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Original Research Article

ADULT STATURE RECONSTRUCTION FROM CEPHALO-FACIAL DIMENSION IN INDIAN FEMALES

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ABSTRACT

Aim: To identify the Stature from the cephalo-facial dimension (facial height) in Indian females.

Materials and Methods: A stadiometer was used to measure the stature, and the facial height was taken by utilizing a vernier caliper, in 43 female medical students. To know about the significance and correlation, the data were analysed statistically.

Results: Mean stature and the mean facial height were found to be 158.93±11.06 cm and 10.39±0.83 cm respectively. P value was less than 0.001 and Pearson's coefficient obtained was 0.93. Hence, there is found to be a significant positive correlation between stature and facial height in Indian females.

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

KEY WORDS: Facial Height, Stature, Cephalofacial dimension.

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INTRODUCTION

Personal identification is grit of uniqueness of a person. Personal identification is of two types i.e. complete (absolute) and incomplete (partial). Complete identification is an absolute fixation of individuality of a person. Knowing only some particulars regarding the identity of an individual is partial identification. One of the primary characteristics of identification is Stature [1].

Cephalo-Facial Dimensions are the different parameters of the head and face. One of the important Cephalo-Facial Dimension is Facial

height [2]. Stature or Height is a very much important anthropometric parameter in the personal details of any individual. Many anthropometric studies have been performed to establish the relationship between stature and length of the long bones and other body dimensions such as arm length. However, studies that correlate facial height and stature are uncommon [3].

Anthropometric techniques have been applied to find body size for more than a hundred years. With an increase in mass disasters, the identification of the stature of the person became quite a 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 found that even from the smallest bone the stature can be estimated. Fragments of the long bones have been used by some scientists for the estimation of stature [5].

Some authors have done studies from various parts of the body like upper and lower limbs, hands, trunk and intact vertebral column for the estimation of stature. Foot and footprints, individual long and short bones have been utilized for estimation of stature by another group of scientists. But only a few researches have been done on cephalofacial dimensions of the facial height with respect to estimating the stature [6-12].

MATERIALS AND METHODS

The present study was conducted in the department of Anatomy at Hind Institute of Medical Sciences, Sitapur UP (India). A total of 43 female medical students participated in this study as subjects. Their age was 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.

Inclusion criteria: Subjects with age between 18-25 years, Healthy adults without any skeletal deformities like dwarfism or gigantism, Subjects were able to stand in an erect posture without any spinal or muscular pathology.

Exclusion criteria: Subjects with spinal deformities like kyphosis, lordosis and scoliosis, Subjects with facial deformities that can affect facial height, Individuals with craniofacial deformities(congenital or acquired), Individuals with abnormal neurological findings (such as facial palsy, ptosis and squint)

Equipments used in the study: Stadiometer, Vernier calliper, Digital camera.

Somatometric Parameters: Stature, Facial Height Stature and Facial Height are calculated for the subjects according to the benchmark anthropometric methods of the global Society for the development of Kin anthropometry [13].

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

Definition of Stature: It is the distance from the plane where the individual stands to the vertex (the highest point on the head when the head is in eye ear plane). The individual should be in erect posture [14].

Procedure for measurement of Stature (Fig. 1): Stature is calculated to the adjacent 0.1 centimetres in bare feet with the individual standing erect against stadiometer. The subjects head has to be in the Frankfort horizontal plane. This is obtained when the inferior rim of the orbit is parallel with the tragion (A point in the depth of notch just above the tragus of the ear). The subjects are said to stand straight with his heel in concert and his backs in a straight line as achievable in order that his head, shoulders, buttocks and heels touch the rod of stadiometer. The arms are hanging liberally by the sides. Asking the subject to take a deep breath and hold it, interpretations are taken from the stadiometer scale at his vertex point. The subject is then told to breathe and to step away from the floor of stadiometer [15].

Definition of Facial Height: The distance from the nasion (the nasal root) to the gnathion (the lowest point on the lower border of the mandible in the mid sagittal plane) [16].

Procedure for measurement of Facial Height (Fig. 2): The subject was asked to sit on a chair with the head facing forward. From nasion to gnathion, the two sliding ends of the vernier caliper were placed. The vernier caliper was then removed from the face and the facial height was recorded in the nearest mm, which is the

straight distance from the nasion to the gnathion [17].

Data obtained were interpreted using SPSS software 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.

RESULTS

Our study was conducted on 43 female medical students. The subjects mean age was 21.34 ± 1.29 years. The sample size is shown in table 1.

Table 2 depicts mean values (± SD), minimum and maximum values of stature and facial height of adult females of the Indian population. In the sample of 43, the adult females have an average stature of (158.93±11.06) cm and the mean Facial Height was found to be (10.39±0.83) cm.

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

Therefore, there is a statistically significant positive correlation ($p < 0.001$ and Pearson's coefficient 'r'=0.93) between the stature and the facial height as shown above in table 3.

Fig. 1: Method of Measuring the Stature.

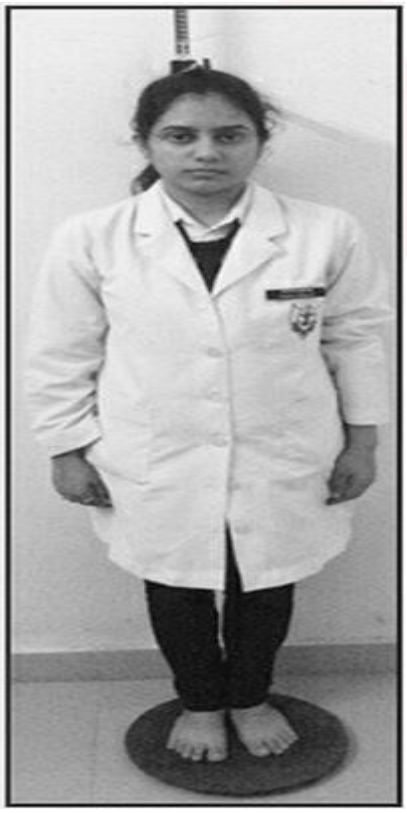


Fig. 2: Method of Taking the Facial.

Table 1: Sample size.

Sample	No. of Subjects	Mean Age (Years)
Medical Female Students	43	21.34 ± 1.29

Table 2: Description of different variables.

Variables	sex	Mean ± SD	S.E.M	Range	
				Min.	Max.
Stature (cm)	F	158.93±11.06	1.686	130	180
Facial Height (cm)	F	10.39±0.83	0.126	4.7	7.3

Table 3: Correlation statistics of stature with facial height.

Correlation of Stature with	Pearson's coefficient (r)	P-value
Facial height	0.93	<0.001

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	F	11.16
	Singaporean Chinese	F	11.49
	Vietnamese	F	11.31
	Thai	F	11.28
	Japanese	F	11.38
	Polish	F	11.16
Patil & Mody (2005)	Central Indian population	F	14.11
Sahni et al., (2010)	Northwest Indian Population	F	10.8
Aghnihotri et al.,(2011)	Indo-Mauritian Population	F	11
Hossain (2011)	Japanese (1975-79) & (1998-2001)	F	11.44
Wankhede et al., (2012)	Nagpur Medical college students	F	10.66
Present Study	Sitapur Medical College Students	F	10.38

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)	Haryanvi Baniyas	10.07
Present Study	Sitapur Medical College Students	10.38

Table 6: Researches showing comparison of mean stature of previous studies with present study.

Researchers	Population	Mean Stature (cms)
Patil & Mody (2005)	Central Indian Populations	150.55
Ryan& Bidmos (2007)	Indigenous South Africans	143.08
Kalia et al., (2008)	Mysorean patients	155.67
Sahni et al., (2010)	Northwest Indians	163.24
Akhter et al., (2010)	Bangladeshi	152.79
Ilayperuma (2011)	Srilankans	152.48
Agnihotri et al., (2011)	Indo-Mauritian Populations.	157.36
Asha and Prabha (2011)	South Indian Populations North Indian Populations	156.82 156.39
Wankhede et al., (2012)	Medical students of Nagpur	156.89
Present Study	Medical students of Sitapur	158.93

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 very much importance. The stature of an individual is genetically predetermined and is an inherent feature [3, 5].

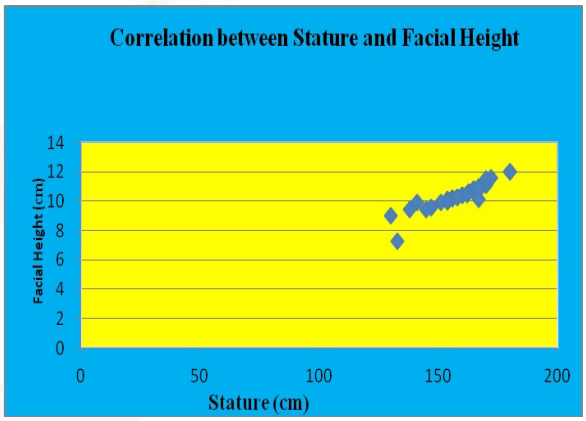
Estimation of the stature in these cases can also be helpful to identify the other personal data like estimation of sex, race and age [18].

In the present study, facial height has been measured and related with stature. The positive correlation between the facial height and stature in Indian study population (Pearson's

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	------	<0.01
Jibon & Lilancnandra (2006)	Kabuis of Imphal Valley	------	----
Krishan & Kumar (2007)	North Indian Kolis	-----	-----
Krishan (2008)	North Indian Gujjars	------	------
Sahni et al., (2010)	North west Indians	0.181	0.021
Pelin et al., (2010)	Turkish Population	-------	------
Agnihotri et al., (2011)	Indo –Mauritian Population	0.164	<0.001
Wankhede et al., (2012)	Medical Students of Nagpur	0.144	0.001
Present study	Medical Students of Sitapur	0.928	0.002

Graph 1: Correlation between stature and facial height.



r = 0.93, P<0.001) was in accordance with the studies done elsewhere [3, 14, 17, 18].

The mean stature of the subjects of the present study was 158.93 cm that was dissimilar to the mean stature of the Gujarati male medical students 168.10 cm [19].

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 exist among different religions [3].

The positive correlation between the facial height and the stature (Pearson's r= 0.93) was significantly higher than a similar kind of study done in Kabui's males (Pearson's r = 0.21) [14].

The 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 10.38 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 Haryanvi Baniyas in the study of Krishan (2011) where it is less than the present study. So, it is concluded from the present study that the Haryanvi Baniyas and North Indian Kolis have a short facial height in comparison to the mean Indian face length.

The mean value of stature in females in the present study is 158.93cm. Table 6 also shows in the present study that the mean value of stature is higher than the Srilankans, South Africans and Bangladeshis but is lower than the Northwest Indians studied by Bale et al [19]. The study when compared with Indian studies on the mean values of stature are higher in Haryanvi Baniyas than the Gujarat Population, central Indian Population, Kabuis of Imphal Valley, North Indian Kolis, Northwest Indians and Punjabi populations but lower than the South Indian population, Mysorean population(south Indians), North Indian Gujjars and almost similar to the North Indian population.

In the present study, correlation coefficient (r) between stature and facial length in females was 0.298 which is higher than the previous as shown in table 7.

The present work was done on 43 female 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, oculofacial trauma and craniofacial deformities were excluded from the study. All the collected data were analysed statistically. The mean stature and mean facial height of the female students were found to be 158.9 cm and 10.39 cm respectively. These findings were similar to 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 study provides a statistically significant positive correlation between the facial height and the stature. Estimation of the stature in the 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 a statistically significant positive correlation between the facial height and the stature.

2. Estimation of the stature in the present study can also be helpful in identification of other personal data like estimation of sex, age, race etc.

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

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Conflicts of Interests: None

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