

ORIGINAL RESEARCH

Anthropometric Assessment of Stature from Digital Length

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ABSTRACT

Stature is a minor criterion for establishing identity. As per Quetelet's law there is one in four chances of two persons having exactly same height. This study of anthropometric assessment of stature from the five digits of both hands in male and female was carried out among 100 second year medical students (55 Females and 45 males) in Government Medical College, Suryapet, Telangana to determine the stature. Prior consent from the participating students had been taken. The digit length of both hands was measured from proximal crease of digit to the tip using a vernier caliper. The individual height was measured by height measuring scale. The estimated height by multiplying the total digital length with five (05) in both right and left hands were found to be similar with the measured height. Pearson correlation analysis had suggested highly positive statistically significant correlation between estimated height and measured height in all participants, males and females. So, this can be concluded that the equation may be helpful to obtain approximate stature in situations where mutilated remains are to be examined and all digits are available. This equation could be useful in forensic anthropology or any anthropological research.

Keywords: Anthropometry, Digit, Caliper, correlation, stature.

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INTRODUCTION

Establishing the identity of an individual from mutilated, decomposed and fragmented remains has gained value in recent times due to an increase in man-made calamities and accidents. Stature estimation is simple in cases of living persons or unamputated human remains but becomes complicated in cases of fragmented or mutilated remains. Length of the fingers of an individual enables us to establish stature in cases of mutilated remains especially when the five digits of the hand are intact. Estimation of stature from finger and phalangeal length had been reported in previous studies. Number of multiplication factors and regression equations have been developed to reconstruct stature from long bones throughout the world. Regression formulas for stature do not predict the exact height of an individual, but rather provide a range in which an individual's height is expected to fall. The formula provides two numbers that construct this range. The first number is the mean stature, or average height. The second number is a margin of error, which provides the limits of the range above and below the mean.

Therefore, the aim of this study is to establish a correlation between total length of five digits of the hands and measured stature with a multiplication factor.

MATERIALS & METHODS

The study was conducted among second year medical students of 2019-2020 batch, Govt. Medical college, Suryapet, in the Department of Forensic Medicine and toxicology. A total 100 students (55 Females and 45 males) of 19 to 23 year of age had participated. Prior consent was obtained from the participating students. Significant deformities of digits and stature were excluded.^[1-4] Individual height (in cm) was measured as vertical distance from the vertex to the heel making the participant stand erect on the plane floor with bare foot with shoulder blocks and buttocks touching the wall, Palms of hand turned inwards and fingers horizontally pointing downward. Anthropometer was placed in straight vertical position in front of the subject with the head oriented in eye-ear-eye plane (Frankfurt Plane). The movable rod of the anthropometer was brought in contact with vertex in the mid sagittal plane.^[5,6] The length (in cm) of the five digits of right and left hands were measured with the help of Vernier caliper. The distance from the proximal flexor crease till the tip of the finger was taken as digital length. The stature was estimated from the five digits length by a hypothesized formula as follows:

Estimated Stature (ES) = Total length of five digits of right/left hand x 5. All the measured data were entered and statistical analysis done by Microsoft Excel.

RESULTS

The height of the individual was measured. The height was found higher in males (172.02 ± 6.03 cm) compared to females (158.30 ± 6.03 cm). The total digital length also was found more in males than females for both the hands.

Table 1: showing the mean and standard deviation of the parameters.

	Total (n=100)	Males (n=45)	Females (n=55)
Measured height	163.64 ± 9.01	172.02 ± 6.03	158.30 ± 6.03
Total digital length (right)	35.42 ± 3.52	37.38 ± 3.08	34.16 ± 3.22
Total digital length (left)	35.61 ± 3.41	36.95 ± 3.53	34.75 ± 3.06
Estimated height	164.78 ± 9.56	173.42 ± 6.10	160.28 ± 5.83

Table 2: correlation analysis between measured and estimated heights.

Parameters	Estimated Height Total (N=100)	Estimated Height Males (N=45)	Estimated Height Females (N=55)
Total Digital Length (Right)	0.991 (p=0.000)	0.990 (p=0.000)	0.980 (p=0.000)
Total Digital Length (Left)	0.993 (p=0.000)	0.991 (p=0.000)	0.982 (p=0.000)

The estimated height by multiplying the total digital length with five (05) in both right and left hands were found to be similar with the measured height. Pearson correlation analysis had suggested highly positive statistical significant correlation between estimated height and measured height in all participants, males and females.

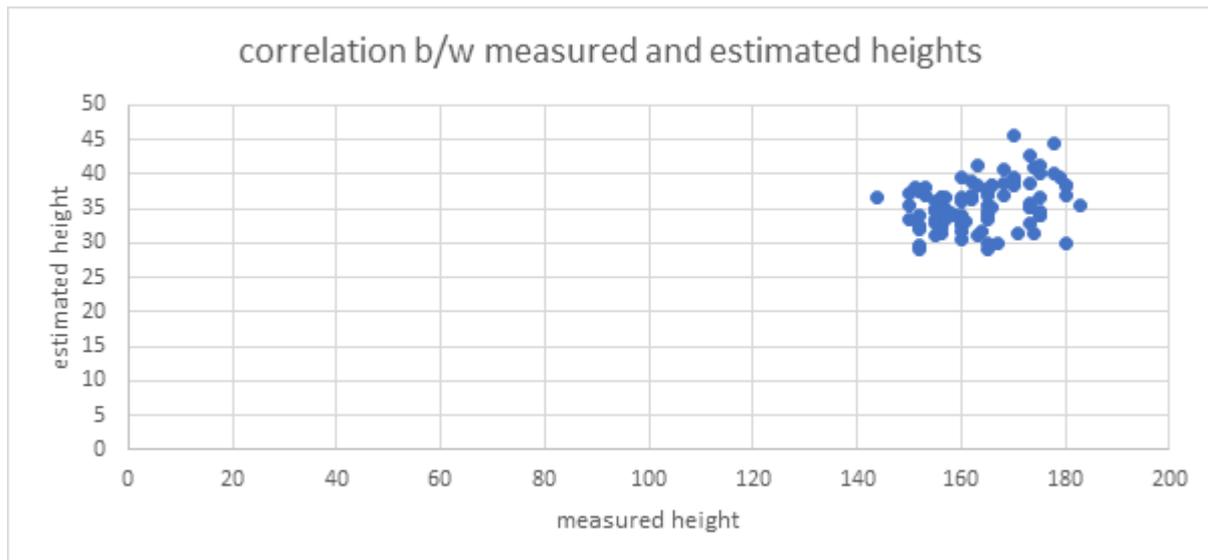


Figure 1: showing positive correlation between measured height and estimated height. Coefficient of correlation was calculated; $r = 0.57$.

DISCUSSION

Though estimation of stature from long bones is preferable due to higher correlation coefficient, practical difficulty arises with mutilated remains where probability of fragmentation is greater in long bones. The stature of a person has a direct proportional relationship with various body parameters of that individual. Various studies had indicated that anthropometric parameters of the upper extremity were reliable to estimate individual height. Similarly, the present study showed correlation between estimated height from five digits and measured height.^[7,8]

Tyagi et al studied the subjects from Delhi and found positive correlation between stature and finger lengths and have suggested that index finger was best for the prediction of stature in both males and females.^[9] Jasuja et al had studied the hand and four phalange lengths in 60 subjects belonging to Jat Sikhs community. The researchers had observed correlation coefficient that ranged from 0.215 to 0.681 and concluded that stature could be estimated from studied parameters

In the present study, digits of both right and left hands were taken as parameter to measure the stature of the individual and a statistically significant correlation ($p = 0.000$) was found in between estimated stature and measured stature. In the present study, the direct relation of height was established with a multiplication factor five.^[10]

Mean stature, higher in males as compared to females was found similar with the present study. Females had higher correlation than males. In the present study, both males and females had similar correlation and it was observed with both right and left hands ($p = 0.000$). Calculated stature was found close to the actual height with ± 10 cm difference in most of the cases which was not similar in the present study, where calculated stature was similar to the measured height in both males and females.

Estimation of stature from bones especially longer bones were preferable because of higher correlation coefficient and small error of estimate. Of all fingers the ring finger is the best to calculate height of the individual. All the three phalanges of each finger were studied for stature estimation in both the sexes and was evident that as the range of error of stature estimation remains almost same from all the phalanges therefore any phalangeal length may be used for this purpose. In the present study, all the phalanges of all five fingers were used to estimate the stature.

CONCLUSION

Correlating the anthropometric parameters might serve as a feet step in identifying the individual. Identification by estimating stature in mutilated especially by long bones is a tedious and time-consuming process which involves cleaning and preparing of bones. Stature can be estimated from actual as well as by measuring the length of five digits of hand by the formula, Estimated Stature = Total length of digits (Right/Lefthand) x 5. Calculated statures from the equations are close to the actual height and direct positive statistically significant correlation was found between the stature and total length of five digits of hands. So, this can be concluded that the equation may be helpful to obtain approximate stature when there is difficulty in obtaining stature by either direct estimation or by using regression formulas for long bones. This can be immensely useful in forensic anthropology or any anthropological research.

Limitations of Study

The study was conducted among a small group (n=100) of medical students with a narrow age range of 19 to 23 years. A larger study has to be conducted with more extremes of age and among a more diverse population, with diverse socio-economic backgrounds, to observe for the presence of any variations.

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