Maxillary molar and premolar indices in North Indians: A Dimorphic Study

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Citation

G Agnihotri, M Gulati. *Maxillary molar and premolar indices in North Indians: A Dimorphic Study*. The Internet Journal of Biological Anthropology. 2007 Volume 2 Number 1.

Abstract

Tooth morphometry is known to be influenced by cultural, environmental and racial factors. Tooth size standards can be used in age and sex determination. One hundred models (50 males & 50 females) of normal occlusion were evaluated and significant correlations ($p<0.001$) were found to exist between the combined maxillary incisor widths and the maxillary intermolar and interpremolar arch widths. The study establishes the morphometric criterion for premolar and molar indices and quantifies the existence of a statistically significant sexual dimorphism in arch widths ($p<0.02$).

INTRODUCTION

Teeth are an excellent material in living and non-living populations for anthropological, genetic, odontologic and forensic investigations [1] .Their morphometry is known to be influenced by cultural, environmental and racial factors. The variations in tooth form are a common occurrence & these can be studied by measurements. Out of the two proportions-width and length, the former is considered to be more important [2] . Tooth size standards can be used in age and sex determination [3] . Whenever it is possible to predict the sex, identification is simplified because then only missing persons of one sex need to be considered. In this sense identification of sex takes precedence over age [4] . Various features like tooth morphology and crown size are characteristic for males and females [5] .The present study on the maxillary arch takes into account the premolar arch width, molar arch width and the combined width of the maxillary central incisors in both the sexes.

Pont's established constant ratio's between tooth sizes and arch widths in French population which came to be known as premolar and molar indices [6] .In the ideal dental arch he concluded that the ratio of combined incisor width to transverse arch width was .80 in the premolar area and .64 in the molar area. There has been a recent resurgence of interest in the clinical use of premolar and molar indices for establishing dental arch development objectives [7] . The present study was conducted to ascertain whether or not Pont's Index can be used reliably on north Indians and to establish the norms for the same.

MATERIAL AND METHODS

SELECTION CRITERIA

One hundred subjects, fifty males and fifty females in the age group of 17-21 years were selected for the study as attrition is considered to be minimal for this age group. The study was conducted on the students of Sudha Rustagi College of Dental Sciences & Research, Faridabad, Haryana.

INCLUSION CRITERIA

- Healthy state of gingival and peridontium.
- Caries free teeth.
- Normal over jet and overbite.
- Absence of spacing in the anterior teeth.
- Normal molar and canine relationship

ANTHROPOMETRY

All measurements were taken by a Vernier Caliper (Least Count-0.02mms) taking into account the error if any, in the instrument. Measurements were conducted on these study casts after mounting them on an articulator using Vernier calipers.

The premolar arch width: was taken from the first premolar of the left side to the right side at the distal end of its occlusal groove.

The molar arch width: was taken from the maxillary left

permanent molar to the same of the right at its mesial pit on the occlusal surface.

The combined width of the maxillary incisors: was taken at the distal contact points with the canines on either side.

Premolar Index: Pont's premolar index is obtained by dividing the sum of the incisal widths X 100 by the premolar arch width.

Figure 1

$$\text{Premolar Index} = \frac{\text{Sum of incisalwidths}}{\text{Premolararch width}} \times 100$$

Molar Index: Pont's molar index is obtained by dividing the sum of the incisal widths X 100 by the molar arch width.

Figure 2

$$\text{Molar Index} = \frac{\text{Sum of incisal widths}}{\text{Molar arch width}} \times 100$$

STATISTICAL ANALYSIS

The collected data was subjected to extensive statistical analysis. Unpaired‘t' test was utilized to compare the parameters as measured for males and females and the‘t' distribution table was consulted. The coefficient of correlation was calculated to determine the impact of the combined maxillary incisor widths on the maxillary intermolar and interpremolar arch widths .The coefficient of regression between incisor widths and arch widths was determined to predict the premolar arch width and molar arch width from a known value of the combined width of maxillary incisors.

RESULTS

(1)The observed values of the three parameters i.e. Premolar arch width, Molar arch width and the combined width of the maxillary central incisors are depicted in table 1.

Figure 3

Table 1: Statistical significance between sexes

Parameter	Sex	Mean ± S.D.	't'	'p'	Significance
Premolar Arch Width	Males	38.77± 0.39	2.39	<0.02	Highly Significant
	Females	37.66± 0.46			
Molar Arch Width	Males	48.10± 0.10	1.72	<0.02	Highly Significant
	Females	47.34± 0.19			
Combined width of Maxillary Incisors	Males	31.79±0.26	1.62	<0.02	Highly Significant
	Females	30.02± 0.18			

't' - t value according to t distribution table

'p' - predictive value <0.02 for the t values

S.D. - standard deviation

These three parameters as measured for males and females were found to be statistically highly significant (p<0.02).

(2)The Premolar and Molar indices were determined to establish the norms in North Indians. The morphometric norms for North Indians are depicted in table 2.

Figure 4

Table 2: Premolar and molar indices

Parameter	Premolar Index	Molar Index
Males	82	66.10
Females	79.54	63.42

(3) The Coefficient of Correlation was determined between the combined maxillary incisor widths and the maxillary intermolar and interpremolar arch widths. The values for the same are depicted in table 3.

Figure 5

Table3: Combined maxillary incisor width to premolar arch width(Cor1) and molar arch width(Cor2)

Parameter	Cor1	Cor2
Males	0.4814	0.4990
Females	0.4420	0.4710

Significant correlations (p<0.001) were found to exist between the combined maxillary incisor widths and the maxillary intermolar and interpremolar arch widths. The

values obtained were found to be highly significant at p<0.001 level.

(4) The Coefficients of Regression (r1 and r2) were also calculated to predict the premolar arch width and molar arch width by knowing the combined maxillary incisor widths. The coefficient values are depicted in table 4.

Figure 6

Table4: Coefficient of regression to predict the premolar arch width(r1) and molar arch width(r2)

Parameter	r1	r2
Males	0.18890	0.75810
Females	0.18242	0.74770

(5)Regression equations for prediction of premolar and molar arch widths in males and females were derived using the regression coefficient values (r1 and r2).The prediction equations are presented in below:

PREDICTION EQUATIONS

MALES

Premolar arch width = 0.18890(S^{*} -28.80) +36.30

Molar arch width = 0.75810(S^{*} -28.80) +45.20

FEMALES

Premolar arch width = 0.18242(S^{*} -28.80) +36.42

Molar arch width = 0.74770(S^{*} -28.80) +45.34

Where 'S^{*}' is the combined maxillary incisor width.

By regression equation a table was prepared to predict the probable arch width from the combined mesiodistal widths of maxillary incisors in males and females (Table5)

Figure 7

Table5: Prediction of arch widths (mms)

	Males		Females	
'S*'	Premolar	Molar	Premolar	Molar
25	35.70	42.44	35.62	42.35
26	35.89	43.21	35.30	43.10
27	36.08	43.97	35.98	43.85
28	36.27	44.73	36.16	44.60
29	36.46.	45.49	36.34	45.35
30	36.65	46.25	36.52	46.10
31	36.84	47.01	36.70	46.85
32	37.03	47.74	36.88	47.60
33	37.22	48.53	37.06	48.35
34	37.41	49.29	37.24	49.10

Where 'S^{*}' is the combined maxillary incisor width.

Figure 8

DISCUSSION

The results of the present study indicate that the arch width's (both premolar and molar) are greater in males than in females. This is in agreement with the result obtained for a British sample [8], and for Saudi population [9], but in disagreement with the findings for Egyptian population [10]. This is of definite significance as the tooth morphology is known to be influenced by cultural, environmental and racial factors [11].

A significant and definite correlation between the widths of four maxillary incisors and arch width found in the present study indicates parallelism with Pont's figures. Index values of 84 and 65 have been proposed for German's [12]. The studies conducted on Indonesians [7] and Jordanians [13] indicate that these indices are not useful to pre-determine ideal arch

width in these populations. The variations observed may possibly be attributed to the different racial inheritance for these groups. In a study on subjects from Lucknow these values have been calculated to be 81.66 and 65.44.The present pioneer study is the only one to have taken the impact of 'sex factor' into consideration. Premolar index was found to be 82 for males and 79.54 for females. The Molar index was found to be 66.10 for males and 63.42 for females. Pont's values were 80 and 64 for premolar and molar indices.

Although statistical evaluation revealed that Pont's index was reliable to use, it would be fallacious to assume that every case will be in the same order as predicted by the index. An assessment of the facial profile, determination of the angle classification [14] ,relationship of upper and lower jaws to one another ,and the midline are possible other parameters which need to be taken into consideration. On the other hand, Pont's index can be used as a target to achieve when working towards the ideal.

CONCLUSION

Significant correlations ($p<0.001$) were found to exist between the combined maxillary incisor widths and the maxillary intermolar and interpremolar arch widths. The study establishes the morphometric criterion for premolar and molar indices and quantifies the existence of a statistically significant sexual dimorphism in arch widths ($p<0.02$).

ACKNOWLEDGEMENT

The authors would like to thank Dr Satish Agnihotri,Colonel(Retd) , Dr Vikram Agnihotri(Capt) for their invaluable suggestions and encouragement. We also appreciate our immaculate statistician Mr Amrit Pal from Punjab Agriculture University,Ludhiana for his efforts and hard work. We are also indebted to resident doctors at Sudha Rustagi College of Dental Sciences & Research, Faridabad, Haryana for their wholehearted support for the timely completion of the study.

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