CORRELATION BETWEEN BODY STATURE AND FACIAL HEIGHT AND TO FIND OUT PRESENCE OF ANY RACIAL AND SEXUAL VARIATIONS IN STUDENTS OF EASTERN U.P REGION

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ABSTRACT

Introduction: In many cases, brought for medico legal and forensic examinations, where only the cephalo-facial region is available it becomes difficult for the forensic scientist to identify the deceased in the absence of any detailed and in depth study on this region some time due to lack of data scientist cannot apply the technique, the present study provides anthropometric correlation of Five important cephalo-facial dimensions with stature and also devises regression formulae for reconstruction of stature from these dimensions. The study is further aimed to test the reliability and accuracy of regression formulae in the same population which was originally used to make these formulae and in another sample taken from mixed population of north India.

Material and methods: In the present study a no. of 400 students were examined in which 200 Male and 200 female. Study population was selected with in age ranges from 18-25 years. Total facial Height of each subject along with their stature was measure in following way.

Results: The mean of the Facial Height and Stature for the male subjects was 10.23±0.68 cm. and 168.13±5.89cm. The mean of the Facial Height and Stature for the female subjects was 9.58±0.65 cm. and 156±5.61cm.

Conclusion: Total Facial Height is an important parameter for deciding the race and sex of an individual. Total Facial Height is important in comparison of the face of population from different racial background, assessing growth, development of an individual and in diagnosis of any abnormalities of face size and shape.

Keywords: medico legal, Facial Height, Stature, cephalo-facial dimensions

INTRODUCTION

The mandible is composed of 2 hemi mandibles joined at the midline by a vertical symphysis. The hemi mandibles fuse to form a single bone by age 2 years. Each hemi mandible is composed of a horizontal body with a posterior vertical extension known as the ramus. Gnathion is the lowest point in the lower border of the mandible in the median plane. It is found on the bony mandibular border when palpated from below and naturally lies posterior to the midline on border of the chin. It is a common reference point in the diagnosis and orthodontic treatment of various kinds of malocclusion and is an anthropometric landmark. The maxilla has several roles. It houses the teeth, forms the floor of and contributes to the lateral wall and roof of the nasal cavity, houses the maxillary sinus, and contributes to the inferior rim and floor of the orbit. Two maxillary bones are joined in the midline to form the middle third of the face. The Zygomatic bone forms the lateral portion of the inferior orbital rim, as well as the lateral rim and lateral wall of the orbit. It forms the anterior zygomatic arch, from which the masseter muscle is attached. The frontal bone forms the anterior portion of the cranium, houses the frontal sinuses, and forms the roof of the ethmoid sinuses, nose, and orbit. The paired nasal bones form the antero superior bony roof of the nasal cavity. They are approximately quadrangular. They articulate with the nasal process of the frontal bone superiorly, the frontal process of the maxillary bone laterally, and with one another medially. Their inferior border is free and forms the superior margin of the piriform aperture. The external surface is convex except for the superior-most portion, where a concavity forms as the margin turns superiorly to articulate with the frontal bone. In many cases, brought for medico
legal and forensic examinations, where only the cephalo-facial region is available it becomes difficult for the forensic scientist to identify the deceased in the absence of any detailed and in depth study on this region some time due to lack of data scientist cannot apply the technique, the present study provides anthropometric correlation of five important cephalo-facial dimensions with stature and also devises regression formulae for reconstruction of stature from these dimensions. The study is further aimed to test the reliability and accuracy of regression formulae in the same population which was originally used to make these formulae and in another sample taken from mixed population of north India. Works concerning estimation of stature from facial dimensions are scanty. As any part of the human skeleton can be found as the evidences, there is perhaps a need to investigate whether there is any possible significant co-relation between stature and facial dimension in human body. Therefore, the present work attempts to estimate stature from facial measurements among Height Vertex (HV): It measures the greatest distance from the plane where the subject stands to the vertex (v) on the head. It is measured by using anthropometer rod or the Stadiometer. 

MATERIALS AND METHODS
In the present study a no. of 400 students were examined in which 200 Male and 200 female were taken from Hind Institute of Medical Science, Sitapur, Lucknow. Study population was selected with in age ranges from 18-25 years. Total facial Height of each subject along with their stature was measure in following way.
1. Height Vertex (HV): It measures the greatest distance from the plane where the subject stands to the vertex (v) on the head. It is measured by using stadiometer. The subject was asked to stand on the metal stand of the measuring instrument in anatomical position.
2. Total Facial Height (TFH): It measures the straight distance from the nasion (n) to the Gnathion (gn). It is measured by using sliding caliper, in this way subject was asked to sit in the chair in a relaxed position, the face looking forward with close mouth as the face lies in anatomical position.

Including criteria
1-Age from 18 to 25 years
2-Belonging only from Western U.P
3-Healthy subjects
4-Willing to participate in study

Excluding criteria
1-Age group below from 18 years and above from 25 years
2-Any type of physical deformity
3-Any type of congenital anomalies
4-Any facial injury or body stature injury.

RESULTS
In the present study, As stated in the methods, measurement of 200 Male and 200 female subjects were taken, from Associate Professor, Department of Anatomy, Hind Institute of Medical Science, Sitapur, Lucknow. and having the age group of 18 to 25 years. Total facial height of each subject along with their stature was measured. Mean and standard deviation were calculated for each variable and frequency distributions were also determined.

STATISTICAL ANALYSIS
A summary of the anthropometric measurements in both genders is shown in table 1 and table 2. The mean of the Facial Height and Stature for the male subjects was 10.23±0.68 cm. and 168.13±5.89cm. The mean of the Facial Height and Stature for the female subjects was 9.58±0.65 cm. and 156±5.61 cm.

Table 1: Descriptive statistics for stature and facial height anthropometric measurements in adult male of western UP region:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stature</td>
<td>168.13</td>
<td>5.89</td>
<td>152.00</td>
<td>183.00</td>
</tr>
<tr>
<td>Facial Height</td>
<td>10.23</td>
<td>0.68</td>
<td>8.40</td>
<td>12.00</td>
</tr>
</tbody>
</table>

Table 2: Descriptive statistics for stature and facial height anthropometric measurements in adult female of western UP region:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stature</td>
<td>156.00</td>
<td>5.61</td>
<td>143.5</td>
<td>184.00</td>
</tr>
<tr>
<td>Facial Height</td>
<td>9.58</td>
<td>0.65</td>
<td>8.00</td>
<td>11.50</td>
</tr>
</tbody>
</table>

The result of the linear regression analysis is shown in Table 3 and in Table 4 for male and female, respectively. The high values of the regression coefficient shows that facial height may clearly predict the body stature in both sexes.
Correlation between body stature and facial height

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Table 3: Equation for estimating stature from facial height in Male:

<table>
<thead>
<tr>
<th></th>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.30</td>
<td>1.22</td>
<td>1.05</td>
</tr>
<tr>
<td>169</td>
<td>0.05</td>
<td>0.07</td>
<td>7.26</td>
</tr>
</tbody>
</table>

Table 4: Equation for estimating stature from facial height in Female:

<table>
<thead>
<tr>
<th></th>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t Stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.98</td>
<td>1.18</td>
<td>1.67</td>
</tr>
<tr>
<td>146</td>
<td>0.04</td>
<td>0.07</td>
<td>6.41</td>
</tr>
</tbody>
</table>

Figure 1: Scatter diagram and relationship between facial height measurements and body height in males:

Figure 2: Scatter diagram and relationship between facial height measurements and body height in females:

After completion of survey, we analyzed the data in the following way:
Maximum height observed in the sample was 183.00cms and 184.00cms in males and females respectively. The least height was observed 152.00cms and 143.50cms for males and females respectively. We have used computer based programs to calculated a linear equation to form regression equation; - “Y = a + b(X)”. The linear regression equation derived from facial height for estimating body height showed statically non-significant
relationship [P >0.05] in both genders. The Regression formulae have been obtained by using the statistical equations in both males and females separately;-

The Regression formulae is:

\[ y = a + bx \]

Where; \( y \) = Value of stature, 
\( x \) = Total facial height 
\( a \) = Intercept, 
\( b \) = Regression coefficient.

The Regression formulae for males and females;-
1: For male; 
\[ \{ Y = a + b(X) \} \text{ or } \{ Y = 1.30 +0.05 \ (168.13) \} \]
2: For females; 
\[ \{ Y = a + b(X) \} \text{ or } \{ Y = 1.98 +0.4 \ (156.00) \} \]

**DISCUSSION**

According to NaraynaKulkarni and Monika kohli, (2011)⁷ A total no. of 1000 students with equal sex distribution were examined, using a measuring tape. One observer measured all the body heights of all the individuals. Another observer recorded all the total facial height. Resulting, Males were observed to have more Total Body Height, and Total Facial height. No significant Correlation was found in relation to Total Body Height v/s Total Facial Height. But in the present study the maximum height observed in the sample was186.00cms and 172cms in males and females respectively. Least height of 157.00cms and 145.00cms in males and females respectively was observed. Maximum samples had the total body and total facial height of 161.00-170.00and 17.00-19.00 cm respectively in the students of age ranging from 22-24 years, in majority of the sample if body height increase, total facial height also increase so total body height can be a precursor for total facial Height, In the present study. The mean of the Facial Height and Stature for the male subjects was 10.23±0.68 cm. and 168.13±5.89cm. The mean of the Facial Height and Stature for the female subjects was 9.58±0.65 cm and 156±5.61cm, but among the kabui Naga of Imphal Valley, Manipur, the mean values with their respective standard deviation of the seven different facial parameters of the Kabuis. It is seen that the average height of the Kabui Naga males fall under the range 150.20 cm to 175.00 cm. The mean and S.D for total facial height and stature of male are as 11.25±0.437 (mean) in cm and 0.61±0.030 (S.D) in cm in case of male while 162.29±0.38 (mean) in cm and 5.40±0.271(S.D) in cm in case of male. The present study shows facial measurements with respect to stature of male the r-value observe 0.53 and standard error observe .007,while the r-value and standard error was shown 0.213 and 0.067 in male Kabuis of Imphal Valley. Mahesh et.al (2013)⁷ showed the anthropometrical variations among Haryanvi Adults. The mean value of facial height that study in male was 11.07and S.D was 0.698 while in case of female mean and S.D was 10.21 and0.940 and the mean of the facial height in male was 9.58and S.D 0.65 and in female the mean of the facial height was 10.23 in male of western U.P respectively In the previous study by Parasanna LC et al (2013)⁸ showed that people who stay in north India are tall, fair and thin, while south Indians are short in stature, . The climates of these two regions are different and so, according to the environment, there are changes in facial heights. The present work in the western U.P region was undertaken to compare variations in north and south Indian populations, and to correlate their facial heights with the stature a of an individual. This correlation could be beneficial in facial reconstruction surgeries, maxillofacial surgeries, estimation of a person's stature, and even in forensic application. A Facial form may be an important factor in increasing susceptibility to obstructive sleep apnea. The shape of the head and face is useful in designing various head and face equipments like helmets, head phone, goggles etc.³ There are many inherited birth defects associated with abnormal craniofacial development.⁹ It clearly indicates that there is research vacuum in facial height, facial width, and facial index; that is why it demands more studies.¹¹

**CONCLUSION**

The current study and its statistical analysis confirm with the observation of previous worker. The observing tables and graphs can be implied that the value of present study coincide with the values as observed in previous studies. After completion the survey we analyzed the data in following way the maximum body height was observed for male and female was 183.00cms and 184.000cms respectively. The least body height was observed for male and female was 152.00 cms and 143.50cms respectively. The maximum facial height was observed for the male and female was12.00 cms and 11.50 cms. The least facial height was observed for the male and female was 08.40 cms and 08.00 cms. The Mean and S.D of stature was observed for male and female was 168.13±0.589 and 156.00±0.561 respectively. The Mean and S.D of facial height was observed for male and female was 10.23±0.68 and 09.58±0.65 respectively the important conclusion can be drawn are as follows: -Total Facial Height is an important parameter for deciding the race
and sex of an individual Total Facial Height is important in comparison of the face of population from different racial background, assessing growth, development of an individual and in diagnosis of any abnormalities of face size and shape.

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