

## Correlation between facial height and body height: a prospective anthropometric study

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### Abstract

**Aim:** To find a correlation between facial height and body height.

**Materials and Method:** The subject's height was measured by a stadiometer and the facial height by a vernier calliper in 150 medical students. The data was analyzed statistically for significance and correlation.

**Results:** Mean body height was 167.54±9.59 cm and mean facial height was 10.77±0.76 cm. The P value was less than 0.001 and the Pearson's coefficient was 0.34. This shows a significant positive correlation between body height and facial height.

**Conclusion:** The measurements of facial height can be used for estimation of body height when facial remains are brought for anthropometric examination.

**Keywords:** Facial Height, Body Height, Anthropometry

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### Introduction

Human beings belong to the species *Homo sapiens*.<sup>(1)</sup> Two persons are never alike in all their measurable characters, that the latter tends to undergo changes in varying degrees from birth to death, in healthy and in diseases. Since persons living under different conditions, members of different ethnic groups and the offspring of unions between them, frequently present interesting differences in bodily form and proportions.<sup>(2)</sup>

Identification of a person means determination of individuality of a person; it may be complete or incomplete. Complete identification means absolute fixation of individuality of a person. Incomplete identification implies to find out only some facts about the identity of the person while others still remain unknown. Age, sex and stature are the primary characteristics of identification.<sup>(3)</sup>

Anthropometry is a systematized measuring technique that expresses quantitatively the dimensions of the human body and skeleton.<sup>(4)</sup> Estimation of Body height is an important tool in anthropometric examination especially in unknown, highly decomposed, fragmentary and mutilated human remains. While conducting a medico-legal autopsy in such cases, anthropologist is often asked to remark about the identity of the deceased. Body height is one of the criteria of personal identification which helps in the investigation process and provides useful clues to the investigation agencies.<sup>(5)</sup>

### Materials and Method

The study was conducted on medical students studying at Hind Institute of Medical Sciences, Sitapur,

Uttar Pradesh (India). After obtaining an informed consent from 150 students (107 males and 43 females), they were examined for the study. The subjects taken for this study belonged to different states of India. They were healthy and without any abnormality like kyphosis, scoliosis and any spinal disease.

**Source of data:** Students of Hind Institute of Medical Sciences.

**Study subjects:** 107 Male and 43 Female students.

**Age range:** 18-25 years

#### Inclusion criteria

1. Subjects of 18-25 years age were selected for the study.
2. Only healthy adult subjects without any skeletal deformities were included.
3. The subject must be able to stand in an erect posture without any spinal or musculoskeletal pathology.

#### Exclusion criteria

1. Individuals with spinal deformities like kyphosis and scoliosis that can affect body height were excluded.
2. Individuals with facial deformities that can affect facial height were also excluded.

#### Equipment's used in the study

- ❖ Stadiometer
- ❖ Vernier caliper
- ❖ Digital camera

#### Method of collection of data

Body height and facial height are measured for all the participants according to the standard anthropometric methods. These were as per the guidelines of International Society for the Advancement of Kin anthropometry.<sup>(6)</sup>

**Parameters:**

- ❖ Body height
- ❖ Facial height

**Measurement of Body Height:** Body height is defined as the vertical distance from the vertex to the floor. It is measured to the nearest 0.1 centimetres in bare feet while the participant stands upright against a stadiometer. The participant’s head is kept in the Frankfort horizontal plane. It is achieved if the lower edge of the eye socket is horizontal to the trignon. The vertex is the highest point on the head. The participant was asked to stand erect with his heels together and back straight. In this position participant’s heels, buttocks, shoulders and the head should have touched the rod of the stadiometer. The arms should have hung freely on either sides of the body. The participant was told for taking a deep breath and holding it. The readings were taken on the stadiometer scale at vertex point. Then the participant was told to exhale and to get away from the floor of the stadiometer.

- ❖ **Trignon:** It is a point in the notch just above the tragus of the ear.
- ❖ **Vertex:** The highest point on head when the head is in eye ear plane.
- ❖ **Facial Height (FH):** The distance from the nasal root (nasion) to the lower border of the mandible in the mid sagittal plane (gnathion). 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.<sup>(8)</sup>

While collecting data, all the instruments were checked for accuracy and precision. The subjects were measured by the two authors separately. If a difference in reading was observed then a third reading was taken to ensure accuracy.



**Fig. 1: Method of Measuring the Body Height**



**Fig. 2: Method of Taking the Facial Height**

**Results**

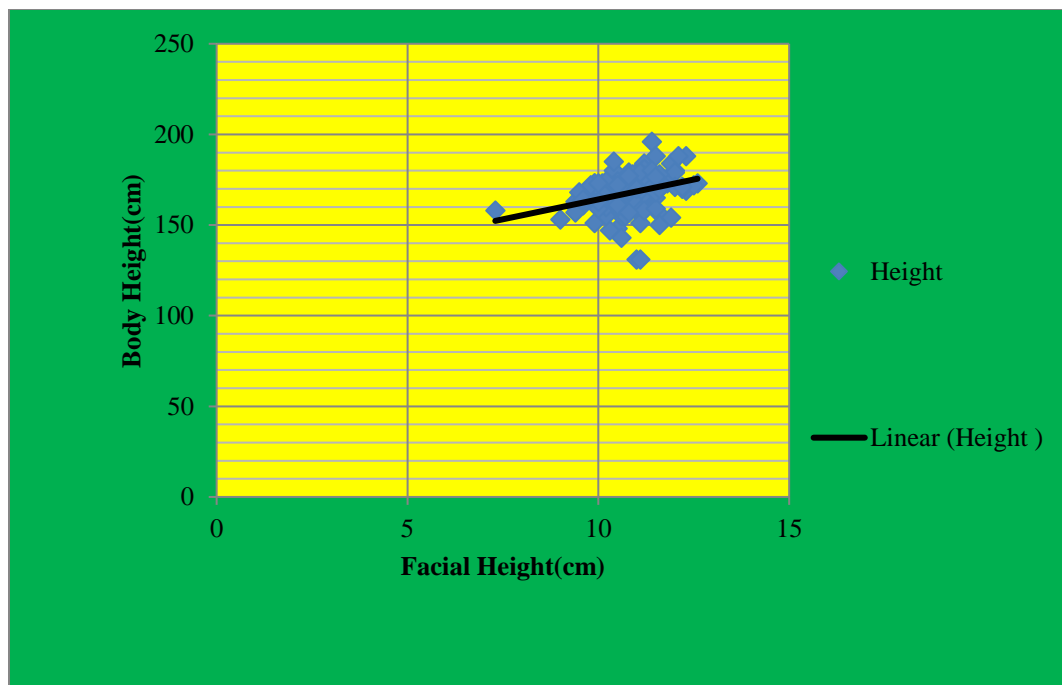
The study was conducted on 107 Male and 43 Female students, age range (18-25 yrs). The results are shown in Table 1.

**Table 1: Descriptive Statistics of Body Height and Facial Height**

S.N.	Variable	Mean	Median	Mode	Standard Deviation	Pearson’s Coefficient ‘r’	P-value
1.	Body Height (cm)	167.54	168	173	9.59	0.34	<0.001
2.	Facial Height (cm)	10.77	10.8	10.8	0.76		

Table 1 shows mean body height and mean facial height are (167.54±9.59) cm and (10.77±0.76) cm respectively (p<0.001 and Pearson’s coefficient ‘r’=0.34). Therefore, there is a significant positive correlation between body height and facial height.

Fig. 3 shows as the facial height of the individual increases, there is also increase in the body height.



**Fig. 3: Correlation Between Facial Height And Body Height**

### Discussion

The dimensions of anthropometry are different for age, sex, body size, race, ethnic groups, geographical location, dietary variation and even religion. Despite of this variation, height has been measured from many other parameters of the human body by refining formulae. The obtained data have become very much important in identifying the persons. The body height of a person is genetically predetermined and is an inherent characteristic. Estimation of height is taken an important parameter in the identifying unknown remains of human beings.<sup>(9,10,11)</sup>

Craniofacial anthropometry has become an important tool for genetic counsellors and reconstructive surgeons. It is necessary in genetic counselling, to recognize dysmorphic syndromes as accurately as possible. Many dysmorphic syndromes are diagnosed on the basis of advanced cytogenetic and molecular techniques, but also on identification of various morphological anomalies in craniofacial region. The values obtained in the normal population can be compared with the measurements taken from the patients. Thus, deviations from the normal values can be calculated. Therefore, anthropometric data can be used in early diagnosis of common syndromes. It was observed that children with partial foetal alcohol syndrome and foetal alcohol syndrome had a special facial phenotype that could be defined anthropometrically.<sup>(12)</sup>

In our study mean body height and mean facial height is found to be (167.54±9.59) cm and (10.77±0.76) cm respectively (p<0.001 and Pearson's

coefficient 'r'=0.34). Thus, there is a significant positive correlation between body height and facial height.

In Gujarat Region, Jadav HR and Shah GV derived the body height from the length of head. They observed that the mean body height was 168.10 cm in Gujarati male medical students with their last age range 22 years.<sup>(10)</sup>

Jibonkumar and Lilinchandra conducted study among the Kabuis Naga of Imphal Valley, Manipur. They observed mean body height was (162.29±0.38) cm and facial height was (11.25±0.437) cm. P value was less than 0.001 and Pearson's coefficient was 0.213. Therefore, there was a significant correlation between the two parameters.<sup>(13)</sup>

Swami S, Kumar M and Patnaik VVG conducted anthropometric study in adult Haryanvi Baniyas. There was also observed a significant positive correlation in both sexes.<sup>(14)</sup>

Yadav SK et al also found statistically significant positive correlation between the body height and the other cephalometric variables in Nepalese population. The observed parameters were; Mean Height (cm) =162.70 ± 8.45, Facial Height (cm) =10.70 ± 0.73, (p<0.001 and Pearson's coefficient 'r'=0.61).<sup>(15)</sup>

Kumar M and Patnaik VVG estimated the body height from Cephalo-Facial Anthropometry in 800 Haryanvi Adults. Their results showed a significant positive correlation between stature and all cephalo-facial measurements except for maximum head breadth which showed an insignificant correlation with stature in both sexes.<sup>(16)</sup>

**Table 2: Showing comparison between various studies done by different authors with our study**

Authors/year	Mean body height (cm)	Mean Facial height (cm)	P value	Pearson's coefficient 'r' value
Jadav HR and Shah GV (2004)	168.10	-	-	-
Jibonkumar and Lilinchandra (2006)	162.29±0.38	11.25±0.437	<0.001	0.213
Swami S, Kumar M and Patnaik VVG (2015)	-	-	<0.001	-
Yadav SK et al (2015)	162.70 ± 8.45	10.70 ± 0.73	<0.001	0.61
Kumar M and Patnaik VVG(2013)	-	-	<0.001	-
Our study	167.54±9.59	10.77±0.76	<0.001	0.34

### Conclusion

The study was conducted on 107 Male and 43 Female students, age range (18-25 yrs) with the aim to establish database on body height and facial height and to find out any correlation between these measurements. Subjects with any apparent physical deformities of the body were not included in the study. The data recorded were tabulated and analyzed statistically.

In the present study mean body height and mean facial height were (167.54±9.59) cm and (10.77±0.76) cm respectively ( $p < 0.001$  and Pearson's coefficient  $r = 0.34$ ). Thus there is significant positive correlation between body height and facial height. Estimation of body height from facial height is a supplementary approach when useful samples like extremities and other body parts are not available for examination.

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