

Frenal attachment and its association with oral hygiene status among adolescents in Dakshina Kannada population: A cross-sectional study

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ABSTRACT

Background and Objective: Frenum is a mucous membrane fold that attaches the lip and the cheek to the alveolar mucosa, gingiva, and the underlying periosteum. The frena may jeopardize the gingival health when they are attached too closely to the gingival margin, either due to interference in the plaque control or due to muscle pull. Identifying labial frenum attachment and its association with oral hygiene helps in primary prevention of gingival health. The purpose of this study was to examine the prevalence of the various types of maxillary labial frenum attachment and its association with oral hygiene status in adolescent population. **Methodology:** A total of 300 adolescents between 13 and 18 years were selected randomly. They were clinically examined for maxillary frenum attachment. Placek's classification of the labial frenum attachments was used to check the origin of frenum. Oral hygiene index (simplified) was recorded and results were subjected to statistical analysis. **Results:** Among 300 examined children 53% were males and 47% were females. The prevalence of the maxillary labial frenum was gingival type (39%) followed by mucosal (28.3%), papillary (23.7%), and papillary penetrating type (9.0%). The gingival type of frenal attachment was statistically significant among different age of children and also between different types of frenal attachment and oral hygiene status (p value < 0.001). There was no significance between frenum attachment and gender. **Conclusion:** The type of frenal attachment is strongly associated with oral hygiene status. as the age progresses the frenum tends to migrate apically. However, our study did not reveal any relationship between the gender and type of frenal attachment.

Keywords: Frenum, gingival, mucosal, oral health, papillary, papillary penetrating, prevalence

Introduction

The frenum is a collagenous fibrous tissue fold of the mucous membrane connecting the lip to the alveolar process in the midline of both maxilla and mandible. Any abnormalities in the size and location of the frenulum can cause functional and

esthetic problems which requires surgical excision.^[1] The frenum, which embryologically originates as remnant of the central cells of the vestibular lamina at the midsagittal area,^[2] consists primarily of connective tissue and epithelium and occasionally contains muscle fibers.^[3,4]

The size and location of the frenum varies among individuals and it inserts into the soft tissues covering the alveolar process. When the frenum inserts into the gingiva in a manner that allows the frenum to retract the gingival margin, to facilitate diastema development, or to limit lip movement, it is considered abnormal.^[5,6]

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Received: 02-08-2019

Revised: 21-08-2019

Accepted: 30-08-2019

Published: 15-11-2019

Access this article online

Quick Response Code:



Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_611_19

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How to cite this article: Divater V, Bali P, Nawab A, Hiremath N, Jain J, Kalaivanan D. Frenal attachment and its association with oral hygiene status among adolescents in Dakshina Kannada population: A cross-sectional study. J Family Med Prim Care 2019;8:3664-7.

The primary function of the labial frenum is to support or provide stability to the upper lip and to keep the lip in harmony with the growing bones of the maxilla. Thus, it contributes to the regulation of the facial growth. A frenum that is attached too close to the gingival margin can cause diastema, gingival recession, bone loss due to the muscle pull, poor lip mobility, especially during smiling and speaking.^[7]

The maxillary labial frenum is also a local anatomic factor that affects the accumulation and retention of plaque and can interfere with effective tooth brushing. In adults, an abnormal frenum might contribute to the establishment and progression of periodontal disease, increase the difficulty in controlling gingival recession, and influence the fit or retention of dentures.^[8]

Placek *et al.*^[9] introduced a clinical morphological classification of maxillary frenum insertion, depending on the anatomic location of attachment. They classified frenum attachment based on whether the attachment was located in the mucogingival junction, the attached gingiva, the interdental papilla, and through the interdental papilla right up to the palate.

The prevalence of different types of maxillary labial frenum has been examined in adults, but studies utilizing this classification in adolescents are lacking. Furthermore, the prevalence of different types of frenum attachment and its association with oral hygiene status has not been studied. The aim of the present study is to determine the prevalence of the various types of maxillary labial frenum attachment and its association with oral hygiene status among adolescents in Dakshina Kannada.

Methodology

Study design and study population

A cross-sectional study was done among children aged 13–18 years studying at different schools of Dakshina Kannada district, Karnataka, India. Ethical clearance is taken from KVG dental college, Sulia in month of September 2014 and informed consent were obtained from all subjects.

A total of 300 systemically healthy children were recruited for the study. Children with orofacial anomalies, history of surgical intervention in the maxillary labial area, or on medications known to affect the gingiva (e.g. phenytoin) were excluded.

Clinical examination: A single trained examiner recorded Frenal attachment type and OHI (Simplified)^[10] index. Frenal attachment was categorized into four types according to the classification of Placek *et al.*^[9]

The four types of frenal attachment were defined as follows:

(a) Mucosal. (b) Gingival. (c) Papillary. (d) Papillary penetrating.

Mucosal [Figure 1a]: Frenum inserting up to and including the mucogingival junction with no evidence of crossing into the attached gingiva.



Figure 1: (a) Mucosal type. (b) Gingival type. (c) Papillary type. (d) Papillary penetrating type

Gingival [Figure 1b]: Frenum inserting into the attached gingiva and not extending coronal to the line demarcating the base of the midline papilla. The line demarcating the base of the midline papilla was defined as the line connecting the gingival zeniths of the two central incisors.

Papillary [Figure 1c]: Frenum inserting coronal to the line demarcating the base of the midline papilla without any visible evidence of frenum extension to the palatal aspect or of blanching anywhere on the palatal aspect of the midline papilla or on the incisive papilla, even when further tension was applied to the frenum.

Papillary penetrating [Figure 1d]: Frenum inserting coronal to the line demarcating the base of the midline papilla combined with visible evidence of frenum extension to the palatal aspect or of blanching anywhere on the palatal aspect of the midline papilla or on the incisive papilla when further tension was applied to the frenum.

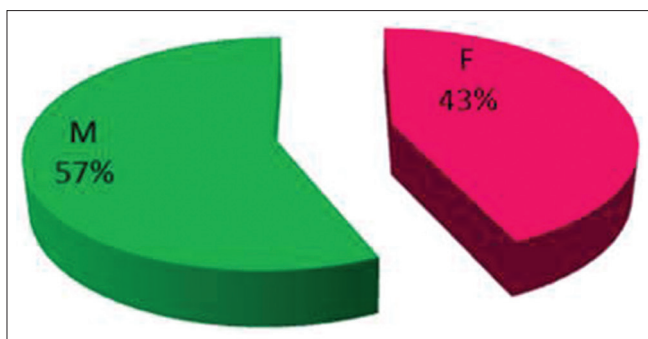
Data analysis

Statistical analysis was done using SPSS version 23. The association of frenum type with age, gender and oral hygiene status was examined using Chi-square test. Post hoc analysis of differences between specific groups was performed using the Mann-Whitney test. ($p = 0.05$).

Results

The mean age of 15.3170 ± 1.5 years was noted among study subjects. A total of 101 children were 13–14 years old, 123 were 15–16 years old, and 74 were 17–18 years old. And 170 children were males (56%) and 130 females (43%) [Graph 1].

The most common frenum attachment [Graph 2] type was the gingival type (39%), whereas papillary-type attachments were less common, the least common type of attachment was the papillary penetrating one (9%).



Graph 1: Gender distribution of frenal attachment

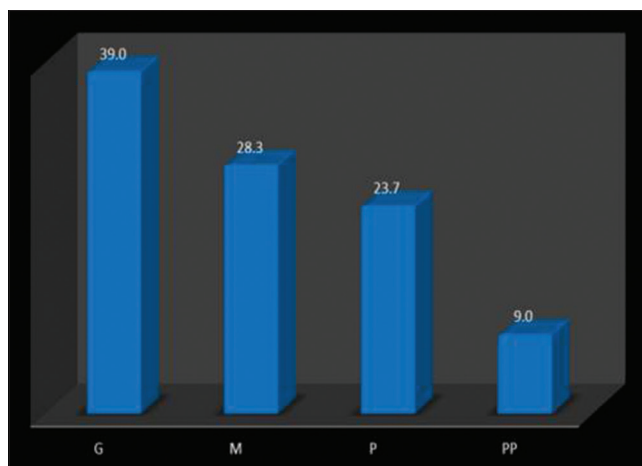
The frenum-type frequency distribution was examined in relation to age, gender, and its association with oral hygiene status. There were no statistically significant differences in frenum-type distribution between genders ($p = 0.528$) [Table 1]. Frenum distribution, however, varied by age ($p = 0.00$). Age differed significantly among children with different type of frenum attachment ($p = 0.0006$). Children with gingival type frenum were the oldest, while children with papillary type frenum were the youngest among all groups [Table 2]. There was statistical significance among different types of frenal attachment and oral hygiene status [Table 3]. Among different types of frenal attachment, post hoc analysis revealed that children with gingival type ($n = 117$) and papillary type ($n = 71$) of frenum attachment were statistically significant. ($p < 0.01$) [Table 4].

Discussion

Abnormal frenum and muscle pull has been considered detrimental to periodontal health. A tight or abnormal frenal attachment may also contribute to the failure of healing of traumatic injuries, restrict movement of the lip, contribute to speech abnormalities, and create undesirable esthetics in the anterior teeth.^[11] The present cross-sectional study was conducted to know the prevalence of various frenum attachments and its association with oral hygiene status so that reinforcement of oral hygiene habits can be implemented in these groups to avoid clinical problems as a preventive measure. Several surgical procedures to deepen the vestibule as well as to reduce the height of frenal attachments have been developed as preventive therapeutic measures.^[12]

The present study shows that gingival type of attachment was prominent in 39% of children followed by mucosal in 28.3% of children. The papillary type was observed in 23.6% and least was papillary penetrating type (9%). The results comparable with the study done by Mirko *et al.*,^[13] where authors found mucosal (46.6%), gingival (34.3%), papillary (3.1%), and papillary penetrating (16.1%) as prevalence of various frenal attachments. Similar results were reported by Jańczuk and Banach.^[14] The slight difference in the results could be due to the diversity of population. In gender-based comparison, no statistically significant difference was found which was similar to the study done by Townsend *et al.*^[15]

Popovich *et al.*,^[16] reported that from age 9 to 16, the frenum attachment might move from a more coronal to a more apical



Graph 2: Prevalence of different types of frenal attachment

Table 1: Correlation between different types of frenal attachment and gender

Sex	Type of frenal attachment in %				Total
	Gingival	Mucosal	Papillary	Papillary penetrating	
F	45 34.6	41 31.5	31 23.8	13 10.0	130 100.0
M	72 42.4	44 25.9	40 23.5	14 8.2	170 100.0
Total	117 39.0	85 28.3	71 23.7	27 9.0	300 100.0

Chi square test=2.221, $P=0.528$, Not significant

Table 2: Correlation between different types of frenal attachment and age of the children

Age (in years)	Type of frenal attachment				Total
	Gingival	Mucosal	Papillary	Papillary penetrating	
13	19 31.7	6 10.0	25 41.7	10 16.7	60 100.0
14	13 30.2	6 14.0	16 37.2	8 18.6	43 100.0
15	7 35.0	7 35.0	6 30.0	0 0	20 100.0
16	39 37.9	45 43.7	14 13.6	5 4.9	103 100.0
17-18	39 52.7	21 28.4	10 13.5	4 5.4	74 100.0
Total	117 39.0	85 28.3	71 23.7	27 9.0	300 100.0

Chi square test=57.177, $P=0.000 < 0.001$, Highly significant

Table 3: Correlation between different types of frenal attachment and oral hygiene status

Type of frenum attachment	n	Mean 70±SD
Gingival	117	0.70±0.47
Mucosal	85	0.75 70±0.66
Papillary	71	0.85 70±0.37
Papillary penetrating	27	0.92 70±0.41
Total	300	0.77 70±0.51

$P < 0.001$ highly significant

position, while movement in the opposite direction was never detected. The results of this longitudinal assessment are

Table 4: Post hoc analysis for oral hygiene index (S)

Type of frenal attachment	P	Significance
Gingival type		
Mucosal type	0.329	NS
Papillary	0.870	NS
Papillary penetrating	0.026	S
Mucosal type		
Papillary	0.321	NS
Papillary penetrating	0.178	NS
Papillary		
Papillary penetrating	0.034	S

S=Significant, NS=Nonsignificant

consistent with the results of the present cross-sectional study, where the children with the most coronal attachment were, on average, the youngest. The apical migration of the frenum is due to growth of alveolar process in a coronal direction.

Addy *et al.*,^[17] studied the effects of frenal attachment, upper lip coverage, and mandibular vestibular depth on plaque and bleeding indices in the maxillary and mandibular anterior segments. The position of the mandibular labial frenum was relatively unimportant to plaque and mandibular gingivitis, but anterior frenal attachment in the maxilla appeared to affect the retention of plaque and the degree of gingivitis. The results of study support the present study, this finding helps to identify children having abnormal frenum attachment and reinforce preventive oral hygiene measures.

The overall evidence indicates that the attachment of the frenum in children will shift to a more apical position with increasing age.^[18] While there is strong evidence for age-dependent differences in frenum attachment and oral hygiene status, there is little, if any, evidence to support gender-dependent differences. The limitations of present study are limited sample size, limited age group selection and did not include adverse oral habits. The future research can be carried out including different age groups with inclusive of adverse effects on oral health and also by considering the relation between frenal attachment and periodontal status of the samples.

Conclusion

In children, age consideration is very important in deciding treatment options for frenum and differences in gender do not have significance in type of frenum attachment. The clinician should be aware of morphology of the frenal attachment before planning for any surgical intervention, as it may change its position as the child grows older. Papillary and papillary penetrating type of the frenal attachment showed relatively poor oral hygiene status compared to other types.

Acknowledgement

To all the study participants and school authorities Dakshina Kannada.

Financial support and sponsorship

Self-sponsored.

Conflict of interest

There is no conflict of interest.

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