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Prevalence and Variations of Maxillary Labial Frenal Attachment among the Patients in a Tertiary Health Care Center: An Analytical Cross-sectional Study

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ABSTRACT

Introduction

A high frenal attachment can cause diastema, distend the gingival sulcus, increasing plaque accumulation, gingival recession, bone loss, poor lip mobility while smiling and speaking, along with speech and esthetic issues. The objective of this study was to assess the prevalence of maxillary labial frenum and its' variations among patients visiting a tertiary care hospital..

Methods

This analytical cross-sectional study was conducted from July 2022 to March 2023 among 385 patients. The demographic details of the participants were recorded and the types of frenal attachment and its' morphological variations were assessed using the classification by Mirko et al. and Sewerin. Pearson Chi-square test was used to determine the association between categorical variables where p-value ≤0.05 was considered statistically significant.

Results

The most prevalent frenum was found to be gingival 237(61.56%) while the least common was papillary penetrating type 29(7.53%). Only 85(22.08%) frenum showed morphological variations where, commonest variation was frenum with nodule 51(13.25%) followed by frenum with appendix 27(7.01%). The gingival frenal attachment was found to be more among younger patients while papillary and papillary frenal attachment were seen lesser among older individuals.

Conclusions

Gingival type was the commonest frenal attachment followed by mucosal, papillary and then papillary penetrating frenum in all the age groups and both sexes. Around three-fourth of the participants showed no variations in frenal morphologies.

Keywords: Diastema; high frenum; maxillary labial frenum; normal frenum; prevalence.

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INTRODUCTION

Maxillary labial frenum, also known as frenulum labiisuperioris, is a soft membranous fold providing support and stability to the upper lip and is subjected to variation in shape, size and position during growth.[1] A high frenal attachment is detrimental to both gingival and periodontal health. It can cause diastema, distend the gingival sulcus, increasing plaque accumulation and gingival recession.[2,3] This abnormal muscle pull is also associated with bone loss, poor lip mobility while smiling and speaking, along with speech and esthetic issues. Several researches have been conducted globally with handful studies in Nepal in order to assess the prevalence and variations of maxillary labial frenum and the results are diverse.[4–7] Till date, no such studies have been conducted in the Western part of Nepal. With this context, this study was designed to assess the prevalence of maxillary labial frenumand its' variations among patients visiting a tertiary care hospital.

METHODS

An analytical cross-sectional study was conducted from July 2022 to March 2023 among the patients visiting Department of Periodontology and Oral Implantology, Gandaki Medical College Teaching Hospital and Research Center, Pokhara. Ethical clearance was taken from Institutional Review Committee, Gandaki Medical College (Ref. No. 298/077/078). After explaining the nature of the study and possible discomfort, written informed consent were obtained from the enrolled participants. Only the willing participants, with age ≥18 years were included in the study. A study conducted by Rathod et al.[8] showed the prevalence of type of frenal attachment as 49.9%. By taking this prevalence with 95% confidence interval and permissible error of 5%, sample size was calculated using following formula: n = z2 p q/ E2, where, z=1.96 at 95% confidence interval. The optimum sample size for this study was 385. Non probability (convenience sampling) technique was used for data collection. Similarly, the patients whose labial frenum and adjacent mucosa were affected by trauma,those who had undergone frenal surgeries and/or orthodontic treatment, those with congenital/developmental anomalies of upper labial frenum or premaxillary region and who were under any medication known to affect the gingiva were excluded from the study. The demographic details of the participants were recorded. The various types of frenal attachment and its' morphological variations were assessed under dental unit light. The patient's lips were gently stretched and distended in a horizontal direction away from the labial alveolar process and the frenal attachment was classified according to Mirko et al.[9] as:

i) **Mucosal:** Frenuminserting upto and including them ucogingival junction with no evidence of crossing into the attached gingiva.

ii) **Gingival:** Frenum inserting into attached gingiva and not extending coronal to the line demarcating the base of midline papilla.

iii) **Papillary:** Frenum inserting coronal to the line demarcating the base of 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 incisive papilla when the tension was applied to the frenum.

iv) **Papillary penetrating:** Attachment of frenum passes right up to the papilla, with visible evidence of frenum extension to the palatal aspect or of blanching anywhere on the palatal aspect of the midline papilla or the incisive papilla when the tension was applied to the frenum.

Similarly, the variations in morphology of frenal

attachments were recorded using Sewerin's classification[10] as: normal frenum, normal frenum with a nodule, normal frenum with appendix, normal frenum with nichum, bifid labial frenum, persistent tecto labialfrenum, double frenum and wider frenum. Additionally, the types of frenal attachments were compared among various age-groups and amongst males and females. The collected data were entered in Microsoft Excel sheet and the statistical analysis was done using statistical packages for the social sciences (SPSS) version 16.0. Pearson Chi-square analysis test was used to determine the association between demographic variables and the type of frenal attachment where, p-value ≤0.05 was considered statistically significant.

RESULTS

Out of total 385 participants, majority 161(41.80%) belonged to 18 - 40 years of age-group and 195 (50.65%) were males. The mean±S.D. of the study population was 44.74±15.978 (Table 1).

Table 1. Demographic details of study participant (n-385).

Demographic information	Frequency n(%)
Age	
18-40	161(41.80)
41-60	148(38.40)
>60	86(22.30)
Mean±S.D	44.74±15.978
Gender	
Male	195(50.64)
Female	190(49.36)

Based on the type of attachment location, the most prevalent type of frenum was found to be gingival 237(61.56%) and the least common was papillary penetrating type 29(7.53%). Out of total 385 participants, 85(22.08%) frenum showed morphological variations. Large number of participants showed normal frenum 300(77.92%) followed by frenum with nodule 51(13.25%) and frenum with appendix 27(7.01%). Furthermore, only 1(0.26%) showedfrenum with nichum and double frenum. The wider frenum type was not observed in this study. (Table 2)

Table 2. Prevalence of different frenal attachments and its' variations in the study population (n=385).

Frenal Attachment types	Frequency n(%)	95% Confidence interval (C.I.)	
		Lower	Upper
Types			
Mucosal	72(18.70)	0.149	0.23
Gingival	237(61.56)	0.565	0.664
Papillary	47(12.21)	0.091	0.159
Papillary penetrating	29(7.53)	0.051	0.106
Variations			
Normal frenum	300(77.92)	0.734	0.82
Normal frenum with a nodule	51(13.25)	0.1	0.17
Normal frenum with appendix	27(7.01)	0.047	0.1
Normal frenum with nichum	1(0.26)	0	0.014
Bifid labial frenum	3(0.78)	0.002	0.023
Persistent tecto labialfrenum	2(0.52)	0.001	0.019
Double frenum	1(0.26)	0	0.014
Wider frenum	-	-	-

In all the age-groups, the most prevalent type of frenal attachment was found to be gingival followed by mucosal type. The gingival type of frenal attachment was most commonly seen in the younger age-group i.e, 18 to 40 years 104(27.01%). Similarly, the least common of all the frenal attachments was papillary penetrating type in all age groups, with least 3(0.77%) being in >60 years age-group. However, these differences were found to be statistically insignificant. (Table 3)

Table 3. Distribution of various frenal attachments according to age-group (n=385).

Types of frenal attachment	Age-groups			p-value
	18 - 40 years	41-60 years	>60 years	
Mucosal	29(7.53)	26(6.75)	27(7.01)	0.524
Gingival	104(27.01)	87(22.59)	46(11.94)	
Papillary	18(4.67)	19(4.93)	10(2.59)	
Papillary penetrating	10(2.59)	16(4.15)	3(0.77)	

The frenum type frequency distribution was examined in association with sex where, gingival frenum was the commonest frenum followed by mucosal, papillary and papillary penetrating being the least type of frenal attachment in both sexes. The prevalence of all the types of frenal attachments were comparable in both sexes (Table 4).

Table 4. Distribution of various frenal attachments according to sex (n=385).

Types of frenal attachment	Sex		p-value
	Male	Female	
Mucosal	36(9.35)	36(9.35)	0.925
Gingival	122(31.68)	115(29.87)	
Papillary	24(6.23)	23(5.97)	
Papillary penetrating	13(3.37)	16(4.15)	

DISCUSSION

Aberrant location of maxillary labial frenum has been documented to have impact on the growth and development of premaxilla[2] causing problems in speech, mastication and maintenance of oral hygiene.[11] Additionally, upper lip tie has been associated with breastfeeding problems, midline diastema[5] further complicating orthodontic treatment.[12] Various classifications have been proposed regarding the types and variations in frenal attachment, with the classifications given by Mirko et al., and Sewerin being the most widely accepted. Hence, these classification systems were taken into the present study. Knowing the various types of frenal attachments and their morphologies can help the clinician assess whether an attachment is pathological or non-pathological. The present study was attempted to highlight the importance of prompt and early diagnosis of abnormal frenum, which in turn, can prevent the emergence of mucogingival deformities and enhance both function and esthetics.

In the present study, gingival frenum was the most prevalent type of frenal attachment followed by mucosal, papillary and papillary penetrating being the least common type. This finding was in congruence with the study

by Niazi et al.,[1]Rathod et al.,[8] Kilinc et al.[13] However, few other studies including the study by Rajkarnikar et al.,[5] Chaulagain et al.,[6] Varghese et al.[14] showed mucosal type. This slight difference in the results could be due to the diversed population and dentition. Furthermore, papillary penetrating frenal attachment was the least common of all in this study which is consistent with the studies by Joshi et al.,[4] Rajkarnikar et al.[5] There were no papillary or papillary penetrating type of frenal attachment in the study by Christabel et al.[15] The lesser prevalence of this frenal attachment could be attributed to the fact that with aging, attachment level of frenum might shift from coronal to more apical level[16] which is due to growth of alveolar process in a coronal direction.[11] In the present study, about three-fourth of the participants showed normal frenum which is in line with the study by Joshi et al.,[4] Chaulagain et al.[6] The most common variation in the frenal attachment was found to be frenum with nodule followed by frenum with appendix which is in accordance with the study by Chaulagain et al.[6] However, some studies have shown persistent tectolabial frenum as the commonest variations in frenal attachment.[17,18] In addition to this, only 1(0.26%) participant showed frenum with nichum and double frenum while the wider frenum type was not observed in this study. Frenum with nodule and appendix are the developmental remnants that show no pathological potential and do not require any investigations or treatment. Misdiagnosis of normal variations in frenum as abnormal frenum leads to unnecessary surgical corrections. Hence, lack of knowledge regarding the various types of frenal morphology resulted in unnecessary surgeries.[17] However, thick and wider frenum attached close to marginal gingiva could contribute to midline diastema and delayed growth of premaxilla.[19] Hence, the knowledge of the various types of frenal attachments and their morphologies to determine whether an attachment is pathological or non-pathological is of utmost importance.In all the age-groups, the most prevalent type of frenal attachment was found to be gingival followed by mucosal, papillary and papillary penetrating type. The gingival type of frenal attachment was frequently observed in the younger age-group. Similarly, the papillary and papillary penetrating frenal attachment was more commonly seen in younger and middle-aged population in comparison to the older age-group. However, these differences were found to be statistically insignificant. These findings were comparable with the study by Kilinc et al.[13] although the results were statistically significant.While there is strong evidence for age-dependent differences in frenum attachment there is little, if any, evidence to support gender-dependent differences. In consistent to the findings of earlier studies,[11,12,16] the prevalence of all the types of frenal attachments were comparable in both sexes in the present study. Frenectomy is recommended when an abnormal frenum is present. Afrenum is considered pathogenic when it is unusually wide or there is decreased zone of attached gingiva along the midline or the interdental papilla shifts when frenum is extended. The timely intervention of pathological frenal attachment can help in primary prevention of gingival health. Additionally, it is important to properly identify the frenum before orthodontic treatment so that proper planning for a successful outcome is achieved.

CONCLUSIONS

In the present study, gingival type was the commonest frenal attachment followed by mucosal, papillary and then papillary penetrating frenum in all the age groups and both sexes. Majority of the participants showed no variations in frenal morphologies. The commonest variation was found to be normal frenum with nodule followed by frenum with

appendix. The gingival frenal attachment was found to be more among younger patients while papillary and papillary frenal attachment were seen lesser among older individuals. However, these findings were statistically insignificant. Furthermore, the prevalence of all the types of frenal attachments were comparable in both sexes. The frenum is a small structure but has a diverse morphology and attachment types, so it is important to be able to differentiate the normal and abnormal frena before planning for any dental procedures. A thorough examination of the frenum is utmost to prevent the misdiagnosis and unnecessary surgical interventions.

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REFERENCES

1. Niazi M, Shahroz N, Sajjad S, Haroon S. Morphological and attachment variations of median maxillary labial frenum. POJ. 2019;9(1):19–23.
2. Priyanka M, Sruthi R, Ramakrishnan T, Emmadi P, Ambalavanan N. An overview of frenal attachments. J Indian Soc Periodontol. 2013;17(1):12–5.
3. Rajani ER, Biswas PP, Emmatty R. Prevalence of variations in morphology and attachment of maxillary labial frenum in various skeletal patterns - A cross-sectional study. J Indian Soc Periodontol. 2018;22(3):257–62.
4. Joshi U, Pradhan M, Neupane A, Lawaju N, Khadka N, Chaulagain R. Variations in maxillary frenal morphology in a sample of Newari children of Bhaktapur. J Nepal Soc Perio Oral Implantol. 2021;5(9):34–8.
5. Rajkarnikar J. Prevalence and variations of the maxillary labial frenum in children, adolescents and adults. Nepal Med Coll J. 2018;20(1–3):94–7.
6. Chaulagain R, Khanal N, Singh A. Morphology of maxillary labial frenum in chepang community of Chitwan. J Nepal Health Res Counc. 2021;19(50):185–8.
7. Upadhyay D, Ghimire N. Attachment of maxillary labial frenum in Nepalese children. Orthod J Nepal. 2012;2(1):29–32.
8. Rathod S, Bawankar P, Chikhale P, Bidwaikar A. Evaluation of variations in morphology and attachment of frenum in diverse population - A cross-sectional study. CEGH. 2020;8:1094–7.
9. Mirko P, Miroslav S, Lubor M. Significance of the labial frenum attachment in periodontal disease in man. Part 1. Classification and epidemiology of the labial frenum attachment. J Periodontol. 1974;45(12):891–4.
10. Sewerin I. Prevalence of variations and anomalies of the upper labial frenum. Acta Odontol Scand. 1971;29(4):487–96.
11. 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(11):3664–7.

12. Rajani ER, Biswas PP, Emmatty R. Prevalence of variations in morphology and attachment of maxillary labial frenum in various skeletal patterns - A cross-sectional study. J Indian Soc Periodontol. 2018;22(3):257–62.

13. kılınç G, ÇETİN M, KÖSE Z, Ergün Ertunç FÜ, Atesci A. Evaluation of median maxillary labial frenum type and morphology in different age groups. J Basic Clin Health Sci. 2021;3:30–5.

14. Varghese T, Kalburgi V, Dodani K, Parihar A, Prashant M, Nagpal N. Various Morphological Variations in Attachment of Maxillary Labial Frenum: An Observational Study. J Res Adv Dent. 2018;8(1):189–92.

15. Christabel S, Gurunathan D. Prevalence of Type of Frenal Attachment and Morphology of Frenum in Children, Chennai, Tamil Nadu. World J Dent. 2015;6(4):203–7.

16. Boutsi EA, Tatakis DN. Maxillary labial frenum attachment in children. Int J Paediatr Dent. 2011;21(4):284–8.

17. Díaz-Pizán ME, Lagravère MO, Villena R. Midline Diastema and Frenum Morphology in the Primary Dentition. JDC. 2006;73(1):11–4.

18. Biradar SM, Patil AY, Kotnoor SS, Bacha S, Bijjaragi SC, Kattimani PT. Assessment of diverse frenal morphology in primary, mixed, and permanent dentition: A prevalence study. J Contemp Dent Pract. 2020;21(5):562–7.

19. Ceremello PJ. The superior labial frenum and the midline diastema and their relation to growth and development of the oral structures. Am J Orthod. 1953;39(2):120–39.

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