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# Significance of Ethnicdisparity in Cephalometric Analysis in Indian Population

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**Abstract**

**Introduction:** It has been a widely accepted fact that race specific norms, diagnosis and treatment planning is now a explicit need for achieving desired orthodontic treatment outcome.

**Aim:** The present study compares the cephalometric norms of Tweeds diagnostic triangle of the Assamese population with other Indian population s to justify this very fact.

**Method:** Tweeds cephalometric study was done on the cephalograms of Assamese ethnic origin and the norm for the population was derived . These cephalometric norms for the Assamese population was compared with the established Tweeds cephalometric norms of other Indian population.

**Conclusion:** The statistically significant differences observed in the values of the parameters, are justify the legitimacy of the aforementioned hypothesis.

**Keywords:** cephalometric norms variation, Indian population, Tweed's analysis

**Introduction:**

India represents an ethnological museum of diverse races, cultures, languages etc. Thepopulation of India is a colourful blend of various races of the world including the TurkIranian, Indo Aryan, Scytho Dravidian, Aryo Dravidian, Mongol Dravidians, Mongoloids etc. It is therefore very obvious to find a vast range of normal facial types with their relative underlying skeletal and dental pattern, in this population. With the present trend of urbanisation , employment needs etc there is influx of these different populations in different regions of the country leading to a multicultural society.

Orthodontics is no longer the practice of just fitting the teeth together, but instead a specialty for prettification of the entire facial skeleton by harmonizing the whole dentition to the rest of the structures in the skull. William B. Downs had very well related the role of cephalometrics in orthodontics to that of dissection in anatomy. Both of the procedures being used to understand better the underlying structures[1].

Various studies have been conducted to better relate the standard cephalometric norms to a particular population and have observed repeatedly the significant deviation from these standard norms. Suh's study of Koreans[2], Mitani's study of Japanese[3], Chan's study ofChinese[4], Garcia's study' of Mexican Americans[5], Drummond's study of Negroes[6] , Nanda's study of North Indians[7], O.P.Kharbanda's study of North Indians[8], Manan Bharat Atit et al study of Marathi population[9], Nabanita Baruah et al study of Assamese population[10] etc have shown that there exists difference in the cephalometric norms of these populations.With the present changing importance towards soft tissue paradigm, orthodontists have to devote due attention to the final soft tissue outcome after orthodontic treatment. These soft tissue changes are related to the underlying hard tissue correction[11,12].

The normalcy or beauty of a face, which is dependent on the soft tissues, however is a matter of perception. Different races and populations have their individual perceptions of beauty and normalcy depending on the facial features of that particular race or population. The facial profile which is normal and beautiful for one population might be perceived as abnormal or disproportionate by others[13,14]. We as orthodontists play a major role in being the architect of creating a pleasing facial appearance. It is also important to remember the principles of the change to soft tissue paradigm from that of exclusive focus on the hard tissues[15,16].

The present study focuses on the difference in the skeletal patterns within the Indian population. Orthodontists now come across a wide range of patients of different racial backgrounds, having different sleletal patterns, irrespective of the place where they practise. This study thus aims to help orthodontists and other clinicians to understand this difference and utilise them to correctly correlate the patients to their respective cephalometric norms, resulting in a stable and successful orthodontic treatment outcome.

This study aims to determine the Cephalometric norms of Tweeds Analysis for the Assamese Population and compare them with the two other Indian populations i.e. North Indian population (Kharbanda et al), Maratha population(Manan Bharat Atit et al).

**Materials and Methods**

The materials used in this study consist of cephalometric radiographs of 50 subjects (23 males, 27 females) from Assamese ethnic background. The criteria for the selection of the sample were:

1. Subjects of Assamese origin aged 18 to 30 years
2. Angle Class I molar relationship
3. Acceptable profile.
4. No history of previous orthodontic treatment, grosscarious lesion, periodontal disease.
5. No history of facial trauma.
6. Subjects who have mild crowding or spacing (up to 3mm per jaw), with overjet and overbite up to 4mm.

The cephalometric norms for Tweeds analysis of the North Indian population has been derived from the article “Cephalometric profile of north Indians: Tweed’s analysis”.( Int J Orthod, Fall-Winter; 1991;29(3–4):3–5.) published by O.P.Kharbanda et al and that of the Maratha population has been derived from the article “Mean values of Steiner, Tweed, Ricketts and McNamara analysis in Maratha ethnic population:A cephalometric study.( APOS Trends in Orthodontics | September 2013 | Vol 3 | Issue 5.)

**Materials**

1. Computed Radiography (CR) system – Regius Model 190 & Drypro-793. (Konika) Dental
X-ray Unit with Cephalometry.
2. CR cassette –Advapex Panaromic System 8 x 10inches
3. X-ray illuminator.
4. Tracing paper of 0.003 mm (Acetate matt ).
5. Geometry box set containing protractor, set squares, scale, 0.3mm 3Hb pencil, eraser etc.

The subjects were positioned with their spines erect and FH plane parallel to the floor. The head was immobilized in the cephalostat using ear rods and the Nasion holder. The subject was requested to look in to the reflection of their eyes in a mirror located 200cm ahead. The object source distance was 5 feet. A voltage of 80 Kvp and a current of 10 mA was used to obtain the lateral head film (8x10 inches film). The exposure time was 1 second. The head films were traced on A4 size acetate matt paper using 3Hb pencil.

Three orientation crosses are marked on the cephalogram; two within cranium and one on the cervical vertebrae with a sharp pointed tool. These orientation crosses were transferred to the tracing paper.

The following cephalometric parameters were used to do the Tweeds analysis:

1. **Frankfort Mandibular plane Angle (FMA):** The Frankfort mandibular plane angle isformed by the intersection of the Frankfort horizontal plane with the mandibular plane. Themean value is 25°.
2. **Frankfort Mandibular Incisal Angle (FMIA):**The Frankfort mandibular incisor angle is obtained by the intersection of the long axis of thelower incisor with the Frankfort horizontal plane. The mean value is 65°.
3. **Incisor Mandibular Plane Angle (IMPA):** The incisor mandibular plane angle isconstructed by drawing a line through the apex and insical edge of the mandibular centralincisor, extending it to intercept the mandibular plane. The mean value is 90°.

The tracings were analyzed using angular measurements according to Tweed's analysis. The angular measurements were done to an accuracy of 0.5 degrees. All essential landmarks were identified and traced thrice and the average of three values was considered.The mean, standard deviation, minimum and maximum values of each measurement were tabulated and statistical evaluation was done. The student't' test was used to determine the significance of difference in the mean cephalometric values between the Assamese, North Indian, Marathi population.

| Parameter | Mean | SD | SE | Minimum | Maximum |
|---|---|---|---|---|---|
| FMA | 26.54 | 3.70 | 0.70 | 18 | 34 |
| FMIA | 56.61 | 6.30 | 1.19 | 45 | 68 |
| IMPA | 97.04 | 6.93 | 1.31 | 85 | 111 |

Table 1: Descriptive statistics for the cephalometric measurements for Assamese population in this study

| Parameter | Assamese | | North Indian | Marathi | |
|---|---|---|---|---|---|
| | Female | Male | | Female | Male |
| FMA | 26.54 | 23.95 | 23.49 | 23.9 | 20.8 |
| FMIA | 56.61 | 56.68 | 53.87 | 57.2 | 63.9 |
| IMPA | 97.04 | 99.36 | 101.7 | 98.20 | 95.3 |

Table 2: Mean values of three population

| Parameter | Mean | SD | SE | p value |
|---|---|---|---|---|
| FMA | 23.9545 | 5.1221 | 1.092 | 0.0088 |
| FMIA | 56.6818 | 7.5302 | 1.6054 | 0.0002 |
| IMPA | 99.3636 | 6.2453 | 1.3315 | 0.0061 |

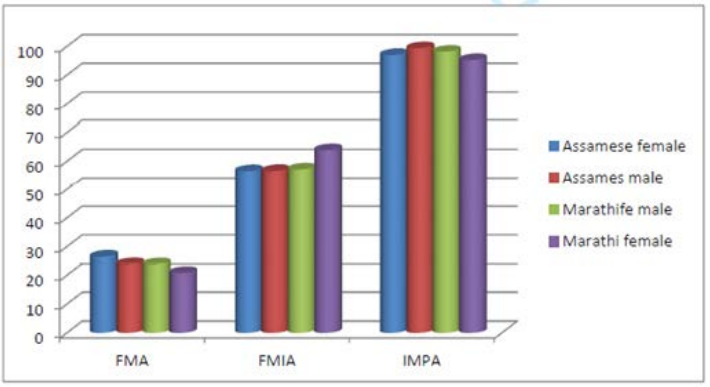
Table 3: Comparative statistics of Tweeds cephalometric norms between Assamese and Maratha male population.

| Parameter | Mean | SD | SE | p value |
|---|---|---|---|---|
| FMA | 26.5357 | 3.7017 | 0.6996 | 0.0008 |
| FMIA | 56.6071 | 6.2957 | 1.1898 | 0.6223 |
| IMPA | 97.0357 | 6.9348 | 1.3106 | 0.3822 |

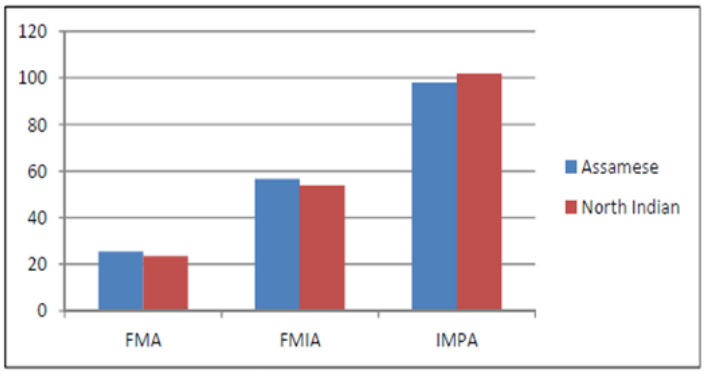
Table 4: Comparative statistics of Tweeds cephalometric norms between Assamese and Maratha female population

| Parameter | Mean | SD | SE | p value |
|---|---|---|---|---|
| FMA | 26.5357 | 3.7017 | 0.6996 | 0.0008 |
| FMIA | 56.6071 | 6.2957 | 1.1898 | 0.6223 |
| IMPA | 97.0357 | 6.9348 | 1.3106 | 0.3822 |

Table 5: Comparative statistics of Tweeds cephalometric norms between Assamese and North Indian population.




Graph 1: Comparison of Tweeds cephalometric values of Assamese and Marathi male and female.




Graph 2: Comparison of Tweeds cephalometric values of Assamese and North Indian female.

**Discussion:**

**Frankfort Mandibular Plane Angle(FMPA)**

**Comparison between mean FMPA of Assamese with North Indians and Marathas**

There was statistically significant difference ($p< 0.01$) in the mean value of Frankfort Mandibular Plane Angle for the Assamese population for both the male and the female, when compared to other Indian population like the North Indians, Marathas. The mean value of Frankfort Mandibular Plane Angle of the Assamese population is 25.4° which is greater than that of North Indians and the Marathas, indicating that the Assamese population have a steeper and more vertical mandibular growth pattern as compared to the other Indian populations .

**Incisor Mandibular Plane Angle(IMPA)**

**Comparison between mean IMPA of Assamese with North Indians**

The mean value of Incisor Mandibular Plane Angle for the Assamese population i.e. 98.06° is lesser than the mean for North Indian population i.e. 101.7° which indicates that the Assamese population have slightly more upright lower incisors in relation to the mandibular plane as compared to that of the North Indian population .This mean difference of 2.64° between the Assamese and the North Indian population is highly significant statistically ($p<0.001$).

**Comparison between mean IMPA of Assamese with Marathas**

There was no statistically significant difference ($p>0.05$) in the mean values of IncisorMandibular Plane Angle of the Assamese female when compared to the Maratha females as presented, which indicates that Assamese and Maratha females have similar inclination of the lower incisors in relation to the mandibular plane.. However there was statistically significant difference ($p<0.05$) in the mean value of Incisor Mandibular Plane Angle for the Assamese male i.e. 99.36° when compared to that of the Maratha males i.e. 95.3° respectively. This indicates that the Assamese male have more proclined lower incisors in relation to the mandibular plane as compared to the Maratha males.

**Frankfort Mandibular Incisor Angle(FMIA)**

**Comparison between mean FMIA of Assamese with North Indian**

The mean value of Frankfort Mandibular Incisor Angle for the Assamese population i.e. 56.64° is lesser than the mean for North Indian population i.e. 53.8° which indicates that the Assamese population has slightly more upright lower incisors in relation to the Frankfort plane as compared to that of the North Indian population. This mean difference of 2.84° between the Assamese and the North Indian population is significant statistically ($p<0.05$).

**Comparison between mean FMIA of Assamese with Marathas**

There was no statistically significant difference ($p>0.05$) in the mean values of Frankfort

Mandibular Incisor Angle of the Assamese female when compared to the Maratha females, which indicates that Assamese and Maratha females have similar inclination of the lower incisors in relation to the mandibular plane.. However there was high statistically significant difference ($p<0.001$) in the mean value of Incisor Frankfort Mandibular Incisor Angle for the Assamese male i.e. 56.68° when compared to that of the Maratha males i.e. 63.9°

respectively. This indicates that the Assamese male have more proclined lower incisors in relation to the mandibular plane as compared to the Maratha males.

**Conclusion:**

Tweed's cephalometric analysis is a simple yet very clinically significant diagnostic method to determine the direction and pattern of the growth of the lower face. The present study uses this diagnostic tool to bring into attention the normal values of Tweed's cephalometric norms of the individual population and compares these individualized norms. Upon comparison varying amount of statistically significant differences among the cephalometric parameters of the three populations i,e. Assamese, North Indian, Maratha Indian. This study has not used the various other cephalometric parameters routinely used in orthodontic diagnosis and treatment planning, because the aim of the study is not to determine the difference in each such parameter, rather the aim is to prove the theory that there exists variations in the skeletal pattern between the various populations within India which is proved by the statistically significant differences between the parameters. The recent use of various softwares for cephalometric analysis has reduced the time needed and the inherent manual errors of diagnosis. While we embrace the newer advances we also have to keep our feet deeply rooted into the basic foundations of diagnosis and treatment planning and hence remember the differences that exist in the cephalometric parameters between the individual populations. This will help the clinician to correctly correlate the skeletal or dental pattern of a patient to his/her individualized population norms, and then diagnose the underlying problem and structure a treatment plan which will be in accordance to the normal cephalometric parameter of the particular population. A good treatment plan will ultimately help to achieve the Andrews principles of functional occlusion, esthetic balance and stability, in the final treatment outcome.

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