Original research article

COMPARISON OF STATURE AND FOOT LENGTH IN ADULTS IN SRMSIMS BAREILLY

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Abstract

Introduction: Estimation of stature plays an important role in forensic anthropometry as it helps in estimating the identity of an individual. Many studies for estimating the stature from measuring long bones, with derivation of formulas are there. The present study is an attempt to evaluate a possible correlation between stature of an individual and foot length in adults.

Material and Methods: A sample of 100 medical students; 50 males & 50 females studying in Shri Ram Murti Smarak Institute of Medical Sciences was considered & measurements were taken for height and foot length.

Results: It was found that both the parameters showed a correlation with each other. The linear equation derived from this relationship is y=0.1436x+0.7097.

Conclusion: It can be concluded that the present study has provided regression equations for stature and foot length of an individual that can be used for stature estimation.

Keywords: Foot length, Stature, Height

INTRODUCTION

Stature is the height of the person in standing posture. It is one of the most important elements in the identification of an individual.[1] In forensic anthropology, stature is among the four major categories of the basic biological profile along with sex, age and ancestry.

Estimation of stature occupies a relatively central position both in anthropological research and in identification necessitated by medical jurisprudence or medico legal experts. Stature is one element of biological profile that can narrow the field of possible identification. .

In the recent times, due to natural disasters like tsunamis, earthquakes, floods, cyclones, and man-made disasters like bomb blasts, terror attacks, wars, plane crashes, mass accidents and other accidents, the need of establishing the identity of the person has become an important necessity for both legal and humanitarian reasons[2] eg. The purpose of funerals, family claims, insurances, etc. Sometimes, mutilation of a dead body is done by a criminal who wants to destroy all the traces of the identity of an individual. In this case, many variables will not be known about the victim as well as the suspect. Information about the victim or suspect's identity is therefore deduced from little evidence left. Person's height is one identifying characteristic that is often used. The Aim of the present study was to find out the correlation between foot length and height of an individual and to derive regression formulae to estimate the height from foot length of an individual.

MATERIAL AND METHODS

This study was conducted on 100 healthy individuals (50 males & 50 females) from the students of MBBS studying at Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly, Uttar Pradesh. The subjects were apparently free from any skeletal deformity, and informed consent was taken from all subjects.

Students unwilling to participate, students suffering from any skeletal deformities, students with Dwarfism and Gigantism were excluded from the study.

Written consent was obtained from all those students included. Data was collected by visiting the students after their lecture timings. The measurements were taken at fixed time between 02:00 pm to 05:00 pm in order to eliminate discrepancies due to diurnal variation.

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Measurements

Stature was measured as vertical distance from the vertex to the floor, where vertex is the highest point on the head when the head is held in Frankfurt Horizontal plane.[3] Measurement was taken by making the subject to stand erect on a horizontal resting plane, bare footed with back of the shoulders and buttocks touching the wall. Palms of hand were turned inwards and fingers pointing downwards. Anthropometer was placed in straight vertical position in front of the subject with head oriented in eye-ear-eye plane (Frankfurt Plane).[3] The movable rod of the Anthropometer was brought in contact with vertex in the mid sagittal plane. Precautions were taken not to exert pressure as that may affect the contact measurement.

Foot length was measured as a direct distance from the most prominent point of the back of the heel to the extreme point longest toe when the foot was fully stretched in centimeters to nearest mm through osteometer.

Statistical Analysis

Statistical analysis was done using SPSS statistical analysis software, appropriate to the nature of the results and observations. The statistical values and terms calculated included mean, standard deviation, tests of significance and application of other significant test for data analysis. Regression equations were computed and Pearson's correlation coefficient was calculated to establish the correlation between the stature and head measurements. The significance of results was tested using Z-test. P value of less than 0.05 was considered as significant. Predictive value of all equations was compared.

RESULTS

In this study 100 subjects were taken, 50 males and 50 females. The mean age was 20.31 years and the difference between the two was statistically significant ($p < 0.05$). Figure 1 shows the age wise descriptive statistics.

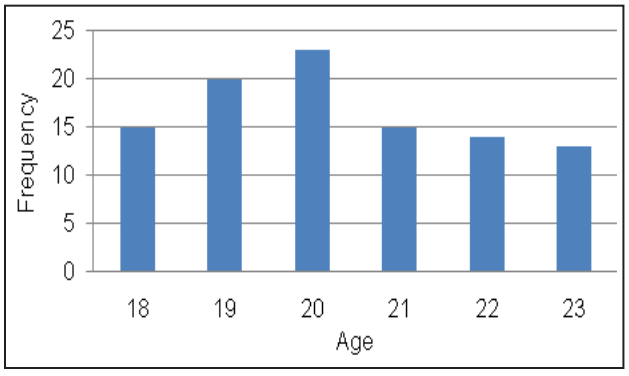

Fig.-1 : Age distribution of study participants

Maximum number of participants was of 20 years of age while least was of 23 years. The mean height among males was 173.5 cm and among females was 158.11 cm with standard deviation of 6.21 among males and 4.98 among females and the difference between two was statistically significant ($p < 0.001$). The mean foot length among males was 25.006 cm and among females was 22.75 cm with standard deviation of 1.51 among males and 0.976 among females and the difference between the two was statistically significant ($p < 0.05$).

Table 1 Indicates a strong positive correlation between the foot length and height of the study participants and is statistically significant ($p<0.01$).

Table-1 : Correlation between height & foot length of study participants

		Height	Foot Length
Height	Pearson Correlation	1	.811**
	Sig. (1-tailed)	-	.000
	N	100	100
Foot Length	Pearson Correlation	.811**	1
	Sig. (1-tailed)	.000	-
	N	100	100

** Correlation is significant at the 0.01 level (1-tailed).

The linear equation derived from this relationship is $y=0.1436x+0.7097$.

Linear equation for derivation of stature from different measurements in male & female study participants is shown in Table-2 & 3.

Table-2 : Linear equation for derivation of stature from different measurements in male study participants

S. No.	Measurement	Linear Equation	p value
1	Right foot length	Y=80.442+3.692x	<0.01
2	Left foot length	Y=83.016+3.602x	<0.01
3	Right foot breadth	Y=123.26+4.821x	<0.01
4	Left foot breadth	Y=123.111+4.899x	<0.01

Table-3 : Linear equation for derivation of stature from different measurements in female study participants

S.No.	Measurement	Linear Equation	p value
1	Right foot length	Y=57.726+4.388x	<0.01
2	Left foot length	Y=62.078+4.209x	<0.01
3	Right foot breadth	Y=129.006+3.106x	<0.01
4	Left foot breadth	Y=127.286+3.320x	<0.01

Figure 2 shows scatter diagram depicting the relationship of height with foot length. The figure shows a positive correlation between the two. The value of regression coefficient (R2) is found to be 0.6572.

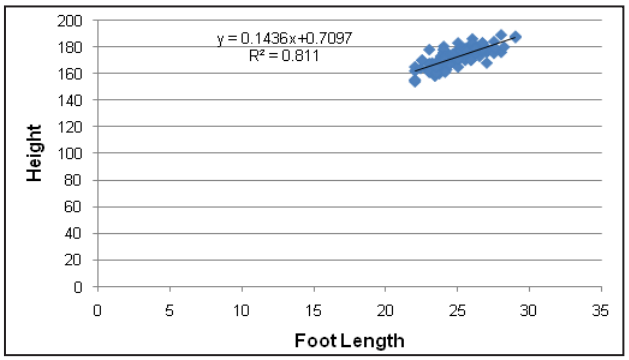

Fig.-2 : Relationship of height with foot length

DISCUSSION

A number of studies have been conducted on the estimation of stature, many methods are established in estimating stature from the bones but the one of the easiest and the reliable method is by regression analysis. In the present study we have observed the correlation of Height (in anatomical position) with foot length in population studied.

Mohanty & Agrawal[4] studied on population of Odisha has developed a regression equation that could calculate the height of an individual from his foot length. Three hundred students (M=206, F=94) aged 18-25 years were included in their study. As height increases foot length of both male and female also increases.

The study done by Kewal Krishnan et al[5] by estimation of stature from foot print and foot outline dimensions in Gujjars of North india suggests that the correlation of stature with foot length is extremely high suggesting a close relationship with them.

Patel et al[6] conducted the study on 500 asymptomatic healthy medical students of Gujarat region in the age group of 14 to 25 years and concluded that fairly good estimation of height can be made using regression equations in either sex. Jakhar et al[7] in a study of 103 medical students observed positive correlation of height with foot length and it was statistically significant.

Sen et al[8] estimated of stature from foot length and foot breadth among population of North Bengal. The higher correlation coefficient between stature and foot length over that of stature and foot breadth points to the fact that foot length rather than foot breadth, is more accurate in estimating stature.

CONCLUSION

In present study the correlation coefficient between height and foot length is + 0.851 which is highly significant ($p<0.05$). The regression analysis is considered as the best criteria for stature estimation from fragmented body remains.[9] From the above facts, it is clear that if either of the measurement (foot length or total height) is known the other can be calculated and this fact may be of practical use in Medico-legal investigations and in anthropometry.

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