Correlation Between Association of ABO Blood Groups and with Gingival Biotype in the Maxillary Anterior Region: A Cross-Sectional Study

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Abstract

Background: *Gingival biotype, now termed periodontal phenotype, influences periodontal, restorative, and implant outcomes. Gingival thickness affects recession risk, healing, inflammation response, and esthetics. Since ABO blood groups are hereditary traits linked with several oral and systemic conditions, their relationship with gingival biotype remains of interest.*

Aim: *To evaluate the correlation between ABO blood groups and gingival biotype in the maxillary anterior region.*

Materials and Methods: *A cross-sectional study was conducted in the Department of Periodontics, Rama Dental College, Kanpur. A total of 702 subjects aged 18–35 years were selected by simple random stratified sampling over two months. Demographic data and blood group details were recorded. Gingival biotype in the maxillary anterior region was assessed by transgingival probing using an endodontic spreader. Data were analyzed using descriptive statistics, Chi-square test, and Pearson's correlation coefficient (SPSS version 23.0).*

Results: *The study included 702 participants with equal distribution of males and females (50% each). Blood group B (27.9%) was most common, followed by A (27.6%), AB (23.4%), and O (21.1%). Thick gingival biotype (53.8%) was more prevalent than thin (46.2%). A and O blood groups showed predominance of thick biotype, while AB showed more thin biotype, with a statistically significant association ($p < 0.05$). Males had more thick biotype and females slightly more thin biotype, but this difference was not statistically significant ($p > 0.05$).*

Conclusion: *No significant association was found between ABO blood groups and gingival biotype. Direct clinical assessment of gingival phenotype remains essential for treatment planning.*

Keywords: Gingival biotype, ABO blood group, periodontal phenotype, gingival thickness, maxillary anterior teeth.

Introduction

The morphology of the gingival tissues is an important factor influencing periodontal health, esthetics, and the outcome of restorative and implant procedures. Muller H. introduced the term gingival or periodontal phenotype to describe the considerable clinical variation observed in the thickness and width of keratinized facial gingiva. Later, Seibert and Lindhe used the concept of periodontal biotype to classify gingival tissues according to their bucco-lingual thickness as thick or thin. In contemporary literature, the terms gingival biotype, morphotype, and periodontal phenotype are often used interchangeably

to describe the dimensional characteristics of the gingiva.

Assessment of gingival biotype is clinically significant because soft- and hard-tissue dimensions play a decisive role in predicting treatment outcomes. Thin gingival biotypes are generally associated with a delicate osseous contour, higher susceptibility to gingival recession, and less favorable tissue response following surgical or restorative procedures. In contrast, thick gingival biotypes are characterized by dense fibrotic tissue, greater resistance to trauma and inflammation, and more predictable healing responses. Therefore, identifying the gingival biotype is essential during treatment planning for periodontal therapy, crown lengthening, veneers, orthodontic movement, and implant placement, particularly in the esthetic maxillary anterior region.

The maxillary anterior teeth are of special importance because they are highly visible during speech and smiling, making soft tissue harmony crucial for patient satisfaction. Variations in gingival contour and thickness in this region may significantly affect the final esthetic result and long-term stability of treatment.

ABO blood group system is a genetically determined trait widely studied in relation to systemic and oral diseases. Previous investigations have suggested associations between blood groups and conditions such as periodontal disease, dental caries, oral cancer, and wound healing patterns. Since both blood group inheritance and gingival tissue characteristics may have genetic influences, a possible relationship between ABO blood groups and gingival biotype warrants further investigation.

However, limited data are available regarding the correlation between ABO blood groups and gingival biotype, especially in the maxillary anterior region. Understanding such an association may help clinicians identify individuals predisposed to specific periodontal phenotypes and improve personalized treatment planning.

Therefore, the present cross-sectional study was undertaken to evaluate the correlation between ABO blood groups and gingival biotype in the maxillary anterior region.

Materials and Methods

This study was conducted in the Department of Periodontics, Rama Dental College, Hospital and Research Centre, Kanpur, over a period of two months to evaluate the correlation between ABO blood groups and gingival biotype in the maxillary anterior region. A total of 702

participants aged between 18 and 35 years were selected through simple random stratified sampling. Written informed consent was obtained from all participants prior to their inclusion in the study. Participants with a minimum of 20 natural teeth, healthy maxillary anterior teeth, and willingness to participate were included. Individuals who had undergone periodontal therapy within the previous six months, were receiving hormonal therapy, taking medications known to affect gingival tissues, had systemic conditions influencing periodontal health, or were unwilling to participate were excluded from the study.

Data Collection

Demographic details including age, gender, and ABO blood group were recorded as reported by the participants.

Gingival Biotype Assessment

After delivery of topical and/or local anaesthesia that was deposited at the depth of the vestibule, gingival thickness measurements were taken to prevent any unintentional increase in gingival thickness at the gingival biotype assessment site. Visual examination and probe translucency were used in our survey to identify the gingival biotype.

Visual Examination

The gingival biotype is examined appropriately according to the morphology of the gingiva around the tooth through simple visual examination. Gingival biotype refers to the quality and thickness of soft tissues surrounding the teeth. Gingival thickness greater than 1.5 mm is considered thick biotype, whereas thickness less than 1.5 mm is categorized as thin biotype. Thick gingiva is generally dense, fibrotic, and resistant to trauma, while thin gingiva is delicate, highly scalloped, and more susceptible to recession and inflammation.

The evaluation of gingival biotype was assessed for every patient by one calibrated investigator to avoid any bias in the results.

Transgingival Probing Test

For confirmation of gingival thickness, transgingival probing was performed using an endodontic spreader under aseptic conditions. The instrument was inserted perpendicularly through the gingival tissue until bone contact was achieved, and the tissue thickness was measured. Based on the recorded thickness, gingiva was categorized as thin or thick biotype. This method was considered practical and reliable for assessing gingival thickness.

Figure 1: Transgingival probing test for assessment of gingival thickness

Statistical Analysis

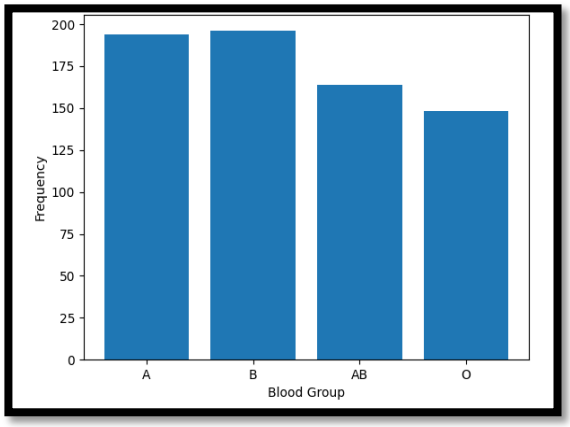
Data were analyzed using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were computed to summarize the data and presented as frequencies and percentages. The association between categorical variables, including age, gender, blood group, and gingival biotype, was assessed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 702 participants were included in the present study, all within the age group of 18–35 years. The study population was equally distributed between males (n = 351, 50%) and females (n = 351, 50%), ensuring uniform gender representation and minimizing gender-related bias.

Distribution of ABO Blood Groups

Graph 1:Distribution of ABO blood groups



The distribution of ABO blood groups among the study participants revealed that blood group B was the most prevalent, accounting for 27.9% (n = 196) of the total sample. This was closely followed by blood group A with 27.6% (n = 194) participants. (graph 1)

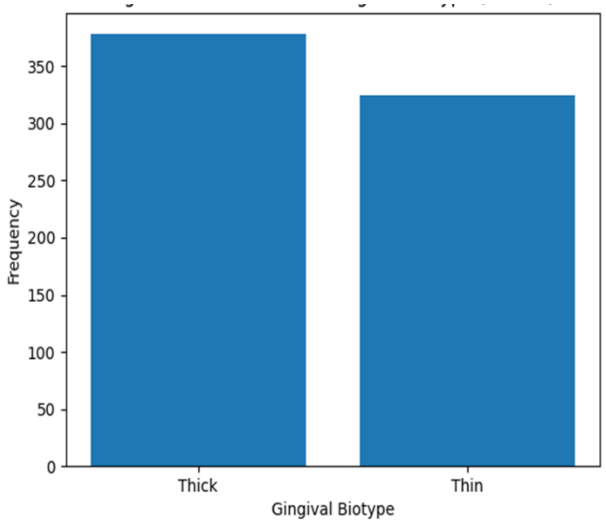
Blood group AB constituted 23.4% (n = 164) of the study population, while blood group O was the least common, representing 21.1% (n = 148) of the participants.

This distribution indicates a relatively balanced representation of all blood groups, with a slight predominance of blood groups B and A in the studied population.

Distribution of Gingival Biotype

Assessment of gingival biotype using transgingival probing demonstrated that thick gingival biotype was more prevalent in the study population. A total of 378 participants (53.8%) exhibited thick gingival phenotype, whereas 324 participants (46.2%) were categorized as having thin gingival phenotype.(graph 2)

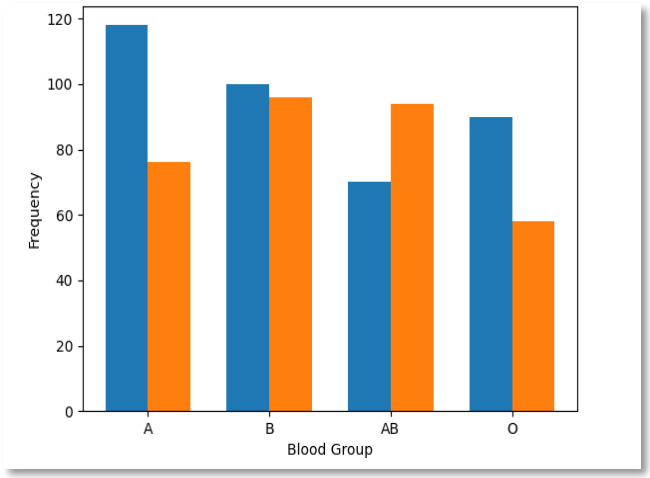
This finding suggests that a thicker gingival phenotype is slightly more common in the selected population.



Graph 2: Distribution of gngival biotype

Association Between ABO Blood Groups and Gingival Biotype

The relationship between ABO blood groups and gingival biotype was analyzed using the Chi-square test.



On comparative evaluation, it was observed that:

Graph 3: Association between ABO blood groups and gingival Biotype

Participants with blood groups A, B, and O showed a higher frequency of thick gingival biotype (graph 3)

* In contrast, blood group AB demonstrated a relatively higher proportion of thin gingival biotype

Although these variations suggest a possible trend in distribution, statistical analysis revealed that the association between ABO blood group and gingival

biotype was not statistically significant ($p > 0.05$).

This indicates that the observed differences in gingival biotype distribution across blood groups may be due to random variation rather than a true biological association.

Gender-wise Distribution of Gingival Biotype

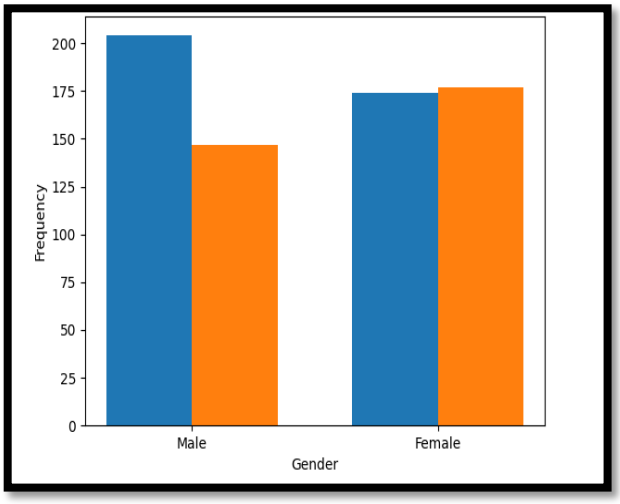
The comparison of gingival biotype between males and females showed that:

* Males had a higher proportion of thick gingival biotype

* Females exhibited a relatively balanced distribution, with a slight predominance of thin gingival biotype (graph 4)

However, on statistical evaluation, this difference was found to be not statistically significant ($p > 0.05$).

Thus, gender did not demonstrate a significant influence on gingival biotype in the present study.



Graph 4: Gender-wise distribution of gingival biotype

Discussion

Assessment of gingival thickness is clinically important because the periodontal phenotype strongly influences treatment response, esthetic outcomes, and long-term prognosis. Thick gingival tissues are generally dense, fibrotic, and well vascularized, showing greater resistance to inflammation and mechanical trauma. They usually heal with minimal post-surgical shrinkage and maintain stable gingival margins, making them favorable for implant placement, regenerative procedures, and esthetic restorative therapy. In contrast, thin gingival tissues are delicate, less vascular, and frequently associated with thin cortical bone. Such tissues are more prone to gingival recession resulting from plaque-induced inflammation, traumatic tooth brushing, orthodontic movement, or restorative interventions. In implant therapy, a thin phenotype may predispose to soft tissue collapse, labial plate resorption, and compromised esthetic outcomes. Therefore, careful tissue evaluation and augmentation procedures are often recommended in such cases.

The present study investigated whether ABO blood group, an inherited biological trait, could serve as a predictor of gingival phenotype. Although O positive participants showed a relatively higher prevalence of thick biotype and A positive participants demonstrated a greater tendency toward thin biotype, the association was not statistically significant. These findings suggest that gingival phenotype is likely multifactorial and influenced by several determinants such as genetic background, tooth form, alveolar bone thickness, oral hygiene practices, occlusal forces, and environmental factors rather than blood group alone.

Our findings are in agreement with the observations of Müller et al., who emphasized that periodontal phenotype is determined by multiple anatomical and biologic variables rather than a single isolated factor. Similarly, De Rouck et al. reported that gingival biotype is associated with tooth morphology, crown form, and periodontal dimensions, indicating a complex interaction of local factors. Kan et al. also noted that tissue thickness in the anterior maxilla plays a critical role in esthetic outcomes and varies considerably among individuals. Cook et al. further suggested that periodontal biotype should be evaluated clinically rather than assumed based on demographic or hereditary characteristics.

In the present study, males demonstrated a comparatively higher prevalence of thick gingival biotype than females. This observation is consistent with previous reports indicating that males often exhibit broader periodontal dimensions and thicker gingival tissues. However, the difference was not statistically significant and should therefore be interpreted with caution.

Clinically, the findings of this study highlight that direct assessment methods such as transgingival probing, probe transparency test, ultrasonic measurement devices, and cone beam computed tomography remain more reliable for determining gingival phenotype than indirect prediction based on blood group status. Since treatment planning in periodontal, restorative, and implant therapy depends heavily on tissue thickness, clinicians should rely on individualized clinical evaluation rather than hereditary markers alone.

The limitations of the present study include its cross-sectional design, single-center setting, and restricted age group, which may limit generalizability. Further multicenter studies with larger and more diverse populations are recommended to

better explore any possible genetic association between ABO blood groups and gingival phenotype.

Conclusion

Within the limitations of this study, no statistically significant correlation was found between ABO blood groups and gingival biotype in the maxillary anterior region. Although O+ individuals showed a tendency toward thick biotype and A+ individuals toward thin biotype, these trends were insufficient to establish blood group as a reliable predictor. Gingival biotype remains an important determinant in periodontal, restorative, and implant dentistry, affecting healing, recession risk, tissue stability, and esthetic outcomes. Therefore, gingival phenotype should be assessed directly through clinical methods rather than inferred from blood group status.

References

1. Müller HP, Eger T. Gingival phenotypes in young male adults. J Clin Periodontol. 1997;24(1):65-71.
2. De Rouck T, Eghbali R, Collys K, De Bruyn H, Cosyn J. The gingival biotype revisited: transparency of the periodontal probe through the gingival margin as a method to discriminate thin from thick gingiva. J Clin Periodontol. 2009;36(5):428-33.
3. Olsson M, Lindhe J. Periodontal characteristics in individuals with varying form of the upper central incisors. J Clin Periodontol. 1991;18(1):78-82.
4. Seibert J, Lindhe J. Esthetics and periodontal therapy. In: Lindhe J, editor. Textbook of Clinical Periodontology. Copenhagen: Munksgaard; 1989. p. 477-514.
5. Kao RT, Pasquinelli K. Thick vs thin gingival tissue: a key determinant in tissue response to disease and restorative treatment. J Calif Dent Assoc. 2002;30(7):521-6.
6. Kan JY, Rungcharassaeng K, Umezu K, Kois JC. Dimensions of peri-implant mucosa: an evaluation of maxillary anterior single implants in humans. J Periodontol. 2003;74(4):557-62.
7. Cook DR, Mealey BL, Verrett RG, Mills MP, Noujeim ME, Lasho DJ, et al. Relationship between clinical periodontal biotype and labial plate thickness: an in vivo study. Int J Periodontics Restorative Dent. 2011;31(4):345-54.
8. Claffey N, Shanley D. Relationship of gingival thickness and bleeding to loss of probing attachment in

shallow sites following nonsurgical periodontal therapy. J Clin Periodontol. 1986;13(7):654-7.

9. Eger T, Müller HP, Heinecke A. Ultrasonic determination of gingival thickness. Subject variation and influence of tooth type and clinical features. J Clin Periodontol. 1996;23(9):839-45.
10. Fu JH, Yeh CY, Chan HL, Tatarakis N, Leong DJ, Wang HL. Tissue biotype and its relation to the underlying bone morphology. J Periodontol. 2010;81(4):569-74.