



Original Article

Measurement of stature from somatometry of the facial height in males

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ABSTRACT

Aim: To measure the Stature from the Somatometry of the Facial Height in Male students of Hind Institute of Medical Sciences, Sitapur, UP (India).

Materials and methods: A stadiometer was used to measure the stature, and the facial height was taken by utilizing a digital vernier calliper. The subjects selected were 107 medical students from different states of India studying at HIMS, Sitapur, U.P. To know about the significance and correlation, the data was analyzed statistically.

Results: Mean stature and the mean facial height were found to be 171.19 ± 8.25 cm and 11.20 ± 0.67 cm respectively. P value was 0.002 and Pearson's coefficient obtained was 0.30. Therefore, there is a significant positive correlation between stature and facial height.

Conclusion: Estimation of stature from facial height could be performed where only unknown head and face are brought for anthropometric examinations.

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1. Introduction

Determination of individuality of a person is Personal identification. Personal identification is of two types i.e. complete (absolute) and incomplete (partial). Absolute fixation of individuality of a person is complete identification. To know only some facts about the identity of the person is partial identification. Stature is one of the primary characteristics of identification.¹ The measurement of the dimensions of the human body, especially while keeping the soft tissue intact is called as Somatometry. Facial height is one of the important somatometric body dimensions.²

Height or stature is an important anthropometric parameter in the personal details of any individual. Many anthropometric studies have been performed to establish relationship between stature and length of the long bones and other body dimensions such as arm length. However, researches that correlate facial height and stature are uncommon.³

Anthropometric techniques have been applied to find body size for more than hundred years. With an increase in mass disasters,

the identification of the stature of the person became quite difficult task.⁴

Earlier, researchers have utilized many bones of human skeleton such as long bones to short bones to find the stature of a person. They concluded that the stature can be estimated even from the smallest bone. Some scientists have used fragments of the long bones for the estimation of stature.⁵

Many authors have performed studies for the estimation of stature from various body parts like hands, trunk, intact vertebral column, upper and lower limbs, individual long and short bones, foot and footprints. But only a few researches have been done on somatometry of the facial height with respect to estimate the stature.^{6–12}

2. Materials and methods

Present study was conducted in the department of Anatomy at Hind Institute of Medical Sciences, Sitapur UP (India). Prior to start the research work informed consents from the students and clearance from ethical committee of the institute were obtained. A total of 107 medical students, from different states of India studying at the institute, participated in this study as a subject. They were aged between 18 to 25 years. Subjects with the history of abnormal neurological findings affecting the facial dimensions, oculofacial trauma and craniofacial deformities were excluded from the study.

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2.1. Inclusion criteria

- 1 Subjects in age group of the 18–25 years.
- 2 Healthy adult subjects without any skeletal deformities (dwarfism and gigantism).
- 3 Subjects being able to stand in an erect posture without any spinal or muscular pathology.

2.2. Exclusion criteria

- 1 Subjects with spinal deformities like kyphosis, lordosis and scoliosis.
- 2 Subjects with facial deformities that can affect facial height.
- 3 Individuals with craniofacial deformities (congenital or acquired)
- 4 Individuals with abnormal neurological findings (such as facial palsy, ptosis and squint)

2.3. Equipments used in the study

- 1 Stadiometer
- 2 Digital Vernier caliper
- 3 Digital camera

2.4. Somatometric parameters

- 1 Stature
- 2 Facial Height

Stature and Facial Height are measured for all the participants according to the standard anthropometric methods of the International Society for the Advancement of Kin anthropometry.¹³

Informed consents were taken from the subjects. The (anthropometric variables) facial height and the stature were measured.

2.4.1. Stature

It is the distance from the standing plate of the stadiometer to the vertex (the highest point on head when the head is in Frankfort horizontal plane) of the subject. The individual should be in erect posture.¹⁴

2.4.1.1. Procedure for measurement of stature. Stature is measured to the nearest 0.1 cm (cm) in bare feet with the subject standing upright against a stadiometer. The subjects head has to be in the Frankfort horizontal plane. This is achieved when the lower edge of the eye socket (the orbitale) is horizontal with the tragion (A point in the depth of notch just above the tragus of the ear). The subject is told to stand erect with his heel together and his back straight as far as possible so that his heels, buttocks, shoulders and the head touches the rod of the stadiometer. The arms are hung freely by the sides. Asking the subject to take a deep breath and hold it, a reading is taken from the stadiometer scale at his vertex point. The subject is then told to breathe and to step away from floor of stadiometer (vide Fig. 1).¹⁵

2.4.2. Facial height

It is the distance from the nasion (i.e. the nasal root) to the gnathion (i.e. the lowest point on the lower border of the mandible in the mid sagittal plane).¹⁴

2.4.2.1. Procedure for measurement of facial height. The subject was asked to sit on a chair with the head facing forward. The upper fixed end of vernier calliper was placed at nasion and the lower



Fig. 1. Method of Measuring the Stature.

sliding end of vernier calliper was placed at gnathion. The vernier calliper was then removed from the face and the facial height was recorded in nearest mm, which is the straight distance from the nasion to the gnathion (vide Fig. 2).¹⁶

Data obtained were analyzed using SPSS (Statistical Package for Social Sciences) v. 20 and descriptive statistic was used. Pearson's coefficient and unpaired student-t test were used to describe the correlation and to compare the means respectively. P value less than 0.05 was considered to be statistically significant.



Fig. 2. Method of Taking the Facial Height.

3. Results

Our study was conducted on 107 male medical students. The subjects mean age was 22.36 ± 1.29 years. Sample size is shown in Table 1.

Table 2 depicts mean values (\pm SD), minimum and maximum values of stature and facial height of adult male medical students. In the sample of 107, the adult males have an average stature of 171.19 ± 8.25 cm and the mean Facial Height was found to be 11.20 ± 0.67 cm.

Table 3 shows Karl Pearson's correlation coefficient between the stature and the facial height in adult males of Indian population.

Therefore, there is a statistically significant positive correlation ($p=0.002$ and Pearson's coefficient ' $r=0.30$ ') between the stature and the facial height as shown above in Table 3.

We can also see in Graph 1 there is increase in facial height and there is also positive increase in the stature of the body of an individual. So, there is positive correlation between stature and the facial height.

4. Discussion

The obtained results show that we can estimate stature from facial height in cases where unknown human remains are brought for anthropometric investigations. With respect to age, sex and race absolute dimensions and bodily proportions vary among individuals. Body Stature has been estimated from various other parameters of the body. In the identification of persons, these parameters are of utmost importance. The stature of an individual is genetically predetermined and is an inherent feature.^{3,5}

Table 1
Sample size.

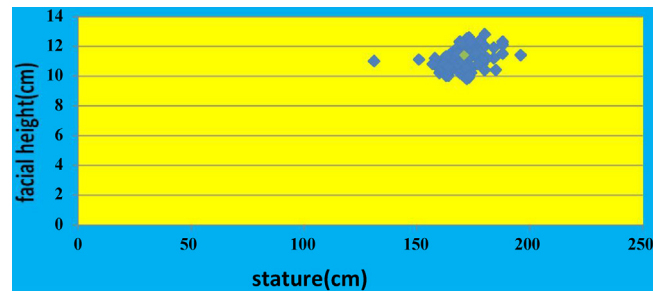
Sample	No. of Subjects	Mean age (Years)
Medical Male Students	107	22.36 ± 1.29

Table 2
Description of different variables.

Variables	Sex	Mean \pm SD (cm)	S.E.M	Range (cm)	
				Min.	Max.
Stature (cm)	M	171.19 ± 8.25	0.80	131	196
Facial Height (cm)	M	11.20 ± 0.67	0.065	9.80	12.80

Table 3
Correlation statistics of stature with facial height.

Correlation of Stature with	Pearson's coefficient (r)	P-value
Facial height	0.30	0.002



Graph 1. Showing correlation between stature and facial height.

Estimation of the stature in these cases can also be helpful to identify the other personal data like estimation of sex, race and age.¹⁴

In the present study, facial height has been measured and related with stature. The positive correlation between the facial height and stature in male medical students (Pearson's $r=0.30$, $P=0.002$) was in accordance with the studies done elsewhere.^{3,14,17,18}

The mean stature of the subjects of the present study was 171.19 cm that was almost similar to the mean stature of the Gujarati male medical students 168.10 cm.¹⁸

Like the stature the mean facial height is lesser in this study than a group of Jews, Protestant, Catholic students at Ohio state university U.S.A. Their study observed that Catholics are having greater facial height and are taller in stature than that of Jews and Protestant. This indicates that the anthropometric variations exists among different religions (3). The positive correlation between the facial height and the stature (Pearson's $r=0.30$) was significantly higher than a similar kind of study done in Kabui's males (Pearson's $r=0.21(14)$). Present study was compared with similar studies performed on other populations of different ethnic groups of India and the rest of the world.

The mean facial height is 11.20 cm as shown in Table 4. The mean facial heights of the earlier researches done were higher than the present study.

Table 5 shows that the mean facial height of the present study is more than the mean facial height of North Indian Kolis in the study of Krishan and Kumar (2008) and North Indian Gujjars in the study of Krishan (2011) where it is less than the present study. So, it is concluded from the present study that the Gujjars and North Indian Kolis have short facial height in comparison to the mean Indian face length.

The mean value of stature in males in present study is 171.19 cm. Table 6 also shows in the present study that the mean values of stature is higher than the Srilankans, South Africans

Table 4

Researches showing mean facial height more than the mean of the present study.

Authors	Population	Sex	Facial Height (cm)		
Farkas et al., (2005)	Azerbaijan	M	12.13		
	Singaporean Chinese	M	12.36		
	Vietnamese	M	12.12		
	Thai	M	12.35		
	Japanese	M	12.28		
Patil & Mody (2005)	Polish	M	11.75		
	Central Indian population	M	12.68		
Sahni et al., (2010)	Northwest Indian Population	M	11.25		
Jibonkumar & Lilanchandra (2006)	Kabuis of Imphal Valley	M	11.25		
Pelin et al., (2010)	Turkish Population	M	12.17		
Aghnihotri et al.,(2011)	Indo-Mauritian Population	M	11.58		
Wankhede et al., (2012)	Nagpur students	Medical	college	M	11.43
	Present Study	Sitapur Students	Medical	College	M

Table 5

Researches showing mean facial height less than present study.

Researcher	Population	Facial Height (cm)
Krishan & Kumar (2007)	North Indian Kolis	10.24
Krishan (2008)	North Indian Gujjars	10.81
Present Study	Sitapur Medical College Students	11.20

Table 6

Researches showing comparison of mean stature of previous studies with present study.

Researchers	Population	Mean Stature (cm)
Bale et al., (1991)	Caucasian Populations	178.13
Jadhav & Shah (2004)	Gujarat Populations	165.92
Patil & Mody (2005)	Central Indian Populations	164.78
Krishan & Kumar (2005)	North Indian Kolis	152.647
Jibonkumar & Lilanchandra (2006)	Kabuis of Imphal Valley	162.29
Ryan & Bidmos (2007)	Indigenous South Africans	153.27
Kalia et al., (2008)	Mysorean patients	171.65
Krishan (2008)	North Indian Gujjars	172.31
Sahni et al., (2010)	Northwest Indians	165.90
Pelin et al., (2010)	Turkish Populations	175.314
Illyperuma (2011)	Srilankans	162.95
Agnihotri et al., (2011)	Indo-Mauritian Populations.	173.40
Asha and Prabha (2011)	South Indian Populations	169.62
	North Indian Populations	168.86
Seema & Mahajan (2011)	Punjabi Populations	166.93
Wankhede et al., (2012)	Medical students of Nagpur	170.97
Present Study	Medical students of Sitapur	171.19

Table 7

Comparison of correlation coefficients between stature and facial height of previous studies with present study.

Researchers	Population	Correlation coefficient (r)	P-value
Patil & Mody (2005)	Central Indian Population	0.925	<0.01
Jibon & Lilanchandra (2006)	Kabuis of Imphal Valley	0.213	<0.001
Krishan & Kumar (2007)	North Indian Kolis	0.345	<0.001
Krishan (2008)	North Indian Gujjars	0.455	<0.001
Sahni et al., (2010)	North west Indians	0.219	<0.002
Pelin et al., (2010)	Turkish Population	0.199	<0.001
Agnihotri et al., (2011)	Indo –Mauritian Population	0.328	0.004
Wankhede et al., (2012)	Medical Students of Nagpur	0.19	0.001
Present study	Medical Students of Sitapur	0.30	0.002

but are lower than the Turkish, Indo-Mauritian and Caucasian studied by Bale et al. ¹⁹ The study when compared with Indian studies on the mean values of stature are higher in Sitapur medical students of Uttar Pradesh than the Gujarat Population, central Indian Population, Kabuis of Imphal Valley, North Indian Kolis, Northwest Indians, South Indian population and Punjabi populations but lower than the North Indian Gujjars and almost similar to the Mysorean population and Medical students of Nagpur.

In present study, correlation coefficient (r) between stature and facial length in males was 0.30 which is lower than the previous studies in males in some researches while it is higher in other research works done, as shown in Table 7.

The mean stature and mean facial height of the male students were found to be 171.19 cm and 11.20 cm respectively. These findings were similar with the previous studies. Such trends based on racial or ethnic data are desirable because these trends show the potentiality of craniofacial growth. This potentiality is resulted from ethnic, racial and sexual difference.

The present work was done on 107 male medical students of a medical college in Sitapur, Uttar Pradesh. Our aim was to find out a correlation between the facial height and the stature, if any. Subjects with the history of abnormal neurological findings affecting the facial dimensions, oculo-facial trauma and craniofacial deformities were excluded from the study. All the collected data were analyzed statistically.

5. Conclusion

The present study provides statistically significant positive correlation between the facial height and the stature. Estimation of

the stature in present study can also be helpful in identification of other personal data like estimation of sex, age, race etc where only head and face are brought for anthropometric examinations. Therefore, the following conclusions can be obtained from the present study:

- 1 There is statistically significant positive correlation between the facial height and the stature.
- 2 Estimation of the stature in present study can also be helpful in identification of other personal data like estimation of sex, age, race etc.
- 3 Estimation of stature from facial height could be performed where only unknown head and face are brought for anthropometric examinations.

Conflict of interest

There is no conflict of interest (of any) of the authors.

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