# Correlation Between the Width of Maxillary Anterior Teeth and Several Facial Landmarks of Indonesian Female and Male

**Nina Ariani[1], Hendrik Hendrik[2], Chaidar Masulili[1], Lindawati Kusdhany[1*]**

1. Department of Prosthodontics, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia
2. Private practice, Jakarta, Indonesia

**Abstract**

Prescribing the correct tooth size and proportion to prosthodontics patients is a challenge. Several studies state that the total width of six maxillary anterior teeth (WAT) can be predicted from intercanthal distance (ICD), interalar width (IAW) or commisural width (CMW). A recent study in the USA compares anterior tooth proportions among subjects, including Asian, with even sex distribution. However, it is known that craniofacial characteristics are subjected to environmental adaptations. Therefore, this study was performed to correlate the width of six maxillary anterior teeth and several facial landmarks of Asian living in Asia (Indonesia). Thirty-six females and 24 males (age 20 – 35 y.o.) participated in the study. ICD, IAW and CMW were measured intraorally using caliper three times for each. WAT was measured by adding mesiodistal width of each anterior tooth. The means and standard deviations of each variable were calculated. Correlations between variables were analyzed using Spearman/Pearson correlation coefficient. The mean values were significantly different for male and female for CMW (P = 0.000), IAW(P = 0.000), ICD (P = 0.007) and WAT (P = 0.000).Male has a statistically significant strong correlation between WAT and CMW (P = 0.004, r = 0.53). These results suggested that for this particular population, for males the width of six maxillary anterior teeth is strongly correlated with commissural width.

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## Introduction

Facial appearance and dental esthetics has become a very important component of tooth rehabilitation. Prescribing the correct tooth size and proportion to prosthodontics patients is a challenge, especially when the anterior teeth are missing and there are no pre-extraction records available. In these cases, usually selection of appropriate size of anterior teeth has become arbitrary and relies on several facial landmarks to aid in the selection. Facial landmarks most often used in aiding the correct size of anterior teeth are inter pupillary distance, bizygomatic width, intercanthal distance, interalar width and intercommisural width.[1,2]

Several studies state that the total width of six maxillary anterior teeth can be predicted from intercommisural width, interalar width or intercanthal distance. In contrast, some authors find that the width of six maxillary anterior teeth is not correlated with neither the inter commisural width, interalar width[3] nor intercanthal distance.[4] Therefore, it has been proposed that more than one facial measurement may be needed for determining the width of anterior teeth.[2]

Racial and sex differences in the maxillary anterior teeth dimensions have been reported, but the results were valid only for specific populations. In a recent study, correlation was found between the width of six maxillary anterior teeth and the inter

***Corresponding author:***
Lindawati S. Kusdhany
Department of Prosthodontics
Faculty of Dentistry, Universitas Indonesia
**E-mail**: lindaskusdhany@gmail.com

commissural width in Asian women, but not in African-American, Caucasian nor other sex.[5] Features differentiating craniofacial anthropometric measurements in various races/ ethnic groups are known.[6] Furthermore, anthropometric measurements can also differ between sexes of the same race.[6]

A recent study acknowledges that there is no study comparing anterior tooth proportions among multiple ethnicities with even sex distribution and therefore they perform the study.[5] The results show that the inter commisural width correlated with the width of six maxillary anterior teeth in Asian women, but not in other ethnicities or sex.[5] However, that study was done in the USA. It is known that craniofacial characteristics are subjected to environmental adaptation as well as genetic determinants.[7] Therefore, this study was performed to correlate the width of six maxillary anterior teeth and several facial landmarks for Asian female and male living in Asia (Indonesia).

## Materials and methods

This study was a cross sectional study involving 20 – 35 years old dental student volunteers from Universitas Indonesia. The Asian volunteers involved in this study come from several ethnic groups in Indonesia. Ethical approval was obtained from Faculty of Dentistry Universitas Indonesia. The inclusion criteria were (1) No missing maxillary anterior teeth, (2) No attrition, diastema nor crowding of maxillary anterior teeth, (3) No crown or large restorations on maxillary anterior teeth and (4) No congenital nor acquired facial deformities. Thirty-six females and 24 males selected based on above criteria participated in the study. All volunteers signed informed consent prior to their participation.

Measurements were done directly on each volunteer. In a well-lit room, volunteer sat upright on a stool and gazed forward intercanthal distance (ICD), interalar width (IAW) and commissural width (CMW) were measured using caliper three times for each measurement. The three facial landmarks (ICD, IAW and CMW) represents the independent variables.

ICD was defined as the distance between medial angle of palpebral fissures.[1] IAW was measured by putting the tip of the caliper on the outmost nose alae without pressure.[8] The mesiodistal width of each maxillary anterior teeth was measured intraorally with caliper using contact point as reference. The width was then transferred to paper, and the total width of six maxillary anterior teeth (WAT) was measured by adding the mesiodistal width of each maxillary anterior teeth.

The data were statistically analyzed using descriptive statistics and Pearson/ Spearman correlation coefficients (SPSS IBM, New York, NY) to determine whether correlation existed between the WAT and the three facial landmarks of female and male groups.

## Results

The descriptive statistics of all volunteers are presented in Table 1. The value of the WAT of all volunteers is most similar to CMW. When the volunteers were grouped based on sex, the values were greater for male than female significantly for all variables (Table 2).

Since the female data was not distributed normally, the correlation coefficient for female was analyzed using Spearman correlation, while for male group Pearson correlation was used. The results can be seen in Table 3. Only WAT in male has a statistically significant correlation with CMW, and with a strong correlation.

**Table. 1**. Mean values and range of WAT and the three facial landmarks

| | Minimum (mm) | Maximum (mm) | Mean ± SD |
|---|---|---|---|
| WAT | 46.00 | 55.00 | 49.22±2.11 |
| ICD | 28.15 | 38.75 | 33.38±2.58 |
| IAW | 34.00 | 47.00 | 39.12±3.44 |
| CMW | 40.65 | 57.50 | 48.60±3.75 |

WAT = width of 6 maxillary anterior teeth;
ICD = intercanthal distance; IAW = interalar width;
CMW = commissural width.

**Table 2.** Mean values and range of WAT and the three facial landmarks

| | Female | Male | P |
|---|---|---|---|
| WAT | 48.14±1.27 | 50.83±2.10 | 0.000* |
| ICD | 32.67±2.54 | 34.46±2.30 | 0.007* |
| IAW | 37.34±2.39 | 41.79±3.05 | 0.000* |
| CMW | 46.97±2.74 | 51.05±3.76 | 0.000* |

**Table 3**. Correlation between the width of six maxillary anterior teeth and facial landmarks in female and male

| | Female | | Male | |
|---|---|---|---|---|
| | Pv | Correlation coefficient | Pv | Correlation coefficient |
| WAT – ICD | 0.472 | 0.01 | 0.110 | 0.26 |
| WAT – IAW | 0.228 | 0.13 | 0.082 | 0.29 |
| WAT – CMW | 0.322 | 0.08 | 0.004* | 0.53 |

## Discussion

The value of the width of six maxillary anterior teeth of all volunteers is most similar to commissural width. Even when the volunteers were grouped based on sex, those two variables remain most similar in both sexes. However, there are significant differences for measurement of all variables when comparing female and male group (Table 2). This significant differences in facial morphology is in accordance with Barbosa et al that states biometric analysis of the face should be examined separately due to sexual dimorphism.[9]

The mean width of six maxillary anterior teeth in this study (Asian female: 48.14mm; Asian male: 50.83mm) is greater than the ones by Parciak (Asian female: 46.6mm; Asian male: 48.9mm).[5] This can be explained by different measuring techniques. In this study the width was measured intraorally while Parciak measures the width on a maxillary cast.

The intercanthal distance correlation with the total width of six maxillary anterior teeth was not found in this study. This is not in agreement with findings of Al Wazzan.[1] The subjects of Al Wazzan study are all of Arab extraction, while Asian volunteers were involved in this study. The different ethnic groups of the volunteers may explain the difference. The Asian, particularly both sexes of Singaporean Chinese, Vietnamese females, Thai and Japanese males, have significantly greater intercanthal distance compared to North American whites. While among the Middle Eastern ethnic groups, intercanthal distance is identical if not smaller than the North American whites.[6]

In this study, the interalar width did not have significant correlation to the width of six maxillary anterior teeth for both female and male group. This is in line with previous studies that mentioned that neither the nasal nor interalar width correlate with the distance from canine to canine.[3,5] However, this is not in agreement with Mavroskoufis and Ritchie that found on soft tissue, interalar width is correlated with the width of six maxillary anterior teeth.[10]

Parciak reported a correlation between the width of the six maxillary anterior teeth to commissural width in Asian women[5], while no stable ratio was found between the combined width of six maxillary anterior teeth and commissural width in white female and male.[1] Our study found a strong correlation in Asian male ($r$ = 0.53) between the six maxillary anterior teeth and commissural width. Facial morphological characteristics can be different among groups from the same ethnicity, even from different villages.[9,11]

Standardized methodology, more samples, and further investigations into migration and genetic influence on craniofacial morphology might help explain these differences.

## Conclusions

Within the limitations of this study, it was concluded that the mean values of width of six maxillary anterior teeth, intercanthal distance, interalar width and commissural width were significantly greater in male compared to female. The width of six maxillary anterior teeth is strongly correlated with male commissural width.

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