

## Tweeds analysis of Nepalese people

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### ABSTRACT

The aim of the present study was to establish the Tweed's norms for Nepalese people, compare the values between the Nepalese male and female samples as well as to compare with the Caucasians. One hundred lateral cephalogram was taken by the same x-ray technician and later traced by manually and all three angular parameters Frankfort Mandibular plane Angle (FMA), Frankfort Mandibular Incisal Angle (FMIA), Inciso Mandibular Plane Angle (IMPA) were measured and found to be 28°, 56° and 96° respectively. There was no clinical significant different between Nepalese male and female but there is highly significant among Nepalese and Caucasian.

**Keywords:** Cephalometric, analysis, mandibular plane, frankfort plane.

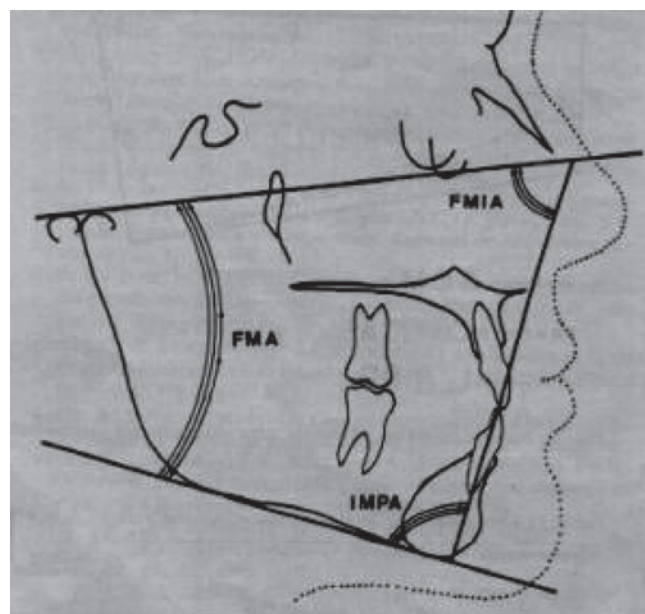
### INTRODUCTION

Cephalometrics can be utilized to describe, compare and classify the nature of orthodontic problems. Different analyses and their corresponding norms have been formulated by various authors to interpret the diagnostic data that the lateral cephalogram provides. Among the investigators, the systematic approaches developed by Downs,<sup>1</sup> Steiner,<sup>2</sup> Ricketts<sup>3</sup> and Tweed<sup>4</sup> probably gained the widest acceptance. However, their norms were usually based on Caucasian samples only. The Caucasian standards, evidently do not readily apply to other populations.

Gradually a number of cephalometric analyses specific to racial or ethnic groups have been established. Cotton,<sup>5</sup> Craven,<sup>6</sup> Mieura<sup>7</sup> Kam<sup>8</sup> and Drummond<sup>9</sup> were among those who provided the clinician with guides and standards for specific racial groups. A number of cephalometric studies of different ethnic groups are now available, including Steiner's of the Caucasians, Park's<sup>10</sup> study of the Korean, Mieura's study of the Japanese, Chan's<sup>11</sup> study of the Chinese, Nanda's<sup>12</sup> study of the North Indians, Garcia's<sup>13</sup> study of the Mexican American, Drummond's<sup>9</sup> study of the Negroes, Lim's<sup>14</sup> study of the Filipinos and Bhattarai's<sup>15</sup> study of Nepalese.

Tweed 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 Frankfort horizontal plane, mandibular plane and long axis of lower incisor. The first angle is Frankfort mandibular incisal angle (FMIA). He established a standard of 68 degrees for individuals with a Frankfort mandibular angle (FMA) of 22 to 28 degrees. The

standard should be 65 degrees if the FMA is 30 degrees and above, and FMIA increase if the FMA is lower. Tweed believed that this value was significant in stabilizing balance and harmony of the lower face. The second measurement was FMA. This angle is probably 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 standard or normal range of 22-28 degrees projects a skeletal pattern with a normal growth direction. An FMA greater than the normal range indicates excessive vertical growth, and FMA less than the normal range indicates deficient vertical growth. The third and most important measurement is Incisal mandibular plane angle (IMPA). It is the angle between the axial inclinations of incisor



**Fig. 1.** Tweed's diagnosis triangle

**Table-1:** Sample size and age distribution

Gender	No	Min	Max	Mean	S.D.
Male	50	11	25	14.2	3.2
Female	50	11	25	14.94	3.89
Total	<b>100</b>	<b>11</b>	<b>25</b>	<b>14.57</b>	<b>3.56</b>

in relation to the mandibular plane. The standard of 88 degrees indicates an upright position of lower incisors. With a normal FMA this position reflects optimum balance and harmony of the lower facial profile. If the FMA is above normal, the orthodontist must compensate by further uprighting the mandibular incisors. If the FMA is below the normal range, compensation can be made by leaving the mandibular incisors at their pretreatment position or by positioning them more to the labial. Labial inclination of the mandibular incisors is generally limited to 94 degrees in patients with normal muscular balance because of tissue health and stability.

Till date there is no recorded data on Nepalese value of Tweed's analysis this paper will establish the standard for the Nepalese people.

The purpose of this paper is to establish the Tweed's norms for Nepalese, compare the values between the Nepalese male and female samples as well as to compare with the Caucasians.

## MATERIALS AND METHODS

The materials used in this study consist of cephalometric radiographs of 100 subjects (50 males and 50 females) developed from Kodac Diagnostic film shot by Rotograph plus (85 kVp-10mA) of Villa Systemi Medicali of Italy by the one x ray technician at a distance of 5 feet looking straight to his/her own eyes on the mirror at The Orthodontic Center, Kathmandu Plaza, Kathmandu, Nepal.

All the x ray was traced by the single investigator by manually

The criteria for the selection of the sample were:

1. Male and female of Nepalese origin aged 11 to 25 years
2. Class I molar relationship
3. Overjet and overbite (upto 4 mm and 4 mm respectively)

**Table-2:** Range, mean, standard deviation of Nepalese male subjects

Measurement	Min	Max	Mean	SD
FMA	18	39	28	5.8
FMIA	43	69	56	5.7
IMPA	84	105	96	6.0

**Table-3:** Range, mean, standard deviation of Nepalese female subjects

Measurement	Min	Max	Mean	SD
FMA	15	38	28	6.0
FMIA	42	75	58	7.6
IMPA	85	105	94	5.5

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 Nepal
8. No history of previous orthodontic treatment

The following three planes that form Tweed's diagnostic triangle were used.

1. Frankfort horizontal plane: Line joining from external auditory meatus to orbitale
2. Mandibular plane : Line passing tangent to the lower border of mandible
3. Long axis of lower incisor:

The following three angles formed in Tweed's triangle (Fig. 1) was measured

1. Frankfort Mandibular plane Angle (FMA),
2. Frankfort Mandibular Incisal Angle (FMIA),
3. Inciso Mandibular Plane Angle (IMPA)

An angular measuring device designed by Ormco was used to measure all the three angular values and were recorded to the nearest 0.5 mm degree.

## Statistical Analysis

Microsoft Excel was used for data management. Descriptive statistics, including the mean, standard deviation and the range were computed for each variable. The paired t- test was performed to compare the sexual differences within the sample. The t- test was also used to compare the racial difference with the Steiner's means. The statistical significance for all the tests carried out was defined as  $p < 0.05$ .

**Table-4:** t -test of significance for the difference between two groups

Measurement	Male	Female	P-value	Significance
FMA	28	28	0.42	NS
FMIA	56	58	0.06	NS
IMPA	96	94	0.17	NS

NS: Non-significant

**Table-5:** Combined range, mean, standard deviation of Nepalese male and female subjects

Measurement	Min	Max	Mean	SD
FMA	15	39	28	5.9
FMIA	42	75	57	6.8
IMPA	84	105	95	5.8

## RESULTS

The most relevant data of this study is presented in Tables-1 to 6. The samples comprised of 50 males and 50 females subjects. The age range of this study was 11 to 25 years with the average age of 14.6 years. The average age of males was 14.2 years while female was 14.9 years. The range, mean and standard deviation of all the Tweed's parameters of male and female are depicted in Table-2, 3. Table-4 analyzes the statistical difference between Nepalese Male and Female while Table-6 analyzes the statistical difference between Nepalese and Caucasian. Table-5 shows combined values of Male and Female for the use as the reference norms of the Tweed's analysis for Nepalese people.

## DISCUSSION

### Comparison between male and female

Both male and female of Nepalese people have horizontal growth pattern with the same value of 28°.

The Nepalese male samples presented a mean FMIA (56°) with slighter smaller than that of the Nepalese female sample (58°). The mean difference of 2° suggests that the Nepalese male tend to have a proclined lower incisor than the Nepalese female subjects. However no statistical difference was found in the FMIA between the Nepalese male and female samples.

The Nepalese male samples presented a mean IMPA (96°) with slighter larger than that of the Nepalese female sample (94°). The mean difference of 2° suggests that the Nepalese male tend to have a proclined lower incisor than the Nepalese female subjects. However no statistical difference was found in the FMIA between the Nepalese male and female samples.

The results of t test, when applied to male and female values, showed that there were no significant differences between sexes. Therefore, the mean values for the two sexes were combined for use as the reference norms of the Tweed's analysis for Nepalese people.

### Comparison between Nepalese and Caucasian

When FMA is compared with Tweed's value it is 3° more for Nepalese sample suggesting that the Nepalese have more vertical growth pattern of mandible than the

**Table-6:** t-test of significance for the difference between caucasian and nepalese

Measurement	Caucasian	Nepalese	P-value	Significance
FMA	25	28	.001	S
FMIA	65	57	.001	S
IMPA	90	95	.001	S

S: Significant

Caucasian group. This data (tangent to lower border of mandible) is very close to Rajbhandiri<sup>16</sup>'s mandibular's plane (Gonion to Menton). Statistical analysis showed that the there is significant different between these two groups.

Similarly when FMIA of Nepalese (57°) compared to Tweed's value (65°) it is 8° more for the Nepalese suggesting that proclination of lower incisor is more to Nepalese subjects. Statistical analysis showed that the there is significant different between these two groups.

When IMPA is compared with Tweed's value it is 5° more for Nepalese sample suggesting that the Nepalese have more proclined lower incisors than the Caucasian group. Statistical analysis showed that the there is significant different between these two groups. Probably due to more proclination of lower anterior teeth, Nepalese people have more frequency of extraction<sup>17</sup> (46%) than the Caucasians<sup>18</sup> (28%). Tweed's<sup>19,20</sup> and other authors<sup>21-24</sup> believe that if the lower incisors are placed upright over basal bone, they are more likely to remain in good alignment. Similarly the health of the dentition and gingival tissues are also affected adversely if the mandibular incisors are not positioned over basal bone.<sup>25</sup> Therefore attention should be directed to the proper angulation and placement of the mandibular segment.

### Summery and conclusion

1. The mean value of FMA, FMIA and IMPA for Nepalese are 28°,56° and 96° respectively.
2. There is no significant different of FMA, FMIA and IMPA between Nepalese Male and Female.
3. There is significant different among Nepalese and Caucasian in Tweed's value.

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