An analysis of stature using the ulnar bone was performed on fifty-four women from the Indian population in a cross-sectional study

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Abstract:

Background: Aim: With the hope of developing regression formulas that could be used to estimate height solely from ulnar length, this study sought to investigate the anthropometric relationship of female subjects between ulnar length and height. **Materials& Methods:** Index Medical College & Hospital's Ethics Committee approved the current study. This study was descriptive and analytical. Descriptive analysis determined the mean ulnar lengths of female study participants. Participants were 18 to 22-year-old medical and paramedical students from Index Medical College & Hospital in Indore (Born & Brought up in Indore). **Results:** The height of the female subjects taken into considerations for present study was 154.2±10.1. The ulnar length of the right ulnar is slightly higher than on the left side. When compared between the two sides of the ulnar bone lengths, did observe significant difference. The present study observed a stable incline, with a positive regression of Y= 101.55+1.49X when compared between height and ulnar bone length of the female subjects. In addition, the present study also observed a positive Pearson correlation coefficient with a P value of <0.05. **Conclusion:** Simple linear regression equation derived can be used for estimation of height from ulna and vice versa. Thus, the data of this study will be of practical use in medical science investigations and in anthropometry.

Keywords: Indore Population; Pearson's Correlation; Stature; Female Ulnar bone; Linear regression.

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Introduction:

The population of the world is highly variable as far as biological variability is concerned. Indian population is no exception, rather Indian population compromises various ethnic and racial groups leading to even greater variability in biological characteristics [1-4].

Accuracy in stature estimation depends to some extent on the specificity of the samples on which the estimation is based and formulae of one population should not be used in another population [5-9]. An individual's anthropometric characteristics, which in turn have an impact on the internal structure and tissue components, which in turn are influenced by a person's genetic and environmental influences, are directly linked to a person's sex, shape, and form.

With the hope of developing regression formulas that could be used to estimate height solely from ulnar length, this study sought to investigate the anthropometric relationship of female subjects between ulnar length and height.

Materials & Methods:

Index Medical College & Hospital's Ethics Committee approved the current study. This study was descriptive and analytical. Descriptive analysis determined the mean ulnar lengths of female study participants. Using the analytical component, a regression equation for height and ulna bone length was developed.

Sample: The average male height in the Indian population of 21 is 26.92 cm, with a standard deviation (SD) of 1.32 cm, and the SD (mean) for

females is 26.92 cm and 1.32 cm, respectively [1-9]

Participants were 18 to 22-year-old medical and paramedical students from Index Medical College & Hospital in Indore (Born & Brought up in Indore). Patients with achondroplasia, polio, scoliosis, fractured forearms, or amputated upper limbs will be excluded. The study includes non-Indore natives.

Before the interview, participants signed free-will waivers. Data was collected using Vernier calipers and a stadiometer. Using a Vernier caliper and the forearm bent 90 degrees, ulnar length was measured. The height was measured barefoot in a stadiometer facing Frankfurt. Sliding the horizontal part measured the sagittal vertex. To minimize daylight variation, all measurements should be taken between 2 and 4 p.m.

Statistical analysis:

Means, standard deviations and standard errors were calculated using Microsoft Excel and the correlation coefficient was tested for statistical significance using the t test for correlation coefficient to determine the statistical significance of the correlation coefficient.

Results:

Table 1 shows the mean and standard deviation of ulnar bone of female gender subjects. The height of the female subjects taken into considerations for present study was 154.2±10.1. The ulnar length of the right ulnar is slightly higher than on the left side. When compared between the two sides of the ulnar bone lengths, did observe significant difference.

Figure 1 shows the regression equation of height with ulnar bone length of the female study subjects. The present study observed a stable incline, with a positive regression of Y= 101.55+1.49X when compared between height and ulnar bone length of the female subjects. In addition, the present study also observed a positive Pearson correlation coefficient with a P value of <0.05.

Discussion:

Ulna length is superior to arm span [6,9,12] and hand length [10,12] in predicting height, according to this study. Asian, White, and Black populations differed significantly in their ulna length-to-body-height correlation [11-13] according to a previous study.

A universal formula for height estimation is nearly impossible to devise because of the complex relationship between limb and thorax growth and the individual's race, age, and gender. Therefore, scientists have emphasized the importance of developing population- and gender-specific formulas for height estimation. Percutaneous ulna [13], tibial [1], hand breadth [14], and hand length [15] length regression models for height estimation have been developed after earlier studies. was found in a study regarding the relationship between upper-limb size and height [16]. An earlier study [17] found results that matched ours, and regression formulas for estimating stature were developed. An alternative way to gauge a person's height is to measure their arm length, as it was discovered in another study of adult Bangladeshi females [18]. A study proposed linear and multiple regressions to estimate body stature in the North Indian Rajput population [19]. A linear regression equation for estimating height in both sexes was proposed by researcher, using the length of the hand [20]. A significant correlation was found between hand length and height in both genders, with high correlation coefficients indicating that this parameter could be used to estimate height accurately.

In our research, we are examining the correlation between an individual's height and the average length of the right and left ulna. In comparison to other upper-limb bones, the ulna's length is easier to measure precisely because of the ulna's distinct bony markings. For estimating height from ulna length, we used formulas developed in our study that showed similar precision to that of a previous study. The correlation coefficient was 0.78 for the right ulna and 0.68 for the left ulna in a study conducted by Mondal MK et al. [12]. We used the average lengths of the right and left ulna in this study and found that the correlation coefficient was 0.977 for males and 0.979 for females. In our study, we found results that were similar to those found in the work of Ilayperuma et al. [6]. The present study observed a stable incline, with a positive regression of Y= 101.55+1.49X when compared between height and ulnar bone length of the female subjects. In addition, the present study also observed a positive Pearson correlation coefficient with a P value of <0.05.

Conclusion:

In the present study an attempt was made to document a relationship between the ulna and height in Indore population. A positive correlation was found between stature and length of ulna. Simple linear regression equation derived can be used for estimation of height from ulna and vice versa. Thus, the data of this study will be of practical use in medical science investigations and in anthropometry. Hence the present study would be useful for Forensic Medicine experts and Anthropologists. Assessment of height from different parts of body by anthropometric study of skeleton is an area of interest in medicine.

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Table 1: Mean and standard deviation of ulnar bone of female gender

Variables (cm)	Mean	Standard Deviation
Height	154.2	10.1
Length of ulna (right)	21.4	1.6
Length of ulna (left)	21.1	1.9

Figure 1: Correlation of Height with ulnar bone length in female subjects (n =54)