http://doi.org/10.33279/jkcd.v15i04.887

Original Article

DETERMINING THE CORRELATION BETWEEN INTERCANINE DISTANCE, INTERCOMMISSURAL DISTANCE AND INTERPUPILLARY DISTANCE IN POPULATION OF TWIN CITIES

Sajjad Hussain[1], Amna Amjad[1], Abdul Rehman[2], Moiza Ijaz[2], Zainab Riaz[3], Mahgul Nasr Aheer[3]

[1]Department of Department of Prosthodontics, Rawal Institute of Health Sciences, Islamabad
[2]Department of Department of Prosthodontics, Margalla College of Dentistry, Rawalpindi
[3]House Officer, Margalla College of Dentistry, Rawalpindi

ABSTRACT

Objectives: *Finding a relationship between the maxillary intercanine width and facial landmarks such interpupillary distance and intercommissural width, as well as calculating the ratio between the variables that were evaluated, were the goals of this study; this information may be helpful in clinical settings.*

Materials and Methods: *This was a cross sectional study that required use of a precise digital vernier caliper [Mitutoyo (UK) Ltd.] with a 0.01 mm precision and the ability to measure distances ranging from 0 to 150 mm was used for all of these measurements. The Intercanine width measurements were taken directly on the participant with the help of a dental floss. Each dimension was recorded thrice and a mean was calculated.*

Results: *Inter commissural width was also significantly higher in males as compare to the females (49.0±5.8 vs 46.63±4.2 respectively, p<0.001). Whereas, no significant association was found between mean width of maxillary anteriors among males and female participants.*

Conclusion: *When building a prosthesis for an edentulous patient, the physician should consider these facial landmarks to help them determine the best canine positioning.*

Key words: *Anterior, intercanine width, intercommissural width, interpupillary distance, edentulous*

Cite as: Hussain S, Amjad A, Rehman A, Ijaz M, Riaz Z, Aheer MN. Determining the correlation between intercanine distance, intercommissural distance and interpupillary distance in population of twin cities. Journal of Khyber College of Dentistry Dec 2025, Vol. 15, No. 4. http://doi.org/10.33279/jkcd.v15i04.887

INTRODUCTION

Human relationships and personality are impacted psychologically by face appearance and aesthetic beauty. Psychologists claim that those with greater physical attractiveness are more socially acceptable[1]. When teeth are lost, especially in the anterior area, one's aesthetic appeal and physical look deteriorate. This can lead to an inferiority feeling and all of its aftereffects, which frequently cause psychological distress[2]. A person's smile plays a major role in their sense of self-worth. From a clinical standpoint, it appears that biomechanical concerns about denture stability and function sometimes obscure conceptions of denture aesthetics. Enhancing dental esthetics and oral health is the responsibility of dental professionals[3]. The primary components that contribute to the aesthetic significance of dentofacial attractiveness are the maxillary anterior teeth. A complete edentulous individual must have their anterior teeth to blend in with their surrounding facial structure in terms of size, shape, and color. Lack of pre-extraction

Correspondence:
Amna Amjad
Assistant Professor
Department of Prosthodontics, Rawal Institute of Health Sciences, Islamabad
Email: amnaamjad6@gmail.com

Date Submitted: August 2025
Date Revised: October 2025
Date Accepted: November 2025

records makes it harder to accomplish any of these goals[3,4]. When selecting prosthetic teeth, a variety of facial and oral factors should be taken into account[4]. While recording the maxillomandibular relationship for complete dentures, on the occlusal rims, different reference parameters are recorded including smile line, midline, canine line and high-lip line. These reference lines are a useful marker in establishing the width of anterior teeth. During taking measurements, these lines are positioned in relation to specific facial landmarks, such as intercommissure, labial frenum, interalar, interpupillary distance and bizygomatic width[5,6].

A number of attempts have been carried out to precisely determine the anterior tooth selection. Some of the commonly used extraoral parameters include but are not limited to interpupillary distance, bizygomatic, philtral and interalar width, skull circumference and intercanthal distance. A few intraoral parameters have also been taken into account, including pterygomaxillary notch, palatal width, length, and depth, and maxillary arch length and width. However, little investigation has been done to demonstrate that a single aesthetic feature may be used with reliability when selecting artificial teeth[3,4,7]. Research on anthropometric facial features and how they relate to natural teeth has revealed information about their shared individual agreement. Several studies on the human face show that there are notable differences in parameters between different racial groups, countries, populations, and individuals. When choosing artificial denture teeth, they have proposed a proportion between the face and tooth size. However, the main drawback is the subjectivity of the soft tissue measures[4,6,7,8]. Using consistent facial references that are not subject to change is the answer to this issue. One such constant facial feature is the interpupillary distance, which remains stable beyond the age of fourteen[6].

Relation between various measurements of the face and maxillary teeth selection in the esthetic zone for complete dentures has been highlighted in multiple previous studies. Aziz N et al found that although interpupillary, intercanthal, and interalar distances show a strong correlation, they may not serve as reliable guides for selecting maxillary anterior teeth in Malayan individuals[9]. Similarly, Isa ZM et al observed positive relationship between maxillary anterior teeth dimensions and both interpupillary and interalar distances in Malaysian Malay and Chinese ethnic groups[10]. Research by Banik RK et al demonstrated that maxillary teeth width in the esthetic zone and interpupillary distance are positively associated across different facial types in the Bangladeshi population[5]. Additionally, Gomes VL et al examined the link in anterior maxillary teeth distoproximal width and interpupillary gap, suggesting that the latter could consistently aid in artificial tooth selection[11]. A systematic review by Ashish RJ et al highlighted that facial measurements (bizygomatic and interalar width) are positively correlated with anterior maxillary teeth width in the Indian population. In contrast, the intercanthal distance was more closely associated with the width of maxillary anterior teeth in the Saudi population, on the other hand the intercommissural width demostrated a strong relationship with maxillary teeth width in Brazilian populations of mulatto and black ethnicities[12].

Previous research has demonstrated that the canine position is derived from the anatomical components of the face, and may therefore be related to a specific race.

There aren't ample studies on Asians, particularly Pakistani population, that look at the distance between canines and facial markers. Finding a relationship between the intercanine width and landmarks of face, as well as calculating the ratio between the same was the primary goal of the study. We believe that this information will be very helpful in appropriate planning and better patient outcomes in routine clinical practice.

MATERIALS AND METHODS

Participants in this study included 245 people between the ages of 18 and 45. Each participant had complete craniofacial and dental growth. There were of 97 men and 148 women. Ethics approval was obtained from the Ethics Committee of Rawal Institute of Health Sciences (Approval no: RIHS/IRB/D/24/010). Subjects that were not included in the study were those with occlusal and orthodontic anomalies, facial asymmetry, extractions and restorations on the anterior teeth. Additionally, none of the participants' anterior teeth in either the upper or lower jaw exhibited crowding, spacing, or fixed crowns. A precise digital vernier caliper [Mitutoyo (UK) Ltd.] with a 0.01 mm precision and the ability to measure distances ranging from 0 to 150 mm was used for

all of these measurements. One observer measured the subjects' interpupillary distance, intercanine width, and intercommissural width. The distance between the eyes' mid-pupils was measured during the interpupillary distance assessment. Using the participant's mandible at rest and their lips unstretched, the intercommissural measurement measured the distance between the mouth's corners. Readings to measure intercanine width were taken directly on the participant using a dental floss. Each dimension was recorded thrice and a mean was calculated.

RESULT

Data was recorded and analyzed for 245 participants in this study. The mean age was 21.80±3.26 years (age range of 18 – 42 years). Majority of the participants were females 148 (60.4%) while 97 (39.6%) were males. Majority of the participants were residents of Rawalpindi, 186 (75.9%), followed by Islamabad, 45 (18.4%). The summary of baseline characteristics is given in table 1. The mean inter pupillary width was calculated to be 60.43±4.1 mm, mean inter commissural width was 47.60±5.0 mm. While width of maxillary anteriors was reported to be 49.93±4.3 mm demonstrated in table 1.

Overall, there was a weak correlation in positive direction, found between inter pupillary and anterior teeth width (coefficient of correlation (r) = 0.331, p<0.001). Similarly, there was a weak correlation found between inter commissural and max anterior width (coefficient of correlation (r) = 0.196, p=0.002) as shown in table 3.

For two gender groups, the correlation test was stratified for males and females separately as given in table 3. Among males, there was a moderate correlation between max anterior and inter pupillary width (coefficient of correlation (r) = 0.577, p<0.001), whereas in females, there was no significant correlation (p=0.359), and the correlation coefficient was calculated to be 0.076, which shows minimal to no

Table 1: Baseline characteristics summary table (n=245)

Characteristics		Values
Age (years)	Mean age	21.80±3.2
	Minimum age	18
	Maximum age	42
Gender n(%)	Male	97 (39.6%)
	Female	148 (74.0%)
Residence n(%)	Islamabad	45 (18.4%)
	Rawalpindi	186 (75.9%)
	Others	14 (7.0%)
Inter Pupillary Width (mm)	Mean IPW	60.43±4.1
	Minimum IPW	32.61
	Maximum IPW	68.40
Inter Commissural Width (mm)	Mean ICW	47.60±5.0
	Minimum ICW	22.01
	Maximum ICW	59.79
Width of max anteriors (mm)	Mean WMA	49.93±4.3
	Minimum WMA	23.77
	Maximum WMA	60.18
Ratio between IPW / WMA	Mean	1.21±0.1
	Minimum	0.96
	Maximum	2.13
Ratio between ICW / WMA	Mean	0.95±0.1
	Minimum	0.41
		1.85

Table 2: Comparison of dental parameters with gender (n=400)

	Gender groups		p
	Male (n=52)	Females (n=148)	
Mean age (years)	22.5±3.5	21.32±2.9	0.004
Inter Pupillary Width (mm)	62.29±4.8	59.20±3.0	<0.001
Inter Commissural Width (mm)	49.0±5.8	46.63±4.2	<0.001
Width of max anteriors (mm)	50.21±4.5	49.7±4.1	0.407

Table 3: Correlation of max anterior width with inter pupillary width and inter commissural width

			r	p
Max anterior width	Inter pupillary width	Overall (n=245)	0.331	<0.001
		Males (n=97)	0.577	<0.001
		Females (n=148)	0.076	0.359
	Inter commissural width	Overall (n=245)	0.196	<0.001
		Males (n=97)	0.421	<0.001
		Females (n=148)	-0.33	0.693

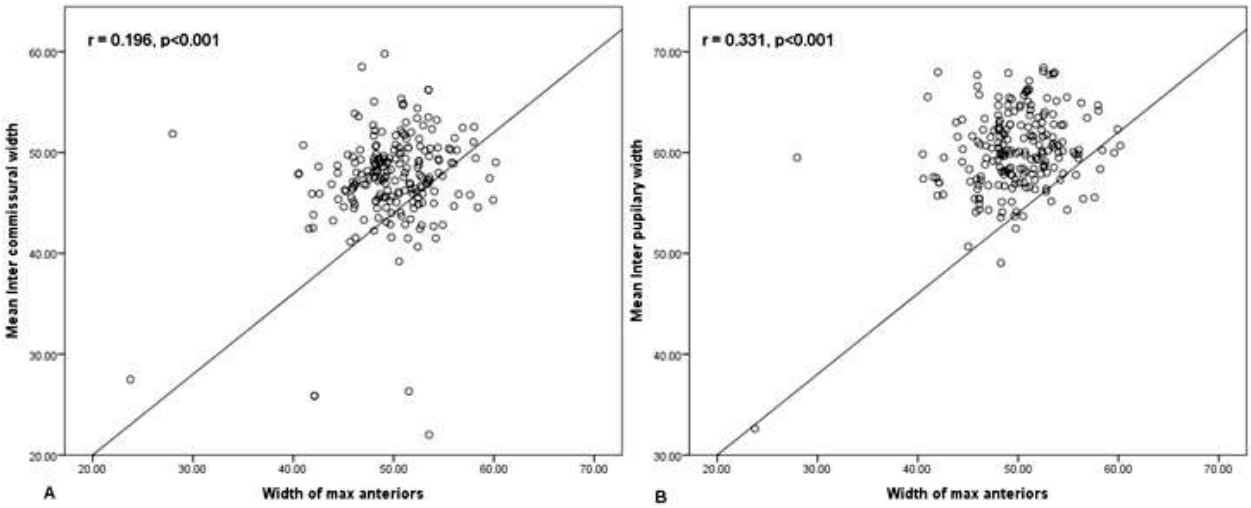

Fig 1: Correlation between A). Max anterior width and inter commissural width, B). Max anterior width and inter pupillary width.

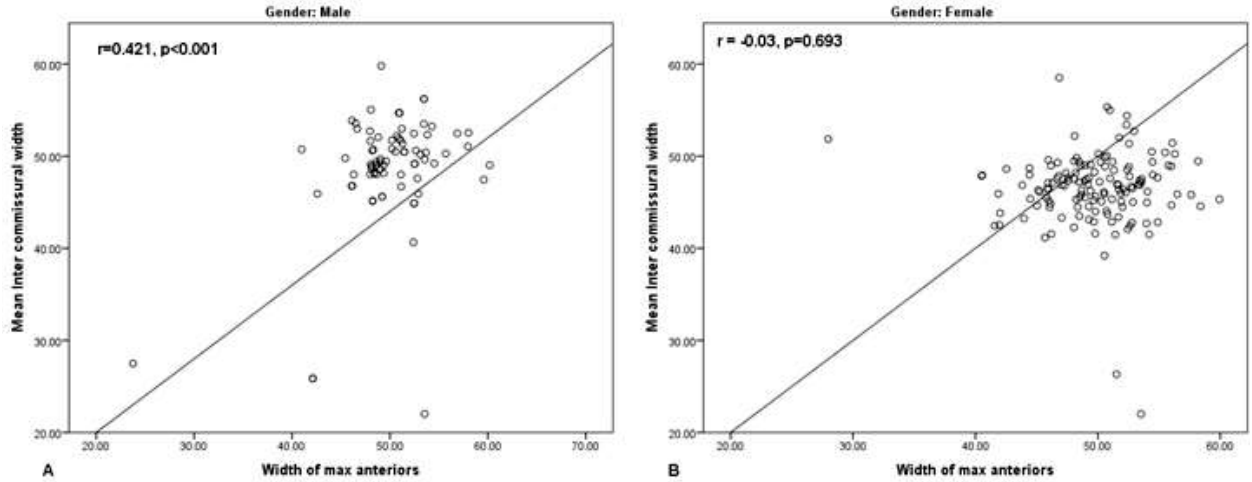

Fig 2: Correlation between max anterior width and inter commissural width, A). Males, B). Females

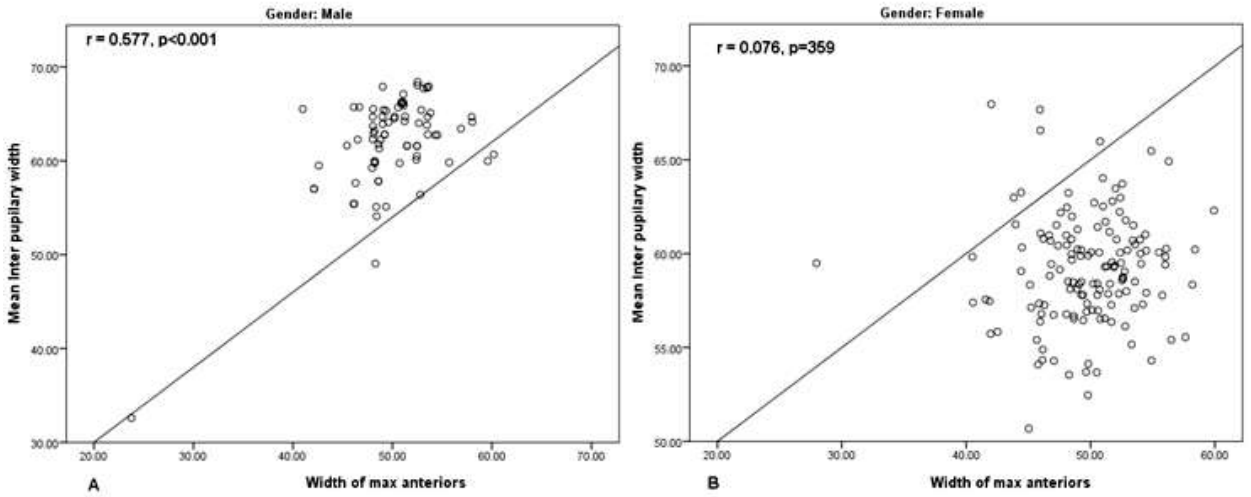

Fig 3: Correlation between max anterior width and inter pupillary width, A). Males, B). Females

correlation. On the other hand, among males, max anterior width was found to be moderately correlated with inter commissural width correlation coefficient r = 0.421, p<0.001), while no significant correlation was found among females (coefficient of correlation = -0.333, p=0.693)

The overall correlation graphs and gender stratified graphs are given below. Figure 1 gives scatter plot between; a). Inter commissural and maxillary anterior width, b). Inter pupillary and maxillary anterior width. Figure 2 and 3 shows scatter plot for males and females, correlating parameters including maxillary anterior and interpupillary width; and maxillary anterior and inter commissural width respectively.

DISCUSSION

No significant association was found between mean width of maxillary anteriors among males and female participants (p=0.407). As suggested by previous literature, men had wider six maxillary anterior teeth than women[13,14]. However, several studies on other populations have shown contrasting results[15,16,17].

A moderate positive relaptioship was observed between maxillary anterior teeth and intercommissural width, (r= 0.421, p<0.001). However, among females, no significant correlation was identified (p = 0.693), and the calculated correlation coefficient of -0.333 indicated a weak negative relationship. Grevisse et al. also reported a statistically significant difference in intercommissural width (ICW) based on sex (p = 0.048), aligning with findings from some previous studies[18,19]. The observed differences in this study, including the greater dimensions of long bones and height disparities in gender, may be influenced by the predominance of younger women in the sample, which could also account for the higher ICW values in women.

This study identified a weak relationship between the width of the maxillary anterior teeth and the interpupillary distance, with a correlation coefficient (r) of 0.331 and a significance level of p < 0.001. In another study by Alshamri HA et al, strong correlation was reported between central incisors, all four central and lateral incisors, and altogether six maxillary anterior teeth and interpupillary distance (IPD) and the combined width of the anterior teeth[19]. Among male participants, the IPD showed a significant relationship with the width of the left canine and both central incisors, whereas for female participants, it was significantly associated with the width of the right central incisor, the right and left lateral incisors, and the left central incisor. These findings suggest a strong statistical connection between the IPD and width of all six anterior teeth in the general population. Similar observations were reported by Al-Kaisy and Garib; however, these results contrast with the findings of Parciak et al., who did not identify a significant correlation between IPD and the width of the six maxillary anterior teeth[20].

These facial cues could be used to provide the doctor with guidance regarding the canine positioning for prosthesis construction for an edentulous patient, even though the link was not very strong. Positioning of front teeth plays a vital part in the aesthetics of the patient and thus it is important to highlight any variable that has the chance to even play the slightest role in the success of the prosthesis. Given the multitude of factors influencing the canine location, it would be incorrect to conclude that this study endeavor has demonstrated the superiority of either facial landmark. As a preliminary approach, the sculpting of the occlusion wax rim to achieve the ideal occlusal vertical dimension and sufficient lip support, followed by the marking of the canine line, must be taken into consideration when evaluating the canine position.

CONCLUSION

When building a prosthesis for an edentulous patient, the physician should consider these facial landmarks to help them determine the best canine positioning. This lacks the necessary level of reliability to serve as the basis for the ultimate decision but facial measurements should always be taken into consideration.

REFERENCES

1. Pisulkar S, Nimonkar S, Bansod A, et al. (July 28, 2022) Quantifying the Selection of Maxillary Anterior Teeth Using Extraoral Anatomical Landmarks. Cureus 14(7): e27410. DOI 10.7759/cureus.27410

2. Shakila Nazreen Banu U. Determining the Correlation Between Maxillary Anterior Teeth Size with Bitragion Width, Wrist Width, Interpupillary Width, Nasal Height in Indian Population and Using These Anthropometric Measurement as A Guide For Selecting Maxillary Anterior Dimensions. Annals of International Medical

and Dental Research, Vol-9, Issue-4 | July- August 2023 DOI: 10.53339/aimdr.2023.9.4.23

3. Tripathi, Shuchi; Singh, Raghuwar D; Chand, Pooran; Kumar, Lakshya; Singh, Gulshan K1. A Study to Correlate Various Facial Landmarks with Intercanine Distance. Indian J Dent Research 29(4):p 440-444, Jul–Aug 2018. | DOI: 10.4103/ijdr.IJDR_80_17
4. Girish et al. Comparative Evaluation of the Relationship between the Intermedial Canthus Width on the Face and the Width of the Maxillary Central Incisor in Males and Females in The Local Population. Int J Cur Res Rev Vol 13 Issue 24 Dec 2021 DOI: http://dx.doi.org/10.31782/IJCRR.2021.132407
5. Rajib kumar Banik et al. Relationship between the Interpupillary Distance and the Width of Maxillary Anterior Teeth of Different Face Forms Among Bangladeshi Adult Population. IJMS, 10(1), 15-19, 2023 DOI: https://doi.org/10.14445/23939117/IJMS-V10I1P103
6. Deogade SC, Mantri SS, Saxena S, Daryani H. Correlation between Combined Width of Maxillary Anterior Teeth, Interpupillary Distance and Intercommissural Width in a Group of Indian People. Int J Prosthodont Restor Dent 2014;4(4):105-111. DOI: 10.5005/jp-journals-10019-1116
7. Ayman Ellakwa et al. Quantifying the Selection of Maxillary Anterior Teeth Using Intraoral and Extraoral Anatomical Landmarks. The Journal of Contemporary Dental Practice, November-December 2011;12(6):414-421 DOI: 10.5005/jp-journals-10024-1069
8. George Attokaran, Kamalakanth Shenoy Correlation between Innercanthal Distance and Mesiodistal Width of Maxillary Anterior Teeth in a Thrissur, Kerala, India, Population. The Journal of Contemporary Dental Practice, May 2016;17(5):382-387 383. DOI: 10.5005/jp-journals-10024-1859
9. Aziz, N., Che Mohd, N., Baharuddin, I., Rajali, A., Lim, T., Tan, S., & Ahmad, R. The Relationship of Facial Measurements with the Mesiodistal Width of the Maxillary Anterior Teeth. J Dent Indones. 2021;28(3): 158-162 DOI: 10.14693/jdi.v28i3.1270
10. Isa ZM, Tawfiq OF, Noor NM, Shamsudheen MI, Rijal OM. Regression methods to investigate the relationship between facial measurements and widths of the maxillary anterior teeth. J Prosthet Dent. 2010;103(3):182-8.
11. Gomes VL, Goncalves LC, Parado CJD, Junior IL, et al. Correlation between facial measurements and the mesiodistal width of the maxillary anterior teeth. J Esthet Restor Dent 2006;18:196-205..
12. Ashish Rathanchand Jain et al., Correlation of Width of Maxillary Anterior Teeth in Indian Population. Journal of Clinical and Diagnostic Research. 2019 Jul, Vol-13(7): ZC10-ZC17 DOI: 10.7860/JCDR/2019/41082.12988
13. Flavie, A.M.E., Pierrot, K.N., Omer, N., Michael, A., Paul, S.I.B.J. and Fidele, N.B. (2022) Correlation between the Bizygomatic Distance and the Width of the Upper Central Incisor in the Cameroonian Melanoderma Adult. Open Journal of Stomatology, 12, 294-304. https://doi.org/10.4236/ojst.2022.1210026
14. Fernandes, T.M., Sathler, R., Natalício, G.L., Henriques, J.F. and Pinzan, A. (2013) Comparison of Mesiodistal Tooth Widths in Caucasian, African and Japanese Individuals with Brazilian Ancestry and Normal Occlusion. Dental Press J Orthodontics, 18,130-135. https://doi.org/10.1590/S2176-94512013000300021
15. Hashim, H.A. and Al-Najoomi, H. (2018) Tooth Width among Qatari with Different Malocclusion. Int J Dent Oral Health, 4, 1-7. https://doi.org/10.16966/2378-7090.252
16. Alshamri, H.A., Moaleem, M.M., Al-Huthaifi, B.H., Al-Labani, M.A., Naseeb, W.R.B., Daghriri, S.M., Suhail, I.M., Hamzi, W.H., Illah, M.J.A., Thubab, A.Y., Aljabali, S.A. and AlNehmi, M.M. (2023) Correlation between Maxillary Anterior Teeth and Common Facial Measurements. Clinical, Cosmetic and Investigational Dentistry, 15,289-300. https://doi.org/10.2147/CCIDE.S438302
17. Nazir, S., Zargar, N.M., Khurshaid, S.Z., Shah, A.F., Mir, S. and Rashid, R. (2015) The Selection of Maxillary Anterior Teeth Width in Kashmiri Population. J Orofacial Research, 5, 40-42. https://doi.org/10.5005/jp-journals-10026-1175
18. Hamid, M.M.M., Faragalla, A.I., Ibrahim, W.S.A. and Eldin, A.B.G. (2021) Facial Anthropometry among Saudi Population. Annals of Medical and Health Sciences Research, 11, 1398-1402.
19. Alshamri HA, Al Moaleem MM, Al-Huthaifi BH, Al-Labani MA, Naseeb WRB, Daghriri SM, et al. Correlation Between Maxillary Anterior Teeth and Common Facial Measurements. Clin Cosmet Investig Dent. 2023;15.
20. Parciak EC, Dahiya AT, AlRumaih HS, Kattadiyil MT, Baba NZ, Goodacre CJ. Comparison of maxillary anterior tooth width and facial dimensions of 3 ethnicities. J Prosthet Dent. 2017;118(4):504–510. doi:10.1016/j.prosdent.2016.10.035.

CONFLICT OF INTEREST
Authors declare no conflict of interest.
GRANT SUPPORT AND FINANCIAL DISCLOSURE
None declared.

AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	SH, AA, AR, MI, ZR, MNA
Acquisition, Analysis or Interpretation of Data:	SH, AA, AR, MI, ZR, MNA
Manuscript Writing & Approval:	SH, AA, AR, MI, ZR, MNA

All the 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.