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Prevalence of gingival biotype among patients visiting a dental hospital in Kathmandu

Dr. Samriddhi Vaidya,[1] Dr. Junima Rajkarnikar,[1] Dr. Anju Khapung,[2] Dr. Seema Shrestha[3]

[1]*Department of Periodontics and Oral Implantology, Nepal Medical College, Jorpati, Nepal;*
[2]*Department of Community Dentistry, TU Teaching Hospital, Maharajgunj, Kathmandu, Nepal;*
[3]*Department of Dentistry, University of the Pacific, Arthur A. Dugoni School of Dentistry, California, USA.*

ABSTRACT

Introduction: Gingival biotype plays a significant role in predicting the response of gingiva to various dental operative procedures like periodontal, restorative, orthodontic and implant therapy.

Objective: To assess the prevalence of gingival biotype among patients visiting a dental hospital in Kathmandu

Methods: An analytical, cross-sectional study was conducted among 184 patients aged 18-55 years who attended the Department of Periodontology and Oral Implantology of Nepal Medical College Teaching Hospital, Attarkhel, Kathmandu from November 2021 to January 2022. Participants were selected by convenience sampling method. Gingival biotype of the patients was measured by probe transparency method. Prevalence of gingival biotype its association with sociodemographic and clinical characteristics were assessed.

Results: Of the total, majority had thick gingival biotype in all central incisors (113, 61.4% each in maxillary central incisors, 105, 57.1% in right mandibular central incisors and 107, 58.2% in left mandibular central incisors). Gingival biotype was significantly associated with ethnicity (p-value 0.039). Higher proportion of Janajati/ Newar (58, 72.5%) had thick gingival biotype as compared to individuals from other ethnicities.

Conclusions: Thick gingival biotype were more prevalent in maxillary and mandibular central incisors.

Keywords: Central incisors; gingival biotype; probe transparency technique.

INTRODUCTION

Gingival biotype is defined as the thickness of the gingiva in faciopalatal or faciolingual dimension.[1] "Periodontal phenotype" a term given by Siebert and Lindhe, also advocated by the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Disease and Conditions, denotes the gingival phenotype and bone morphotype as a single component to classify biotypes as "thick flat" and "thin scalloped" biotypes.[2, 3]

Correspondence
Dr. Anju Khapung
Email: khapunganju@gmail.com

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Among various new methods to differentiate the gingival biotypes like direct measurement probe transparency method, ultrasonic devices and cone beam computed tomography scans, probe transparency method still serves as a gold standard.[4] Gingival biotype assessment is important as it determines the prognosis of various treatment modalities from conventional periodontal treatment, esthetic restoration, root coverage to soft tissue augmentation surgery and implant dentistry.[5, 6]

There are limited studies regarding the distribution of gingival phenotype in Nepalese population. Thus this study was conducted to assess the prevalence of gingival biotype and find its association with different age groups, gender, ethnicity, smoking status and gingival recession.

METHODS

An analytical, cross-sectional study was conducted among patients attending the Out Patient Department (OPD) of Department of Periodontology and Oral Implantology of Nepal Medical College Teaching Hospital, Attarkhel, Kathmandu, Nepal from November 2021 to January 2022. Ethical approval was obtained from the Institutional Review Committee (IRC) of Nepal Medical College (Reference number: 035-078/079) prior to data collection. All the study participants were fully informed of the study and a written informed consent was also obtained from each participant.

Participants of either sex between 18 and 55 years of age, having all eight central incisors, willing to participate and who gave informed consent for participation were included in the study. Those with systemic diseases having gingival manifestations and/or that influenced the bone metabolism, gingival enlargement with history of periodontal flap surgery and orthodontic treatment, crown restorations or fillings, incisal attrition, abrasion, erosion, caries, or restorations involving the cervical margin of teeth, severe tooth crowding and distinct tooth angulation were excluded from the study.

Sample size was calculated by using the formula for finite population size, $n= (Z^2pq)/\{d^2+ (Z^2pq)/ N\}$ =183.9 (184 approximately) where Z = Z score at 95% Confidence Interval=1.96, p = 70.8% (proportion of patients with thick gingival biotype taken from a study by Shrestha S et al.[7]), q=29.2%, d = margin of error = 5%, N = Finite population (Average number of dental patients visiting dental OPD for 3 months as calculated from the dental patients who visited the dental OPD in last 6 months as obtained from dental OPD register) = 450. Convenience sampling method was used.

The gingival biotype for each study participant was determined by using transparency of the calibrated and standardized University of North Carolina-15 probe through gingival sulcus (TRAN technique). UNC 15 probe was inserted in the mid-buccal/ mid-facial aspect of maxillary and mandibular central incisors with a gentle force. The gingival biotype was categorized as thin (Figure 1), if the outline of the underlying periodontal probe was seen through the gingiva, if not, it was categorized as thick (Figure 2).[8] The clinical examination was done by a single trained examiner to minimize inter-examiner variation. Central incisors were selected for assessment of gingival biotype as they are located in the esthetic zone and are easily accessible for clinical examination allowing for a more reliable and accurate evaluation compared with other teeth. Midfacial gingival sulcus was chosen because it is unlikely to be obstructed by the facial bone level.

Data were entered in Microsoft Excel and exported to IBM SPSS Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA) for further analysis. Descriptive statistics were expressed as frequency and percentage. Chi square and Fisher's tests were used to find the association between categorical variables. Level of significance was set at p-value<0.05.

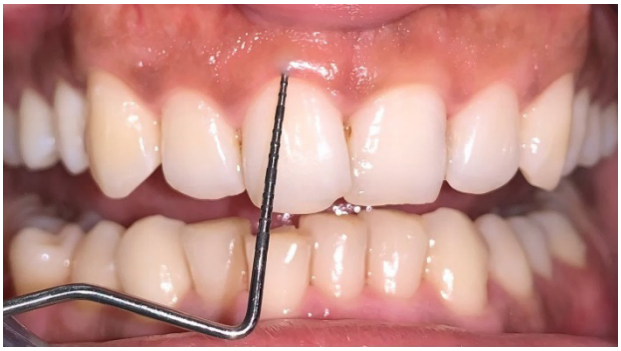

Figure 1: Thin gingival biotype

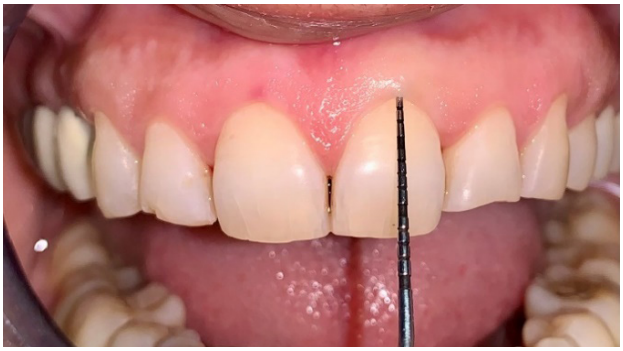

Figure 2: Thick gingival biotype

RESULTS

A total of 184 study participants were included in the study. Of the total, majority were of age group 18-25 years (53, 28.8%), females (98, 53.3%), Brahmin/ Chhetri (81, 44.0%) and non-smokers (157, 85.3%) (Table 1).

Majority of study participants had thick gingival biotype in maxillary right and left central incisors (113, 61.4% each) and presence of gingival recession in mandibular left central incisors (54, 29.3%) (Table 2).

Higher proportion of Janajati/ Newars (58, 72.5%) had thick gingival biotype and higher proportion of Dalits (3, 60.0%) had thin gingival biotype. The association between gingival biotype and ethnicity was found to be statistically significant (p-value 0.039). There was no statistically significant association of gingival biotype with age group (p-value 0.621), gender (p-value 0.955) and smoking status (p-value 0.301) in maxillary central incisors (Table 3).

Table 1: Distribution of study participants according to socio-demographic characteristics

Variables		n (%)
Age group (in years)	18-25	53 (28.8)
	26-35	43 (23.4)
	36-45	38 (20.7)
	46-55	50 (27.1)
Gender	Male	86 (46.7)
	Female	98 (53.3)
Ethnicity	Janajati/ Newar	80 (43.5)
	Brahmin/ Chhetri	81 (44.0)
	Dalit	5 (2.7)
	Others	18 (9.8)
Smoking status	Smoker	27 (14.7%)
	Non-smoker	157 (85.3%)

Table 2: Distribution of study participants according to clinical characteristics

Teeth		Gingival biotype		Gingival recession	
		Thick n (%)	Thin n (%)	Present n (%)	Absent n (%)
Maxillary	Right CI	113 (61.4)	71 (38.6)	21 (11.4)	163 (88.6)
	Left CI	113 (61.4)	71 (38.6)	19 (10.3)	165 (89.7)
Mandibular	Right CI	105 (57.1)	79 (42.9)	48 (26.1)	136 (73.9)
	Left CI	107 (58.2)	77 (41.8)	54 (29.3)	130 (70.7)

CI: Central incisors

Table 3: Association of gingival biotype with socio-demographic characteristics in maxillary central incisors

Characteristics		Gingival biotype		p-value
		Thick n (%)	Thin n (%)	
Age group (in years)	18-25	29 (54.7)	24 (45.3)	0.621
	26-35	26 (60.5)	17 (39.5)	
	36-45	25 (65.8)	13 (34.2)	
	46-55	33 (66.0)	17 (34.0)	
Gender	Male	53 (61.6)	33 (38.4)	0.955
	Female	60 (61.2)	38 (38.8)	
Ethnicity†	Janajati/ Newar	58 (72.5)	22 (27.5)	0.039*
	Brahmin/ Chhetri	44 (54.3)	37 (45.7)	
	Dalit	2 (40.0)	3 (60.0)	
	Others	9 (50.0)	9 (50.0)	
Smoking status	Smoker	19 (70.4)	8(29.6)	0.301
	Non-smoker	94 (59.9)	63 (40.1)	

†Fisher's test, Chi square test, p-value<0.05 statistically significant*

There was no statistically significant association between gingival biotype and age group (p-value 0.519), gender (p-value 0.982), ethnicity (p-value 0.080) and smoking status (p-value 0.864) in mandibular right central incisors (Table 4).

Table 4: Association of gingival biotype with socio-demographic characteristics in mandibular right central incisors

Characteristics		Gingival biotype		p-value
		Thick n (%)	Thin n (%)	
Age group (in years)	18-25	31 (58.5)	22 (41.5)	0.519
	26-35	21 (48.8)	22 (51.2)	
	36-45	21 (55.3)	17 (44.7)	
	46-55	32 (64.0)	18 (36.0)	
Gender	Male	49 (57.0)	37 (43.0)	0.982
	Female	56 (57.1)	42 (42.9)	
Ethnicity†	Janajati/ Newar	54 (67.5)	26 (32.5)	0.080
	Brahmin/ Chhetri	40 (49.4)	41 (50.6)	
	Dalit	2 (40.0)	3 (60.0)	
	Others	9 (50.0)	9 (50.0)	
Smoking status	Smoker	15 (55.6)	12 (44.4)	0.864
	Non-smoker	90 (57.3)	67 (42.7)	

†Fisher's test, Chi square test, p-value<0.05 statistically significant*

Higher proportion of Janajati/ Newars (56, 70.0%) had thick gingival biotype and higher proportion of Dalits (3, 60.0%) had thin gingival biotype. The association between gingival biotype and ethnicity was found to be statistically significant (p-value 0.031). There was no statistically significant association of gingival biotype with age group (p-value 0.748), gender (p-value 0.767) and smoking status (p-value 0.767) in mandibular left central incisors (Table 5).

Higher proportion of study participants with thin gingival biotype (32, 41.6%) had gingival recession compared to those with thick gingival biotype (22, 20.6%) in left mandibular central incisors and the association was found to be statistically significant (p-value 0.002). No statistically significant association was found between these parameters in maxillary right central incisors (p-value 0.168), maxillary left central incisors (p-value 0.739) and mandibular right central incisors (p-value 0.250) (Table 6).

Table 5: Association of gingival biotype with socio-demographic characteristics in mandibular left central incisors

Characteristics		Gingival biotype		p-value
		Thick n (%)	Thin n (%)	
Age group (in years)	18-25	31 (58.5)	22 (41.5)	0.748
	26-35	23 (53.5)	20 (46.5)	
	36-45	21 (55.3)	17 (44.7)	
	46-55	32 (64.0)	18 (36.0)	
Gender	Male	51 (59.3)	35 (40.7)	0.767
	Female	56 (57.1)	42 (42.9)	
Ethnicity†	Janajati/ Newar	56 (70.0)	24 (30.0)	0.031*
	Brahmin/ Chhetri	40 (49.4)	41 (50.6)	
	Dalit	2 (40.0)	3 (60.0)	
	Others	9 (50.0)	9 (50.0)	
Smoking status	Smoker	15 (55.6)	12 (44.4)	0.767
	Non-smoker	92 (58.6)	65 (41.4)	

†Fisher's test, Chi square test, p-value<0.05 statistically significant*

Table 6: Association of gingival biotype with gingival recession in maxillary and mandibular central incisors

Teeth		Gingival recession	Gingival biotype		p-value
			Thick n (%)	Thin n (%)	
Maxillary	Right CI	Present	10 (8.8)	11 (15.5)	0.168
		Absent	103 (91.2)	60 (84.5)	
	Left CI	Present	11 (9.7)	8 (11.3)	0.739
		Absent	102 (90.3)	63 (88.7)	
Mandibular	Right CI	Present	24 (22.9)	24 (30.4)	0.250
		Absent	81 (77.1)	55 (69.6)	
	Left CI	Present	22 (20.6)	32 (41.6)	0.002*
		Absent	85 (79.4)	45 (58.4)	

CI: Central incisors, Chi square test, p-value<0.05 statistically significant*

DISCUSSION

The significance of gingival biotype has been extensively recognized in periodontal and restorative dentistry. Various studies suggests that thin gingival biotype is more susceptible to inflammatory, traumatic and surgical challenges thereby increasing the risk of gingival recession whereas thick gingival biotype shows greater resistance to tissue breakdown, facilitates tissue manipulation, enhances esthetic outcomes, and is associated with a more favorable prognosis and predictable treatment results.[9-11] So the gingival biotype needs to be identified and its importance should be well understood to provide maximum benefit to the patients after various periodontal and implant treatment procedures.

The present study evaluated the prevalence of gingival biotype and its association with socio-demographic and clinical parameters among patients visiting a dental hospital in Kathmandu, Nepal. The methodology used for gingival biotype assessment in this study aligns with commonly used clinical approaches; however, more advanced diagnostic tools such as cone-beam computed tomography and digital imaging techniques have been suggested to improve accuracy.[12] However, direct measurements using either a caliper or trans gingival probing is recommended for the population with gingival pigmentation.[13]

In the current study, thick gingival biotype was more prevalent than thin biotype in both maxillary and mandibular central incisors (57.1-61.4%). These findings are consistent with previous studies conducted in diverse populations, which also reported a higher prevalence of thick gingival phenotype as compared to thin gingival phenotype.[7, 14-16] This similarity could be attributed to comparable demographic characteristics of the study population. In addition, the inclusion of higher proportion of individuals with healthy periodontium may have also contributed to higher prevalence of thick gingival biotype.

In the present study, there was no statistically significant association of gingival biotype with age group. These findings are consistent with the studies done by Shah et al.[16] Contrary to this, a study by Shrestha et al.[7] showed that the prevalence of thicker gingiva increased with age while another study by Subedi et al.[17] showed that higher proportion of individuals in older age group had thin gingiva as compared to younger age group. Differences in age distribution of the study population as compared to the current study may have contributed to the contrasting findings.

Current study showed that there was no significant association between gingival biotype and gender. Similar association was also reported in various other studies[7, 16, 18] which suggests that gender may not be a major determinant of gingival biotype. However a discrepancy exists between the present study and various other studies[19, 20] which reported the disposition of male participants toward thick biotype and female participants toward the thin biotype variant. These inconsistencies may be related to differences in sample size, population characteristics, ethnic variations and difference in method of gingival biotype assessment.

In this study, there was a statistically significant association between ethnicity and gingival biotype in maxillary central incisors and mandibular left central incisors. A higher proportion of Janajati/ Newar participants had thick gingival biotype. Similar findings have been reported in a study by Shrestha et al.[7] suggesting that gingival biotype varies across ethnic groups due to underlying genetic and ethnic variations in periodontal tissue morphology.

Smoking status did not show a significant association with gingival biotype in this study which is in line with the studies by Shrestha et al.[7] Unlike this finding, studies by Prabhu et al.[21] and Moorpani et al.[22] showed that smokers/ smokeless tobacco users had a thicker gingival biotype as compared to nonsmokers and former smokers/ non tobacco users. The discrepancy between these findings may be attributed to the differences in the type and duration of tobacco exposure as the present study categorized participants based solely on smoking status and did not account for the frequency, duration, or intensity of tobacco use, which may influence periodontal tissue characteristics. Although smoking is known to affect periodontal tissues through alterations in vascularity, inflammatory response, and connective tissue metabolism, its direct effect on gingival thickness and gingival biotype remains inconclusive.

In the current study, a statistically significant association was observed in mandibular left central incisors where a higher proportion of individuals with thin gingival biotype exhibited gingival recession compared to those with thick biotype. This finding is in accordance to studies by Singh et al.,[23] Saeed et al.[24] and Alade et al.[25] Gingival biotype has been suggested as one of the causal factors of gingival recession.[26]

The present study has some limitations. Being a single-center cross-sectional study, the findings may not be generalizable to the broader population. Future studies with larger sample sizes, multi-center designs, and advanced diagnostic tools are recommended.

CONCLUSIONS

Thick gingival biotype was more prevalent in maxillary and mandibular central incisors. Gingival biotype was not associated with age group, gender and smoking status. Ethnicity was found to be associated with gingival biotype.

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