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Original Article

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Labial frenum attachment and its association with oral hygiene status in patients reporting to a local tertiary care dental hospital

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ABSTRACT

BACKGROUND & OBJECTIVE: The labial frenum plays an important role in providing attachment between the lip and the alveolar process and at the same time contributes significantly to the maintenance of proper oral hygiene. The main objective of this study was to evaluate the labial frenum attachment in both the upper and lower jaw and investigate its potential association with the age, gender, and oral hygiene condition among individuals presenting to a local tertiary care hospital.

METHODOLOGY: This cross-sectional study was carried out at Lahore Medical and Dental College, Lahore over a period of six months. A total of 360 patients were included in the study after obtaining permission from the institutional ethical review committee The labial frenum type was identified and recorded for both mandible and maxilla. The oral hygiene status was accessed using the oral hygiene index (simplified). Assessment of both frenal attachment and oral hygiene was done by the same examiner to minimize the chances of any bias.

RESULTS: Our study included a total of 360 patients with 47% (171) males and 53% (189) females. Moreover, in our study, the most common type of frenal attachment was gingival (65%), followed by mucosal (19%) and less commonly the papillary (11%) and papillary penetrating (6%) types. A strong association was observed between the frenal attachment type and oral hygiene status among our study population (P value= 0.00).

CONCLUSION: The association of frenal attachment with oral hygiene and gender is statistically significant.

KEYWORDS: Labial Frenum , Oral Hygiene, Oral Hygiene Index.

INTRODUCTION

The frenum may be defined as a fold of fibrous tissue that is collagenous in nature, and enwrapped in a mucous membrane. It holds the lip in place against the alveolar process in the mandible and maxilla. Irregularities in the frenulum's dimensions and placement can lead to issues that affect both function and appearance, often requiring surgical correction [1,2]. The labial frenum originates embryologically as a residue from the central cells of vestibular lamina in the midline region. It is predominantly comprised of connective tissue and epithelial cells, at times incorporating muscular fibers as well [3,4].

The size, position, and manner in which the frenum attaches to the tissues around the alveolar bone and teeth naturally vary from person to person. However, when this frenum attaches to the gingival tissues in a way that results in the retraction of the marginal gingiva, it encourages the formation of diastemas, or interferes with lip mobility. This type of attachment is categorized as atypical or abnormal [5].

The labial frenum provides the primary role of support and stability, specifically to the upper lip, contributing to facial harmony and regulating facial growth. It also plays a significant role in regulating facial growth. Abnormalities in the frenal attachment, particularly when it is attached close to the gingival margin can lead to numerous problems, including the development of gaps between teeth, recession of gingiva, pull of muscles leading to bone loss, and restricted lip mobility, particularly during speech and smile [6].

One anatomical feature in the local environment that affects the retention and build-up of plaque biofilm is the maxillary labial frenum which also hinders effective tooth brushing.

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In the adult population, the abnormal frenal attachment may lead to the initiation and progression of periodontal disease, complicating efforts to treat receding gingival tissues and hindering oral hygiene practices [7].

Placek and colleagues invented a morphological and clinical categorization of frenum attachment, based on the specific anatomical placement of frenal tissue. Their classification system categorized frenum attachment according to whether it occurred at the MGJ (mucogingival junction), within the attached gingiva, within the interdental papilla, or extended through the interdental papilla and up to the palate [8].

Placek Mirko's classification of frenal attachment [1].

Limited research has been conducted to investigate the occurrence of different types of frenal attachments in both the maxillary and mandibular arches. Therefore, our study aimed to explore the occurrence and types of labial frenum variations in diverse ethnic backgrounds and their connection to oral hygiene.

METHODOLOGY

A cross-sectional investigation was conducted between August 2023 and January 2024, after obtaining approval from the Institutional Review Committee of Lahore Medical and Dental College (Ref. No. LMDC: FD/535/24) for ethical considerations. A cohort of 360 individuals aged 18 to 70 years, reporting to the Department of Oral Implantology and Periodontology, were enrolled following their provision of written informed consent.

Data was collected using the convenient non-probability sampling method. Exclusion criteria consisted of individuals with a history of previous surgical procedures involving the lower and upper labial frenum, a history of traumatic injuries to the anterior regions of the upper and lower jaws, any developmental or congenital anomalies affecting the lower and upper frenum, past orthodontic treatment history, or ongoing orthodontic procedures, and individuals using medications that influence gingival tissues. Those willing to participate and sign the informed consent were examined by a single examiner.

The examining clinician manipulated the lip in various directions to observe the frenum and documented their observations according to Placek Mirko's classification. Examination encompassed both mandibular and maxillary labial frenal attachments. Moreover the OHI-S (Oral Hygiene Index-Simplified) was evaluated for all teeth included in the index using an explorer.

Data was categorized according to the gender & age and described in the form of frequencies, percentages, and Mean ± SD scores. Quantitative descriptive analysis with bar graphs is employed in this study to examine the patients' responses. The chi-square test was used to observe the association between gender, age, OHI status, and Frenum attachment. A 95% confidence interval was used to assess the significance level. The collected data was entered and analyzed using SPSS version 22.

RESULTS

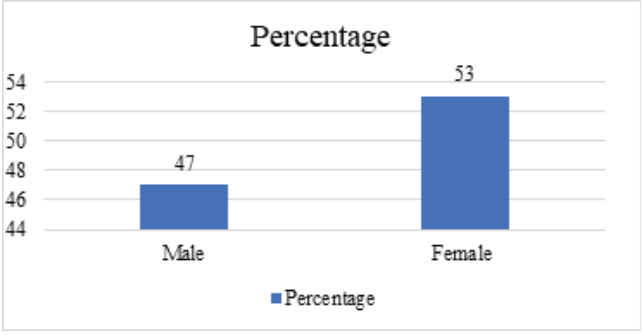
A total of 360 patients were included in this study ranging from a minimum of 15 years to a maximum of 70 years.

Table-I: Distribution of age.

Age in groups	n (%)
15 – 25	85 (24)
26 – 35	93 (26)
36 – 45	113 (31)
46 – 55	45 (12)
56 – 65	23 (6)
Above 65	1 (1)

Within our investigation, 171 (47%) participants were identified as male patients, while 189 (53%) were female resulting in a female-to-male patient ratio in percentage of 1.12:1, as shown in Figure-I.

Figure -I: Distribution of gender.



In our population, the distribution of frenal attachment according to gender was statistically significant. The gingival type of frenal attachment presented as the predominant form. Distribution of frenum exhibited significant variation among the maxilla and mandible with the gingival type being the prevailing form of frenal attachment in the maxilla.. In the mandible mucosal type was most prevalent, whereas no patient reported papillary and papillary penetrating type as shown in Table-II. The most prevalent type of frenum attachment was the gingival type in the maxilla for both males and females. However, in the mandible, patients showed a tendency toward mucosal attachment.

Table-II: Distribution of frenal attachment in the maxilla and mandible based on gender (P- value according to chi-square test).

Variables	Frenal attachment type	Gender		Total	P -Value
		Male n (%)	Female n(%)		
Maxilla	Mucosal	33(19.29)	34(17.98)	67	0.012
	Gingival	99(57.89)	134(70.89)	233	
	Papillary	28(16.37)	12(6.34)	40	
	Papillary penetrating	11(6.43)	9(4.76)	20	
Mandible	Mucosal	116(67.83)	97(51.32)	213	0.001
	Gingival	55(32.17)	92(48.67)	147	
Total		171	189	360	

In terms of the distribution of frenal attachment with age, the type of attachment did not vary according to age both in the maxilla and mandible as shown in Figure-II.

Figure-II: Age-wise distribution of Frenal attachment.

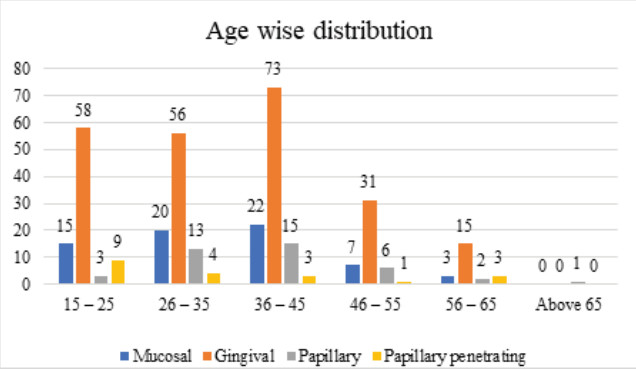
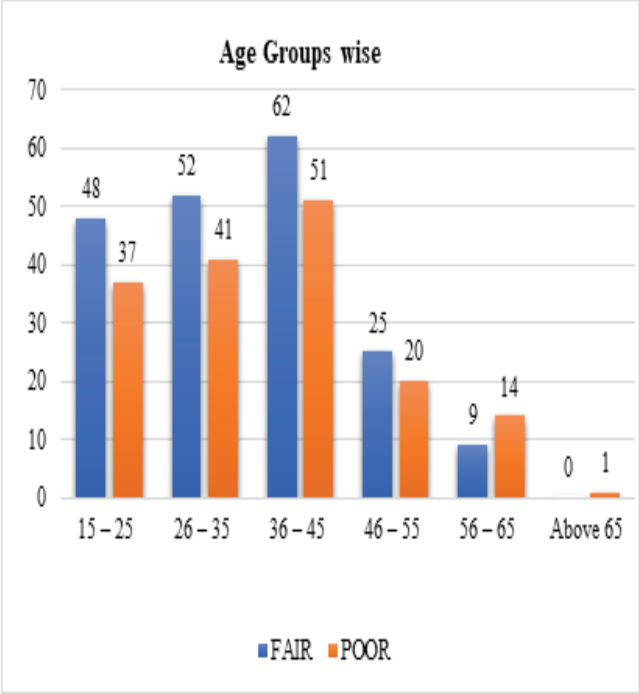


Table-III:Distribution of oral hygiene among various age groups.

OHI Status	Gender		n(%)
	Male n (%)	Female n(%)	
Good	0 (0)	0 (0)	0 (0)
Fair	103(60.23)	93(49.20)	196 (54)
Poor	68(39.76)	96(50.79)	164 (46)
Total	171	189	360

Moreover, the OHI-S (Oral Hygiene Index-Simplified) was documented for each indexed tooth employing an explorer to assess the oral hygiene status among the patients. 54% of patients presented with fair oral hygiene, 46% demonstrated poor oral hygiene and none of the patients exhibited good oral hygiene score. Results of our study show poor hygiene is more prevalent in females as compared to males. (Table-III)



Our study shows no significant variations in frenal attachment type associated with age (Figure-III).

The relationship between oral hygiene and frenal attachment was assessed, yielding highly significant results as depicted in Table-IV.

Table-IV: Distribution of oral hygiene among different frenum attachments (P -values according to chi-square test).

Variables	Frenal attachment type	OHI Range		Total	P -Value
		Male n (%)	Female n(%)		
Maxilla	Mucosal	59(30.10)	8(4.87)	67	≤0.001
	Gingival	137(69.90)	96(58.53)	233	
	Papillary	0(0.00)	40(24.39)	40	
	Papillary penetrating	0(0.00)	20(12.19)	20	
Mandible	Mucosal	194(98.97)	19(11.58)	213	≤0.001
	Gingival	2(1.03)	145(88.42)	147	
Total		196	164	360	

DISCUSSION

Frenum is a part of the mucosal membrane that presents as a fibrous band primarily composed of collagen. This frenum serves as a main attachment point for the underlying periosteum, gingival tissues, and alveolar mucosa to the lip, both labially and lingually [1,9]. The physical form and degree of attachment of the frenum can vary. Stabilizing the top and lower lips while also anchoring the tongue to the floor of the mouth is one of this frenum's advantageous functions [10]. Initially, the attachment of the frenum is present at the level of the attached gingiva, but over the course of development, it moves further up, going beyond the mucogingival junction. In histological sections, the frenum is composed of both, the epithelial tissue above and a core of connective tissue along with skeletal muscle fibers [1,11].

The positioning of the attachment of the frenum can differ intraorally. The attachment of the frenum is classified into four categories, as per the well-known categorization provided by Mirko et al.: mucosal type, gingival type, papillary type, and papillary penetrating type [8]. Gingival and mucosal attachments are viewed as typical, whereas the other two (papillary penetrating and papillary attachments) are considered atypical types of the frenum [12].

In our current study, the prevalent form of frenal attachment in the maxilla was gingival (65%), followed by mucosal (19%) and less commonly the papillary (11%) and papillary penetrating (6%) types. Such findings are in line with other studies previously done by Rijal et al, Rathod et al and Kilinc et al [1,13,14]. Similarly, within the mandible, mucosal frenal attachment emerged as the predominant type, constituting 59% of cases, while gingival attachment accounted for 41% of cases. Notably, the sample population under study lacked both papillary and papillary-piercing frenal attachments.

The findings of our study closely align with those reported in the groundbreaking research conducted by Mirko and colleagues [8] as P values of 0.012 and 0.001, indicate significant association between gender and frenal attachment in the maxilla and mandible. In our current study, we also examined the association between different types of frenal attachments with age yielding no significant results (p value= 0.05 and 0.709).

The placement of various types of frenal tissues is closely associated with a range of periodontal, gingival, and aesthetic concerns. It is striking to note that high-placed frenal attachments, like papillary penetrating attachments or papillary ones, are commonly associated with these issues [15].

The papillary penetrating attachment goes all the way from the papilla to attach at the palatal side, whereas the papillary frenal attachment is normally restricted within the interdental portion of the papilla at the midline [8]. The last two types of frenal attachments can cause a number of issues, such as diastema development, trouble speaking, aesthetic concerns, and chewing difficulties. Furthermore, abnormal frenal attachments, placed higher than usual can complicate patients' efforts to keep up good oral hygiene, often leading to` periodontal problems such as attachment loss and gingival recessions [16].

The main purpose of this study was to explore any potential connection among the type of frenal attachments and oral hygiene status. The findings indicated a robust relation between frenal attachments and oral hygiene status in both the mandible and maxilla (p-value 0.00), consistent with the results reported by Divater et al. In the maxilla, higher frenal attachments were always associated with poor oral hygiene [16].

In contrast, the mandibular gingival type of attachment was associated with compromised oral hygiene and the mucosal type was associated with fair oral hygiene. These results highlight the significance of practicing and advising appropriate oral hygiene protocols among individuals exhibiting aberrant type of frenal attachment. Failure to adhere to good oral hygiene practices in such instances may increase the likelihood of developing periodontal diseases [17]. Surgical procedures such as frenotomy can be employed to address issues caused by irregular frenal attachments. Several surgical methods, including as laser interventions, electrosurgery, or scalpel incisions, can be used to perform frenectomy treatments [7,18].

The gingival type of frenal attachment was predominant across all age groups. Similar findings were also reported by another local study conducted in Islamabad, where the authors concluded that the gingival type of attachment showed the highest occurrence followed by the mucosal type [19].

CONCLUSION

There are significant differences in the anatomy and attachment of the labial frenum in the maxilla and mandible. In the maxilla, we found that gingival attachment was more common, followed by mucosal type of attachment, whereas in the mandible, mucosal attachment was more common, followed by gingival attachment.

Additionally, a significant association was observed between gender and frenal attachment, whereas no similar correlation was identified between age and frenal attachment. Furthermore, a correlation between frenal attachment and oral hygiene was also noted. These findings emphasize the need of upholding proper oral hygiene habits, particularly in situations involving high (abnormal) frenal attachment and, more crucially, in situations involving papillary and papillary penetrating types.

Considering these findings, it is critical to thoroughly assess the frenum's location during standard clinical examination. This approach reduces the risk of periodontal issues associated with high frenal attachment.

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Authors' Contribution:

Maha Maqbool : Substantial contributions to the conception and design of the work.

Usman Manzoor : Analysis and interpretation of data for the work.

Ahmad Danyal : Drafting the work.

Abrar Humayun: Reviewing it critically for important intellectual content.

Nuvaira Ijaz: Final approval of the version to be published.