International Journal of Medical and Health Research
ISSN: 2454-9142
www.medicalsciencejournal.com
Volume 4; Issue 4; April 2018; Page No. 94-96

Assessment of stature from the percutaneous measurement of ulna in healthy volunteers

Dr. Amit Kumar Yadav[1], Dr. Shailendra Patel[2], Dr. Divyesh Saxena[3]
[1] Assistant Professor, AIIMS, Devas, Madhya Pradesh, India
[2] Assistant Professor, Bundelkhand Medical College, Rewa, Madhya Pradesh, India
[3] Senior Resident, AIIMS, Rishikesh, Uttarakhand, India

Abstract
Background: Estimation of stature from bones play an important role in identifying unknown bodies, parts of bodies or skeletal remains. For this purpose, an attempt has been made to derive regression equation formula to estimate stature from length of ulna, in the current study.
Aims and Objectives: To correlate percutaneous length of right and left ulna with the body height and thus estimate stature by deriving regression formula.
Methodology: This study Consist of total 200 (100 male and 100 female) healthy subjects in a Sri Aurobindo Institute of Medical Science, Indore, M.P with age between20 to 25 years. The Ulnar (Rt. & Lt.) length was measured by spreading caliper. The Stature (Height) was measured in standing erect, anatomical position with standard height measuring instrument.. The data was analysed statistically Prizam software for calculation of Mean, SD, Standard error, Correlation coefficient, Regression coefficient, value of constant and 't' test for correlation coefficient**.**
Results: The correlation coefficients for right and left ulnae in males are 0.835 and 0.837 whereas in females 0.772 and0.774 respectively. The difference in mean length of ulna in males and females was found to be statistically significant (P <0.001).
Conclusion: There is Positive Correlation between Stature and Ulna bone length. This fact will be of practical use in Medico Legal investigations and in Anthropometry. Study would be useful for Anthropologist and Forensic Medicine experts.

Keywords: stature, ulnar length, anthropometry, medico-legal

Introduction

Stature is one of the various parameters of identification for establishing individuality of the person. It is well known that there is a definite relationship between the height of the person and various parts of the body like head, trunk and lengths of upper and lower limbs. To assess the height of an individual, from measurements of different parts of the body, has always been of immense interest to Anatomists, Anthropologists and Forensic experts [1].

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 [2].

The forearm bone Ulna is mostly subcutaneous throughout its length and easily approachable for measurement. So it is selected for present study. Ossification of the Ulna starts at 8th fetal week and the proximal epiphysis fuses with the shaft in the 14th year in Females and 16th year in Males. The distal epiphysis unites with the shaft in the 17th year in Females and 18th year in Males [3, 4].

Material & Method

This study was conducted at Sri Aurobindo Institute of Medical Science, Indore, M.P. India. Study consist of total 200 (100 male and 100 female) healthy students of our institution between 20-25 year of age.

Exclusion criteria, any significant systemic diseases, orthopaedic deformity, metabolic, developmental disorders were excluded from study.

Height of the individual was measured in standing erect Anatomical position with bare foot & head in Frankfurt's plane from crown to heel with Standard Height measuring instrument. Ulnar length was measured with help of Spreading Caliper (0-600 mm) with rounded ends from the tip of Olecranon process to the tip of Styloid process of Ulna with Elbow flexed and palm spread over opposite shoulder. Measurement of length of Right and Left Ulna were taken separately for calculation. Both the Stature and the Ulnar length were measured in centimeter.

Measurements of length of right and left ulna were taken separately for calculation. The obtained was analysed stastatically by using Prizam software to calculate Mean, SD, Standard Error, Correlation coefficient, Regression coefficient, value of constant and 't' test for correlation coefficient.

Results

Table 1 shows that in male subjects, mean height is 166.93±6.73 cm, and mean length of right ulna is 25.52±1.45 cm, and mean length of left ulna is 24.75±1.44 cm and in the females, mean height is 158±3.21 cm, and mean length of right ulna is23.57±1.22 cm and mean length of left ulna is

25.70±1.23 cm.

Table 1: Range of all parameters in male and female subjects

Parameter	Mean ±SD	
	Male (n=100)	Female (n= 100)
Height(cm)	169.93±6.73	158.94±3.21
Length of right ulna(cm)	25.52±1.45	23.57±1.22
Length of left ulna(cm)	24.75±1.44	25.70±1.23

Table 2: Comparison of length of right and left ulna

subjects	Mean Length of right ulna (cm)	Mean Length of left ulna (cm)	p-value
Male	25.52	23.57	>0.05
Female	24.75	25.70	>0.05
p-value	<0.001	<0.001	

Table 3 shows that the correlation coefficients for right and left ulnae are 0.835 and 0.837 respectively, in case of male subjects, and those for right and left ulnae of women are 0.772 and 0.774 respectively.

Table 3

subjects	Correlation coefficient (r)		Coefficient of determination(r2)		p-value
	right	left	right	Left	
Male	0.835	0.837	0.696	0.7	<0.0001
female	0.772	0.774	0.595	0.598	<0.0001

Table 3 shows that the correlation coefficients for right and left ulnae are 0.835 and 0.837 respectively, in case of male subjects, and those for right and left ulnae of women are 0.772 and 0.774 respectively.
Table 4 shows regression equation for height with ulna length in males and females.
The equation is as follows:

Height(Y) = a (constant or intercept) + b (slope) × ulnar length.

Table 4

Parameter sex			Side Regression equation
Ulnar length	Male Left	Right Y = 60.91	Y = 61.57+3.81Xright ulnar length + 3.89 X left ulnar length
	Female Left	Right Y = 77.54	Y = 76.78 + 3.122 X right ulnar length + 3.101 X left ulnar length

In men, 61.57 and 60.91 are intercept (constant or a) and 3.81 and 3.89 are regression coefficient (b) for right and left ulnae, respectively. In women, 76.78 and 77.54 are intercept (constant or a) and 3.122 and 3.101 are regression coefficient (b) for right and left ulnae, respectively.
Figures 1 and 2 show positive correlation between ulnar length and height of subjects, indicating that increase in length of ulna leads to increase in total height of male and female subjects.

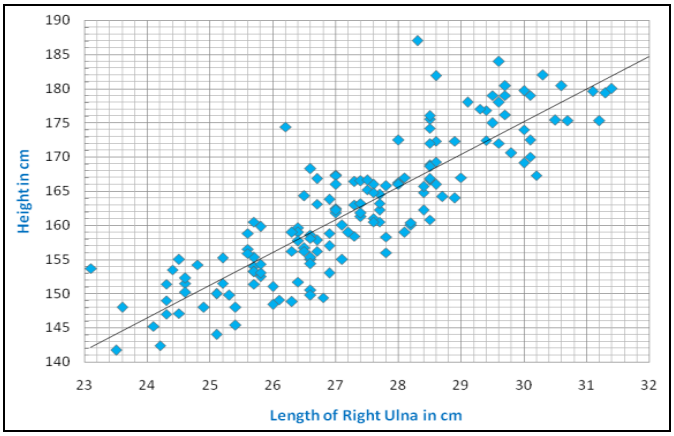

Fig 1: Correlation between length of Right Ulna and Height in Males and Females

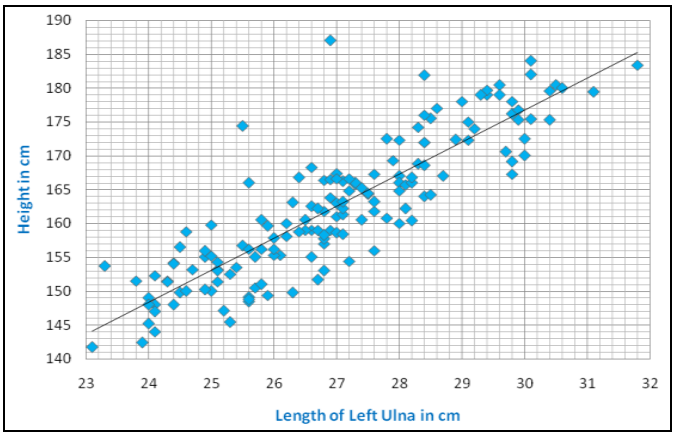

Fig 2: Correlation between length of Left Ulna and Height in Males and Females

Discussion

The estimation of stature is of utmost importance whenever bodies are found in mutilated state or when skeletal remains are available. The stature of an individual mainly being genetically predetermined is an inherent characteristic, the estimate of which is considered to be an important assessment in the identification of unknown human remains.
Height-estimation formulae based on ulna length show similar levels of accuracy to calculations based on the length of other upper limb long bones. This is supported by the standard errors of the estimations reported in several studies.
Athawala M.C: derived a regression formula for estimation of stature and Left Radius (cm) ± 3.66cm. Stature = 56.9709cm +3.9613 X average length of Right and Left Ulna (cm) ± 3.64cm [5].
Sarojini Devi H., Das B.K., Purnabati S., Singh D :computed correlation coefficient (r = 0.619 for male and 0.584 for female) and Regression equation formula for estimation of stature by using upper arm length among living population of Maring tribes of pallel area, Chandel district, Manipur [6].
In our study, mean value of right ulnar length is 25.52 cm and that of left ulnar length is 24.75 cm in females. Our findings correlate with those of Thummar *et al.* [7] Whom studied in female population and correlate in both sexes with Bamne *et al.* [8].

Conclusion

From the present study, it has been concluded that the mean height and length of ulna is more in males than in females. The difference in mean length of ulna in males and females was found to be statistically significant (P <0.001). There is positive correlation between stature and length of ulna. Study would be useful for Anthropologist and Forensic Medicine experts.

Acknowledgements

We acknowledge the whole department of forensic medicine of our institute.

References

1. Patel MP, Joshi NB, Dongre AV. Regression equation of height on tibial length. Indian J Med Res, 1964; 52:531-4
2. Joshi NB, Patel MP, Dongre AV. Regression equation of height from Tibial length, Indian Journal of Medical Research, 1964; 52:531-534.
3. Maloy Kumar M, Tapan kumar J, Jonaki D, Sumohan B. Use of length of Ulna for estimation of Stature in Living Adult male in Burdwan district and adjacent areas of West Bengal, JASI, 2009; 58(1):16-18.
4. Allbrook D. The estimation of stature in British and ulnar bone lengths, journal of forensic Medicine, 1961; 8:pp 15-27.
5. 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.
6. Sarojini Devi H, Das BK, Purnabati S, Singh D, Jayshree Devi. Estimation of stature from upper arm length among the Marings of Manipur, Indian Medical Journal August, 2006; 100(8):271-73.
7. Thummar B, Patel ZK, Patel S, Rathod SP. Measurements of ulnar length for Estimation of stature in Gujarat. NJIRM. 2011; 2(2):36-40.
8. Bamne A, Bamne SN, Chorsia RS, Gohiya VK. Estimation of stature from ulnar length in Maharashtrian population. Int. J Med sci. public health 2015; 4:65-69.