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Variations in Maxillary Frenal Morphology in a Sample of Newari Children of Bhaktapur

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ABSTRACT

Introduction: Frenum attachments are fold of mucous membrane attaching the lips to alveolar mucosa and underlying periosteum. Aberrant location of attachment of maxillary labial frenum poses many clinical problems such as mucogingival problems and midline diastema.

Objective: The study was performed to assess the variations in morphology of maxillary labial frenum in a sample of Newari children of Bhaktapur, Nepal.

Methods: A descriptive cross-sectional study was performed enrolling 340 Newari children residing in Bhaktapur from August 14, 2020 to March 30, 2021. The study comprised both genders within age group of 6 to 16 years. The frenal attachment was recorded according to Mirko and Sewerin classification. The data was analysed with Statistical Package for the Social Sciences version 16 using descriptive statistics.

Results: In total, 340 Newari children participated in this study. The mucosal type was observed in 204 (60%) of the participants followed by gingival type 101 (29.7%). More than 80% of the participants had simple frenum (283, 83.2%). The frenum with nodule was present in 25 (7.3%) and frenum with appendix in 22 (6.5%) of study participants. Frenum with appendix was mostly present in males 18 (10.1%) than females 4 (2.5%).

Conclusion: Within the Newari children, the mucosal type of maxillary labial frenum was more prevalent followed by gingival type. The simple frenum was the most common type on basis of morphology.

Keywords: Location; maxillary labial frenum; morphology.

INTRODUCTION

Frenum is a fold of mucous membrane attaching lip and cheeks to alveolar process of maxilla and mandible. The median maxillary frenum which is present between upper central incisors provides stability to upper lips and restrict its movements.[1-3] Frenum has been classified into four types based on its attachment site as given by Mirko et al. while Sewerin has classified into eight different types based on its variations in morphology.[4] Studies have reported variations in morphology, location, gender, race, and ethnicity with respect to frenum.[2-8] Prevalence of gingival type of frenum was reported by Divater et al.[9] While another study reported mucosal type of frenum as more prevalent.[10] In Nepalese hospital-based study, Upadhyay et al. have shown gingival type to be the most common type of frenum present in children.[11]

Variation in frenum also lead to midline diastema which in turn can complicate orthodontic spacing.[10,12] It is also the cause of post orthodontic relapse.[13] There is paucity of studies related to maxillary labial frenum in Nepal.[11,14] A study pertaining to maxillary labial frenum among Newari community has not been performed and therefore, this study was conducted to assess the variations of maxillary frenal morphology in Newari children of Bhaktapur.

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METHODS

This was a descriptive, cross-sectional study conducted among Newari children at Bhaktapur district, Nepal. Data collection was done from August 14, 2020 to March 30, 2021. Ethical clearance for the study was obtained from KMC-IRC (Ref. 305202003). Consent was obtained from parents and assent was taken from children before initiating the study. Based on the study of Jonathan et al.,[12] taking p = 0.687 (68.7%), q = 1-p = 0.313 at 95% confidence interval, and d = 0.05 (5%), and using formula $n = Z^2pq/d^2$, the sample size was calculated as 331. However, in the study we included 340 children. Convenience sampling was done to collect the study samples. Both males and females with age ranging between six to 16 years belonging to three generations of Newari family were included in the study.

Due to the coronavirus disease 2019 (COVID-19) pandemic the participants were considered among patients who had come to department of Oral Medicine and Radiology and department of Paedodontics, Kathmandu Medical College, Duwakot, Bhaktapur for their checkup and who fitted in the inclusion criteria. When the school reopened in Bhaktapur after January 2021, rest of the participants were enrolled. Any children who had undergone an operation on upper labial frenum, trauma/ injuries in the premaxillary region, any congenital/ developmental abnormality in upper frenum or premaxilla, any orthodontic treatment or presently undergoing orthodontic treatment and under any medication known to affect the gingiva were excluded from the study.

All the participants were explained about the study. First of all, the demographic details of the participants were recorded in a tabulated form. Under adequate light, the site of attachment of frenum with its morphology was examined by distending the upper lip upward in a gentle manner. All the required intraoral photographs were taken. Morphology of the maxillary labial frenum was classified into different groups according to the Sewerin's frenum classification, and on the basis of attachment location given by Mirko et al.[4]

The data was then transferred into Statistical Package for the Social Sciences (SPSS) Statistics for Windows, version 16.0 (SPSS Inc., Chicago, Ill., USA) and the data were analysed using descriptive statistics (frequency and percentage). The obtained results were presented in the form of tables.

RESULTS

Out of 340 participants, 178 (52.4 %) were males and 162 (47.6%) were females (Table 1).

Based upon the attachment location, mucosal type of frenum was mostly present (204, 60%) followed by gingival type, papillary, and papillary penetrating type (Figure 1, 2). Based

Table 1: Genderwise distribution of participants.

Gender	Frequency (%)
Male	178 (52.4)
Female	162 (47.6)
Mean age (in years)	9.60±3.03

Table 2: Distribution of types of frenum based upon gender.

Types of frenum	Gender		Total n (%)
	Male n (%)	Female n (%)	
Mirko Classification			
Mucosal	108 (60.7)	96 (59.2)	204 (60.0)
Gingival	51 (28.6)	50 (30.9)	101 (29.7)
Papillary	11 (6.2)	10 (6.2)	21 (6.2)
Papillary penetrating	8 (4.5)	6 (3.7)	14 (4.1)
Sewerin Classification			
Simple frenum	141 (79.2)	142 (87.7)	283 (83.2)
Persistent tectolabial frenum	4 (2.3)	1 (0.6)	5 (1.5)
Frenum with appendix	18 (10.1)	4 (2.5)	22 (6.5)
Frenum with nodule	13 (7.3)	12 (7.4)	25 (7.3)
Double frenum	-	-	-
Frenum with nichum	2 (1.1)	2 (1.2)	4 (1.2)
Bifid frenum	-	1 (0.6)	1 (0.3)
Frenum with two or more variations at the same time	-	-	-

Figure 1: Mucosal frenal attachment with simple frenum.

Figure 2: Mucosal frenal attachment with nodule.

Figure 3: Frenum with appendix.

Figure 4: Bifid frenum.

upon the morphological types, a large number of participants had simple frenum (83.2%) followed by frenum with nodule (7.4%) and frenum with appendix (6.5%, Figure 2, 3). Bifid frenum was present in only one female participant (Table 2, Figure 4).

DISCUSSION

The morphology and location of maxillary labial frenum has clinical significance. Abnormal location of the maxillary frenum causes masticatory problems. Frenum attached to gingival margins interferes with tooth brushing and thus worsens oral hygiene maintenance[15] leading to periodontal problems.[9] In small children, the aberrant maxillary frenum also causes breast feeding problem.[16,17] Many syndromes such as Ehlers-Danlos syndrome, Infantile hypertrophic pyloric stenosis, Ellis-van Creveld syndrome and Oro-facial-digital syndrome also show variation in frenal attachment.[4] This study was carried out to assess the variations of maxillary labial frenum among the Newari children in Bhaktapur region.

Several studies have shown variation in the attachment location and morphology of maxillary labial frenum. These studies have related their findings based on age, gender, race, and ethnicity.[10,14,15,18-20]

Inconsistent to our study, mucosal frenal attachment was to be prevalent in studies done by Kotian et al.,[18] Pandian et al.[21] We also observed similar findings based on Mirko's classification of maxillary labial frenum according to location. In line with our findings, Rajkarnikar et al. also observed mucosal as most common type.[22] In contrast to our findings, gingival type was mostly observed and then mucosal type in a study done at Dhulikhel Hospital, Nepal by Upadhyay and Ghimire.[11] The difference could be due to the sample size taken, variation of ethnicity and geographic location. The present study was performed only among Newari children residing in Bhaktapur. The observation in Chepang community suggested that the mucosal type of frenal attachment was specific to this community.[14] However in Newari community, this study observed presence of all types in varying number and percentages. In relation to genderwise distribution of the findings, both male and female gender showed close resemblance and order (Table 2).

Development of the maxillary labial frenum is observed around 8-10 weeks among humans connecting the upper lip tubercle to the palatine papilla. Later on it recedes and takes more apical position.[19,23] If the continuous band of maxillary labial frenum crosses in between the two maxillary central incisors, it causes midline diastema and is also reported to affect the growth of premaxillary region.[1,24,25] In this instance, the papillary and

papillary penetrating frenum attachment are the only two considered as pathological.[15] In this study, very less number of the papillary type (6.2%) and papillary penetrating type (4.1%) was also observed.

In the present study, based upon the Sewerin's classification, more than 80% of participants had simple frenum. This was followed by frenum with nodule 25 (7.3%) and frenum with appendix 22 (6.5%). Many studies have reported the simple frenum to be the most common type with differences in other types based on Sewerin's classification.[5,14,18,21,27] In line with our results, Rathod et al. reported simple frenum as most common type followed by frenum with nodule and frenum with appendix.[15] However study done by Nagavent et al.[27] and Birader et al.[28] the persistent tectolabial frenum was the common type after simple frenum. These differences may be due to geographical variations of study population, diverse ethnicity taken into consideration and the sample size. In the present study frenum with appendix was observed more in male while bifid frenum was only present in one female participant.

The study also has limitations. The main limitation is its convenience sampling method. The study was conducted among the Newari children residing in Bhaktapur, so this study cannot be generalised to whole Newari population of Nepal.

CONCLUSION

This study showed the presence of mucosal type of frenum to be more prevalent followed by gingival type in Newari children. On the basis of morphological type of frenum the simple frenum was the most common type. There was no major variation in gender among the studied population except the frenum with appendix which was mostly found in male.

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Conflict of Interest: None.

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