ORIGINAL ARTICLE

Estimation of Stature from Ring Finger Length in Haryanavi Population: An Anthropometric Study

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ABSTRACT

Introduction: Stature helps to determine a person's identity. In dead and mutilated bodies, height can be estimated from body parameters using a regression equation or multiplication factor. **Materials and Methods:** The present study was conducted to find the multiplication factor between percutaneous ring finger length (RFL) and stature in the Haryana region, for which 145 medical students (80 males and 65 females) of Post Graduate Institute of Medical Sciences, Rohtak, Haryana, were measured. The correlation coefficient between height and RFL was found to be positive. **Results:** Stature can be accurately estimated from RFL using simple regression equation or multiplication factor. The regression equation determined for male was Height = 1.798 × RFL + 158.6 and for female was Height = 0.919 × RFL + 152.3. **Conclusion:** Our study has a great importance to estimate stature from RFL among Haryana region from the anatomical and medicolegal point of view.

KEY WORDS: Anthropometry, fourth digit length, linear regression, ring finger length, standard deviation, total body height.

Introduction

Criminal investigation always involves identification of unknown individuals. Fingerprints, DNA examination mostly used to establish identity. However, stature also plays a role in identification of an individual. In mutilated or fragmented bodies, any body part can help in estimation of stature. Anthropometry is the study of human body measurements. It is used to help forensic experts and anthropologists to estimate the stature of the living individuals by the measurement of different body measurements.[1,2] Many studies have established the relationship between stature and hand anthropometry.[3-8] Even though regression equations for the estimation of stature from ring finger length (RFL) are available to the local population of other regions of India but to date, is not yet available for the Haryanavi population.[9-13] Due to different hereditary, nutritional, and environmental factors, the height and digits length of the individual can be different in different populations. Hence, the purpose of this study was to examine the body height and RFL in the left hand in both sexes of the Haryanvi population of India:

1. To determine any relationship between height and RFL
2. To derive the regression equation between stature and RFL for Haryanavi population.

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Materials and Methods

The cross-sectional study was conducted during January to March 2013 in tertiary medical college at Rohtak. A total of 145 healthy medical students of the college, i.e., Post Graduate Institute of Medical Sciences, Rohtak, were selected, in which 80 were male and 65 were female. Their age ranged between 18 and 25 years. Informed consent from students was taken.

Inclusion criteria

Students aged between 18 and 25 years and belonging to Haryana region. This age group was chosen because the growth of an individual ceases by this age and there is no age-related loss in body height at this age.

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Exclusion criteria

Any students not belonging to the Haryana region were excluded from the study. Subjects possessing injuries or deformities in the ring finger of the left hand, history of skeletal injuries, and who are on any form of hormonal medications were excluded from the studies.

Stature (S)

Students were made to stand in standard standing position. Projective distance between the standing surface and the highest point on the head (vertex) was measured using an anthropometer.

RFL

Ring finger is the fourth digit of a human hand. It is made up of distal phalanx: Bone at end of the hand, middle phalanx: Middle bone of finger, and proximal phalanx: Closest to the palm of the hand. RFL was measured on the ventral surface of the hand from the most proximal crease of the digit to the tip of the 4th digit or RFL in left hand using Vernier caliper correct up to 0.1 mm. Ring finger was made fully extended and measurements were carefully done (Figure 1). All the observations were recorded 2 times in centimeters between 2.00 and 4.30 p.m by the same person to eliminate diurnal variation and avoid personal error in methodology, then mean was taken.

Statistical analysis

Computer software such as SPSS was used to derive a linear regression equation for stature estimation using percutaneous RFL.

Figure 1: The length of the ring of the left hand measured with the aid of a Vernier caliper from the tip of the digit to the ventral proximal crease

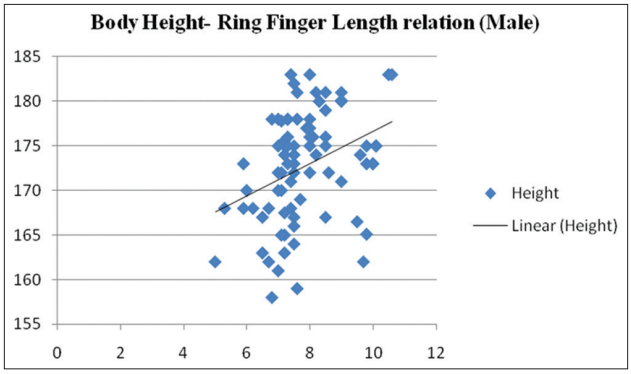
Results

Data of 145 students were analyzed in the current study. Table 1 shows mean height, mean RFL, correlation coefficient®, regression coefficient (b), and value of constant (a) in 80 males and 65 females (Table 1).

In the present study, the formula is derived as under. The linear regression equations which were derived for the estimation of statures from RFL in both males and females are given in Table 2.

Discussion

The correlation coefficient between height and RFL is +0.30 in male and +0.15 in female which



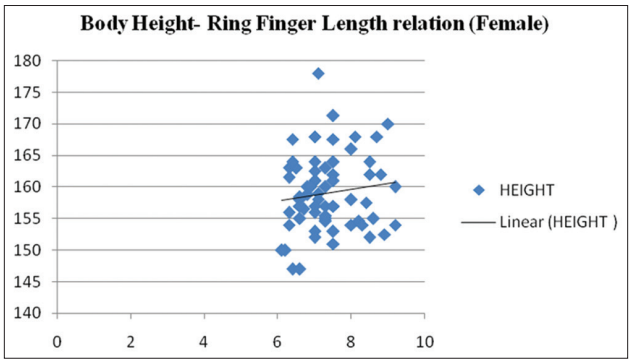


Table 1: Gender-wise distribution of different values in 80 males and 65 females

Parameters	Male	Female
Total number	80	65
Mean height (cm)	172.75	159.10
S.D. of height	6.111	6.048
Mean RFL (cm)	8.07875	7.616923077
S.D. of RFL	1.334327095	0.970111017
Correlation coefficient (r) (height and RFL)	0.302194973	0.15032961

RFL: Ring finger length

Table 2: Regression formula from RFL for both the sexes
Regression equation from RFL in males
Height=1.798×RFL+158.6 R^2=0.119
*RFL-Ring finger length
Regression equation from ring finger length in females
Height = 0.919×RFL+152.3 R^2=0.015
*RFL-Ring finger length

is significant with statistical significance of 0.001 in males and 0.001 in females. It means that there is a strong correlation between height and RFL and if either of the measurements (RFL or total height) is known. Similar findings were noted in other studies also.

A cross-sectional study was carried out on 195 adult students of Government Medical College, Miraj, District Sangli, Maharashtra, out of which 100 were male and 95 were female. Their study results showed that there is a significant correlation between RFL and stature, also Pearson's correlation between finger length and stature was higher among females than males.[9]

Suseelamma *et al*. conducted a study at Kamineni Institute of Medical Sciences, Narketpally, on 200 students and staff (100 males and 100 females) to derive correlation between the stature and RFL in both hands. Significant positive correlation was found in case of RFL with the stature. Linear regression equation derived from ring length for the estimation of stature showed a statistically significant ($P < 0.001$) relationship in both the genders. The equation for male was Height = 94.150 + 7.189 × RFL and for female was Height= 121.768 + 3.760 × RFL.[10]

Matheswaran and Vallabhajosyula conducted study in the Department of Anatomy, Narayan Medical college, Nellore, on 200 individuals (96 males and 104 females) belonging to the age group of 18–25 years. They measured height and digit lengths (2D, 3D, 4D, and 5D). The regression equations for stature and RFL of the left hand drawn from the data collected in male were Height = 113.84 + 7.70 (left fourth digit length) and female were height = 118.63 + 5.69 (left fourth digit length).[11]

Raju *et al*. carried out study in the Department of Forensic Medicine and Toxicology at SSIMS and RC Davangere, Karnataka state, India, by taking the measurement of RFL of the right hand and height of 250 medical students (125 males and 125 females) of 18–25 years of age. They statistically analyzed the obtained data and observed the significant positive relationship between a Pearson's RFL of the right hand and stature. Linear regression equation for the estimation of stature using RFL for male was Height = 96.44 + 10.14 (RFL) and female was Height = 120.59 + 5.53 (RFL).[12]

The study conducted by Moorthy and Zulkifly to derive population-specific regression equations between stature and hand in 200 Malaysian Malays (100 males and 100 females) age ranging from 18 to 60 years determined Stature =126.469 + 5.801 RFL in males and Stature=101.281 + 8.237 RFL in females.[13]

Conclusion

The present study deals with the observations on correlation of total standing height with RFL in people of Haryana region. It has been observed that stature can be estimated from the RFL which will not only serve as a useful tool in medicolegal purposes, clinical practice, and also in creating hand tools and devices.

Limitation

The following are the apparent limitations to this study:

1. In the present study, the adult age range of only 18–25 years is considered, so may not be very useful in predicting body height in many older people
2. It cannot be used long periods after death when putrefaction starts and soft tissues are destroyed
3. Measurements of only healthy individuals are considered. Hence, the data may not be applicable to individuals having injuries or deformities in the ring finger, who are suffering from congenital malformations.

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