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Frequency Distribution of Gingival Phenotype and its Distribution According to Tooth Shape in Patients Reporting to a Tertiary Care Dental Hospital in Lahore

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ABSTRACT

Objective: To determine the frequency of gingival phenotype tooth shape of maxillary central incisors in respective gingival phenotypes.

Study Design: Analytical cross-sectional.

Place and Duration of Study: Fatima Memorial Hospital, Lahore, Pakistan, from Mar to Sep 2018.

Methodology: A total of 201 patients reporting to the Department of Periodontology, fulfilling the inclusion criteria were included in the study. A Michigan "O" Probe was used to evaluate the gingival phenotype and tooth shape. If the probe outline was even slightly showing through the gingiva with the naked eye, the phenotype was regarded as thin otherwise it was labelled thick. A single examiner recorded both the gingival biotype and the shape of the clinical crown.

Results: Analysis of the data revealed that thick biotype was found in 66.17% of patients whereas thin biotype was found in 33.83%. Out of this sample, 70.70% males and 63.00% females had thick phenotype respectively whereas thin phenotype was found in 29.30% males and 37.00% females. Thick phenotype was associated with square tooth shape whereas thin phenotype was associated with slender tooth shape (p-value<0.05).

Conclusion: Thick biotype was more prevalent than thin biotype and thick phenotype was associated with square tooth shape whereas thin phenotype was associated with slender tooth shape.

Keywords: Gingival thickness, Periodontal phenotype, Thick biotype, Thin biotype, Tooth forms.

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INTRODUCTION

Quantitative and qualitative analysis of various periodontal parameters plays a decision-making role in various dental treatment modalities.[1] Objective evaluation of "periodontal phenotype", a new term adopted in place of periodontal biotype to define the combination of gingival phenotype (Gingival thickness, width of keratinized tissue) and bone morphotype (bone plate thickness) is imperative.[2] therefore, in clinical practice identification of the periodontal phenotype is critical.[3] Available literature,[1,4 5] indicates that the gingival phenotype is correlated more strongly with gingival thickness than with gingival width or papilla height and is therefore selected as the principal determinant of gingival phenotype in many studies. The term, periodontal biotype,[6] classified gingiva as "thick-flat" and "thin scalloped.[3,6] Surgical exposure often reveals thin buccal bone with an increased incidence of fenestration or dehiscence,[3,7] therefore, teeth with square tooth forms and long contact areas are associated with a firm, flat, fibrotic gingival architecture and a thick maxillary buccal bone.[3,7,8] Various methods have been proposed to measure gingival thickness.[1,9,10] Probe visibility through gingival sulcus is a method based on the showing of the periodontal probe through the gingival margin while probing the facial gingival sulcus at the mid-buccal aspect of tooth,[8] when the outline of the periodontal probe is showing through the gingiva, the gingival phenotype is considered thin and if not, it is considered as thick gingival phenotype 8-10. The aim of this study was to determine frequency of gingival phenotype and its distribution according to tooth shape in patients from our population so as to confirm the findings of the existing studies which can help clinicians in assessment and treatment planning with predictable treatment outcomes.

METHODOLOGY

This analytical cross-sectional study was conducted at Department of Periodontology, Fatima Memorial Hospital, Lahore, Pakistan, for a period of six months from March to September 2018 with the

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permission of Institutional Ethical Review Board (IERB) via letter number FMH-05-2018-IRB-451-M. Sample size of 201 was calculated using 95% confidence level, 7% margin of error and taking expected percentage of thin gingival biotype as 41.6%,[11] while non-probability consecutive sampling was used to enroll patients after taking informed written consent.

Inclusion Criteria: Patients aged between 18- 50 years, belonging to either gender presenting for routine dental checkup or maintenance therapy, having no clinical attachment loss or restorations in maxillary anterior teeth.

Exclusion Criteria: Patients with clinical signs of periodontal destruction having periodontal pockets deeper than 3 mm or history of any type of periodontal surgical procedures, history of trauma resulting in alteration in the shape of the incisors, pregnant or lactating mothers, previous orthodontic treatment, using medications that might affect gingival tissues e.g., phenytoin, bruxism or smoking.

Demographic details were recorded on a data collection form. Periodontal examination was carried out by a Michigan "O" Probe with Williams markings inserted into the midfacial sulcus of upper central incisors. The transparency of the probe was evaluated to examine the phenotype of the patient: if the outline was seen through the gingiva, it was regarded as thin otherwise, it was regarded as thick phenotype as shown in Figure-1.

Figure-1: Evaluating gingival thickness with Michigan "O" Probe, (n=201)

Crown width to crown length ratio was similarly recorded where length of the crown was taken as the distance between the tooth's incisal edge and the most apical free gingival margin (zenith) and width of the crown was taken as distance between approximal tooth surfaces, measured at the junction of clinical crown's middle and apical third. Data was analyzed using IBM SPSS (Statistical Package for the Social Sciences) version 19. Descriptive statistics were calculated for both qualitative and quantitative variables. For qualitative variables, frequency and percentage were calculated. For quantitative variables, Mean±SD was calculated. Chi-square test was used post-stratification with *p*-value ≤0.05 considered as significant.

RESULTS

A total of 201 patients were enrolled with 82 being males and 119 being females, with mean age of males being 31.78±8.163 years and 30.40±7.95 years among females. Out of the total sample, thick biotype was found in 66.17% whereas thin biotype was found in 33.83% (*p*-value≤0.05). Among 82 males, 58(70.73%) had a thick phenotype while 24(29.26%) had a thin biotype while among females, 75(63.02%) had a thick phenotype, while 44(36.97%) had a thin phenotype, as shown in Figure-2.

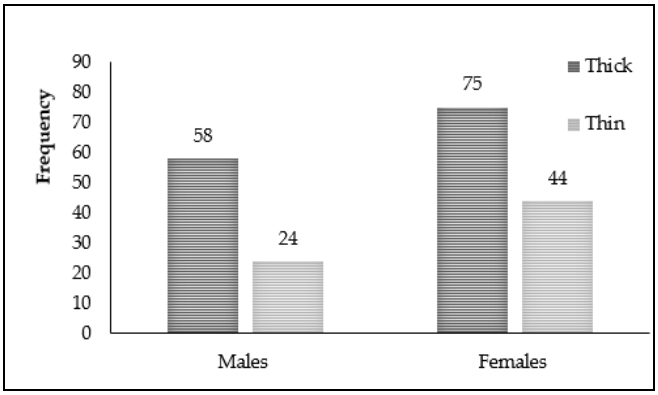

Figure-2: Frequency Distribution of Various Biotypes Among Males and Females, (n=201)

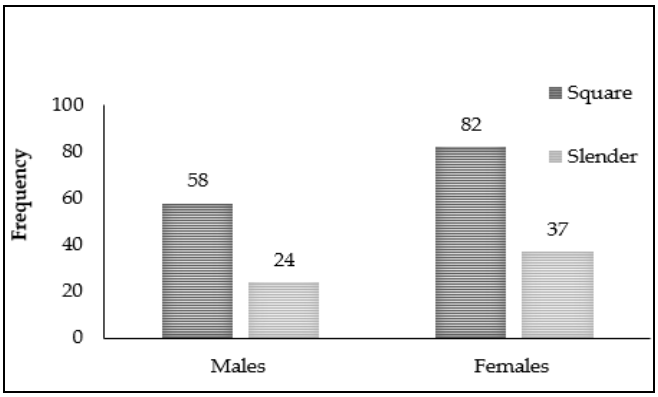

Figure-3: Frequency Distribution of Various Shapes of Central Incisors Among Males and Females, (n=201)

In 19 males, slender tooth shape and thin biotype was found (23.17%) whereas the same was noted in 36 females (30.25%). Square tooth shape, having a crown width to crown length ratio of more than 0.80, was found to be associated with thick gingival phenotype whereas slender tooth shape, having a crown width to crown length ratio of less than equal to 0.80, was found to be associated with thin gingival phenotype (*p*-value <0.05).

As shown in Table-I, frequency of varying forms of central incisor with square tooth shape and slender tooth shape (crown width to crown length ratio) among males and females, showed that 58(70.73%) males had square while 24(29.26%) had slender teeth.

Table-I: Distribution of Square Tooth Shape and Slender Tooth Shape with Crown Width and Crown Length Among Males and Females, (n=201)

Gender	Phenotype	Tooth Shape		Total n(%)	*p*-value
		Square	Slender		
Males	Thick	53	5	58(70.73%)	< 0.01
	Thin	5	19	24(29.26%)	
Females	Thick	73	2	75(63.02%)	< 0.01
	Thin	2	36	38(31.93%)	

DISCUSSION

This study was aimed at determining the frequency of gingival phenotype and tooth shape of maxillary central incisors as numerous studies,[12,13] have explored the differences between a natural tooth and an implant with recent publications,[2,3,14] indicating a higher incidence of gingival recession and alveolar bone dehiscence in patients exhibiting a thin phenotype and in teeth subjected to orthodontic forces, intended to move the teeth outside of the bony housing. One study 8 used a periodontal probe transparency (TRAN) approach to clinically evaluate gingival phenotypes, which was shown to be accurate from earlier research findings with 85% inter-examiner repeatability,[15] while others have shown that this method is not accurate.[1,9] Many studies,[3,4,10,16,17] have indicated that thick phenotype is most common in the general population, with Asian groups having a thin gingival phenotype relative to Caucasians.[16,17] The results of this study were similar to the results of another study with 51.2% of cases with thick biotype and 48.8% subjects had thin gingival biotype.[18] Some studies have reported that neither age nor gender seem to affect or influence gingival phenotype.[3,16,17] but others studies have reported that thin phenotype is more prevalent in females than males.[15,18-20] The relationship between gingival phenotypes and crown forms have been assessed in numerous studies but there is disagreement in literature as to whether the periodontal phenotype is predicted by tooth shape.[7,8,10,19] The relationship of flat thick gingival biotype with square tooth form and thin biotype with tapered tooth form was noted,[21] with other studies,[22,23] documenting that men had thicker phenotype with short square tooth shape while females had slender-tapered tooth shape and thinner phenotype. In one study,[24] no statistically significant difference between crown shape in relation to gingival biotype concluding crown shape was noted which may be due to the difficulty of evaluating the most suitable reference points for measurements, as crown length is influenced by incisal attrition, loss of attachment and gingival inflammation, while crown width is influenced by gingival papilla.

LIMITATIONS OF STUDY

The present study was limited by its analytical cross-sectional design, which precludes establishing causal relationships between gingival phenotype and tooth morphology. Additionally, the sample was drawn from a single institution and may not fully represent broader population variability in gingival biotype and tooth form. The reliance on visual assessment with a Michigan "O" Probe, while clinically practical, may lack the precision of more advanced imaging techniques such as ultrasonic or CBCT measurements. Future studies employing larger, more diverse samples and objective measurement tools could enhance the generalizability and accuracy of these findings.

CONCLUSION

The findings of the present study indicate that the thick gingival biotype exhibits a higher prevalence compared to the thin biotype. Moreover, the thick phenotype showed a notable association with a square tooth morphology, whereas the thin phenotype was predominantly correlated with a slender tooth morphology.

Conflict Of Interest: None.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

YI & MA: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

FQ & SNQ: Conception, data analysis, drafting the manuscript, approval of the final version to be published.

ZAK & KA: Data acquisition, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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