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Original Research Article

Correlation of height with hand length and breadth in adult Kashmiri population of Baramulla district of Jammu and Kashmir

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ABSTRACT

Background: Nature has designed the anatomical framework of an individual in such a way that the significant correlation between different body parts do exists which can be applied to solve the conflicts and controversies, and also there is strong ethnic and geographical variations among individuals is considered to be important assessment in identification of unknown human remains. Estimation of stature from hand dimensions which is one of the very important chapters in the field of Forensic anthropometry.
Methods: This cross-sectional study was conducted amongst 200 participants (100male and 100 female) of Kashmiri population from district Baramulla of Jammu and Kashmir over a period of 4 months during 2021-22. Hand dimensions along with hand dimensions along with stature were measured instead of hand dimensions along with stature and weight were measured. Linear regression coefficient was calculated.
Results: Obtained were statistically significant and showed a positive correlation between height and hand length. P value was <0.05.
Conclusions: The correlation between height and hand dimensions (length and breadth) instead of height and hand length measurements of an individual were statistically significant. This significance of correlation between the measurements can be used practically in forensic medicine to establish identity of persons in case of accidents and disasters where bodies are mutilated and body parts are fragmented.

Keywords: Forensic anthropometry, Hand length, Stature, Vernier slide calipers

INTRODUCTION

Although the determination of stature from fragmented parts is not an easy job even for experts. Many studies have been undertaken so far to correlate hand dimensions with the stature. The hand dimensions, being genetically derived varies in different races and ethnic groups and is used to determine sex, age, stature and nutritional status of an individual. Identification of sex, age, race and stature is the most important aspect of investigations in cases of mass disasters like bomb explosions, public vehicle (plane, railway, bus, truck, car) accidents, cross border terrorist attacks, natural calamities, murders where bodies or isolated extremities are found in disintegrated, mutilated and skeletonized state.[2,3] Stature of an individual is an inherent character, estimation of which is considered to be an important assessment in identifying of unknown human remains.[4,5] Very little is known about the correlation of hand length with the stature in Kashmiri ethnic population of Baramulla district. Since Kashmir being a conflict zone where identification at times may become difficult and is done from the body fragments.[6]

Thus the present study was aimed to study dimensions of hand in relation to stature of an individual with the objective to find statistically significant data which can be applied practically in forensic department in this region for accurate estimation of stature from hand dimensions in

cases where only mutilated and fragmented body parts are left at the scene. The aim and objective of this study were to find correlation between hand length and stature in Kashmiri population of Baramulla district and to devise a method for identification of individuals from the remains of body parts like hand.

METHODS

The present cross-sectional study was carried out in Government Medical College Baramulla for a period of four months during January 2022 to May 2022. Two hundred (100 males; 100 females) right handed healthy individuals belonging to different departments of College between 18-25 years of age and of Kashmiri origin were randomly included in this study after taking ethical clearance from ethical committee of Medical College Baramulla.

Individuals with deformed limbs either congenital or acquired were excluded from this study. Detailed medical history and clinical examination of these subjects was done after taking consent to rule out any disease or deformity that could have affected the general or bony growth. The height and hand length of these subjects was measured. The height was measured using standard stadiometer in a standard standing position with head oriented in ear-eye plane from the standing surface to the highest point on the head. The hand length was measured using the sliding caliper from the proximal crease of the wrist to the tip of middle finger when the hand was held straight and stretched. To minimize subjective errors all the measurements were taken 2 times and then mean was taken. Height (m) was measured to the nearest centimetres using a stadiometer with subject standing erect on a horizontal resting plane bare footed having the palms of the hands turned inward and the finger pointing downwards. Data collection tools like vernier slide calipers, calibrated foot board, stadiomete, questionnaire for collection of personal details, academic scores, Lead pencils, stationary etc.

Data collected were tabulated, graphically represented and statistically analyzed.

Statistical methods

The recorded data was compiled and entered in a spread sheet (Microsoft excel) and then exported to data editor of SPSS version 20.0 (SPSS Inc., Chicago, Illinois, USA). Continuous variables were expressed as mean±SD. Graphically the data was presented by Scatter plots. Karl Pearson's correlation coefficient (r value) was applied to determine the correlation of height with hand length and breadth. Further the significance of correlation coefficient was established by t-test. A p value of less than 0.05 was considered statistically significant.

RESULTS

The height of males ranged between 150-198 cm and mean height observed was 171.5 cm and SD 8.87 was observed. The hand length in males ranged between 14.5-19.0 cm with a mean length of 10.94 cm and standard deviation of 1.09 cm. The hand breadth in males ranged between 7-11 cm with a mean of 8.82 cm and SD of 0.74 cm as shown in Table 1.

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Among the males there was a significant positive correlation between height and hand length (r=0.876) as well as height and hand breadth (r=0.586) as shown in Table 3. These associations were statistically significant with a p value<0.001. Among the females there was a significant positive correlation between height and hand length (r=0.817) as well as height and hand breadth (r=0.431) as shown in Table 3. These associations were statistically significant with a p value<0.001.

Table 1: Descriptive statistics of height, hand length and hand breadth among males.

Variables (cm)	Mean	SD	Range	95% CI
Height	171.5	8.87	150-198	169.7-173.2
Hand length	16.94	1.09	14.5-19.0	16.72-17.16
Hand breadth	8.82	0.74	7-11	8.67-8.97

Table 2: Descriptive statistics of height, hand length and hand breadth among females.

Variables (cm)	Mean	SD	Range	95% CI
Height	157.1	8.46	137-175	155.5-158.9
Hand length	15.71	0.75	14-17	15.56-15.86
Hand breadth	8.11	0.64	7-10	7.98-8.23

Table 3: Correlation of height with hand length and hand breadth among males and females.

Hand (cm)	Males		Females		95% CI
	R value	P value	R value	P value	
Length	0.876	<0.001	0.817	<0.001	0.876
Breadth	0.586	<0.001	0.431	<0.001	0.586

DISCUSSION

This cross sectional study included 200 young adult subjects of both sexes. Their stature ranged between 150-198 cm and hand length between 14.5-19 cm. Mean stature was 171.5 cm in males. While in case of females it ranged between 137-175 cm and hand length between 14-17 cm with a mean stature length 157.10 cm. The observations made in this study were concordant with the observation of earlier studies done on Indian populations.[7-10] Thakur et al estimated height from hand length of 250 Punjabi boys between 17-25 years by deriving regression equations within the error of 3-6 cm.[1] The regression equations were derived from hand length and correlated with stature among Punjabi males.[11] An attempt was also made to derive regression formulae from hand length among 100 Nigerian adult male medical students of Jos Medical School, Nigeria and the results showed significant correlation between stature and hand length.[12] Sexena in his study conducted on 166 subjects statistically analyzed the data indicating a close relationship between stature and hand measurements and also derived the regression equations.[13] Sunil et al in their study found, a significant correlation of human height with hand length in both the sexes.[14] Measurements of right side were found to be greater than the measurement of the left side, but the difference was marginal and statistically insignificant. Hand length would be beneficial for use in an unidentified fragmentary or mutilated parts of upper limb especially hand within the standard error of estimate.

Samoon et al correlated the mean hand lengths of right hand (Rh) and left hand (Lh) with the stature and found a statistically significant correlation.[6] These observations may be used to establish a nomogram for local Kashmiri population. In our present study we correlated the mean hand length and breadth of right hand with the stature and found a statistically significant correlation. The observed correlation with mean length of right hand and breadth right hand and stature was 0.817 and 0.413 respectively. These observations may be used to establish a nomogram for local Kashmiri population of Baramulla district and the observations made in the present study were similar to those made by other workers, who correlated hand length with stature and obtained a population specific nomograms or regression formulae.[5-10]

In the present study only correlation of hand dimensions with stature was investigated. This study would have been more useful if dimensions of other parts of both upper and lower appendages were also correlated with stature because at times hands of an individual are damaged in accidents, disasters, blasts and are mutilated beyond recognition, so in such cases the observation made in the present study will not be helpful in identification. It would have been better to investigate correlation of stature with other parts of limbs also so that if one part is missing, identification would be still possible.

CONCLUSION

The present study was conducted to find correlation between height of an individual and hand dimensions of 200 adults belonging to Baramulla district of Jammu and Kashmir. This correlation between height and hand length measurements were found statistically significant. This significance of correlation between the measurements can be used practically in forensic medicine to establish identity of persons in cases of accidents and disasters where bodies are mutilated beyond recognition and body parts are fragmented.

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