

**RELATION OF FOOT LENGTH WITH THE HEIGHT IN MEDICAL STUDENTS OF
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ABSTRACT

Identification of an individual is an important aspect in Forensic Medicine. It includes various parameters like determination of Age, Sex, Race, Stature etc. The Anthropometry of the individual helps a lot in the identification. The stature of an individual can be measured easily if whole of the body or skeleton is present. However, it becomes difficult when fragmented bodies or some parts of body or skeleton are brought for examination. The relation of foot length with the stature of the individual can be very helpful in such cases. This study was carried out on the medical students of a tertiary care institute of Himachal Pradesh to determine the relationship of their foot length with the stature.

KEYWORDS: Identification, Stature, Anthropometry, Fragmented bodies.**INTRODUCTION**

Identification of an individual is an important aspect in Forensic Medicine. It includes various parameters like determination of Age, Sex, Race, Stature etc. The Anthropometry of the individual helps a lot in the identification. 'Anthrops' means man and 'metron' means to measure. Anthropometry deals with the measurements of different body parts. Stature is the height of an individual in most upright posture. The stature of an individual can be measured easily if whole of the body or skeleton is present. However, it becomes difficult when fragmented bodies or some parts of body or skeleton are brought for examination. Many body parts bear a relation with the height of the individual. By calculating the length of such body part, the height of an individual can be calculated by using some formulas and multiplication factors. Many attempts have been made to assess the correlation of foot length to the height of an individual in our country. However, no study has been conducted in our state to establish a relation between foot length and height of the individual.

Anthropometry is being widely used in Forensic investigations for identification of an individual which is an important step in crime investigation. Various parameters used for identification are determination of age, sex, race etc.^[1]

There is an established relationship between stature and various body parts like head, trunk, upper and lower extremities. This allows a forensic scientist to estimate

stature from different parts of the body. With the increasing frequency of mass disasters, homicides, air plane crashes, blasts train and road accidents etc., there is always need for such studies which help in identifying the deceased from fragmentary and dismembered human remains. In such a situation, measurements of hands and feet provide good approximation about the height of a person.^[2]

There is no universally acceptable formula to express relationship between stature and body parts of an individual. Estimation of stature of an individual in India by using formulae given by western workers involves an error of 5-8%.^[3]

The aim of present study was to establish a relation between right and left foot length with the height of the medical students of a tertiary care institute of Himachal Pradesh.

MATERIALS AND METHODS

This study was conducted on the medical students of a tertiary care institute of Himachal Pradesh to establish a relationship between Stature and Foot length of medical students and to derive a regression equation between Stature and Foot length. This study was performed on 154 medical students (73 males & 81 females) of age group between 18-24 year.

Stature measurement

The stature was measured as direct maximum distance

from vertex to floor in the anatomical position with the help of a measuring tape.

Foot length measurement

Foot length is the length measured from the most prominent part of the heel to the most distal part of the longest toe (1st or 2nd). The foot length is measured with

the help of a sliding caliper.

Statistical analysis

The primary outcome is to establish a relation between foot length and height of an individual. The data is analysed using SPSS (version 16.0.2).

Table 1: Summary of study participants in terms of age, height, left foot length and right foot length:

Indicator	Female (N=81)	Male (N=73)	Total (N=154)
Age in years (Range)	19-23	18-24	18-24
Mean Age (Standard Deviation)	20.81 (1.12)	20.85 (1.29)	20.83 (1.2)
Height in cm (Range)	134.6-177.8	152.4-190.5	134.6-190.5
Mean Height (standard Deviation)	159.63 (6.40)	172.38 (7.14)	165.67 (9.28)
Left foot length in centimeters (Range)	21-26.5	21.5-29.0	21-29
Mean Left foot length (Standard Deviation)	23.23 (1.27)	25.78 (1.43)	24.44 (1.85)
Right foot length in centimeters (Range)	20.5-26.3	21.5-29.0	20.5-29
Mean Right foot length (Standard Deviation)	23.25 (1.26)	25.76 (1.44)	24.44 (1.84)

RESULTS

There was significant positive correlation between foot length and stature ($r=0.745$, $p<0.01$) in our study group (N=154). The correlation coefficient (r) between left foot length and stature was found to be 0.521 ($p<0.01$); between right foot length and stature was 0.521 ($p<0.01$) for male participants (N=73). Among female participants (N=81) the correlation coefficient (r) between left foot length and stature was calculated as 0.508; between right foot length and stature as 0.515 and both were found significant ($p<0.01$).

Regression equations to estimate stature in centimeters (y) given left foot length in centimeters (x) were calculated as follows:

1. $y = 74.49 + 3.73 * x$; for all participants
2. $y = 105.45 + 2.60 * x$; for male participants
3. $y = 99.93 + 2.57 * x$; for female participants

Regression equations to estimate stature in centimeters (y) given right foot length in centimeters (x) were calculated as follows:

1. $y = 73.81 + 3.76 * x$; for all participants
2. $y = 105.80 + 2.58 * x$; for male participants
3. $y = 98.76 + 2.62 * x$; for female participants

DISCUSSION

The stature estimation is an important aspect in medico-legal investigation especially when whole body is not recovered. In a proportionate body there is a correlation between measurement of different body parts and stature which can be proved and measured statistically. Measurements of long bones are widely being used to estimate the stature and their formulas are well documented in literature. Similarly regression equations can be derived to calculate the stature using

measurements of the different body parts.

The present study establishes the statistically significant correlation between foot length and stature irrespective of gender where the coefficient is 0.745 for right foot and left foot length individually.

Sah SK, Karki N, Jeelani BA conducted a study and found that the correlation between foot length and stature, and foot breadth and stature were statistically significant in both gender ($p<0.05$). Greater correlation coefficient between foot length and stature than that for foot breadth and stature indicated stronger correlation between foot length and stature, which is consistent with our study.^[4]

Mritunjay Singh, Umang Patel conducted a study and found that a significant positive correlation existed between right foot length with stature ($r=+0.6092$) and left foot length with stature ($r=+0.6001$). The difference in correlation is statistically significant by ANOVA test ($P<0.01$). This is consistent with our study.^[5]

Mehul C Upadhyay et al conducted a study and found that the stature of males varied in range of 150 to 188 cm with mean of 167 + 4.58 cm and in females in the range of 139 to 171 cm with mean of 154 + 4.7 cm. Right foot length in males varied in range of 20.12 to 28.9 cm and in females 19.1 to 24.4 cm. Left foot length in males varied in range of 20.4 to 29.1 cm and in females 19 to 24.36 cm. Correlation co-efficient for both foot in both males and females are > 0.7 , which is consistent with our study.^[6]

Present study also gives regression equations for stature estimation using right or left foot measurements in the

study age group collectively as well as separately for males and females. These equations can be used to estimate stature of an individual provided foot length is known. Our results are consistent with the study conducted by Kakkar. A et al where they have calculated the stature using foot length in female medical students.^[7]

Similar study by Vidyullatha V. Shetty calculated correlation coefficient between height and foot length as + 0.688 for male and + 0.587 for female.^[8] The correlation coefficient in present study was also similar to results of similar studies conducted in different regions of India.^[9,10]

CONCLUSION

Stature is an important entity to establish the identity of an individual. In various forensic cases, stature can be helpful in identifying a person. In our study, we found that there is positive correlation between the foot length and stature of individual. The present study was conducted on 154 MBBS students. The correlation coefficient between left foot length and stature was found to be 0.521 ($p < 0.01$). From our the study, a regression equation was devised. It can be concluded that a positive correlation exists between the foot length and stature of an individual. This study will be very helpful in calculating the stature from the foot length which will be of great help for us in identifying the individual.

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