

Estimation of Stature Using Foot Measurements: A Clinical Study

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Abstract

Background: In forensic anthropology, estimation of stature from feet dimensions plays a significant role in establishing personal identity. The present study was conducted to estimate stature using foot measurements. **Materials and Methods:** The present study was conducted in sample consisted of 110 healthy individuals in the age group of 20 to 60 years. All the measurements were taken in well-lit room. The standing height method was chosen for measuring stature of each subject. Foot length is the straight distance directly from acropodian to pternion. The recorded data was compiled, and data analysis was done. **Results:** In the present study 58 were males and 52 were females. The average stature for male adults was 165.75 cm and for female adults it was 155.8 cm. The average RFL for males was found to be 24.61 cm. while for females it was 22.04 cm. The average LFL for males was found to be 24.92 cm. while in females it was 22.54cm. The Pearson correlation coefficient of the stature, RFL and LFL for males were statistically significant and there was a positive correlation between stature and foot length. The Pearson correlation coefficient of the stature, RFL and LFL for females were statistically significant and there was a positive correlation between stature and foot length. **Conclusion:** The present study concluded that there was a statistically significant positive correlation between stature and foot length in both males and females.

Keywords: Foot Length, Stature, Forensic Anthropometry.

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Introduction

Identification of a person is of prime and foremost importance in both civil and criminal cases. Though there are several parameters which help in identifying a person, stature is one of the important parameter as it is an inherent characteristic. Examination of footprint provides important evidence in a crime scene investigation as it helps in estimation of stature of a culprit[1,2].The stature estimation is considered to be an important assessment in the identification of individual in forensic sciences[3] Moreover, stature estimation plays an important role when height cannot be measured directly due to deformities such as kyphosis, scoliosis and missing legs[4]. Foot length possesses a biological correlation with stature and it has been shown that the foot measurement provided important predictive information about the individual's stature[5] and the reliability of prediction of stature from foot measurements was as high as that from long bones[6]. As ossification and maturation in the foot occurs earlier than long bones, therefore, during adolescence, stature could be more accurately predicted from foot measurement as compared to that from the long bones[7] The present study was conducted to estimate stature using foot measurements.

Materials And Methods

The present study was conducted in sample consisted of 110 healthy individuals in the age group of 20 to 60 years. This age group was selected based on the fact that all the centers of ossification in the

foot, hand and long bones get completely fused around 18 years. Subjects with age above 60 years were excluded since stature and foot length significantly decline due to osteoporotic changes. Before the commencement of the study ethical approval was taken from the Ethical Committee of the institute and written consent was taken from the patient after explaining the study. All the measurements were taken in well-lit room. The measurements were taken using standard anthropometric instruments according to the technique given in the manual of biological anthropology[8]. Stature is the vertical distance between the highest point on the vertex and platform of stadiometer. The standing height method was chosen for measuring stature of each subject. Foot length is the straight distance directly from acropodian to pternion. It was measured using specially designed instrument more or less like an osteometric board of a miniature size. It consisted of a horizontal rectangular wooden platform with a fixed metal scale with calibration from 0 – 30 cm. to the nearest mm. accuracy. The recorded data was compiled, and data analysis was done using SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA). P-value less than 0.05 was considered statistically significant.

Results

In the present study 58 were males and 52 were females. The average stature for male adults was 165.75 cm and for female adults it was 155.8 cm. The average RFL for males was found to be 24.61 cm. while for females it was 22.04 cm. The average LFL for males was found to be 24.92 cm. while in females it was 22.54cm. The Pearson correlation coefficient of the stature, RFL and LFL for males were statistically significant and there was a positive correlation between

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stature and foot length. The Pearson correlation coefficient of the stature, RFL and LFL for females were statistically significant and

there was a positive correlation between stature and foot length.

Table 1: Distribution of subjects according to gender

Gender	N
Male	58
Female	52
Total	110

Table 2: Mean and SD of the stature, RFL and LFL of the study subjects

Variable in cms	Male Mean \pm SD	Female Mean \pm SD
Stature	165.75 \pm 5.56	155.68 \pm 6.32
RFL	24.61 \pm 1.43	22.04 \pm 1.21
LFL	24.92 \pm 1.32	22.54 \pm 1.09

Table 3: Correlation co-efficient of stature, RFL and LFL in males and females.

Variable	RFL in cm	LFL in cm	p-value
Stature in cm (males)	0.72	0.78	<0.01
Stature in cm (females)	0.69	0.65	<0.01

Discussion

Sociocultural characteristics bring about difference in foot size. Mongoloids including Japanese have wider feet compared to the Caucasoid and Australoid population[9]. It shows the importance of region-specific data[10]. Previously length of long bones was used as a criterion for stature estimation[11]. Raju M (2009) obtained a statistically significant relation between bare foot length while walking and stature ($P < 0.001$)[12].

Deopa Deep (2010) also observed a significant and positive correlation between foot length and height in individuals of Uttarakhand region[13]. Ossification and maturation occur in the foot earlier than the long bones and therefore stature could be more accurately determined especially in adolescence age from foot measurement as compared to that from long bones[14,15].

Qamra et al who computed linear regression equations for estimating stature from either foot length or foot breadth and found that foot length was found to be more suitable. He suggested that a true relationship existed only between foot length and stature[16].

Giles et al also suggested that foot length displays a biological correlation with height and the latter can be estimated from foot length[17]. Singh and Phookan examined Thai male population of Assam and suggested foot length to be a better indicator of stature than foot breadth[18].

Mansur et al. observed correlation of height with foot length among students of Kathmandu university school of sciences as +0.688 in male and +0.587 in female children[10].

Mohanty et al. found that the correlation coefficient between height and foot length was +0.65 in male and +0.80 in female population of Odisha[19].

Conclusion

The present study concluded that there was a statistically significant positive correlation between stature and foot length in both males and females.

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