

# Estimation of Stature by using Linear Regression Equation from Length of Index Finger in Haryana Region

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**Abstract**—Stature or body height is one most important and useful anthropometric parameter that determines the physical identity of an individual. The present study comprises of 145 individuals (80 males and 65 females) studied in Pt. B. D. Sharma PGIMS, Rohtak, Haryana within the age range of 18 to 25 years, were examined to find the relation between percutaneous index finger length and stature along with multiplication factor to reconstruct the stature. The data thus obtained was subjected to statistical calculations using computer programmer to derive linear regression equation. It has been observed that stature can be estimated from the index finger length to be used as predictive values by Anthropologists and Forensic Medicine experts.

**Keywords:** Total body height, Index finger length, Vernier caliper, Biomedical computing, Anthropometry, Correlation.

## 1. INTRODUCTION

To determine the physical identity of an individual the most important and useful anthropometric parameter is stature or body height. If forensic expert gets an incomplete or fragmented corpse, estimation of stature become difficult. But if only hand is found or even just fingers it becomes extremely difficult. In present study we try to find out the correlation between length of index finger and stature. Index finger is the first finger and the second digit of a human hand made up of distal phalanx: bone at end of the hand, middle phalanx: middle bone of finger, proximal phalanx: closest to the palm of the hand.

## 2. MATERIAL AND METHOD

The present study was conducted during January to March 2013 in Department of Forensic Medicine, PGIMS, Rohtak. In this study total 145 (80 male and 65 female) asymptomatic, healthy medical students belonging to various regions of Haryana were selected. Their age ranged between 18 to 25 years. No such type of study was carried out in Haryana.

The digit of the left hand was selected for measurement. The measurements were taken at a fixed time between 2.00 to 4.30

p.m. to eliminate diurnal variation and by the same person to avoid personal error in methodology. Subjects with any abnormality in the digits were not included in the study. All the observations were recorded in centimeters (cm). Each subject was measured for the index finger length of left hand percutaneous dimension besides stature.

Stature (S): It is obtained as the projective distance between the standing surface and the highest point on the head (vertex) when the subject is standing in the standard standing position, using anthropometer.



**Fig. 1: The length of the digits of the left hand measured with the aid of a vernier caliper from the tip of the digit to the ventral proximal crease.**

Digit length: The length of the digits of the left hand of each subject were measured with the aid of a digital vernier caliper from the tip of the digit to the ventral proximal crease as show

in Fig. 1 where there was a band of crease at the base of the digit, the most proximal crease was used.<sup>2,3</sup> Subjects with injuries or deformities in any of the hands were excluded from the study. All measurements were made carefully with digits fully extended.

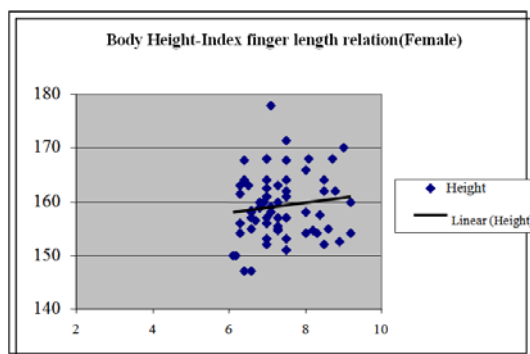
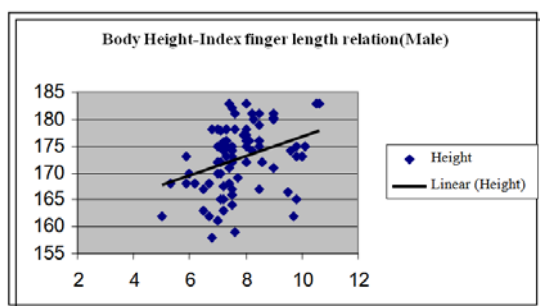
The data thus obtained was subjected to statistical calculations using computer programmer of SPSS, to obtain mean, standard error of mean, and test of significance. Besides these, correlation and regression equations were also formulated to find the relation between percutaneous index finger length and body height.

### 3. RESULT

Data of 145 students was analyzed in the current study. Table 1 shows Mean Height, Mean index finger length, correlation coefficient@, regression coefficient (b) and value of constant (a) in 80 Males and 65 Females. The correlation coefficient between height and index finger length was found to be positive (0.35 in males and 0.12 in females). (Table 1).

**Table 1: Shows Gender wise distribution of different value 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 Index finger length (cm)	7.8175	7.346153846
S.D. of index finger length	1.188954971	0.81912242
Correlation Coefficient(r) (Height and index finger Length)	0.346310835	0.124472852



In the presence study the formula is derived as under. The linear regression equations which were derived for estimation of statures from Index finger length (F) in both males and females are given in table 2. The correlation coefficients between stature and dimensions of femur were found to be positive and statistically significant. (Table 2)

**Table 2: Regression formula from index finger length for both the sexes**

Regression equation from index finger length in males
Height = 158.6 + 1.798x *IFL R <sup>2</sup> = 0.119
*IFL – Index Finger Length
Regression equation from index finger length in females
Height = 152.3 + 0.919x*IFL R <sup>2</sup> = 0.015
*IFL – Index Finger Length

### 4. DISSCUSION

The present study is based on the measurement of index finger length and body height of total 145 students aged between 18 to 25 years of age. Obtained data was analysed and an attempt was made to find out correlation and to derive a regression formula between body height and length of index finger of left hand... The correlation coefficient between height and index finger length is + 0.35 in male and + 0.12 in female which is significant with statistical significance of 0.001 in males and 0.002 in females. It means there is a strong correlation between height and index finger length and if either of the measurement (index finger length or total height) is known, the other can be calculated and this would be useful for Anthropologists and Forensic Medicine experts.

Ishak in his study of 210 adult subjects (91 males and 110 females) collected seven measurements were collected from the hand: hand breadth and length; palm and thumb length; and index, middle and ring finger lengths. The corresponding measurements were also collected for handprints. All hand and handprint measurements were also found to be significantly correlated to stature (p < 0.01); the r-values ranged from 0.45 to 0.87. Multiple regression models for both hand (± 4.66 to 5.96cm) and handprint (± 5.16 to 6.74cm) measurements were Abstract iv found to be more accurate compared to simple linear regression models (hand SEE = ± 4.76 – 7.10cm; handprint SEE = ± 5.42 – 7.68cm).<sup>4</sup> Ibegbu in 2012 reported a relation between index, middle finger length and stature.<sup>5</sup>

Matheswaran and Vallabhajosyula in their study of 200 individuals (96 males and 104 females) belonging to age group of 18 to 25year examined anthropometrically in respect to their height and digit lengths (2D, 3D, 4D, 5D). The regression equations for stature estimation for digit length in both male and female is observed to be statistically significant with a p<.001. The regression equations for stature and index finger of left hand drawn from the data collected in male was

Height =  $110.77 + 8.35(\text{left Second digit length})$  and female was Height =  $98.56 + 8.76(\text{left Second digit length})$ .<sup>6</sup>

## 5. CONCLUSION

The estimation of height from various long bones, head length and hand length has been attempted by many workers. However, have not frequently been used for this purpose. The present study deals with the observations on correlation of total standing height with index finger length in students of Haryana region. It has been observed that stature can be estimated from the index finger length to be used as predictive values by Anthropologists and Forensic Medicine experts.

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