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Facial Measurements as Predictors of Maxillary Anterior Teeth Dimensions in Young Adults from West Bengal: A Cross Sectional Study

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Abstract

Background: In complete denture therapy, selecting the size of maxillary anterior teeth is critical for esthetics and function, yet pre-extraction records are often unavailable. Stable facial references may provide practical guidance.

Aim: To develop clinically usable guidance for selecting the width of maxillary anterior teeth based on facial measurements in the absence of pre-extraction records.

Methods: In this cross-sectional study conducted at HIDSAR (January 2018–July 2019), 300 dentate participants (150 males, 150 females; 18–30 years) underwent standardized extraoral measurements—interpupillary distance (IPD), inner intercanthal distance (ICD), interalar width (IAW), intercommissural width (ICW), philtrum width (PW)—and intraoral measurements—central incisor width (CIW) and the canine-to-canine circumferential arc distance (CARCD). Each parameter was measured in triplicate with an electronic digital Vernier caliper (0.01-mm resolution). Pearson correlations and linear regressions were used to evaluate associations.

Results: All seven dimensions were larger in men than women ($p<0.05$). Sample-level means included (mean ± SD): IPD 64.23 ± 2.67 mm; ICD 31.80 ± 3.15 mm; IAW 36.13 ± 5.12 mm; ICW 51.53 ± 3.82 mm; CARCD 49.61 ± 7.69 mm; CIW

8.60 mm (SD not reported). IAW showed a moderate positive correlation with CARCD ($r \approx 0.50$; $p<0.001$). IPD correlated positively but more weakly with CARCD (males $r=0.13$; females $r=0.33$). ICD showed no correlation with CARCD. Regression equations, including a multiple-predictor model, were derived to estimate CARCD from facial metrics.

Conclusions: In this young adult West Bengal cohort, interalar width is a practical extraoral guide to estimate the combined width/arc of maxillary anterior teeth. The derived formulas may aid clinical tooth selection when pre-extraction records are unavailable; further validation is recommended.

Keywords: Complete Denture Esthetics; Anterior Tooth Selection; Interpupillary Distance; Interalar Width; Philtrum Width; Intercommissural Width; Facial Anthropometry; West Bengal

Introduction

Smile esthetics strongly influence self-image and social interaction. Optimal smiles integrate dental and gingival components in harmony with the lips and facial features; size, shape, color, alignment, and proportion of the maxillary anterior teeth are central to this harmony. When pre-extraction records are unavailable, clinicians need reliable, stable facial landmarks to guide selection—especially width, which is visually dominant from the frontal view. This study evaluates facial measurements (IPD, ICD, IAW, ICW, PW) as predictors of CIW and the canine-to-canine circumferential arc distance (CARCD) in a West Bengal population, aiming to generate clinically usable guidance.

Materials and Methods

Study design and setting

Cross-sectional study at the Department of Prosthodontics & Crown and Bridge, HIDSAR, West Bengal, India; January 2018–July 2019.

Participants

Population: Patients, students, and others attending HIDSAR.

Sample size: 300 participants (150 males; 150 females), ages 18–30 years.

Inclusion: Complete natural dentition (with/without third molars); age 18–30 years.

Exclusion: Craniofacial anomalies or facial/oral surgery; orthodontic or prosthodontic treatment; caries/restorations/attrition/abrasion; crowding/spacing of maxillary anterior teeth.

Ethical considerations

Ethical approval: The study received ethical clearance from the Ethics Committee of Haldia Institute of Dental Sciences and Research (HIDSAR), Banbishnupur, Balughata, Haldia, Purba Medinipur-721645, India. Certificate of Ethical Clearance dated 15-02-2018. Written informed consent was obtained from all participants prior to enrollment.

Measurements and protocol

All measures were taken by the same examiner under standardized conditions, with the participant upright, lips relaxed, in natural head position. Each parameter was measured three times; the mean was recorded. An electronic digital Vernier caliper (0.01-mm precision; 0–150 mm range) was used for all linear measurements.

Table 1: Variables and measurement techniques

Variable	Definition / Anatomical landmarks	Technique / Instrument
IPD	Mid-pupil to mid-pupil distance.	Mark mid-pupils on tongue spatula; measure with digital caliper.
ICD	Distance between medial canthi.	Measure medial canthus to medial canthus with caliper.

IAW	Widest alar points.	Ask subject to momentarily suspend breathing; measure alar-to-alar with caliper.
PW	Width of philtrum at its base.	Measure between two most prominent points at philtral base with caliper.
ICW	Vermilion commissure-to-commissure width at rest.	Relaxed lips, mandible at rest; measure with digital caliper.
CIW	Mesiodistal width of a maxillary central incisor.	Measure at contact points (not too cervical/occlusal) with caliper.
CARCD	Circumferential canine-to-canine arc distance.	Adapt wire along labial curvature through contact points; straighten and measure with caliper.

Results

Table 2: Descriptive statistics (overall sample)

Variable	Mean (mm)	SD (mm)	Range (mm)
IPD	64.23	2.67	—
ICD	31.80	3.15	—
IAW	36.13	5.12	23.64–39.86
ICW	51.53	3.82	—
CARCD	49.61	7.69	—
CIW	8.60	—	—

Note: Sex-stratified descriptive statistics were reported as significantly higher for males across all variables; exact sex-specific means/SDs to be inserted when available.

Table 3: Correlations with CARCD

Predictor	r (male)	r (female)	Overall	p-value / Note
IPD	0.13	0.33	—	Female $p<0.001$ (reported)
ICD	0.059	0.09	—	NS ($p=0.47$ male; 0.29 female)
IAW	—	—	0.50	$p<0.001$
ICW	—	—	—	Weak but significant; $p=0.007$
PW	—	—	—	Weak but significant

Table 4: Regression equations for estimating CARCD

Model	Equation
Single-predictor (IPD)	CARCD = 13.085 + 0.23 × IPD
Single-predictor (ICD)	CARCD = 13.085 + 0.00 × ICD
Single-predictor (IAW)	CARCD = 13.085 + 0.608 × IAW
Single-predictor (PW)	CARCD = 13.085 + 0.87 × PW
Single-predictor (ICW)	CARCD = 13.085 − 0.212 × ICW

Single-predictor (CIW)	CARCD = 13.085 + 0.007 × CIW
Multiple-predictor	Predicted CARCD = 6.40 + 0.184×IPD − 0.008×ICD + 0.604×IAW + 0.86×PW − 0.24×ICW + 1.38×CIW
Auxiliary (to verify)	CIW = 34.07 − 1.77 × PW [verify units/label]

Table 5: Sample characteristics

Characteristic	Value	Note
Total N	300	18–30 years
Male	150	
Female	150	
Setting	HIDSAR, West Bengal, India	
Timeline	Jan 2018 – Jul 2019	

Figure A: Overall means of measured variables (mm)

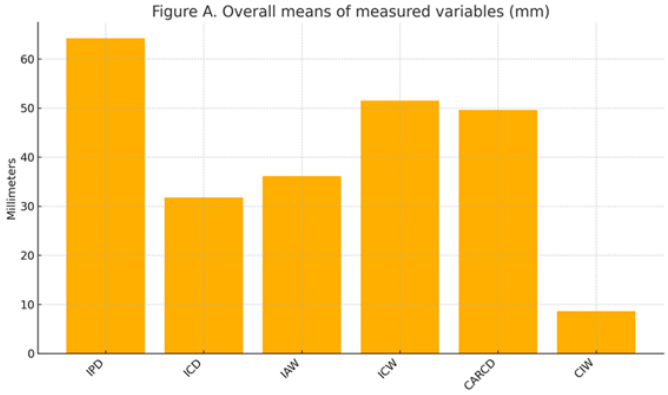
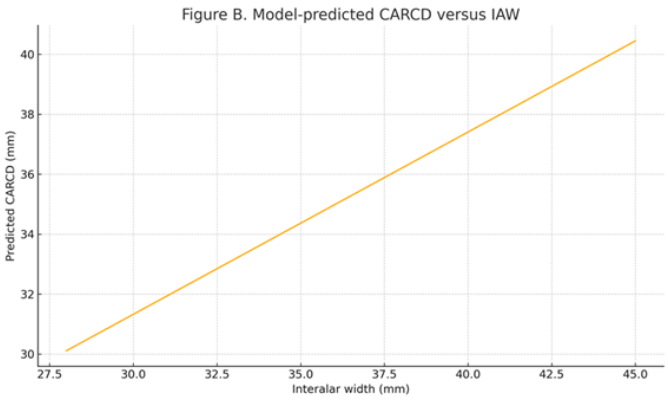


Figure B: Model-predicted CARCD versus IAW (from single-predictor regression: CARCD = 13.085 + 0.608×IAW)



Method Figures (extracted from thesis procedures)

Figure 1. Panels: Fig-3 (Marking IPD) and Fig-4 (Measuring IPD)

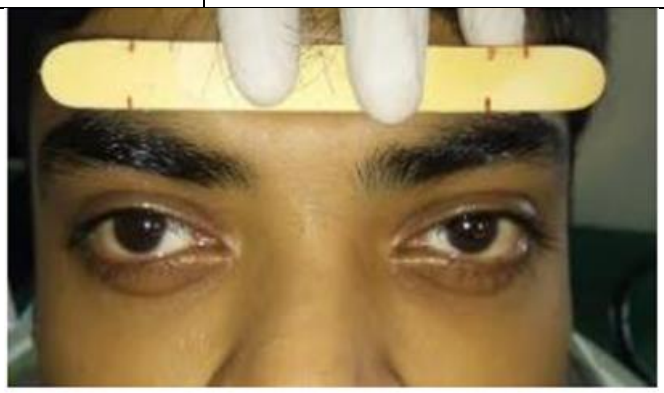


Figure 3: Marking Interpupillary distance on wooden tongue spatula

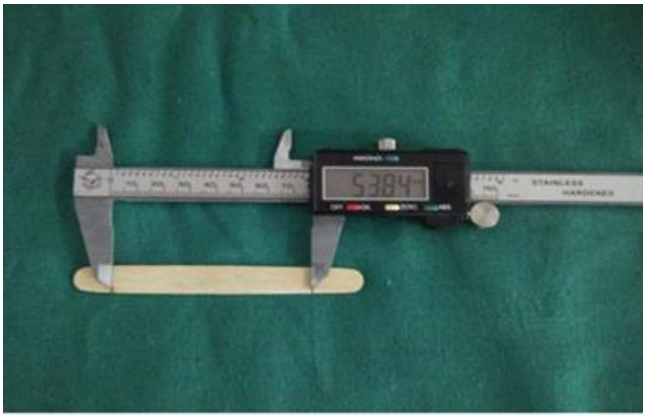


Figure 4: Measuring the Interpupillary distance

Figure 2. Panels: Fig-3 (Measuring ICD) and Fig-4 (Measuring IAW)

Measuring inner inter canthal distance

Measuring Interalar width

Figure 3. Panels: Fig-5 (Measuring PW) and Fig-6 (Measuring ICW)

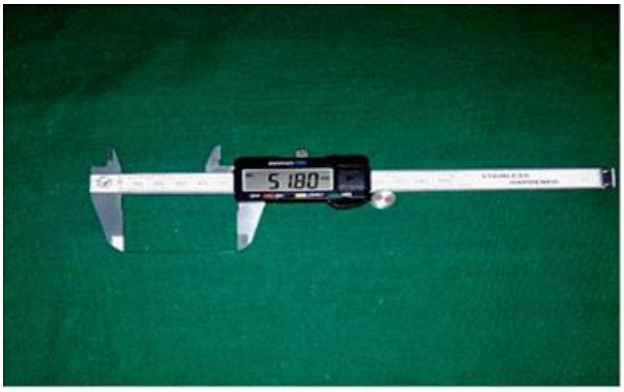
Measuring Philtrum width

Measuring Intercommisural Distance

Figure 4. Panel: Fig-8 (Measuring CIW)

Measuring Central Incisor Width

Recording Curcumferential ARC Width



Measuring Curcumferential ARC Distance

Discussion

This study provides practical, population-specific guidance for selecting maxillary anterior tooth width/arc using extraoral landmarks when pre-extraction records are absent. Interalar width (IAW) demonstrated the most useful single-predictor relationship with CARCD. IPD showed weaker positive associations, ICD showed none, and ICW and PW showed weak yet significant associations. These findings are consistent with several prior reports that highlight IAW as a clinically helpful guide, though effect sizes vary across populations and measurement methods. Multi-parameter approaches offer greater reliability than any single metric.

Methodological strengths include repeated measures, a single examiner, and a young adult sample to minimize growth and wear confounds. Limitations include measurement access in tight contacts for CIW, occasional difficulty positioning caliper tips at the medial canthus for ICD, and generalizability from a single-center cohort. Some reported coefficients/labels (e.g., CIW–PW) require verification against the raw dataset.

Conclusions

Facial anthropometry—particularly interalar width—provides useful guidance to estimate maxillary anterior arc width for denture tooth selection in young adults from West Bengal. The presented prediction formulas can assist clinicians when pre-extraction records are unavailable, with attention to sex differences and the modest strength of single-metric relationships. Further multi-center validation is recommended.

Clinical significance

- IAW is a practical, moderately strong single predictor of CARCD for tooth selection in this population.
- IPD, ICW, and PW add incremental value but show weaker associations; ICD is not useful.
- Use multi-parameter regression rather than any single landmark when possible.

References

1. Scandrett FR, Kerber PE, Umrigar ZR. A clinical evaluation of techniques to determine the combined width of the maxillary anterior teeth and the maxillary central incisor. J Prosthet Dent. 1982;48: 15–22.
2. Hoffman W, Bomberg TJ, Hatch RA. Interalar width as a guide in denture tooth selection. J Prosthet Dent. 1986;55(2):219–221.
3. Latta GH, Weaver JR, Conkin JE. The relationship between the width of the mouth, interalar width, bizygomatic, and interpupillary distance in edentulous patients. J Prosthet Dent. 1991;65:250–254.
4. Smith BJ. The value of the nose width as an esthetic guide in prosthodontics. J Prosthet Dent. 1975; 34:562–573.
5. Mavroskoufis F, Ritchie GM. Nasal width and incisive papilla as guides for selection and arrangement of maxillary anterior teeth. J Prosthet Dent. 1981;45(6):592–597.
6. Wazzan KAA. The relationship between intercanthal dimension and widths of maxillary anterior teeth. J Prosthet Dent. 2001;86:608–612.

7. Abdullah MA, Stipho DH, Talic YF, Khan N. The significance of inner canthal distance in prosthodontics. [Journal details as per thesis].
8. Gomes VL, et al. Correlation between facial measurements and the mesiodistal width of the maxillary anterior teeth. J Esthet Restor Dent. 2006;18:196–205.
9. Gomes VL, et al. Interalar distance to estimate the combined width of the six maxillary anterior teeth in oral rehabilitation treatment. J Esthet Restor Dent. 2009;21:26–36.
10. Isa ZM, et al. Regression methods to investigate the relationship between facial measurements and widths of the maxillary anterior teeth. J Prosthet Dent. 2010;103:182–188.
11. 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 Oral Prosthodont Restor Dent. 2014;4(4):105–111.
12. Deogade SC, et al. The relationship between innercanthal dimension and interalar width to the intercanine width of maxillary anterior teeth in central Indian population. J Indian Prosthodont Soc. 2015;15(2):91–97.
13. Al-Kaisy N, et al. Selecting maxillary anterior tooth width by measuring certain facial dimensions in the Kurdish population. J Prosthet Dent. 2016;115 (3):329–334.
14. Dwivedi A, Yadav NS, Mishra KS. Inter-canthal and inter-alar distance as a predictor of width of maxillary central and lateral incisor—an in vivo study. Ann Med Health Sci Res. 2017;7:276–279.
15. George A, Shenoy K. Correlation between interalar distance and mesiodistal width of maxillary anterior teeth in Thrissur, Kerala, Indian population. J Int Soc Prev Community Dent. 2018;8:118–123.
16. Chaudhury GAM, Khna AA, Qureshi A, Ahamed S. Relationship between intercanthal distance and intercanine width of maxillary anterior teeth in Pakistani population. J Pak Dent Assoc. 2018; 27(3):124–126.
17. Jain RA, Nallaswamy D, Ariga P. Correlation of width of maxillary anterior teeth with extraoral factor (interpupillary width) in Indian population. J Clin Diagn Res. 2019;13(7).
18. Ibrahimagic L, Celebic A, Jerolimov V. Correlation between size of maxillary frontal teeth, width between alae nasi and width between corners of the lips. Acta Stomatol Croat. 2001;35:175–179.
19. Al-el-Sheikh HM, Al-Athel MS. Relationship of interalar width, interpupillary width and maxillary anterior teeth width in Saudi population. Odontostomatol Trop. 1998;21:7–10.
20. Kurien A, et al. Relationship between interalar width, intercommissural width and circumferential arc width of maxillary anterior teeth. J Indian Prosthodont Soc. 2014;14(4):352–357.