

# Estimation of the Height of the Females in Correlation to the Length of Ulna.

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**Abstract :**

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**Aim**

Comparing the height of the females in correlation with the length of the ulna.

**Objective**

To determine the height of the female from the length of the ulna.

**Background**

The estimation of the height in females from the skeletal bears immense importance in the sciences in addition to the long bones, humerus, femur etc., the ulna also been used for this purpose. This serves an important factor in forensic sciences.

**Result**

In this study, the parameters were statistically analysed and tabulated. The study shows a positive correlation between the height of the females and length of length of ulna.

**Conclusion**

The regression equation derived in this study can be of great help to forensic sciences, anatomist and clinicians. The ulna being an accurate parameter can be used for estimating the height of an individual.

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**Keywords:** stature, ulna, height, regression coefficient.

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## INTRODUCTION

The anthropometric analysis to estimate the bony parts of the human skeleton is an extensive application in the forensic sciences<sup>1</sup>. It plays a major role in forensic sciences, and creates interest for anatomist and one of the authenticated procedure in medical science which is used in law enforcement to identify the human remains.

The height of an individual, when it cannot be estimated directly, as in bedridden, old or fragile patients, or in patients who have limb and/or vertebral column deformity: a indirect estimation can be achieved by correlating the height with other skeletal parameters. The ulna has easily identifiable surface landmarks which make the measurements possible in compromised postures, than in any other bones<sup>1</sup>. Therefore, it can be utilised to formulate the height indirectly. Hence this study aims on finding the height of an individual in correlation to the length of ulna.

Height estimation by measurement of various long bones has been attempted by several workers. Pan (1924) worked on cadavers and derived relation between total ulnar length and total height of an individual. Since than many workers carried out work on cadavers as well as living and gave different formulae for stature reconstruction from total length of different bones. Ulna is broader proximally and narrower distally. Ossification of ulna starts at the 8th foetal 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<sup>2</sup>.

Stature is an important parameter in determining or for identification of individual living or dead. When intact bodies are to be examined, stature estimation does not pose any problem. However when dismembered human body parts are the materials to work with, it would have greater

challenge for the forensic experts. This study focus on determining the height of females in relation to the length of ulna.

## OBJECTIVE

This study was basically based on the arising quest that 'whether the height of the individual (adult female) can be estimated from the length of her ulna? as it is the percutaneous bone.

## MATERIALS AND METHOD

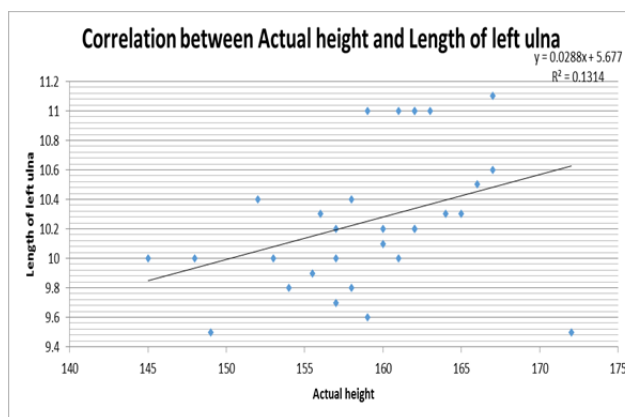
This study was carried out in Saveetha dental college and hospitals, Tamil Nadu, Chennai. 33 subjects were selected for this study, whose age was limited between 16-20. This is due to that the ulnar development and ossification complete by the age of 20. Prior to commencement of study, permission were taken from institution as well as from the subjects who were to participate. Inclusion criteria for the study were the age limits of the subject, which is 16-20. The data was collected within a day.

The vertex to the heel height (in centimetre) was measured for each subject with them in the standing erect posture and also bare foot and they were asked to look forward straight to the horizon, so that the Frankfurt's plane remained horizontal. A ruler was placed on their heads tangentially, so that it could touch the highest point of his/her head. Then, with the help of a pencil, that level was marked on the wall. With the measuring tape, the height of that point was measured from the floor level<sup>1</sup>.

The ulnar length was measured from the tip of the olecranon process to the tip of the styloid process, with the elbow flexed and the palm spread over the opposite shoulder with the help of the tape, on the left side<sup>1</sup>.

	MEAN	STD.DEVIATION	N
Length of left ulna(in cm)	10.253	.4732	30
Actual height	159.05	5.963	

[Table-1]: Estimation of height from length of left ulna in adult females.



[Fig-1]: Graphical representation of correlation between actual height and length of left ulna (N=30)

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.363 <sup>a</sup>	.131	.100	.4488	.131	4.237	1	28	.049

a. Predictors: (Constant), Actual height

[Table-2]: estimation of height from length of left ulna in adult females.

The obtained values were used for the statistical analysis which was done by using the SPSS, version 12.0 software for the required analysis. The prediction of a significant relationship amongst the pair of variables was determined by the “Correlation coefficient” i.e., Pearson’s ‘r’<sup>1</sup>.

**RESULT**

The mean of the heights was extrapolated as 159.05cm, with a standard deviation of 5.96. Similarly, the mean of left ulnar lengths was calculated as 10.25cm, with a standard deviation of 0.47 [Table/Fig-1 and 1]

The correlation coefficient (r) of the height and the left ulnar length was 0.131, with a significant regression coefficient (b) of 5.677. A supportive regression scatter-plot can also be made [Table/Fig-2 and 1]

**DISCUSSION**

Estimation of stature is an important parameter in medico-legal examinations and anthropological studies. Therefore the study was carried out to investigate the relationship between the stature and length of ulna<sup>3</sup>. In this study, the correlation coefficient (r) of the height and the left ulna length was found to be 0.131. The r value implies that there was a positive correlation.

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. Therefore, formulae based on the length of ulna provide an alternative stature predictor under such circumstances. The ulna has easily identifiable surface landmarks making the measurement possible<sup>2</sup>. The result obtained in this study was in correlation with the study done by previous researchers, as were reported in 1952. Trotter M et al., estimated the stature of American whites and negroes from the ulna with linear regression equations. In India, Lal CS et al. (1972) worked on a population of 258 in north Bihar, whose ages ranged from 12 to 21 years, for the estimation of the height from the surface anatomy of the long bones e.g. the tibia and the ulna. Devi S et al. (2006) computed the correlation coefficient (r = 0.619 for males and 0.584 for females) and the regression equation formula for the estimation of stature by using the upper arm length among the living population of the Maring tribes of the Pallel area in the Chandel district, Manipur. In the Bengalee population, Mondal M et al. (2009) postulated the height estimation in males from the ulna. The present study could highlight such a relationship in females<sup>1</sup>.

### CONCLUSION

The length of ulna is an important parameter which is used to estimate the height of an individual. From this study, the correlation coefficient obtained correlate with the previous studies. Hence, future studies can focus on estimating the height using different parameters.

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