root caries (Ariyawardana,

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Athukorala and Arulanandam, 2006)(Gautam et al., 2011; Leelavathi and Shreya, 2020). The affected site or lesion can be a white or yellow-brown color and it may develop a thickened and wrinkled appearance with increased use of the tobacco product. However, analyzing the clinical parameters of only smoking tobacco users is of limited use because they give partial details about the tobacco usage and its effects.

Thus a more accurate assessment of disease activity caused by smoking tobacco and using smokeless tobacco may assist with early intervention in patients with this disease. We have successfully completed numerous epidemiological studies for the betterment of our community(Patturaja, Leelavathi and Jayalakshmi, 2018; Murthy, Sindhu Priya Kuppusamy and Leelavathi, 2019; Shankar and Leelavathi, 2019; Sriram and Leelavathi, 2019) (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). In this study we compare the gingival and periodontal health in smokers and smokeless tobacco users.

MATERIAL AND METHODS

The present study was carried out to analyze and compare the clinical parameters of smokers and smokeless tobacco users. A hospital based cross sectional study was held among 100 patients consisting of 50 smokers and 50 smokeless tobacco users aged between 20 to 70 years. This retrospective study was conducted in the Out Patient Department of a private dental College, Chennai. Prior permission from the patients was taken for conducting the study.

Inclusion criteria: It includes all the patients aged between 20 to 70 years with the presence of at least 20 teeth. They should be periodontally untreated and free of any systemic illness.

Exclusion criteria: Chronically alcoholic patients with any systemic illness or presence of any periodontal abscess, necrotizing ulcerative gingivitis are excluded. Patients who had any previous periodontal treatment or under anti-inflammatory and antimicrobial drug therapy are also excluded from the study. Patients who had recent extractions or trauma to avoid false results are also not included in the study.

Clinical examination: Tobacco usage history was assessed according to a standardized interview and self-reported questionnaire. A detailed case history was then taken followed by a complete clinical examination. Tobacco usage was determined by the form in which it was used, frequency of usage, daily consumption (packets used daily) and how many years they have been using tobacco. The following clinical parameters were recorded. Probing depth, Gingival index and Plaque index. All of these parameters were checked with the help of Williams probe. The probing depth was determined in all the six

surfaces and was scored based on the probing depth range. The gingival health was scored as mild, moderate and severe based on the Loe and Silness index. Mild gingivitis is when there is mild inflammation with no edema, moderate gingivitis when there is moderate inflammation, redness and edema. Severe gingivitis when there is severe inflammation, marked redness and edema. Disclosing solutions were used and after rinsing the oral cavity was examined for the staining. The presence of plaque was noted and the surfaces which do not have soft accumulations at the dentogingival junction were not considered. Based on Loe's plaque index, it is scored as good when there is no or minimal plaque accumulation, fair when there is plaque accumulation in one third of tooth surface and poor when plaque accumulation is more than two third of tooth surfaces.

Data Analysis: Data tabulation was done in excel and the statistical analysis was done using the Statistical Package for the Social Sciences(SPSS). Results on categorical measurement were presented in percentage(%). Chi square test was done and the level of significance was predetermined at the probability value of P = 0.05 and any value 0.05 was considered to be statistically significant. Chi square test was done to assess the difference in the clinical parameters of smokers and smokeless tobacco users.

Table 1. Table showing the frequency in packets used in a day by the smokers. There is a higher percentage of smokers using 1 to 2 packets daily.

Frequency in packets/day	Percentage (%)	No. of patients(n)
Less than 1 packet	36%	18
1 - 2 packets daily	48%	24
More than 2 packets daily	16%	8

Table 2. Table showing the frequency in packets used in a day by the smokeless tobacco users. There is a higher percentage of smokers using 3 to 5 packets daily.

Frequency in packets/day	Percentage (%)	No. of patients(n)
1 - 2 packets daily	20%	10
3 - 5 packets daily	48%	24
6 to 10 packets daily	20%	10
More than 10 packets daily	12%	6

RESULTS AND DISCUSSION

This study was conducted to analyze the clinical parameters in smokers and smokeless tobacco users. Clinical parameters such as the probing depth, gingival index, plaque index were assessed for both smokers and smokeless tobacco users. Type of smoking tobacco preferred by the smokers includes 68% cigarette, 24% beedi and 8% chutta (Figure 1). Type of smokeless tobacco preferred by the reported patients includes 44% Paan, 36% Gutkha and 20 % Hans (Figure 2). The frequency in packets per day usage of smokers shows that 36% of them smoke less than a packet in a day. 48% of patients smoke one to two packets daily and the remaining 16% smoke more than 2 packets daily (Table 1). The frequency in packets per day usage of smokeless tobacco users shows that 20% of the patients use 1 to 2 packets daily, 48% of them use 3 to 5 packets and 12% of them use more than more packets daily (Table 2).

Table 3. Table showing the duration of habit in years of smokers and smokeless tobacco users. There is a higher percentage of smokers and smokeless tobacco users using it for 3 to 5 years when compared to other duration.

Duration of habit in years	Smokers	Smokeless tobacco users
Less than a year	16% (8)	12% (6)
1 - 2 years	32% (16)	36% (18)
3 - 5 years	28% (14)	28% (14)
6 - 10 years	20% (10)	16% (8)
More than 10 years	4% (2)	8% (4)

Figure 1: Pie chart showing the distribution of different smoke forms of tobacco preferred by the patients. The orange colour represents Cigarettes, red colour represents Beedi and gray colour represents Chutta. Cigarettes were the most commonly used tobacco form in the smokers when compared to the other forms.



The duration of habit among smokers shows that 16% of them have been using it in less than a year. 32% of the patients have used it between 1 to 2 years, 28% of them have been using it for 6 - 10 years and 4% of them have been using it more than 10 years. Similarly, 12% of the smokeless tobacco users have been using it in less than a year. 36% of the patients have been using it for 3 - 5 years, 28% of them have been using it for 6 to 10 years and 8% of them have been using it for more than 10 years. (Table 3). Age prevalence in the tobacco using patients showed that, among the age group of 20 to 35 years, 17% smokers and 8% smokeless tobacco users have reported. In the age group of 36 to 50 years, 24% smokers and 22% smokeless tobacco users have reported. 8% of smokeless tobacco

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users have reported in the age group of 51 to 65 years. 4% of smokeless tobacco users have reported above the age group of 65 years and 1% smokers have reported (Figure 3). P value is p=0.001 and hence it is statistically significant.

Figure 2: Pie chart showing the distribution of different smokeless tobacco forms used by the patients. The colour yellow represents Gutkha, green colour represents Paan and black colour represents Hans. Paan was the most commonly used tobacco form in the smokeless tobacco users when compared to the other forms.



Figure 3: Bar graph showing the distribution of different age groups in the smokers and smokeless tobacco users. X axis represents the age group and the y axis represents the number of patients. The blue colour represents the smokers, red colour represents the smokeless tobacco users. Though there exists statistical significance in the age group distribution, there is no clinical difference in the age group between smokers and smokeless tobacco users. Chi square statistical test was done and the p value was found to be 0.001(p value 0.05, statistically significant).



The association of probing depth in the tobacco users show that the probing depth in the range 1 to 4mm was high among smokeless tobacco users(16%) when compared to smokers(14%). The probing depth in the range 5 to 8mm was high among smokeless tobacco users(26%) when compared to smokers(25%). Smokers have probing depth in the range of 8 to 12mm (8%) when compared to smokeless tobacco users (4%). Above 12mm probing depth, more number of smokers have reported(4%) when compared to smokeless tobacco users(3%) (Figure 4). The probability value is p=0.001 and hence it is statistically significant. The gingival index in the tobacco users shows that more number of smokers reported mild gingivitis(24%) when compared to smokeless tobacco users (22%).

Figure 4: Bar graph showing the probing depth observed in smokers and smokeless tobacco users. X axis represents the probing depth and the y axis represents the number of patients. The blue colour represents the smokers, red colour represents the smokeless tobacco users. High probing depth was seen in the smokers when compared to smokeless tobacco users suggesting that smokers have high probing depth. Chi square statistical test was done and the p value was found to be 0.001(p value 0.05, statistically significant).



Figure 5: Bar graph showing the gingival index observed in smokers and smokeless tobacco users. X axis represents the gingival index score and the y axis represents the number of patients. The blue colour represents the smokers, red colour represents the smokeless tobacco users. Severe gingivitis based on gingival index was seen more in the smokers when compared to smokeless tobacco users suggesting that severe gingivitis was more prevalent among smokers. Chi square statistical test was done and the p value was found to be 0.027(p value 0.05, statistically significant).



Moderate gingivitis was seen more in smokeless tobacco users(15%) than the smokers(12%). Severe gingivitis was reported higher in smokers (15%) than the smokeless tobacco users(12%)(Figure 5). The probability value is p=0.027 and hence it is statistically significant. The plaque index report shows that 12% smokeless tobacco users and 11% of smokers have reported with good plaque status. More number of smokers have reported with fair plaque accumulation(28%) when compared to smokeless tobacco users (22%). Smokeless tobacco users have more plaque accumulation(16%) when compared to smokers (11%)(Figure 6). The probability value is p=0.002 and hence it is statistically significant.

Figure 6: Bar graph showing the plaque index score observed in smokers and smokeless tobacco users. X axis represents the plaque index score and the y axis represents the number of patients. The blue colour represents the smokers, red colour represents the smokeless tobacco users. Poor plaque index was seen in the smokeless tobacco users when compared to smokers suggesting that smokeless tobacco users have high plaque accumulation. Chi square statistical test was done and the p value was found to be 0.002(p value 0.05, statistically significant).



Tobacco usage has become one of the serious public health problems due to its adverse effects on systemic and oral health (Bergström, 1990). Every year 6 million people die from tobacco related diseases. Globally, tobacco causes about 71% of lung cancer, 42% of chronic respiratory diseases and about 10% of cardiovascular disease(Critchley, 2003). Earlier studies have shown the adverse effects of tobacco on the periodontium and have proved the tobacco usage is per se a risk factor in the etiology of oral disease(Beck and Offenbacher, 2001)(Haffajee and Socransky, 2001). Out of the various components of tobacco smoke, nicotine acts on the periodontal tissues causing destruction of the supporting tissues (Anand et al., 2013). Free radicals and peroxides from the tobacco are linked with physiological phenomena such as synthesis of prostaglandins and thromboxane, and they are also involved in the pathogenesis of various diseases including atherosclerosis, carcinoma, and inflammatory processes(Stämpfli and Anderson, 2009).

In our study the most used tobacco form by the smokers is cigarette followed by beedi(Figure 1). This finding is similar to the one reported in a study in Delhi(Narayan et al., 1996). Similarly the usage of paan was higher among the reported smokeless tobacco users(Figure 2) which is in accordance with few previous studies(Niaz et al., 2017). Age has been found to be an important determinant of tobacco use in earlier studies(Singh and Ladusingh, 2014) (Jha et al., 2008). In our study, there is a higher preference among the age group of 36 to 50 years in smokers and smokeless tobacco users. This is in accordance with a study in China(Figure 3)(Li, Hsia and Yang, 2011). The present study compared the clinical parameters of smokers and smokeless tobacco users. According to our study, the probing depth was higher in smokers (Figure 4) which is in agreement with earlier studies(Machuca et al., 2000; Weijden et al., 2001). The precise mechanism by which tobacco smoking influences the periodontal tissues remains unclear. Tobacco components can stimulate the production of proinflammatory cytokines, such as interleukin (IL)-1, IL-6, IL-8, tumor necrosis factor- α , as well as transforming growth factor- β , thereby promoting increased bone resorption and tissue destruction.

Tobacco users have reduced bleeding when compared to the general population (Kanakdande, Patil and Nayyar, 2015)(Baab and Ake Oberg, 1987). This can be attributed to the fact that tobacco users have decreased blood flow to the tissues of periodontium, which may manifest clinically as reduced bleeding on probing (Anil, 2008; Katuri, 2016). Smoking also causes immuno-inflammatory imbalances resulting in increased oxidative stress in the body. The latter hastens the inflammation process, which increases the susceptibility to infections and dental caries. In our study severe gingivitis was seen more among the smokers which is similar to the study of Haber(Haber et al., 1993)(Figure 5). Though smoking alters the vascular function, neutrophil, monocytes count, cytokines and inflammatory mediators, the gingival inflammation can be reduced with plaque removal(Haber et al., 1993; Linden and Mullally, 1994) (Lang, Cumming and Löe, 1973). It also destroys the surrounding microflora leading to decreased human immune response causing dental caries and alveolar bone damage thereby affecting periodontium. In our study, the plaque index score value shows that more number of patients reported with fair oral hygiene and slightly higher number of smokeless tobacco users reported with poor oral hygiene(Figure 6).

The rate at which plaque develops varies between individuals, and it may be deduced that the rate of development of gingival inflammation also will show variation(Ilankizhai and Leelavathi, 2018). The reasons why such differences occur has not yet been fully explained, but several factors may act indirectly and it is possible that one of these might be tobacco usage(Genco, Evans and Ellison, 1969)(Jensen et al., 1968)(Mahapatra et al., 2018)(Akhter et al., 2007; Parmar et al., 2008; Agili, Al Agili and Park, 2013). Also, it is stated that it has a stronger potential of leading to addiction compared to chewing tobacco because of its higher nicotine concentration and prolonged mean usage time(Parmar et al., 2008). This clearly states that using tobacco in any form affects the oral and systemic health. The results of the study have provided valuable data by comparing the gingival and periodontal health of smokers and smokeless tobacco users. This information would be useful for the oral health planners to create awareness among the general population regarding its adverse effects. The dental clinicians can provide proper diagnosis and management setup with these details before any specialised procedure.

CONCLUSION

Within the limits of the present study, smoking tobacco is said to have undeniably adverse effects on gingival and periodontal health status of the patients when compared to smokeless tobacco users. Similarly, the plaque index was higher among the smokeless tobacco users suggesting that smokeless tobacco users have poor plaque status. Moreover, the frequency and duration of the habit were directly associated with the above mentioned oral health related conditions. Tobacco is clearly a big burden in terms of its magnitude and use in different forms. The present research further emphasizes on the need to educate and promote awareness about tobacco products. Advising patients to quit tobacco use is a dental professional responsibility, and the dentists may take an active role in nicotine replacement counselling.

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