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## RESEARCH ARTICLE

### A STUDY OF RELATION OF STATURE WITH FOOT LENGTH IN FIRST YEAR MEDICAL STUDENTS OF SOUTH INDIAN ORIGIN

**\*Dr. Girish V. Patil and Dr. Shishirkumar**

Department of Anatomy, DM-Wayanad Institute of Medical Sciences, Meppadi, Wayanad, Kerala, India

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#### ABSTRACT

Stature is the height of the person in the upright posture. It is an important measure of physical identity. Establishing the identity of an individual from mutilated, decomposed and amputated body fragments has become an important necessity in recent times due to natural disasters like earthquakes, tsunamis, cyclones, floods and man-made disasters like terror attacks, bomb blasts, mass accidents, wars, plane crashes etc. The present study was conducted at Department of Anatomy of DM-Wayanad Institute of Medical Sciences, Wayanad, Kerala and Srinivas Institute of Medical Sciences, Mangalore, Karnataka. Sample size was taken as 450 (200 male and 250 female). Stature in Males varied from 138 cm to 184 cm, Stature in Females varied from 132 cm to 166 cm. Foot length in Males varied between 20.2 to 28.6 cm, In females range of Foot length was from 20.3 to 27.4cm. The correlation coefficient between height and foot length is + 0.658 in male and + 0.567 in female which is highly significant. Estimation of stature among the population can be carried out using foot length and there is positive correlation between stature and foot length in a particular population.

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#### INTRODUCTION

Establishment of an identity is very much important in both civil and criminal cases. Stature is the height of the person in the upright posture. It is an important measure of physical identity. Establishing the identity of an individual from mutilated, decomposed and amputated body fragments has become an important necessity in recent times due to natural disasters like earthquakes, tsunamis, cyclones, floods and man-made disasters like terror attacks, bomb blasts, mass accidents, wars, plane crashes etc. It is important both for legal and humanitarian reasons. "Stature" is one of the most important elements in the identification of an individual (Chikhalkar *et al.*, 2010). Many studies have shown that limbs exhibit consistent ratios relative to the total height of a person. A very little work has been done for stature estimation from foot length in south Indians. The forensic scientists are well aware of the fact that the complete skeleton is rarely available at the scene of crime. Thus the scientists may have no choice than to use mathematical method of stature reconstruction. This is of obvious advantage that it is workable even if a part of upper or lower extremity is available for examination (Bhavna 2009).

#### MATERIALS AND METHODS

The present study was conducted at Department of Anatomy of DM- Wayanad Institute of Medical Sciences, Wayanad, Kerala

**\*Corresponding author: Dr. Girish V. Patil**

Department of Anatomy, DM-Wayanad Institute of Medical Sciences,  
Meppadi, Wayanad, Kerala, India.

and Srinivas Institute of Medical Sciences, Mangalore, Karnataka. Sample size was taken as 450 (200 male and 250 female) asymptomatic, healthy medical students of the age group ranging between 17 – 25 years. Subjects with deformities of vertebral column or limbs and with chronic illness were excluded. Informed, written, witnessed consent in vernacular of each subject was taken and in case of minor, informed written consent of legally acceptable representative was taken. Measurements in female subjects were taken in presence of female attendant. Foot length was measured as a direct distance from the most prominent point of the back of the heel to the tip of the hallux or to the tip of second toe when the second toe was longer than hallux by spreading caliper in centimeter. Stature was measured in standing posture using the methods described by Cameron *et al.* (1981). The subject was instructed to stand barefooted on the board of a standard height measuring instrument with both feet in close contact with each other, trunk braced along the vertical board and head oriented in Frankfort horizontal plane. The measurement was taken in centimetres by bringing the horizontal sliding bar to the vertex.

#### RESULTS

Stature in Males varied from 138 cm to 184 cm with Mean value of 158.71 cm and Standard deviation (SD) of 5.988 cm. Median of stature being 161.14 cm. Stature in Females varied from 132 cm to 166 cm with Mean value of 146.82 cm and Standard deviation (SD) of 5.604 cm, Median of stature standing at 149.08 cm. This difference in Mean stature between Males and Females was statistically highly significant

( $p < 0.001$ ). There was statistically no significant difference in the lengths of right and left foot in Males and Females ( $p > 0.05$ ), so right foot length was used in both subjects for further calculations. Foot length in Males varied between 20.2 to 28.6 cm with Mean value of 24.32cm and Standard deviation of 2.02 cm. Median was 24.40 cm. In females range of Foot length was from 20.3 to 27.4cm with Mean value and Standard deviation of 23.81 cm and 1.607 cm respectively. Median was 24.07 cm. This difference observed in Mean Foot length was statistically highly significant ( $p < 0.001$ ). The values were calculated as statistically highly significant indicating very strong positive correlation between Stature and Foot length in males and females.

**Table 1. Height, foot length, correlation coefficient, regression coefficient (b) and value of constant (a) in Male and Female**

	Male	Female
Total Number	200	250
Height range (cm)	138 to 184	132 to 166
Mean height (cm)	158.71	146.82
S.D. of height	5.988	5.604
Foot length Range (cm)	20.2 to 28.6	20.3 to 27.4
Mean foot length (cm)	24.32	23.81
S.D. of foot length	2.04	1.407
Correlation Coefficient(r) (Height and Foot Length)	0.658	0.567
Regression Coefficient (b)	2.71	2.56
Value of Constant (a)	100.18	96.40

## DISCUSSION

Various studies have been conducted on the estimation of stature from the human skeleton. There are various methods to estimate stature from the bones but the easiest and the reliable method is by regression analysis. Estimation of stature from anthropometric measurements is an area of interest for Forensic Experts for the purpose of Identification. Then data derived from entirely different population cannot be used for height assessment for all types of population hence the baseline data shall be derived from local population so that they can be used for the height assessment amongst them. Table 1 shows the correlation coefficients between various parameters between height and foot length. It is positive, suggesting that it is significant. The correlation coefficients between height and foot length, indicate the foot length provides highest reliability and accuracy in estimating stature of an unknown individual (2007). Natarajamoorthy *et al.* (2011) studied on 107 randomly selected subjects in Malaysia and developed a regression equation for stature estimation from foot length obtained from foot impression. Patel *et al.* (2007) in their study on 502 medical students (278 male and 224 female) between 17 to 22 years of age belonging to various region of Gujarat, India and reported a regression formula between foot length and height of an individual. Qamra *et al.* (1980) made a study on height and foot length and derived a correlation coefficient for foot breadth (Male 0.42 and Female .047) and foot length (Male 0.69 and Female 0.70). Charnalia (1961) showed the significant correlation between height and foot-length, where correlation coefficient was 0.46.

In present study the correlation coefficient between height and foot length is + 0.658 in male and + 0.567 in female which is highly significant. 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.

## Conclusion

The study will help in medico- legal cases in establishing identity of an individual when only some remains of the body are found as in mass disasters, bomb explosions, accidents etc. If either of the measurement (foot length or total height) is known, the other can be calculated and this would be useful for Anthropologists and Forensic Medicine experts. It will also help in establishing identity in certain civil cases. Estimation of stature among the population can be carried out using foot length and there is positive correlation between stature and foot length in a particular population. Hence there is a need to conduct more studies among people of different regions & ethnicity so that stature estimation becomes more reliable & identity of an individual is easily established.

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