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Correlation of Maxillary Intercanine Distance with Interalar Width in Dentate Subjects

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ABSTRACT

Objective: To determine the correlation of maxillary intercanine distance with interalar width in dentate candidates.

Study design: Cross-Sectional study

Study place and duration: Department of Prosthodontics, Foundation University College of Dentistry, Islamabad, Pakistan, from Oct 2024 to Mar 2025.

Methodology: A total of 110 candidates with fully erupted natural maxillary and mandibular anterior teeth and Angle Class-I occlusion were enrolled. In order to measure the interalar width, two points were marked on the widest area of right and left alae of nose with the help of indelible pencil and distance between both points was measured with Digital Vernier Caliper Intercanine distance was measured from right to left canine cusp tip using the same vernier caliper.

Results: The mean age of participants was 20.58±1.88 years, with 54(49.1%) males and 56 (50.9%) females. The mean interalar width was 35.65±4.91 mm, and the mean intercanine distance was 38.22±2.48 mm. A positive correlation was found between interalar width and intercanine distance (r = 0.556, *p*=<0.001), though it was neither strong nor weak overall. Agespecific analysis showed a weak correlation in subjects <20 years (r = 0.486, *p*=0.002), and a stronger correlation in those >20 years. Gender-wise, a stronger correlation was noted in females (r = 0.686, *p*=<0.001) compared to males (r = 0.510, *p*=<0.001).

Conclusion: A positive but weak correlation exists between interalar width and intercanine distance in young dentate subjects.

Keywords: Correlation, Interalar Width, Intercanine Distance

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INTRODUCTION

The human nose is a prominent facial feature and a key anthropometric landmark used to determine gender and ethnicity in individuals of unknown identity.[1] Among its parameters, the interalar width has clinical significance in various fields, including prosthodontics.2 In complete denture fabrication, interalar width is often used as a guide for selecting and positioning maxillary anterior teeth, as it is believed to have a correlation with maxillary intercanine distance, which is key for functional and aesthetic outcomes.[3] When pre-extraction records are unavailable, selecting appropriately sized maxillary anterior teeth becomes a significant challenge in complete denture cases.[2,4] To address this, several biometric guides based on facial measurements have been proposed to assist in tooth selection, including bi-zygomatic width, intercanthal distance, interpupillary distance, and interalar width.[2,5] Among these, interalar width has been recognized not only in nasal surgery but also as a helpful landmark in determining the canine position during anterior teeth arrangement for edentulous patients.[6]

Several studies have suggested a correlation between interalar width and intercanine distance, influenced by ethnicity, gender, age, and region.[7]An international study reported a moderate correlation (r = 0.393),[8] while a regional study showed a stronger one (r = 0.642, *p*<0.01).[9] One local study found a weaker correlation (r = 0.306), with no significant gender-wise association.[10] These varying results highlight the lack of consensus and, limited data from the local population highlights the need for further research to establish more reliable population-specific guidelines.

The aim of the present study was to investigate the correlation between maxillary intercanine distance and interalar width in dentate subjects from a local Pakistani population.

METHODOLOGY

This cross-sectional study was conducted at the Department of Prosthodontics, Foundation University College of Dentistry, Islamabad for 6 months from October 2024 to March 2025 after taking approval from Institutional Review Committee (via letter no. FF/FUCD/632/ERC/54, dated 26 January 2023).

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Inclusion Criteria: Patients of either gender aged between 18 to 25 years, having completely erupted natural maxillary and mandibular anterior teeth in Angle Class-I occlusion, a symmetrical facial appearance, and with coinciding dental and facial midlines were included.

Exclusion Criteria: Patients having diastema or crowding of anterior teeth, vertical overlap of maxillary and mandibular anterior teeth greater than 3mm and horizontal overlap greater than 2mm of the height of mandibular incisors, any defects or restorations in anterior teeth, facial abnormality (congenital, trauma or surgical) or patients who are habitual mouth breathers were excluded.

A sample size of 110 was calculated using the OpenEpi calculator, based on a correlation coefficient of 0.306 between interalar width and intercanine distance.[10] Candidates were enrolled by applying non-probability convenient sampling technique, after taking informed consent.

Patients referred to the Department of Prosthodontics from hospital OPD were examined for suitability of inclusion in the study. They were seated on dental unit in a relaxed position, face forward and head supported on the head rest. The entire data collection procedure was explained to the patient in their native language, including the method and the amount of time that was required to carry out the procedure. To measure the interalar width, two points were marked on the widest areas of the right and left alae of the nose using an indelible pencil, and the distance between these points was measured with a digital vernier caliper, yielding a value of 31.87 mm (as shown in Figure-2). The intercanine distance was measured using the same digital vernier caliper by placing it between the cusp tips of the right and left canines, and the distance between these points was recorded as 35.31 mm (as shown in Figure-3). All measurements were filled in the proforma for each patient. The digital vernier caliper available in the department was used with appropriate disinfection between patients. All procedural observations were carried out by trainee researcher herself (as shown in Figure-1) Data analysis was done by using Statistical Package for the Social Sciences (SPSS) version 21. Descriptive statistics were calculated for both quantitative and qualitative variables. Frequency and percentage for qualitative variables, i.e. gender, was calculated. Mean and Standard deviation for quantitative variables such as age, inter-alar width and inter-canine distance were calculated. Data normality was assessed using Shapiro-Wilk test, and the results confirmed that the variables were normally distributed. Effect modifiers like gender and gender were controlled through stratification. Pearson's correlation test was used after stratification. In order to check the correlation between inter-alar width and inter-canine distance, Pearson's correlation was used and a *p*-value of 0.05 or less was considered as significant.

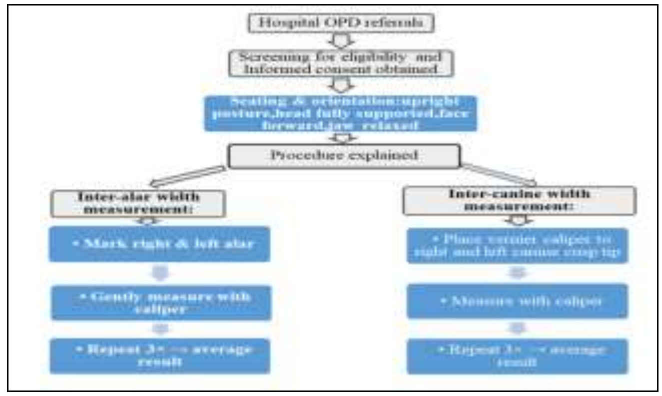

Figure-1 Flow Chart Representing The Steps Involved In The Study of Methodology.

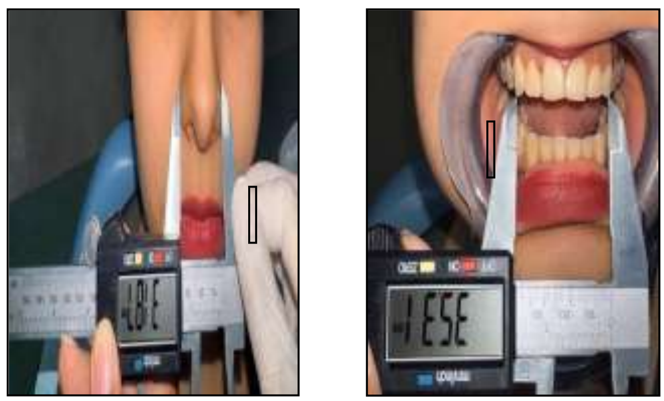

Figure 2 & 3: Measurement of interalar width with the Measurement of intercanine distance with the help of Digital Vernier Caliper the help of Digital Vernier Caliper

RESULTS

The study sample of 110 candidates included 54(49.1%) males and 56(50.9%) females. The participants had a mean age of 20.58±1.88 years. Of the total, 37(33.6%) were younger than 20 years, 51(46.4%) were aged between 20 and 22 years, and 22(20.0%) were older than 22 years.

The mean interalar width within the study sample was 35.65±4.91 mm, while the mean intercanine distance was 38.22±2.48 mm. A detailed view of these measurements is presented in Table-I

The correlation analysis revealed that interalar width is positively and significantly associated with intercanine distance across all groups. In participants younger than 20 years, the relationship was moderate (r = 0.486, p = 0.002). In the 20–22 years (r = 0.624, p < 0.001) and >22 years groups (r = 0.656, p = 0.001), the correlation was strong, indicating that the association becomes stronger with age. Gender-wise comparison showed a moderate correlation in males (r = 0.510, p < 0.001) and a strong correlation in females (r = 0.686, p < 0.001), suggesting that interalar width is a more reliable predictor of intercanine distance in females. A detailed view of these measurements is presented in Table-II.

Table-I: Mean Inter-Alar width and Inter-Canine Distance (n=110)

Parameter	Values
Mean Interalar Width	35.65±4.91mm
27.20 – 33.19	41(37.3%)
33.20 – 39.19	42(38.2%)
39.20 – 52.19	27(24.5%)
Mean Intercanine Distance	38.22±2.48mm
33.20 – 37.19	40(36.4%)
37.20 – 39.19	36(32.7%)
39.20 – 46.19	34(30.9%)
Difference in Mean Distance	2.59±4.09mm

Table-II: Correlation of Interalar Width with Intercanine Distance in different Age and Gender groups (n=110)

Variables		Correlation Coefficient (r)	p-value
Age	<20 years	0.486	0.002
	20-22years	0.624	<0.001
	>22years	0.656	0.001
Gender	Male	0.510	<0.001
	Female	0.686	<0.001

DISCUSSION

The most noticeable and expressive feature of the human body is the face, which also has a significant impact on our social acceptance. Loss of teeth affects not just one's appearance but also one's mental health. Consequently, it is essential to offer a substitute that is both aesthetically pleasing and comfortable to use.[11,13] In this study, a positive but weak correlation was observed between interalar width and intercanine distance in young dentate individuals (r = 0.556, p=<0.001), indicating that interalar width alone may not be a sufficiently reliable guide; therefore, additional parameters should be considered. Age specific analysis showed a weak correlation in subjects <20 years (r = 0.486, p = 0.002), and a stronger correlation in those >22 years (r = 0.656, p = 0.001). Gender-based analysis revealed a statistically significant correlation in both males and females. In males, the correlation coefficient was 0.510 (p = <0.001, n = 54), while females exhibited a comparatively stronger correlation, with a coefficient of 0.686 (p = <0.001, n = 56). In this study, the intercanine distance was found to be greater than the interalar width. These findings suggest that interalar width may serve as a more reliable predictor of intercanine distance in females than in males. These results are consistent with one study which reported a strong positive correlation (r = 0.642, p < 0.01) between interalar width and intercanine distance among Aryan and Mongoloid populations.[9] In contrast, a local study by Mahmood et al.10 found only a weak correlation in the overall sample (r = 0.306), with no significant relationship when males (r = 0.038) and females (r = 0.015) were evaluated separately. Similarly, another study reported a very weak correlation (r = 0.0018) in a Pakistani population. The higher correlation observed in our study, especially among females, may be attributed to the narrower age range (18–25 years) and sample homogeneity.[14]

In a study of 211 students in Peshawar, Ayub *et al.*[14], discovered a relationship between the combined mesio-distal dimensions of the anterior six maxillary teeth and interalar width. They came to the conclusion that while the nose can serve as a reference for choosing the width of the maxillary anterior teeth, many guides are necessary to achieve consistent outcomes. Several studies that examined growth changes in curved widths in the transverse direction reported that the inter-canine and inter-molar widths did not change after the age of 13 in females and 16 in males.[15]

In 1986, Hoffman et al. evaluated the relation between interalar width and intercanine width on 340 fully dentate subjects.[7] The interalar ratio is most often employed in arranging the teeth, but they found that these two widths did not correlate. The interalar width was 3% lesser than the intercanine width and 30% smaller than the intercanine circumferential distance. In our study, we observed the mean Interalar width as 35.65±4.91 mm and mean intercanine distance as 38.22±2.48 mm. Maskey *et al.* reported slightly lower values (intercanine: 34.58 ± 3.25 mm; interalar: 31.68±4.07 mm), while an Indian study found a mean intercanine distance of 48.23±3.7 mm and interalar width of 34.42±2.9 mm, indicating significant variation across ethnic groups.[9,12] In contrast, a study involving a Thai population reported that the interalar width was greater than the intercanine distance by 3.14±3.00 mm in men and 2.61±2.54 mm in women.[7]

The width of the nose, in addition to other markers like bizygomatic width, intercanthal width, and interpupillary distance, can be used to determine the size of teeth.[13] The interalar width suggests that an approximate estimate of the six maxillary anterior teeth can be obtained by drawing parallel lines on the labial aspect of the wax occlusion rims of the maxillary denture base during the maxilla-mandibular jaw relation.[5] People of different ethnicities and geographical locations have different morphological measures, which determine the relationship between the interalar width and the total width of the six maxillary anterior teeth. There is a gender-related difference in its width between males and females. Consequently, a relationship between the interalar width and the intercanine distance has been noted. Different multiplying factors have been demonstrated in a number of experiments to make the interalar width proportionate to the intercanine distance.[14] The maxillary canine is considered the cornerstone of the dental arch, as it defines the curvature of the arch while providing essential support for facial aesthetics.[15] When choosing the size of upper anterior teeth, the appropriate canine placement also offers important information.[16,17] However, directly comparing intercanine distance and interalar width across different studies can be challenging, as variations in measurement landmarks and participant demographics often influence the results. This reversal in the relationship further highlights the impact of ethnicity, gender, and potentially environmental factors on craniofacial dimensions.[18]

LIMITATIONS OF STUDY

Due to limited time and resources, the study was conducted at a single center and focused on a narrow age range (18-25years).

CONCLUSION

Within the limitations of the present study, it can be concluded that a positive but weak correlation exists between intercanine distance and interalar width in young dentate individuals.

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Authors' Contribution

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

AR & SA: Data acquisition, data analysis, critical review, approval of the final version to be published.

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

AMS & PK: Conception, data acquisition, drafting the manuscript, 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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