|| ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||
International Journal of Medical and Biomedical Studies
Available Online at www.ijmbs.info
PubMed (National Library of Medicine ID: 101738825)
Index Copernicus Value 2018: 75.71
Original Research Article
Volume 3, Issue 12; December: 2019; Page No. 97-100

ESTIMATION OF STATURE FROM FOREARM & HAND LENGTH IN WEST BENGAL POPULATION

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Article Info: Received 22 November 2019; Accepted 16 December 2019
DOI: https://doi.org/10.32553/ijmbs.v3i12.812
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Conflict of interest: No conflict of interest.

Abstract

Background: In the present scenario of increasing crime rate the identification of an individual has become immensely important. Measurement of different body parts of human body to estimate stature plays a vital role for establishing individual identity, especially in those cases where mutilated body parts are found or mere body fragments discovered. Here comes the role of anthropometry, where length of hand, forearm, foot etc plays a vital role for estimation of stature of a human being. Objective: The objective of the present study is to find out the relation between length of forearm with hand and stature in west bengal population. Method: For the purpose of study 300 young and healthy medical students both male and female, aged between 18 to 25 years, without any known disease or body deformity, were examined anthropometrically to measure their respective height with stadiometer and length of forearm with hand by vernier slide caliper. Result: The stature varied from 157.48 cm to 169.75 cm with mean value 167.0 cm and 159.0 in case of male and female subject respectively. On the other hand length of forearm with hand varied from 40.1 cm to 46.4 cm with mean value 46.2 and 43.2 respectively. Conclusion: Study results shows that length of forearm and hand poses significant correlation with stature.So, it may be desirable to apply this knowledge especially in cases of fragmented body parts or mutilated bodies.

Keywords: Length of hand, stature, anthropometrical measurement

Introduction

Relationship between different body segments with the whole body, especially from dimensional point of view have been of interest to artist, anatomist, scientist, architecture & medicologist since long time.[1] Earliest evidence of use of dimensional relationship depicting beauty of human body of human body proportions comes from the ancient Egyptians.[2] Virtuvius [3] the architect said in his work on architecture that the measurements of human body are distributed by nature, that 4 fingers make 1 palm and 4 palms make 1 foot, 6 palms make 1 cubit; 4 cubits make a man's height and 4 cubits make one pace and 24 palms make a man; and these measures he used in his building and he says the length of a man's outspread arms is equal to his height. Whereas medicologists use it for establishing human identity from various body parameters. Stature is one of the commonest parameters which may be applied especially in cases where bodies are recovered in mutilated state or in mere fragment. Various methods including percutaneous body measurements, isolated long bones and radiography have been used to measure stature.[1] Previously orthodox methods of estimating stature limited to whole limb length only, which was difficult for mutilated bodies. Later studies have been reported on usage of a certain length of long bones & appendages. It also been observed that stature measured using various body parameters differs with race & demographic region. Thus group specific studies in relation to stature to derive population specific equation become immensely important. The present study was carried out with an objective to establish correlation between stature & hand length in healthy adult individual in both sex.

Material and method

For the purpose of study 300 young and healthy medical students both male and female, aged 18 to 25 years were examined anthropometrically. Study

was carried out with protocol presentation & followed by ethical clearance. Informed consent was taken from the subject .All the individuals were right handed. Detailed medical history and clinical examination of the subjects were conducted to rule out any significant disease or deformity that could have affected the general or bony growth. The subjects were measured for height and hand length. The stature was measured using standard Stadiometer in a standard standing position with head oriented in ear-eye (Frank fort) plane from the standing surface to the highest point on the head. The length of Forearm and hand was measured between tip of olecrenon process of ulna and the tip of middle finger of right hand of the subjects using sliding caliper as well as standard measuring tape. The measurements were taken where the pronated and forearm were placed on flat, hard and horizontal surface with extended and abducted fingers but without any abduction adduction, flexion or extension of wrist-joint so that the forearm was directly in longitudinal axis with the middle finger. All the measurements were taken between 10.00 am to 12.00 pm by the same observer i.e. author number one. To minimize subjective errors all the measurements were taken three times and then mean was taken. A pre structured proforma was used to record information regarding data and enter all subject record. The data thus obtained was subjected to statistical calculations.

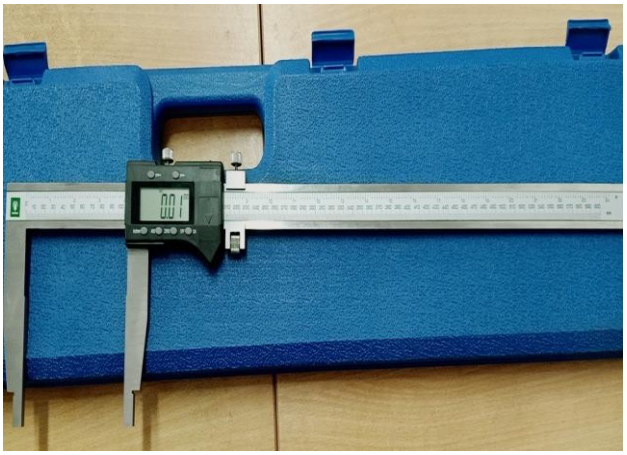

Figure 1: Digital Slide Caliper

Results:

The stature varied from 157.48cm to 169.75 cm. The mean values of stature were 167.0 for male subjects and 159.0 for female subjects. The mean value of stature of total subjects was163.42 cm and the standard deviation was 4.52 cm. On the other hand, length of forearm and hand varied from 40.1 cm to 46.4 cm. The mean value of length of forearm and hand were 46.2 for male subjects and 43.2for female subjects. The mean value of forearm length with hand was 45.3 cm.

The observations in respect to age group, height, length of forearm and hand wise distribution and their mean values were as stated below vide Table number 1 to Table number 3 and Figure number 2.

Table 1: Age group wise average height in male and female subjects

Age group	Number of male	Average height of male (cm)	Number of female	Average height of female(cm)
18-19	26	165.17	16	157.48
19-20	30	165.89	17	157.86
20-21	22	166.85	18	158.56
21-22	36	167.97	15	159.30
22-23	28	168.76	14	160.76
23-24	32	168.88	21	161.45
24-25	16	169.75	9	161.78
Total	190		110	

Table 2: Age group wise average length of forearm and hand in male and female subjects

Age group	Number of male	Average length of forearm and hand(cm) in male	Number of female	Average length of forearm and hand(cm) in female
18-19	26	42.3	16	40.1
19-20	30	42.9	17	40.9
20-21	22	43.6	18	41.0
21-22	36	43.4	15	42.1
22-23	28	44.2	14	43.6
23-24	32	45.6	21	44.1
24-25	16	46.4	9	45.2

Table 3: Measurement of height and length of forearm with hand in male and female subject

Measurements	Mean value in male	Standard deviation in male	Mean value in female	Standard deviation in female
Height	167.0	4.9	159.0	3.6
Length of forearm and hand	46.2	2.4	43.2	1.9

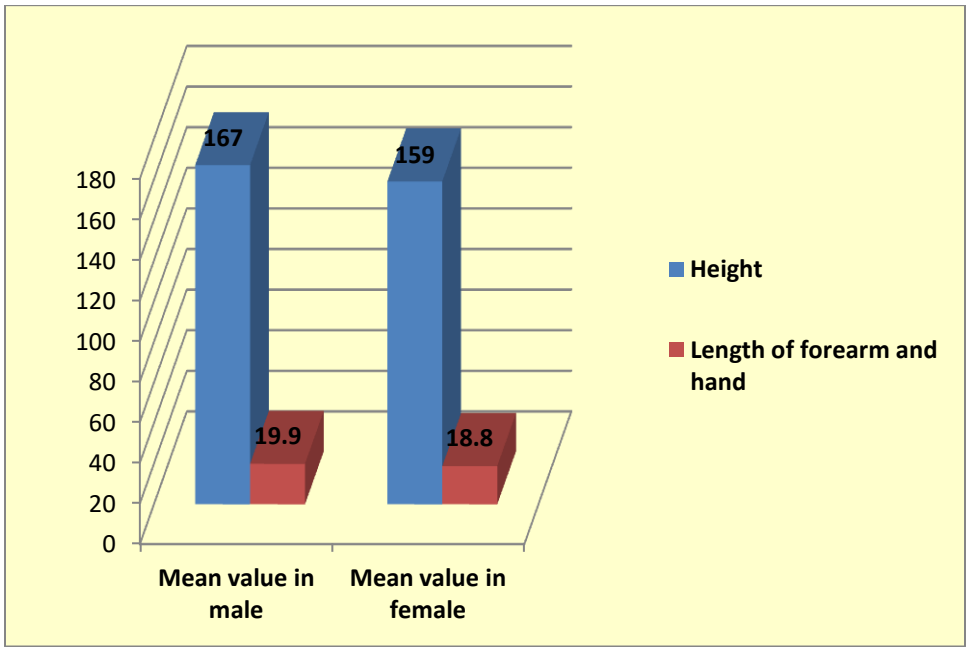

Figure 2: Graphical representation of mean value of height and length of forearm with hand in male and female subject

Discussion:

Studies have been made throughout the world related to stature estimation from skeletal remains. Pearson, Trotter and Glesser [4 &5] report their study on stature from long bones. S R Habib, N N Kamal [6] examines the relationship between stature and hand and phalanges lengths among Egyptians. Statistical analysis of this study indicated that bilateral variation was insignificant for all measurements. Sex differences were significant for all measurements. Regarding Indian perspective, studies on stature estimation were done by Athwale (1963)[7], Patel (1964)[8], Joshi (1964, 1965)[9], Lal and Lala (1972)[10], Saxena (1984)[11], Bhatnagar (1984)[12], Jasuja (1993)[13].

K. Yoganarasimha (2010)[14]conducted study on 500 north and south Indian subjects in Manipal, India, to establish the stature of an individual using the middle finger length. Measurements were analyzed statistically to establish the relationship between person's middle finger length and their stature. The study shows that the middle finger length bears a significant relation to stature and can be an important tool for stature estimation.Sushil[2]studied on north Indian population to establish the stature from forearm and hand. The study result showed that the mean value of stature was 164.97cm with standard deviation 5.52cm and mean value of forearm with hand was 45.47cm, where as our study found the mean value of stature in Bengali population is 163.42 cm and the standard deviation 4.52 cm and the mean value of forearm length and hand is 45.3cm, both are lower than their study value.

Analyzing all the data the, multiplication factor was calculated as 03.575 along with constant 2.9.Stature were estimated by using formula:

Stature (cm) =Length of forearm and hand ×03.575 ±2.9

Comparing with the actual stature of the study subjects, the accuracy of measured heights was tested. Similarity of their values proved that our study formula may be used as a reliable tool for

estimating stature from forearm and hand in bengali population

Conclusion:

Study results showed that length of forearm and hand poses significant correlation with stature. So it may be desirable to apply this knowledge especially in cases of fragmented body parts or mutilated bodies. However specific equation for specific population for this purpose would be more useful.

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