



## MAXILLARY INTER CANINE WIDTHS; COMPARISON ANALYSIS IN VARIOUS POPULATIONS.

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### INTRODUCTION

In orthodontic diagnosis and treatment planning, different treatment plans like maxillary expansion, premolar extractions, leveling are greatly dependent upon arch width measurements, which in turn require calculation of maxillary intercanine width (ICW) and intermolar width.<sup>1-3</sup> Assessment of dental arch dimensions is one of the most significant diagnostic criteria for the orthodontic diagnosis; treatment planning and post treatment stability.<sup>4-5</sup>

Many analysis have been proposed, such as, Brudon prediction method,<sup>6</sup> Pont's index<sup>7</sup> and Schwarz's.<sup>8</sup> modified Pont's index. Howe et al.<sup>9</sup> suggested a simplified rule of thumb. However all analysis gave inaccurate estimation of maxillary arch width.<sup>10</sup> In the ideal dental arch, Pont showed that the ratio of maxillary incisor width to maxillary arch width was 0.80 in the bicuspid site and 0.64 in the molar area. Pont<sup>7</sup> concluded that via this index, an ideal dental arch necessary to accommodate the teeth and relieve crowding can

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**ABSTRACT... Introduction:** Intercanine and intermolar width are key measurements for diagnosis and orthodontic treatment planning. The aim of current study was to determine the mean maxillary intercanine arch width (ICW) of untreated normal arch Pakistani patients and to compare it with other populations. **Study Design:** Cross sectional study. **Setting:** Orthodontic department, Faisalabad Medical University. **Period:** 1/12/2016 to 1/11/2017. **Material and Methods:** ICW measurements on dental casts of 60 normal occlusion patients. ICW was measured using digital caliper between the maxillary canine cusp tips. The Non probability consecutive sampling technique was used in this study. All the data collected was analyze by using SPSS software (version 21.0.0). **Results:** In our study the mean age of the patients was  $19.11 \pm 3.13$  years. The mean value of maxillary ICW of the normal occlusion orthodontic patients was  $35.21 \pm 3.31$  mm. **Conclusion:** Our study results concluded that well aligned arches and ideal occlusions can be achieved in Pakistanis with maxillary intercanine width as narrow as  $35.21 \pm 3.31$  mm.

**Key words:** Intercanine; Arch Width; Occlusion.

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be estimated.

Significant racial differences in mean ICW width were found. ICW in Kuwaitis was  $34.25 \pm 1.84$ <sup>10</sup>, in Colombian mestizo population mean ICW was found to be  $33.0 \pm 2.8$ <sup>11</sup>, in Karachi population it was  $36.3 \pm 0.73$ <sup>12</sup>, and in Chinese it was  $36.92 \pm 0.23$ <sup>13</sup>. Because dental arch widths increase during the mixed and permanent dentitions, knowledge regarding the patient's age and body mass might be expected to alter arch width estimations.<sup>14</sup>

The rational of this study was to measure the mean ICW of our local Pakistanis visiting Faisalabad medical university, as present data is little. As differences were found in many international studies and as we know that in orthodontics difference of even 1 mm make big difference while deciding orthodontic treatment plan, aim of this study was to measure the mean maxillary intercanine width in our population. The findings might guide to which extent the decision to treat maxillary arch length issues with palatal

expansion can be based on objective criteria.

## METHODS

### Study Design

A Cross sectional study

### Sample Size

It was estimated at 60 teeth using 95% confidence level,  $d=1$  with an expected mean ICW as  $34.25 \pm 1.84$ .<sup>10</sup>

### Sampling Method

Non probability consecutive sampling

## SAMPLE SELECTION

### Inclusion Criteria

- No previous orthodontic therapy
- Ideal untreated dental arches
- 12 to 23 year of age, irrespective of gender

### Exclusion Criteria

- Incomplete eruption of premolars
- Worn off canine tips
- Canine rotations
- Incisor irregularity
- Cleft lip and palate or any craniofacial anomies
- Any pathology involving canine cusp tips

### Data Collection Procedure

After taking informed consent and ethics approval, sample of 60 patients were selected according to above mentioned selection criteria. ICW was taken on the dental casts by one examiner, as the distance from maxillary left canine to the same on right at cusp tip, using digital caliper (Guo gen<sup>R</sup>, made in China) accurate to 0.01 mm.

Patients with ideal occlusion were included. Ideal occlusion, was defined as ideal intercuspation and overall teeth alignment with no crossbites, no CO-CR shift, anterior shift < 2 mm, no midline shifts, overjet < 3.5 mm, deep bite < two thirds overlap of the maxillary to the mandibular incisors, spacing < 2 mm in either arch, and crowding < 3.5 mm in either arch.<sup>10</sup>

15 days after the first measurements, 12 dental casts were selected randomly and measured.

A paired samples t-test was applied and results showed that difference between the first and second measurements was insignificant. The method error was calculated using Dahlberg's formula and values remained within acceptable limits.

### Data Analysis

All the data collected was analyze by using SPSS software (version 21.0.0). Mean and standard deviation was calculated for age and mean ICW. Frequency and percentage were calculated for gender. Effect modifier like age and gender was controlled through stratification. Post stratification chi square test was applied by taking  $p \text{ value} \leq 0.05$  as significant.

## RESULTS

In the present study total 60 subjects were enrolled with mean age of  $19.11 \pm 3.13$  years (Table-I). In our study, 25(41.66%) patients were males and 35(58.33%) patients were females.

Age (years)	N	60
	Mean	19.11
	SD	3.13
	Minimum	12
	Maximum	23

Table-I. Descriptive statistics of age (years)

The study results showed that the mean value of ICW was  $35.21 \pm 3.31$  mm (Table-II)

Inter canine width	n	60
	Mean	35.21
	SD	3.31
	Minimum	29
	Maximum	41

Table-II. Descriptive statistics of inter canine width

In our study  $\leq 20$  year patients were 34, in which  $\leq 30$  mm ICW was noted in 3 cases and  $> 30$  mm ICW was noted in 31 cases, similarly  $> 20$  years patients were 26 in which  $\leq 30$  mm ICW was noted in 2 cases and  $> 30$  mm ICW was noted in 24 cases. Statistically there was insignificant difference between the ICW for different age (Table-III&IV) and gender groups (Table-V&VI).

		Inter canine width		Total
		≤30	>30	
Age (years)	≤20	3	31	34
	>20	2	24	26
Total		5	55	60

Table-III. Comparison of inter canine width with age categories  
Chi value 1.88 p-value 0.163 (insignificant)

Inter molar width	Age (years)	Mean	SD
	≤20	35.57	3.26
>20	36.90	3.02	

Table-IV. Comparison of inter canine width with age categories  
t-value -1.72 p value 0.091 (insignificant)

		Inter canine width		Total
		≤30	>30	
Gender	Male	2	23	25
	Female	3	32	35
Total		5	55	60

Table-V. Comparison of inter canine width with gender  
Chi value 2.37 p-value 0.125 (insignificant)

Inter canine width	Gender	Mean	SD
	Male	36.57	3.21
Female	35.82	3.84	

Table-VI. Comparison of inter canine width with gender  
t-value -1.22 p-value 0.129 (insignificant)

Intercanine width	N	Males			N	Females		
		Mean	SE	SD		Mean	SE	SD
Pakistanis (Current study)	25	36.57	3.21	2.2	35	35.82	3.84	2.8
Taiwan Chinese <sup>21</sup>	50	35.12	0.37	2.6	42	34.88	0.25	1.6
Caucasians (American) <sup>34</sup>	15	33.62	0.52	2.1	13	32.54	0.50	2.1
Caucasians <sup>35</sup>	60	34.05		2.1	83	32.77		2.2
Caucasians (British) <sup>36</sup>	50	31.54		2.6	49	30.55		2.2
Arabs (Saudi) <sup>37</sup>	71	35.43		1.6	68	33.69		1.0

Table-VII. Comparison of inter canine widths in various populations  
N= number of patients; SD= standard deviation; and SE= standard error.

**DISCUSSION**

ICW has commonly been used as a measure of anterior arch dimension.<sup>15,16</sup> Moorrees et al.<sup>17</sup> found that the maxillary ICW increased between the ages of 6 and 9 in both sexes, which have been associated to the eruption of the maxillary canines and incisors. According to him, decrease has occurred between the ages of 10 and 12 but thereafter it remained constant. This Current cross sectional study was carried out at to determine mean ICW of untreated ideal arch of Pakistani patients visiting tertiary care dental hospital.

In current study we calculated ICW in millimeters as the distance from maxillary left canine to the same on right at cusp tip, using digital caliper. There are some differences in the method of estimation of the maxillary ICW reported by various authors. De la Cruz defined this parameter as a distance between cusp tip points of the right and left canines. Heiser and Paulino defined this parameter as a distance in millimeters between canine cusp tips or estimated cusp tips in the event of the tooth wear. Gardner and Chaconas defined this parameter as distance between the

cuspid tip center of one deciduous canine to the other.

In our study the mean value of ICW of the patients was  $35.21 \pm 3.31$  mm. Our mean values are different in comparison with other populations (Table 7), Lindsten et al.<sup>18</sup> presented that in Norwegian children average transversal maxillary ICW was  $32.16 \pm 1.55$  mm. ICW in Kuwaitis was  $34.25 \pm 1.84$ <sup>10</sup>, in Colombian mestizo population mean ICW was found to be  $33.0 \pm 2.8$ <sup>11</sup>, in Karachi population it was  $36.3 \pm 0.73$ <sup>12</sup>, and in Chinese it was  $36.92 \pm 0.23$ .<sup>13</sup> Comparisons of data on ICW dimensions from different studies are hampered by the fact that it is not easy to tabulate all data on different landmarks. The maxillary IMCW at the canine cusp tips were wider than those of Caucasians.<sup>19,20,21</sup>

In our study the mean value of ICW in male patients was  $36.57 \pm 3.21$  mm and in females  $35.82 \pm 3.84$  mm which is in contrast to previous findings that adolescent dental arch dimensions are greater in boys than in girls.<sup>11,22-28</sup> Statistically there was insignificant difference between the ICW for different age groups in our study, however arch width increases have been previously reported between 7 and 17 years of age.<sup>17,29-30</sup>

In comparison with other local studies, Amin F<sup>31</sup> conducted a study at university of Lahore and showed ICW of  $34.58 \pm 2.64$  mm in a sample of 100 patients. Mushtaq N<sup>32</sup> showed ICW of  $24.16 \pm 2.93$  mm in a sample of 35 class I patients of Peshawar. In a study conducted in Karachi,<sup>12</sup> ICW was found out to be  $36.3 \pm 0.73$  mm. Because of the lack of significant reference data for Pakistanis, the aim of current study was to find out the mean maxillary ICW values in Pakistanis aged 12 to 23 years. The large variations in ICW width measurements of Pakistani subjects strongly suggested the need for variations in preformed orthodontic arch wires to prevent iatrogenic changes in dental arch forms during fixed orthodontics.

## CONCLUSION

Well aligned arches and ideal occlusions can be achieved in Pakistanis with maxillary intercanine width as narrow as  $35.21 \pm 3.31$  mm.

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*They tried to bury us.  
They didn't know we were seeds.*

– Mexico –

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**AUTHORSHIP AND CONTRIBUTION DECLARATION**

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Muhammad Azeem	Data recording and analysis written the manuscript.	
2	Arfan ul Haq	Conceiving the study, data recording analysis and interpretation of data.	
3	Samina Qadir	Designing the study, Critically reviewed the manuscript.	