Tweed's analysis of Bangladeshi population

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ABSTRACT

Objectives: To measure the Tweed's norms for Bangladeshi population.

Method: Total of 100 samples were collected from students and doctors of Dhaka Dental College and other hospitals aged between 18-26 years of age. Among the samples 52 were male and 48 were female. Mean age of male samples were 22.06 where as mean age of female samples were 21.81 combined mean age of 100 samples were 21.94. Period of study was From July'2013 to Dec'2013.

Results: The values of FMA, FMIA and IMPA for Bangladeshi male subjects were found 23.02, 54.5 and 102.27. For the female samples the values were 21.5, 53.92 and 104.69 respectively. The values of FMA, FMIA and IMPA for Bangladeshi population were found as 22.29, 54.22 and 103.43. Whereas for Caucasians the parameters were 24.6, 68.2, 86.9.

Conclusion: The value of FMA, FMIA, IMPA for Bangladeshi population were measured. The difference of values of FMA, FMIA, IMPA of Bangladeshis with Caucasians were found statistically significant. Whereas the difference of values of FMA, FMIA, IMPA of Bangladeshis with North Indians were found statistically insignificant.

Key words: Cephalometry, Tweed Triangle

INTRODUCTION

Cephalometry is utilized to classify interpret, compare and to diagnose the orthodontic problems. Different analyses and their corresponding norms from around the world have been formulated by various authors to interpret and compare the diagnostic data that the lateral cephalogram provides. Among the investigators, the systemic approach developed by Downs[1], Steiner[2], Ricketts[3] and Tweed[4] probably gained the widest acceptance. But their samples were from Caucasian population only. So their norms applied to Caucasians can not be applied to other populations of the world. Cotton[5], Craven[6], Mieura[7] and Drummond[8] were among those who provided the clinician with guides and standards for specific racial groups. Cephalometric studies of different ethnic groups include Steiner's study of the Caucasians, park's[9] study of the Korean, Mieura's study of the Japanese, Chan's[10] study of the Chinese, Nanda's[11] study of the north Indians, Garcia's[12] study of the Mexican American, Drummond's[8] study of the Negroes, Lim's[13] study of the Filipinos, Bhattarai's[14] study of the Nepalese.

In 1962, Tweed[15] listed the averages of the three angles of the 100 samples of caucasians are as follows:

Table 1: Measurements of Tweed's triangle by Tweed in Caucasians

Angle	Ceph.	Range
FMA	24.6 degrees	15-36 degrees
IMPA	86.9 degrees	76-99 degrees
FMIA	68.2 degrees	65-80 degrees

Till date there is no recorded data on Bangladeshi population of Tweed analysis. Although establishment of the Steiner's norms was done by Rizvi, Hossain and tanne[16] for Bangladeshi population and published in APOS journal in January 2013,Vol 3, Issue 1.

The first morphological study for Bangladeshi subjects with use of cephalograms was done by Sajedeen et al.[17] to obtain cephalometric norms of Bangladeshi children. This paper will help to understand the standard for the Bangladeshis.
The purpose of this paper is to understand the tweed's norms for Bangladeshis, compare the values between the Bangladeshi male and female samples as well as to compare with the Caucasians.

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MATERIALS & METHODS

It is a Cross-sectional study carried out at Department of Orthodontics & Dentofacial Orthopaedics,Dhaka Dental College & Hospital. Period of study was July'2013 to December'2013. Samples were Doctors, students of Dhaka Dental College and other hospitals aged from 18-26 years of age.

Inclusion criteria:

1.Male and female of Bangladeshi origin aged 18-26 years.
2.Class-1 molar relationship
3.Overjet and overbite (upto 4mm and 4mm respectively)
4.Acceptable profile (orthognathic profile, bilaterally symmetrical face)
5.No cross bites of anterior and posterior teeth
6.No proximal caries or restoration
7.Both parents should be born in Bangladesh
8.No history of previous orthodontic treatment

Exclusion criteria

1.   Missing teeth other than third molars.
2.   History of previous orthodontic treatment.
3.   Supernumerary teeth.
4.   Cross bite.

STUDY PROCEDURE

The sample comprised 100 subjects with age range of 18-26 years and excellent occlusions existed. The materials used in this study consist of lateral cephalometric radiograph of 100 subjects(52 males and 48females) developed from Vixwin platinum imaging software shot by Ortholix9200 (85kVp-10mA) of Gendex of Italy. by the one x-ray technician at the x-ray department of Dhaka dental college hospital,Mirpur-14, Dhaka.

MEASUREMENTS

All the x-rays were traced by Vistadent cephalometric software. All the measurements were done by a single examiner at 2 weeks interval. The following three planes that form Tweed's diagnostic triangle were used.

•Frankfort horizontal plane: Line joining from external auditory meatus to orbital.
•Mandibular plane: Line passing tangent to the lower border of mandible.
•Long axis of lower incisor.

The following three angles formed in Tweed's triangle (Fig:1) were measured

1.Frankfort mandibular plane angle (FMA)
2.Frankfort mandibular incisal angle (FMIA)
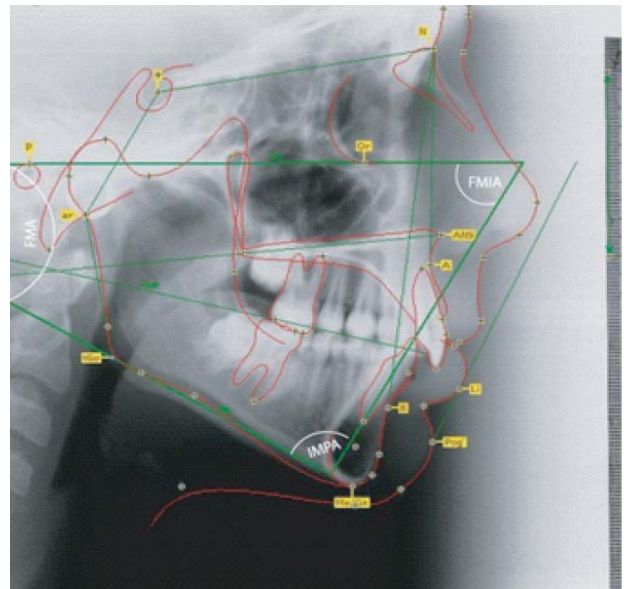3.Inciso mandibular plane angle (IMPA).

DATA COLLECTION AND PROCESSING

All the measurements were done by a single examiner at 2 weeks interval.

The following three angles (Fig:1) were measured
1.Frankfort mandibular plane angle (FMA)
2.Frankfort mandibular incisal angle (FMIA)
3.Inciso mandibular plane angle (IMPA)

Fig 1 Show FMA, FMIA, IMPA

DATA ANALYSIS

Statistical analysis was performed with a software package by using statistical package for social sciences software (Version 11.5, SPSS). Descriptive statistics including the mean, standard deviation, minimum, maximum were computed for each variable. The paired t-test was calculated to compare sexual differences within the sample. The t-test was also used to compare the racial difference with the Tweed's means. The statistical significance for all the t-tests were carried out was defined as $p<0.05$.

ETHICAL MEASURES

Since this is a cross sectional study, there was no physical risk of the participants throughout the study period. No experimental drug or placebo was used. I have taken ethical clearance was needed as there was radiograph procedure

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may be some risk of radiation so to minimize this risk protective measures have been taken. The kVa and mA are set such level that there should be no harmful effects on samples of this study. All the samples have weared led aprons during x-ray procedure.

RESULTS

This was a cross sectional observational study conducted among 100 doctors, students of Dhaka Dental College and other hospitals aged from 18-26 years of age. Among the 100 samples 52 were male and 48 were female. Lateral Cephalometry were collected one from each subject. Lateral cephalometric radiographs were traced using vistadent cephalometric software. Each x-ray was traced by a single examiner twice at 2 weeks interval. SPSS were used for data analysis. The statistical test to be used for comparison between groups was t-test. The level of p value<0.05 was considered significant.

Table 2: sample size and age distribution.

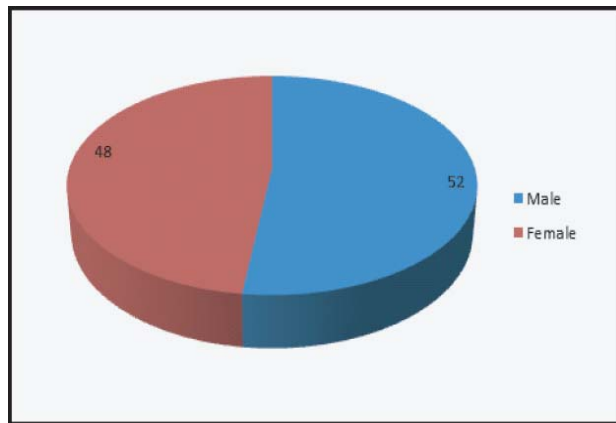| Gender	No	Min	Max	Mean	S.D
Male	52	18	26	22.06	1.52
Female	48	18	24	21.81	1.47
Total	100	18	26	21.94	1.49

Fig 2: Sex distribution of male and female samples

Table -4: Range, mean, standard deviation of Bangladeshi male subjects.

Measurement	Min	Max	Mean	SD
FMA	11^0	43^0	23.02^0	6.72
FMIA	34^0	72^0	54.50^0	7.90
IMPA	83^0	117^0	102.27^0	8.18

Table -5 : Range, mean, standard deviation of Bangladeshi female subjects.

Measurement	Min	Max	Mean	SD
FMA	10	35	21.50	6.57
FMIA	41	68	53.92	7.01
IMPA	83	118	104.69	6.86

Table -6: T-test of significance for the difference between two groups (male and female)

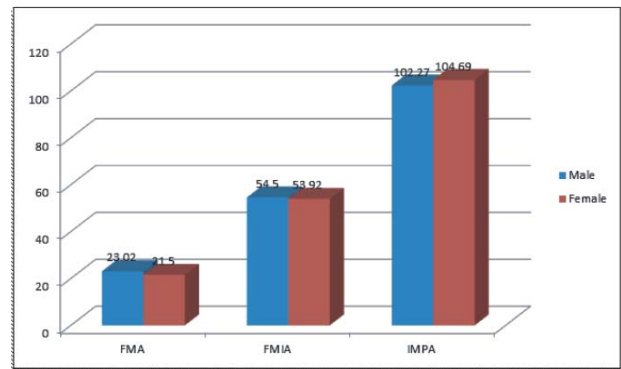| Measurement	Male	Female	P-value	Significance
FMA	23.02^0	21.50^0	0.26	NS
FMIA	54.50^0	53.92^0	0.70	NS
IMPA	102.27^0	104.69^0	0.11	NS

NS: Non-significant

Fig 3: Bar chart of Mean of FMA, FMIA, IMPA of Bangladeshi Male and Female subjects.

Table -7: Combine range, mean, standard deviation of Bangladeshi male and female subjects.

Measurement	Min	Max	Mean	SD
FMA	10^0	43^0	22.29^0	6.66
FMIA	34^0	72^0	54.22^0	7.46
IMPA	83^0	118^0	103.43^0	7.63

Table -8: T-test of significance for the difference between Caucasians and Bangladeshis.

Measurement	Caucasian	Bangladeshi	P-value	Significance
FMA	24.6^0	22.29^0	0.0064	S
FMIA	68.2^0	54.22^0	<0.0001	S
IMPA	86.9^0	103.43^0	<0.0001	S

S: Significant

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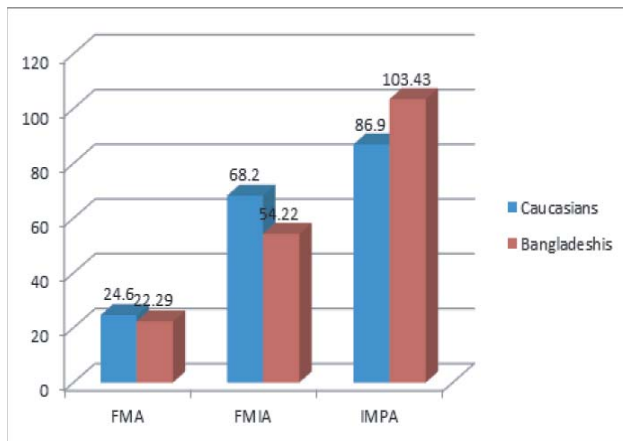*Vol. 5, No. 1 & 2, October 2014 & April 2015 [April 2015]*

Table -9: T-test of significance for the difference between North Indians and Bangladeshis.

Measure-ment	N. Indians	Bangla-deshi	P-value	Signifi-cance
FMA	23.49^o	22.29^o	0.26^o	NS
FMIA	53.87^o	54.22^o	0.79	NS
IMPA	103.77^o	103.43^o	0.80	NS

NS: Non-significant

Table shows the means of FMA, FMIA, IMPA of Bangladeshis and North Indians. Note that the p value for each parameter is not statistically significant.
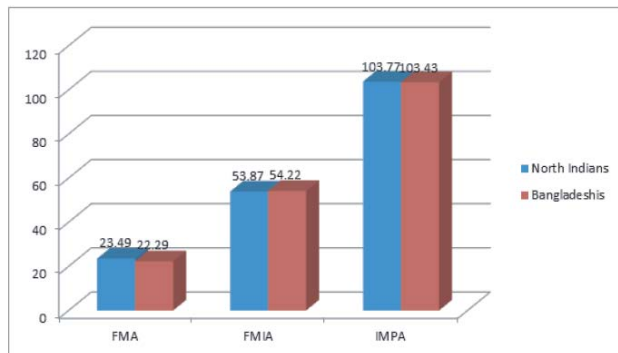

Fig 5: The mean of FMA, FMIA, IMPA of Bangladeshis and North Indians.

DISCUSSION

Total of 100 samples were collected from students and doctors of Dhaka Dental College and other hospitals aged between 18-26 years of age. Among the samples 52 were male and 48 were female. Mean age of male samples were 22.06 where as mean age of female samples were 21.81 combined mean age of 100 samples was 21.94.

The values of FMA, FMIA and IMPA for Bangladeshi male subjects were found 23.02, 54.5 and 102.27 respectively. For the female samples the values were 21.5, 53.92 and 104.69 respectively.

The average values of both sexes of FMA, FMIA and IMPA for Bangladeshi population were found as 22.29, 54.22 and 103.43. whereas for Caucasians the parameters were 24.6, 68.2, 86.9.

Table 8 shows the mean value for Caucasians and Bangladeshis. T-test was performed considering p<0.05 as significant. The p value for FMA,FMIA, IMPA were suggestive of highly statistical significant difference between Bangladeshi and Caucasian means. FMA and FMIA were lower for Bangladeshi population where as IMPA was higher.

At first Tweed[15] developed this analysis as an aid to treatment planning, anchorage preparation and determining the prognosis of orthodontic cases. Tweed makes use of three planes that form a diagnostic triangle. The planes used were Frankfurt horizontal plane, mandibular plane and long axis of lower incisor.

The first measurement was FMA. This angle is the most significant value for skeletal analysis because it defines the direction of the lower face growth both in the horizontal and vertical dimension. The values for male subjects were 23.02 whereas for female subjects the value is 21.5 this indicates that males have a more vertical growth pattern than female. However no statistical significance was found between male and female samples.

When FMA is compared with tweed's value it is less for Bangladeshi subjects. This suggests that the Bangladeshis have a less vertical growth pattern than Caucasians. Statistical analysis showed that there is significant difference between this two groups. This difference is supported by the study of Rizvi, Hossain and Tanne[16] who found that there is a tendency for less mandibular plane angle for Bangladeshi population than Caucasians.

When FMA was compared with North Indian value which was 23.49, this means still Bangladeshis have a less vertical growth pattern than North Indians. Statistical analysis showed that this difference is statistically insignificant.

The value for FMIA of Bangladeshi male and females were found 54.5 and 53.92. The mean difference suggests that Bangladeshi females have a proclined lower incisor than the males. However no statistical difference was found between Bangladeshi male and female samples.

Similarly when FMIA of Bangladeshis (54.22) was compared with Tweed's value (68.2) it is lower for Bangladeshi population. This suggests that proclination of lower incisor is more for Bangladeshi subjects than Caucasians. Statistical analysis showed that there is significant difference between this two groups.

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When FMIA was compared with North Indian value which was 53.87, this suggests that proclination of lower incisor is more for North Indian subjects than Bangladeshis. However Statistical analysis showed that this difference is statistically insignificant.The value for IMPA of Bangladeshi male and females were found 102.27 and 104.69. The mean difference suggests that Bangladeshi females have a proclined lower incisor than the males. However no statistical difference was found between Bangladeshi male and female samples.

When IMPA was compared with Tweed's value it is 103.43 and 86.9 respectively for Bangladeshi and Caucasians. It is significantly larger for Bangladeshi population than Caucasians. It suggests that the Bangladeshis have a more proclined lower incisor than the Caucasians. This difference was found statistically significant.When IMPA was compared with North Indian value which was 103.77, this suggests that proclination of lower incisor is more for North Indian subjects than Bangladeshis. However Statistical analysis showed that this difference is statistically insignificant.

These data supports the study by Rizvi, Hossain and Tanne[16] which suggests that Bangladeshis have a tendency for more bimaxillary protrusion than Caucasians.

Tweed also observed that those subjects whose FMA ranged upward from 25^0, demonstrated nature's compensation of a reduced IMPA where as in those with low or flat FMA (less than 25^0) nature compensated by a higher IMPA, keeping the FMIA relatively constant in all cases. He, therefore, postulated the FMIA is critical for optimal esthetics and suggested that for every degree increase of FMA, the IMPA should be similarly compensated to a minimum of 77^0. Likewise for every decrease of FMA, there should be compensatory increase of the IMPA, to a maximum of 105^0. The findings of the present study also corroborate Tweed's observations.

CONCLUSION

The value of FMA, FMIA, IMPA for Bangladeshi population was measured for the first time in Bangladesh. The difference of values of FMA, FMIA, IMPA of Bangladeshis with Caucasians was found statistically significant. The difference of values of FMA, FMIA, IMPA of Bangladeshis with North Indians was found statistically insignificant. The information of the study will assist in orthodontic and surgical orthodontic case diagnosis, treatment planning and prognosis of Bangladeshi population.

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