Original Article

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Maxillary labial frenulum attachment among patients visiting a tertiary level hospital of Nepal

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Abstract

Background: The maxillary labial frenum is frequently inserted in the mucogingival junction. However, it may show variation in attachment. Despite the fact that an aberrant labial frenum has been associated to a range of syndromic and non-syndromic disorders, it is frequently overlooked during routine intraoral examinations.

Objectives: To find the prevalence of types of maxillary labial frenum attachment in patients visiting tertiary hospital in Nepal.

Methods: This analytical cross-sectional study comprised of 140 patients visiting the dental outpatient department of Tribhuvan University Teaching Hospital from December 23, 2021 to March 13, 2022. Investigators assessed the patient's frenum insertion in the dental chair with the lip softly pulled away from the alveolar process in a nearly horizontal direction under good lighting. Data were entered and analysed statistically using SPSS.v21 where mean, standard deviation, frequency, and percentage were calculated depending upon the nature of data. Fisher's exact test was done to determine the association of age category and sex with the types of frenulum attachment.

Results: Most of the individuals (83, 59.3%) had the mucosal type of frenum followed by gingival (46, 32.9%), papillary (9, 6.4%), and least with papillary penetrating (2, 1.4%). Age and sex did not show any association with types of frenulum attachment.

Conclusion: The insertion level of the labial frenum may vary, implying the significance of careful assessment during an intraoral examination. It also suggests that in presence of the abnormal attachment, an effective treatment approach planned timely could prevent gingival and interdental papilla pathological alterations.

Key words: Maxillary labial frenum attachment; Nepal; Patients; Tertiary hospital.

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INTRODUCTION

The frenum is a band of fibroelastic tissue and develops embryologically as a remnant of the vestibular lamina's central cells in the midsagittal area. Both the maxilla and the mandible have a labial frenum located in the midline.[1-3]

The size of the frenum and the point at which it penetrates the soft tissues differ from person to person. When the frenum inserts into the gingiva in a location that allows it to retract the gingiva, it results in a midline diastema or restriction of lip mobility.[4,5]

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Maxillary labial frenum has been linked to midline diastema, which prevents central incisors from making contact; it can delay orthodontic treatment and result in post-orthodontic relapse;[6] and it may also contribute to caries development in nursing children.[7]

To aid physicians identify functional impairments that require therapy, Mirko et al.[8] gave clinical morphological classification based on the anatomic site of attachment. The placement of frenum attachment in the mucogingival junction, attached gingiva, interdental papilla, and up to the palate through the interdental papilla described the frenum attachment. This analytical cross-sectional study aimed to identify the prevalence of maxillary labial frenum attachment in patients visiting dental outpatient department of Tribhuvan University Teaching Hospital, Kathmandu, Nepal.

METHODOLOGY

This was an analytical cross-sectional study conducted among patients visiting the dental outpatient department of Tribhuvan University Teaching Hospital, Nepal from December 23, 2021 to March 13, 2022. Ethical clearance for the study was obtained from Institutional Review Committee, Institute of Medicine [Ref. 222 (6-11) E2 078/079]. Informed consent was obtained from the patients before conducting the study and from parents/guardians in case of minors. The sample size was calculated using the prevalence of 50.7% labial frenum attachment seen in the study done by Biradar et al.[9] using the following formula: Sample size = $Z_{1-a/2}$ $p(1-p)/d^2=1.96^2 \times 0.507(0.493)/0.1^2$; where, Z = 1.96; n = minimum desired sample size; p = 0.507 (50.7%); q = 1-p = 1-0.507 = 0.493 and d = 0.1 (10% margin of error). From the above formula, the minimum desired sample size was estimated to be 96.02 ≈ 97. However, 140 patient data were collected. Convenience sampling was used to collect the study samples. All the patients with the age ranging between 12 to 71 years who came for routine dental treatment in Tribhuvan university hospital, Kathmandu, Nepal, and were willing to participate in this study were included. The patients with previous orthodontic treatment, surgical treatment in the anterior maxilla or craniofacial anomalies/congenital syndrome, and patients who had taken any drugs that were known to have an effect on the gingiva were excluded in the study.

The demographic details of the participants were recorded. The frenulum attachment was examined by two investigators with lips gently stretched away from the alveolar process in an almost horizontal direction under adequate lighting. The frenulum attachment was categorised according to the classification of Mirko et al.[8] into four types- mucosal, gingival, papillary, and papillary penetrating.

The data were entered and analysed statistically using Statistical Package for the Social Sciences (SPSS) Statistics for Windows, version 21.0 (IBM corp., Armonk, N. Y., USA) with a confidence level set at 95% (p-value <0.05) to test for significance. Descriptive statistics were used to examine the data (frequency and percent). The correlation between age group and sex with frenulum attachment types was determined using Fisher's exact test.

RESULTS

There were 63 (45%) males and 77 (55%) females among the 140 patients (Table 1). The mean age of the patients was 30.59 ± 15.43 years. The prevalence of frenum attachment was mucosal in 83 (59.3%), gingival in 46 (32.9%), papillary in nine (6.4%), and papillary penetrating in two (1.4%) (Figure 1).

The males showed the prevalence of mucosal frenum in 43 (68.2%), gingival in 16 (25.4%), papillary in three (4.8%), and papillary penetrating in one (1.6%). The females showed the prevalence of mucosal in 40 (51.9%), gingival in 30 (39%), papillary in six (7.8%), and papillary penetrating in one (1.3%). The maxillary labial frenulum did not exhibit any sexual dimorphism.

The individuals less than 20 years showed the prevalence of mucosal in 30 (66.7%), gingival in 12 (26.7%), papillary in two (4.4%), and papillary penetrating in one (2.2%). While the individuals of 21 to 40 years showed the prevalence of mucosal in 33 (51.6%), gingival in 24 (37.5%), papillary in six (9.4%), and papillary penetrating in one (1.6%). The individuals of 41 to 60 years showed the prevalence of mucosal in 16 (69.6%), gingival in six (26.1%), papillary in one (4.3%), and papillary penetrating in none. The individuals of more than 60 years showed the prevalence of mucosal in four (50%), gingival in four (50%), papillary in none and, papillary penetrating in none.

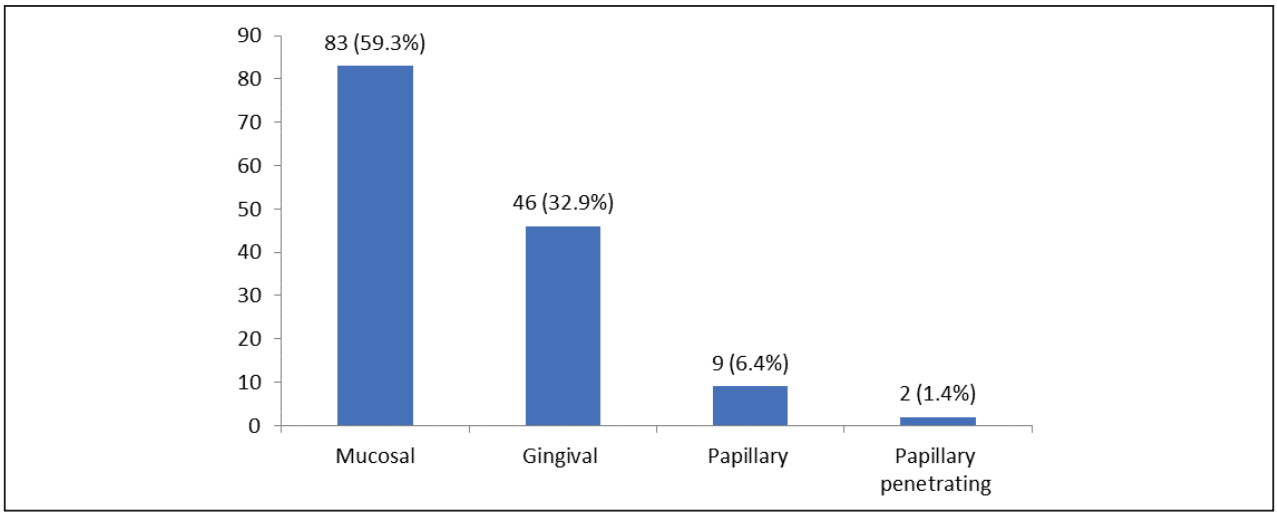


Figure 1: Distribution of study participants according to frenum type (N = 140)

Table 1: Association of demographic variables with types of the frenum

Characteristics	Category	Types of frenum n (%)				Total (N)	p -value
		Mucosal	Gingival	Papillary	Papillary penetrating		
Sex	Male	43 (68.2)	16 (25.4)	3 (4.8)	1 (1.6)	63	0.216
	Female	40 (51.9)	30 (39)	6 (7.8)	1 (1.3)	77	
Age category (years)	≤20	30 (66.7)	12 (26.7)	2 (4.4)	1 (2.2)	45	0.745
	21-40	33 (51.6)	24 (37.5)	6 (9.4)	1 (1.6)	64	
	41-60	16 (69.6)	6 (26.1)	1 (4.3)	-	23	
	>60	4 (50.0)	4 (50.0)	-	-	8	

Fisher's exact test

DISCUSSION

The alveolar mucosa is attached to the lips by labial frenal attachments, which are small folds of mucous membrane with enclosed muscle fibers originating from the orbicularis oris muscle of the upper lip. Its main function is to support the upper lips.[10,11]

The literature has detailed the many forms of maxillary labial frenulum. The mucosal type is inserted up to and including the mucogingival junction with no signs of bridging into the associated gingiva.[8] In the present study, mucosal was the most prevalent type similar to the other studies done in the Nepali population such as the studies by Chaulagain et al.,[12] Rajkarnikar et al.,[13] and Joshi et al.,[14] where the prevalence were 100%, 70.5%, and 60% respectively.

However, it contradicts the study done by Upadhyay and Ghimire[15] where the gingival type of attachment was the most predominant type. The variation in the level of attachment may be due to the fact that the study was done in children between 1-14 years of age while the rest of the study mentioned above was done in the adult age group. As the age of the child progress, the frenum appears to move along the labial surface of the alveolar process. This movement is relative during the primary dentition because the frenal attachment remains in place while the new bone deposits raise the alveolar ridge's height. However, as the permanent maxillary central incisors erupt into the oral cavity, the maxillary arch undergoes accelerated vertical growth.[16] Similarly, the studies from the other population such as Italy (100%),[17] Poland (39%),[18] Pakistan (61.3%),[19] and Iraq (37.31%),[20] also reported findings similar to the present study. The mucosal type is the most preferable type of attachment as the attached gingiva's band protects the gingiva from the frenum's pull during the lip movement.[8]

The gingival types do not extend coronal to the line demarcating the base of the midline papilla, but it does penetrate the attached gingiva.[8] This type was the second most prevalent type similar to the other studies from Nepal. Similarly, this finding was per Bergese,[17] Janczuk and Banach,[18] Tajasar et al.,[19] and Hussain and Alwan.[20] Contrary to this finding, the studies done by Upadhya and Ghimire[15] and Kaimenyi[21] reported it to be

the most prevalent type. This could be possibly due to the lower age group (1-16 years) of the study population. This particular type of frenulum attachment can result in diastema, gingival recession, bone loss owing to a muscle pull, and poor lip mobility, particularly when smiling and speaking.[22]

The papillary type inserts coronal to the line demarcating the base of the midline papilla without any visible indication of frenum extension to the palatal aspect or on the incisive papilla.[8] The prevalence of this type was reported to be 0%[12] to 17.2%[15] in the Nepali population while 0% to 20.0%[17-22] in other populations. Mirko et al. reported the pull syndrome was frequently seen in papillary-type attachment with the prevalence of 100%. In addition, the pathological changes to interdental papilla from this form of attachment are reported to be very common.[8]

The papillary penetrating extends to the palatal aspect or blanching anywhere on the palatal aspect of the midline papilla.[8] The prevalence of this type is reported to be 0% to 8.1% in both the Nepali and other populations.[17-22] Both the papillary and papillary penetrating types were less prevalent as reported by various studies[17-22] which is in accordance with the present study.

Mirko et al. reported the pull syndrome to be the second most prevalent (100%) in papillary type in their studies. However, this variant is reported to cause fewer pathological changes in the midline interdental papillae.[8] There are two possible explanations mentioned for the less harmful effect of papillary penetrating attachment. This particular type of attachment passing through the midline interdental papilla gets partly lost in the attached gingiva and partly gets anchored in the palate. Thus, the vestibular deflecting forces get significantly obstructed or deviated resulting in minimal injury.[8]

The clinical implications of papillary and papilla penetrating maxillary labial frenulum are speech difficulties, esthetics, mastication, and diastema. The aberrant location of the difficulty in cleaning teeth, and hindrance in oral hygiene maintenance, can lead to periodontal problems such as a gingival recession. The papillary penetrating is also evident in the smiling photograph thus has a strong association with esthetics and has been correlated with psychological disorders in individuals.[23-25]

The abnormal frenal attachment can also be utilised to diagnose the various syndromes in concurrence with other points of agreement. The syndromes associated with different frenal attachments are Ehlers-Danlos syndrome, infantile hypertrophic pyloric stenosis, Holoprosencephaly, Ellis-van Creveld syndrome, and Orofacial-digital syndrome. Each condition has its own set of frenal abnormalities, which can range from several frenal abnormalities to hyperplastic, hypoplastic, or absent frenum.[10]

Frenectomy and frenotomy are two procedures that can be used to treat abnormal frenal attachments. It's done with a surgical blade, electrocautery, or, more recently, a soft tissue laser.[26,27]

In this study, unlike Mirko et al. there were no age or sex variations in the prevalence of various types of labial frenum attachment.[8] According to studies, children with the highest coronal attachment levels are younger than those with the most apical frenal attachment levels. The coronal to apical shift of frenum attachment occurs with age. However, there has been no documentation of movement in the opposite way.[26] However, the present study couldn't access this aspect as the extremes of ages were not taken into the consideration during the study.

CONCLUSION

The labial frenum was seen to vary in shape and gingival insertion level, highlighting the significance of thorough assessment during the intraoral examination. The present study also recommends that in case of inappropriate attachment an effective treatment strategy could prevent pathological changes in the gingiva and interdental papilla.

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