

Original Article

Estimation of Stature by Percutaneous Measurement of Forearm and Hand

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ABSTRACT

Stature is one of the important criteria for identification. Estimation of stature has special importance when a dead body is found in the mutilated or dismembered state. In present study, attempt is made to reconstruct stature by percutaneous measurement of forearm and hand. A total 180 healthy medical students (90 male and 90 female) of SRG Hospital and Medical College, Jhalawar, Rajasthan were included in study. All students belonged to 18-25 age group. Measurements of stature and left forearm and hand were taken. They were statistically analysed to determine the correlation between stature and length of forearm and hand.

The regression equation was derived by using formula $y - \bar{y} = r \frac{E_y}{E_x} (x - \bar{x})$ and

Calculated as $y = 2.51 x + 54.31$ for male and $y = 2.55 x + 50.41$ for female.

Where, y = stature and x = length for forearm and hand of the person.

The multiplication factor was also calculated and obtained as 3.68 for male and 3.73 for female.

Keywords: Stature, Regression equation, Multiplication factor, Percutaneous measurement, Forearm and hand

INTRODUCTION

Stature is one of the important criteria to establish the identity of an unknown person living or dead. Estimation of stature has its importance when a dead body is found in the mutilated or dismembered state.

Such types of cases are seen in mass disaster like bomb blast, plane crash, train accidents, etc. Sometime criminals also mutilate the dead body to destroy the identity. Studies have been conducted to reconstruct stature using the long bones by Pearson¹, Trotter and Glesser^[2], Pan^[3], Nath^[4] and Siddiqui and Shah^[5].

But, when the dead body is found in the mutilated state, percutaneous measurement of different body parts and their relation with stature is helpful. Rough estimation of stature from parts of upper limb and lower limb has been used since years. Stature is equal to length of one arm in

cm (from tip of middle finger to acromion process of clavicle) $\times 2 + 34$ cm (30 cm for length of two clavicles and 4 cm for breadth of menubrium). Stature is 3.7 time the distance between the tip of olecranon process and tip of middle finger of the same side, see Krishan^[6].

Length of forearm measured from the tip of olecranon process to the tip of middle finger is equal to 5/19 of stature, see Reddy and Murty^[7].

Recently, studies are being conducted to develop appropriate formula for the re-construction of stature by the percutaneous measurement of different body parts. Such studies have been conducted by Bhatnager *et al.*^[8], Nath and Kaur^[9], Krishan and Sharma^[10], Rani *et al.*^[11] and Kumar *et al.*^[12]

The present study is an effort to establish correlation between the stature and length of forearm and hand. This

study will help to estimate stature when an unknown dead body is found in the mutilated state but forearm and hand is intact.

MATERIAL AND METHODS

Hundred and eighty healthy medical students (90 males and 90 females) of SRG Hospital and Medical College, Jhalawar of 18-25 years of age were selected for study. Their informed consent has been taken. After that their measurements were taken.

Height was taken in standing position on stadiometer without shoes, with head oriented in eye-to-eye (Frankfort) plane. Lengths of left forearm and hand were measured as distance between the tip of olecranon process and tip of middle finger of the same side by the sliding caliper.

All measurements were taken by author no 1 at the same time on each day. After that these data were statistically analysed, regression equations and multiplication factors for both male and female were derived.

OBSERVATION AND DISCUSSION

The height of the male varied from 155 to 187 cm with mean height 171.411 cm and standard deviation 6.3208. In female the height ranged from 140 to 178 cm with mean height 158.622 cm and standard deviation 6.3874 (Table 1).

Table 1: Stature of the study group (in cms)

	Male	Female
Min.	155	140
Max.	187	178
Mean	171.411	158.622
S.D.	6.3208	6.3874

The length of forearm and hand varies from 39.4 to 51.9 cm in male with mean length 46.6077 cm and S.D. 2.1640 and correlation coefficient with stature was 0.8602. In female, the length of forearm and hand varies from 36.5 to 48.2 cm with mean length 42.4977 cm, S.D. 2.1051 and correlation coefficient with stature was 0.8391 (Table 2).

For estimation of stature, the regression equation was calculated as

$$y = r \frac{E_y}{E_x} (x - \bar{x}) + \bar{y}$$

Table 2: Length of forearm and hand (in cms)

	Male	Female
Min.	39.4 cm	36.5 cm
Max.	51.9 cm	48.2 cm
Mean	46.6077	42.4977
S.D.	2.1640	2.1051
Correlation coefficient with stature	0.8602	0.8391

For male: $0.8602 \times \frac{6.3208}{2.1640} (x - 46.60) + 171.40$

$y = 2.51x + 54.31$

For female: $y = 0.8391 \times \frac{6.3874}{2.1051} (x - 42.4977) + 158.62$

$y = 2.55x + 50.41$

We calculate the stature by putting the value of *x* (length of forearm and hand) in a different situation and compared with the actual stature, in most of the cases it was very close to it (± 3 cm). A variation of more than ± 5 cm is obtained in less than 5% cases in male and female.

Multiplication factors were also derived by the ratio of height and length of forearm and hand. It was calculated as 3.68 for male and 3.73 for female which was close to the observation of Krishan^[6].

- With the help of the multiplication factor when stature was calculated, it was also within ± 3 cm to the actual stature in the majority of the cases but more than ± 5 cm difference from the actual stature was seen in 10% cases of male and 8% cases of female.

CONCLUSION

- There is a significant correlation between the length of forearm and hand and stature in male and female.
- The regression equation for the estimation of stature from the length of forearm and hand are $2.51x + 54.31$ for male and $2.55x + 50.41$ for female where *x* is the length of forearm and hand (distance between the tip of olecranon process and tip of middle finger of the same side).
- The calculation of stature from the regression equation is close to the actual height (within ± 3 cm) in most of the cases.
- The multiplication factor between stature and forearm and hand is 3.68 for male and 3.73 for female which are much accurate than the ratio of 19/5.

- The regression equation is statistically superior and more reliable than the multiplication factors.

ACKNOWLEDGEMENT

We are thankful to Mrs. Anju Jain for helping us to derive statistical data.

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