Original Article

ESTIMATION OF STATURE FROM ULNA

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ABSTRACT

Stature is among the factors required to establish individuality of an unidentified dead body or any mutilated part of such body. In present study an attempt will be made to estimate the stature from percutaneous length of ulna. Study consists of 50 adult males and 50 adult females between the age group of 18- 30 years, born in Central India. On computing the data, significant positive correlation between the stature and percutaneous ulnar bone length will be assessed. Stature will be estimated from percutaneous length of ulna using simple regression analysis.

KEY WORDS: Stature, ulna, Bone length, Regression equation.

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INTRODUCTION

Human bones are not just a frame for the flesh; they are also frames for our identities. In mutilated bodies or in skeleton remains; an utmost challenge to anatomists, forensic experts is to identify the individuality. Many factors are taken into consideration for establishing the identity in these cases, amongst which height or stature of the person is one. Estimation of the standing height of the individual is exclusively a metric procedure. The regression formulae of Trotter and Glesser [1,2] for the long bones were used to reconstruct the stature of an individual. These measurements are based on the maximum length of the adult bones [3]. However, numerous factors such as diet, climate, hereditary, region etc. influence the morphological parameters of a population [4-5].

In view of the same generating formulae specific to a region and population is a need necessity. Extensive work has been done on correlation of measurements of various body parts with stature of a person in India and abroad [4-8]. All the studies have concluded that there is a linear relationship between the measurements and stature. However they have been conducted in different regions on different races, hence their data and statistical formulae cannot be generalized. In this work an attempt was made to use the surface bony length i.e. percutaneous length of ulna for calculating the stature of the individual by formulating regression formulae.

Aims and Objectives: To correlate percutaneous length of right and left ulna with the body height and thus estimate stature by deriving regression formula.

MATERIALS AND METHODS

Standing height and percutaneous length of long bones of 100 apparently healthy individuals comprising of 50 adult males and 50 adult females of age range from 18 to 30 years in PCMS & RC, Bhopal were taken for establishment of regression formulae. Written informed consent was taken from all the subjects. Standing height of the individual will be measured by asking them to stand on the baseboard of a standard metric height measuring stand with head oriented in eye-to-eye plateau i.e the Frankfurt plane was horizontal. The measurement of height will be taken in centimeters by bringing the projecting horizontal sliding bar to the vertex. Percutaneous ulna length will be measured in centimeters (cm) with the help of spreading calipers, by measuring the distance between the tip of olecranon process and tip of styloid process of ulna with fixed elbow and palm faced over opposite shoulder. The data will be then subjected statistical analysis using computer software SPSS 19.

RESULTS AND OBSERVATIONS

Table 1 and Table 2 showing the various parameters, which were calculated by using statistical analysis. The mean height of the study subjects was found to be 165 cm with standard deviation (S.D.) of 10.025 cm. Average length of right ulna was 26.67 cm with S.D. of 2.122 cm whereas average length of left ulna was 26.10 cm with S.D. of 2.07 cm. Regression analysis was done for estimating individual's height from the length of ulna. The correlation coefficient (r) of right and left ulna was 0.754 and 0.70 respectively which shows the positive correlation between length of ulna and estimated height.

After statistical analysis stature can be estimated by using linear regression formula

derived for the estimation of height from length of right or left ulna. The regression formula derived is

$Y_1 = 70.004 + 3.562X_1$ and

$Y_2 = 79.24 + 3.285X_2$.

Where, Y_1 and Y_2 are estimated heights from length of right and left ulna

X_1 and X_2 are length of right and left ulna respectively.

Table 2: Regression formula derivation for calculating stature from length of ulna.

Independent variable	Length of right ulna in cm (X_1)	Length of left ulna in cm (X_2)
Intercept (a)	70.004	79.24
Regression coefficient (b)	3.562	3.285
Correlation coefficient (r)	0.754	0.7
Coefficient of determination (r^2)	0.569	0.49
Standard error of estimate	6.616	7.102

Fig. 1: Scatter diagram showing correlation of right ulna and height.
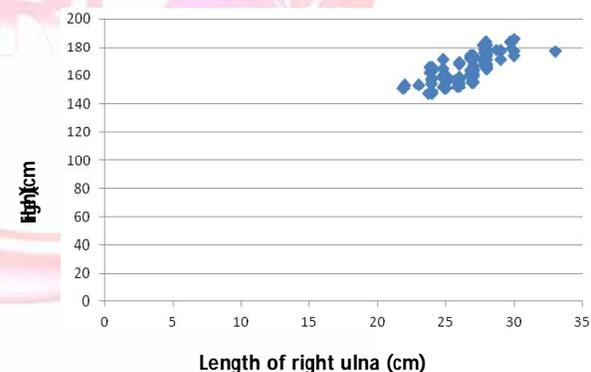
Fig. 2: Scatter diagram showing correlation of left ulna and height.
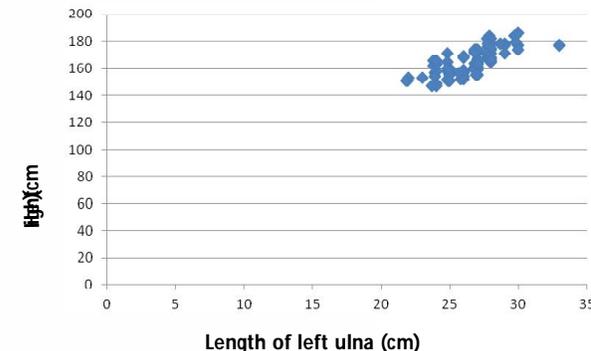
Table 1: Showing height and length of ulna.

S. No.	Variables (cms)	Average	Standard deviation	Summation	Summation of square	Summation of product XY	Co-efficient of variation
1	Height (y)	165	10.025	16500	2722500		6.075
2	Right ulna- X_1	26.67	2.122	2667	71128.89	440055	7.956
3	Left ulna – X_2	26.1	2.07	2610	68121	430650	7.931

DISCUSSION

The estimation of stature is of utmost importance whenever bodies are found in mutilated state or when skeletal remains are available. Present study was done to estimate the stature from percutaneus length of ulna on living subjects belonging to Central India. A simple regression formula was derived which can be implicated for estimating stature.

Allbrook D [9] estimate the stature from ulna by formulating regression formula - stature=88.94 + 3.06 (ulnar length) ± 4.4 (standard error).

Athawale MC [10] observed definite correlation between stature of individual and length of long bones.The regression formula derived was – stature =56.9709 + 3.9613 (ulnar length) ± 3.64(standard error).

Sarojini Devi et al [11] found correlation coefficient (r=0.619 for male and 0.584 for female) and formulated regression formula for estimation of stature by using upper arm length among Maring tribes in Chandel, Manipur. In present study the correlation coefficient (r) of height and length of right ulna is 0.754 and of left ulna is 0.70. The value of r implies positive correlation.

To conclude with it is possible to determine the stature of a deceased person with ulnar length by using the regression formula derived from the present study fairly accurately which are region specific and population specific. Thus the data of this study can be used for estimation of stature amongst the ethnic group under study.

Conflicts of Interests: None

REFERENCES

[1]. M. Trotter and G. Glesser. A re-evaluation of Estimation Based on measurements of Stature Taken during Life and of Long Bones after Death. AJPA 1958;16:79-123.

[2]. M. Trotter and G. Glesser. Estimation of Stature from Long Bones of American Whites and Negroes. AJPA 1952;10:463-514.

[3]. Pan, N. Length of long bones and their proportion to body height in Hindus. Journal of Anatomy; 1924;58:374-378.

[4]. Steele, D. Gentry. Estimation of Stature from Fragments of Long Limb Bones. T.D. Stewart ed. Personal Identification in Mass Disasters. National Museum of Natural History, Smithsonian Institution, Washington D.C., 1970: 85-97.

[5]. Nath, S. Estimation of stature from long bones in Indians of the united provinces: a medicolegal inquiry in anthropometry. Indian Journal of Medical Research; 1931;18:1245-1253.

[6]. W. Bass. Human Osteology and J. Schwartz, Skeleton Keys: An Introduction to Human Skeletal Morphology, Development and Analysis (New York: Oxford University Press, 1995).

[7]. Nath, S. and Krishan, G. Determination of stature using percutaneous measurements of upper and lower limb bones among Hindu (Baniya) females of Delhi. J. Anthrop. Survey. Ind. 1990;39:151-156.

[8]. Chibba K, Bidmos MA. Using tibia fragments from South Africans of European descent to estimate maximum tibia length and stature. Forensic Sci Int. 2007;169(2-3):145-51.

[9]. Allbrook D. The estimation of stature in British and East African males based on tibial and ulnar bone lengths. J. For. Med.1961;8:15-28.

[10]. Athawala, MC. Estimation of height from length of forearm bones. A study of one hundred Maharashtrian male adults of age between twenty five and thirty years." American journal of Physical Anthropology 1963;21;105-12.

[11]. Sarojini Devi et al. Estimation of stature from upper arm length among the Maringsof Manipur. Indian Medical Journal. Aug 2006;100(8):271-73.

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