Dental
Communication

Biosc.Biotech.Res.Comm. Special Issue Vol 13 No (7) 2020 Pp-400-405

BBRC
Bioscience Biotechnology
Research Communications

# 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

ARTICLE INFORMATION

*Corresponding Author: ganesh.sdc@saveetha.com
Received 15th June 2020 Accepted after revision 9th August 2020
Print ISSN: 0974-6455 Online ISSN: 2321-4007 CODEN: BBRCBA

*Thomson Reuters ISI Web of Science Clarivate Analytics USA and Crossref Indexed Journal*

Clarivate Analytics

crossref

*NAAS Journal Score 2020 (4.31) SJIF: 2020 (7.728)*

*Online Contents Available at: http//www.bbrc.in/*
*Doi: http://dx.doi.org/10.21786/bbrc/13.7/66*

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

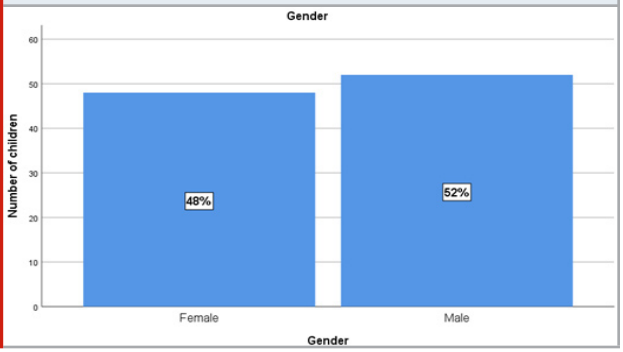
The final data set consisted of 100 children within the range of 3-12 years who were assessed for Maxillary labial frenum morphology and Midline diastema.

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.

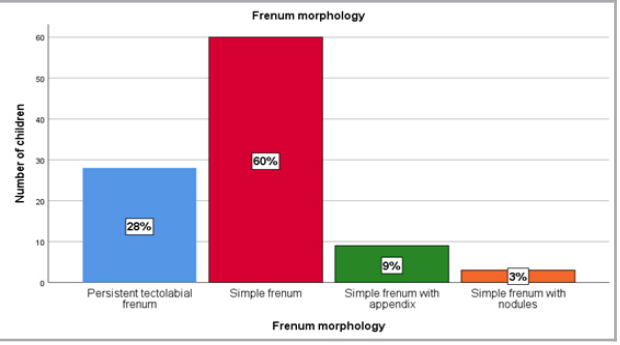
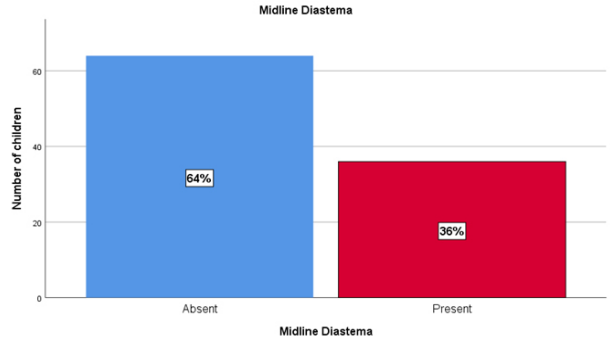



Figure 3: bar chart depicts Midline diastema among the study population (N=100). X axis represents the Midline diastema and Y axis represents the number of children. 36% of the children were diagnosed with Midline diastema.




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.

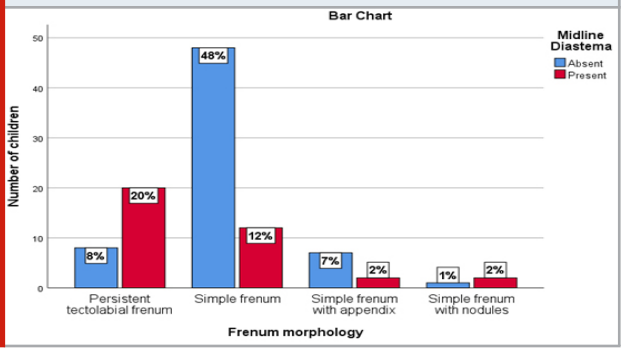
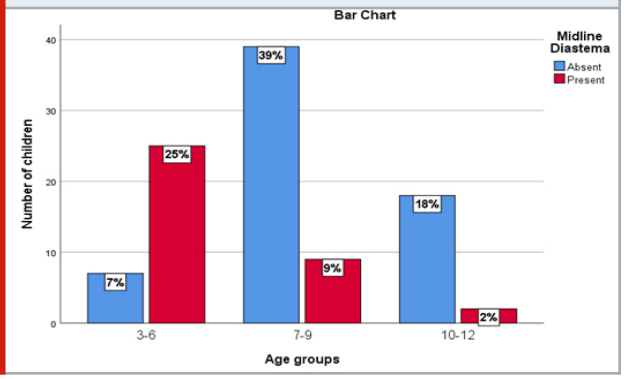



Figure 5: Bar graph depicting the association between Age groups and Midline diastema. X-axis represents the age groups and y-axis represents the number of children. Blue depicts absence of Midline diastema, whereas red depicts the presence of Midline diastema. There was a statistically significant association 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

## ACKNOWLEDGEMENTS

The authors of this study would like to express their gratitude towards everyone who facilitated and enabled us to carry out this study successfully.

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