ORIGINAL RESEARCH

Estimation of Stature and Gender From Thumb Indices: An Institutional Based Study

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ABSTRACT
Background: The main purpose of investigating the damaged remains is to develop a biological profile that identifies individuals by estimating the age, gender, and stature of the remains. This profile helps to increase the likelihood of identifying the information of the victim's events or disasters. Estimating statures through human remains is based on the principle that there is a linear relationship between statures and various parts of the human body and bones. Hence; the present study was undertaken for assessing stature and gender from thumb indices.
Materials &Methods: A total of 50 male and 50 female subjects within the age range of 25 to 40 years were enrolled. The length (in cm) of the thumb- was measured with the help of Sliding Digital Callipers. The distance from the midpoint of proximal flexor crease till the tip of the thumb when the subject's hand was placed supine on a flat horizontal surface with the fingers stretched and extended is taken as the length of the thumb. For stature estimation, Stadiometer was used. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software.
Results: Mean length of left thumb among males and females was 7.23 cm and 6.85 cm respectively. Mean right of left thumb among males and females was 7.21 cm and 6.88 cm respectively. Mean height among males and females was 164.9 cm and 155.3 cm respectively. Significant results were obtained while comparing mean thumb lengths and height among males and females. While assessing the correlation between thumb length and stature among females and males, significant results were obtained.
Conclusion: Their exists a significant correlation between stature and length of both the thumbs. So, even if only thumb is available it is possible to estimate the stature of individual.
Key words: Stature, Gender, Thumb.

INTRODUCTION
The major goal of a forensic investigation is to verify identity through the victim's remains, which consists of individual parts of the body that are ashes, damaged, or dismembered. As such, partially damaged bodies and human remains are often encountered in fields, where intentional cutting, dismantling, explosion, or other mass disasters took place. The main purpose of investigating the damaged remains is to develop a biological profile that identifies individuals by estimating the age, gender, and stature of the remains. This profile helps to increase the likelihood of identifying the information of the victim's events or disasters.

Estimating statures through human remains is based on the principle that there is a linear relationship between statures and various parts of the human body and bones.[1-4]

Stature is the height of a person in the upright posture and has a definite and proportional biological relationship with each and every part of the human body, i.e. head, face, trunk, extremities. This relationship helps a forensic scientist to calculate stature from dismembered and mutilated body parts during forensic examinations and thus aids in narrowing down the investigation process by providing useful clues to the investigation agencies.[5-7] Hence; the present study was undertaken for assessing stature and gender from thumb indices.

MATERIALS & METHODS

The present study was undertaken for assessing stature and gender from thumb indices. A total of 50 male and 50 female subjects within the age range of 25 to 40 years were enrolled. All the measurements were taken in a reasonably well lit room, at a fixed time for avoiding environmental influenced biasness. Measurement of anthropometric measurements viz: hand length and breadth, were measured separately. Landmarks and technique involved in taking anthropometric measurements as described in previous literature were as follows:[5,6]

Stature (S): It is the vertical distance between highest point on vertex and the platform of stadiometer. The length (in cm) of the thumb- was measured with the help of Sliding Digital Callipers. The distance from the midpoint of proximal flexor crease till the tip of the thumb when the subject's hand was placed supine on a flat horizontal surface with the fingers stretched and extended is taken as the length of the thumb. For stature estimation, Stadiometer was used. All the results were recorded in Microsoft excel sheet and were analysed by SPSS software.

RESULTS

A total of 50 males and 50 female subjects were enrolled. Mean age of the subjects was 28.6 years. Mean length of left thumb among males and females was 7.23 cm and 6.85 cm respectively. Mean right of left thumb among males and females was 7.21 cm and 6.88 cm respectively. Mean height among males and females was 164.9 cm and 155.3 cm respectively. Significant results were obtained while comparing mean thumb lengths and height among males and females. In the present study, while assessing the correlation between thumb length and stature among females and males, significant results were obtained.

Table 1: Demographic data

Variable	Number
Mean age	28.6
Males	50
Females	50

Table 2: Anthropometric variables

Variable	Males	Females	p- value
Mean length of left thumb (cm)	7.23	6.85	0.011*
Mean length of right thumb (cm)	7.21	6.88	0.023*
Height (cm)	164.9	155.3	0.001*

*: Significant

Table 3: Pearson's Correlation of thumb length and stature

Variable	Males	p- value	Females	p- value
Length of left thumb	0.335	0.011*	0.254	0.011*
Length of right thumb	0.112	0.023*	0.239	0.023*

*: Significant

Table 4: Student's t test for assessing the significance of the difference between males and males

Variable	t-value	p- value
Length of left thumb	3.235	0.001*
Length of right thumb	8.114	0.001*
Height	7.858	0.005*

*: Significant

DISCUSSION

Literature is replete with studies that have dealt with estimation of stature from dimensions of hands and feet in the past and have documented that these parameters can be successfully used for stature estimation. Due to strong influence of genetic and environmental factors on the height of the individual, homogeneity of the study population is vital in formulating the regression equations. Stature is mainly controlled by genetic factors, although it is also influenced by environmental, nutritional, socioeconomic, and climate factors, which also influence the relationships between stature and variable anatomical measurements. Relative to proximal body parts, distal limb bones or parts are disproportionately influenced by various stressors, especially nutritional and environmental factors, and these changes are more pronounced in men. Furthermore, secular changes are observed in intralimb proportions and stature. Unfortunately, previous reports have indicated that population-specific genetic and environmental factors can lead to large estimation errors when estimation equations for one specific population are applied to a different population. Therefore, the best stature estimation models are specific to a single population.[6-9] Hence; the present study was undertaken for assessing stature and gender from thumb indices.

A total of 50 males and 50 female subjects were enrolled. Mean age of the subjects was 28.6 years. Mean length of left thumb among males and females was 7.23 cm and 6.85 cm respectively. Mean right of left thumb among males and females was 7.21 cm and 6.88 cm respectively. Mean height among males and females was 164.9 cm and 155.3 cm respectively. Significant results were obtained while comparing mean thumb lengths and height among males and females. Our results were in concordance with the results obtained by Gupta S et al, who also reported similar findings. In their study, authors estimated the gender by using index and ring finger length ratio, hand and foot index along with the correlation of both the hand and foot index to determine the vital role of all the indices in establishing gender identity. 300 subjects (150 males and 150 females) were analysed. Various anthropometric measurements like hand length, hand breadth and hand index, Index Finger Length (IFL), Ring Finger Length (RFL) and IFL/RFL ratio as well as foot length, foot breadth and foot index were estimated in millimeters (mm) with the help of sliding-anthropometric caliper. The index and ring finger ratio was found to be higher in females as compared to males. The hand and foot index was more in males than in females. The index and ring finger length ratio, hand and foot index between males and females was found to be statistically significant for both hands and feet. A statistically significant correlation was determined between hand indexes versus foot index. Their study can be useful to establish the gender of a dismembered hand or foot when subjected for medicolegal examination.[10]

In the present study, while assessing the correlation between thumb length and stature among females and males, significant results were obtained. In a similar study conducted by Geetha GN et al, authors documented anthropological work on the tribes of Kasargod district, Kerala, India. Two hundred subjects comprising of 100 males and 100 females in 20-30 years age group were included. Statistical analysis indicated that the bilateral variations were

insignificant for all the measurements except foot breadth among females (p<0.001). The correlation between the stature and various parameters studied in males and females were found to be positive and statistically highly significant. Linear and multiple regression equation for stature estimation were calculated separately for males and females. The significant positive correlation between the study variables and the stature indicates that these variables can be successfully used to predict stature.[11]Milašinović et al found that the coefficient of determination between arm span and stature of adolescents in Montenegro was 0.673 for males. According to Ibegbu et al, the coefficient of determination between hand length and stature of Nigerian students was 0.498 for males and 0.494 for females. Krishan et al designed a model that estimates the stature of adolescent males in North India through the measurement variables associated with the foot length. The coefficients of determination of the models were from 0.613 to 0.666.[12-14]

CONCLUSION
From the above obtained results, it can be concluded that their exists a significant correlation between stature and length of both the thumbs. So, even if only thumb is available it is possible to estimate the stature of individual.

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