Original Article

"Craniofacial morphometric evaluation of Bangladeshi adults by lateral cephalometry with Tweed-Merrifield analysis"

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Abstracts:

Objectives: Craniofacial variations presents in different ethnic populations around the world. Therefore proper morphpmetric comparison of this craniofacial structure with that ethnic norm require to determine dentofacial deformity while orthodontic management. **Methodology:** To evaluate a morphometric norm of Bangladeshi populations by Tweed's methods of lateral cephalometric parameter, 112 cephalographs of Bangladeshi young adults (56 male, 56 female) with mean age of 19($\pm$2.13) years were traced and evaluated by tweed's analysis on angular measurement. **Results:** The study shows increase value of FMA with decrease value of IMPA, which indicate that this populations mid-facial height are a bit larger and incisor are a bit retrocline. **Conclusions:** Differentiation between the Bangladeshi populations value with that of tweed's study explain the craniofacial patter of this populations which should be properly compare for diagnostic and therapeutic measure.

Introductions:

Ethnical and racial variations of craniofacial morphometry among different population have been reported by many researchers[1]. From an orthodontist point of view management of dento-alveolar and craniofacial structure-

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cephalometric studies was introduced in classical anthropometry and its today being constantly used in the evaluation of craniofacial variations[1]. The main goals of cephalometric analysis are to evaluate the dentofacial and skeletal relationship, of the five major functional components of the face: the cranium and the cranial base, the skeletal maxilla, the skeletal mandible, the maxillary dentition and the alveolar process, and the mandibular dentition and alveolar process [3]. The important goals of orthodontic treatment are the maintenance of facial balance and harmony as well as ideal occlusion. If facial balance does not exist it should be overriding priority of orthodontic treatment [4]. Angle's philosophy[5] of retaining all thirty two permanent teeth does

not fullfill balance the facial balance and harmony in post treatment cases. On the other hand tweed by using cephalometric radiograph introduced a new norm to achieve facial aesthetics[6]. His standard leads orthodontics into the extraction of first premolar to achieve post treatment stability better facial aesthetics and harmony. However, the measurement proposed for these analyses were achieved based on a white American sample and may not be applicable as references for diagnosis and treatment planning of other ethnic group. It is unscientific to use cephalometric norm of a specific racial group for another different group o populations. It is important to have data concerning relevant human group for purposes of clinical diagnosis and planning of treatment. These data may also be useful in forensic dentistry. The ethnic differences in facial profile and skeletal features should be considered during treatment, especially in orthodontics, maxillofacial surgery and prosthodontics where arch shape can be modified appreciably[4].

Therefore the aim of this study was to evaluate the morphometric norm for Bangladeshi populations with study population and comparing the value with those of previous study on other Bangladeshi populations. To evaluate the gender discrepancy of the norm and compare that with rest other previous study on Bangladeshi populations. There is patchy & paucity of such standard for Bangladeshi orthodontic populations. So far there is only one research[7] has been reported with lateral cephalometric radiograph by tweed's analysis on Bangladeshi population, which was constitute of mostly undergraduate dental school students. Therefore our study was aimed to perform in a larger number of populations with orthodontic complain, so that the norm for Bangladeshi orthodontic populations could be revealed, and compare our study result with that of previous study so that a mean norm could me calculated for future references.

Materials and Methods:

A cross sectional observational type of study were performed where the study populations included 112 lateral cephalogram of Bangladeshi collected from the patients' record of orthodontics department, faculty of dentistry, BSM Medical University and another two private orthodontic office of Dhaka, Bangladesh. The 112 radiographs (56 male and 56 female) were selected on the basis of having a harmonious face with a convex facial profile (from their photographic record), Angles[5] class I molar relationship with presence of all permanent teeth up to second molar (from their dental cast record), and without history of any type of previous orthodontic treatment (fixed/ removable/ functional). Their ages range from 16 years to 26 years with mean age of 19($\pm$2.13) years of age. Those entire lateral cephalometric radiographs were taken from a specific non-government diagnostic center of Dhaka, with a single operator with specific radiographic machine Broadbent Bolton cephalometer (Siemens, Erlanger, Germany). The radiograph operator was instructed to record the lateral cephalometric radiograph when the each subject position in the cephalostat with the head oriented to the Frankfort horizontal plane and the teeth in centric occlusion with lip relaxed. All those recored radiograph were traced manually and analysis by a single investigator to avoid the investigator error. Tracing were done on a systemic manner with manually on A4 size tracing paper and 2B hard pencil with well illumination viewer. The image lines were traced without stopping or lifting the pencil, eraser were avoided as much as possible. Bilateral structures were first traced independently. An average was then drawn by dotted line with visual approximation (Figure 1). Then the interpretation were measured and evaluated by SPSS 17 (Chicago, USA) for statistical analysis.
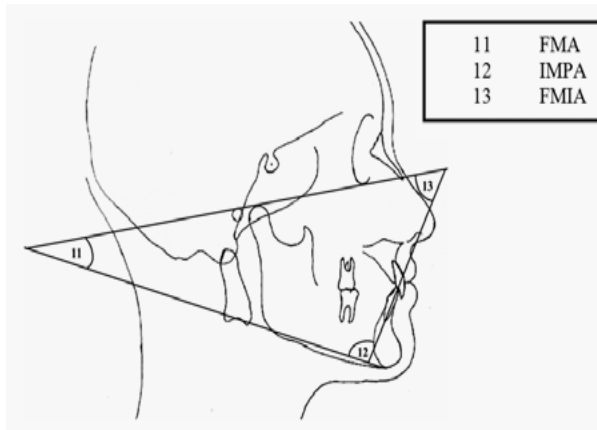
Figure 1: Tweed's diagnostic triangle. FMA (Frankfort Mandibular Angle); IMPA (Incisor Mandibular Plane Angle); FMIA (Frankfort Mandibular Incisal Plane Angle).

The following cephalometric landmarks were identified:

1. Orbitale (Or): Inferior border of the orbital rim.
2. Porion (Po): The highest point on the bony shadow of external auditory meatus.
3. Menton (Me): The most inferior point of the symphysis.

The following cephalometric angle were drawn: (Figure:1)

1. Frankfort Horizontal Plane: A horizontal plane running through the porion and orbitale.
2. Mandibular Plane: A line tangent to the lower border of the mandible.
3. Long axis of the lower incisor.

Results:

The significance level for this study was set at $p < 0.05$ and highly significant at $p < 0.001$. The descriptive statistics were done for all lateral cephalometric radiographs to evaluate angular measurements for the entire sample (112 subjects) from both genders of Bangladeshi population (Tables 1). For each variable, mean and standard of deviation (SD) were obtained. The p-values for all the comparisons were statistically not significant among gender.

Table 1: Descriptive statistics of Bangladeshi Adults with Tweed Analysis

	Gender	N	Average	Mean	SD
FMA	M	56	26.2	25.4	2.2
	F	56	24.6		
FMIA	M	56	60.8	60.6	2.6
	F	56	60.4		
IMPA	M	56	94.5	94	2.4
	F	56	93.5		

Table 1: Comparative statistics of Bangladeshi Adults with Tweed Analysis with that of Caucasian, Nepalese and previous study on Bangladeshi population by Alam MK et all.

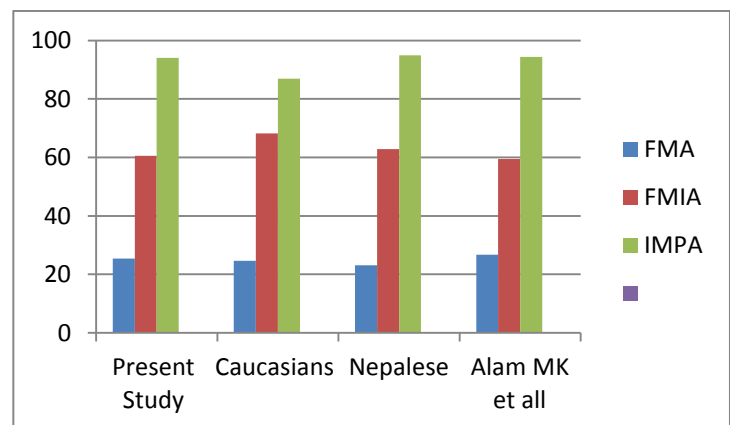|	Present Study	Caucasians	Nepalese	Alam MK et all
FMA	25.4±2.2	24.6±5.1	23.1±4.2	26.69±2.7
FMIA	60.6±2.6	68.2±5.5	62.8±4.3	59.47±2.1
IMPA	94±2.4	86.9±4.3	94.9±4.5	94.34±2.4

Figure 1: Graphical Comparison of tweed's angle among present populations, with that of Caucasians[6], Nepalese[8], and Alam MK et all's[7] study.

Discussions:

This investigation concludes the mean value of craniofacial morphometric norm for Bangladeshi populations by lateral cephalometric radiograph with tweed's analysis. This study also compare those value with that of Caucasian value[6], neighboring country Nepalese populations[8] and also the previous value on Bangladeshi populations[7] (Table 2),

Increase FMA value in our present study on Bangladeshi populations than that of Caucasian's value and Nepalese populations indicates that this populations has a bit larger mid facial height than those populations. Whereas, decrease in FMIA in compare to that populations indicate that this populations incisor teeth are a bit retrocline that that of those populations. Comparative representations are given on Figure 1.

Conclusions:

It is evident that, the norm of Bangladeshi craniofacial morphometry is quite differing from that of the Caucasian norm recorded by Tweed's. This study sum up a parameter for those values recorded through all those study done in Bangladeshi populations for future references and diagnosis and treatment planning by orthodontist, prosthodontist, general dentist and also by forensic odontology moreover for anthropometric analysis.

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