

Hand: a scientific tool of measurement?

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Abstract

Introduction: Hand is as an important tool in the field of forensic science in predicting height of the person and at the same time hand breadth is also being used as a unit of measurement during routine clinical examination, diagnostic and surgical procedures of patients. For accurate clinical assessment of patients, practitioner as well as paramedical staff should be aware of their hand breadth. **Objective:** To predict the hand breadth from height and hand length in male and female. **Materials and methods:** This study was conducted on 85 male and 56 female in the age group of 20-40year. Height of the subjects was measured using anthropometer rod. Hand length and breadth were measured with the help of sliding calliper. Hand length was measured as a straight distance between distal crease of wrist and the tip of middle finger. Hand breadth was measured at two levels, proximal and distal. **Results:** Linear regression analysis was performed and the regression equations for predicting hand breadth from height and hand length were formulated. Regression coefficient for predicting hand breadth from height was ranging from 0.28-0.35 and 0.31-0.39 in male and female respectively; and from hand length was ranging from 0.51-0.57 and 0.55-0.75 in male and female respectively. **Conclusion:** The results showed that hand length provides a reliable means of predicting hand breadth than the height.

Keywords: clinical assessment, height, hand length, proximal hand breadth and distal hand breadth.

1 Introduction

Hand is one of the most used and versatile part of the human body. It is of great scientific importance in the field of forensic sciences. Various studies have been undertaken to establish the relationship of hand dimensions with the height of individual and implicated its use for the personal identification, sexual dimorphism and racial dimorphism (JASUJA and SINGH, 2004; SUNIL, DIKSHIT, AGRAWAL et al., 2005; ILAYPERUMA, NANAYAKKARA and PALAHEPITIYA, 2009; RASTOGI, NAGESH and YOGANARASIMHA, 2008; DANBORNO and ELUKPO, 2011; CHIKHALKAR, MANGAONKAR, NANANDKAR et al., 2010) but calculation of hand breadth from stature for its use in physical examination and diagnostic procedures of patients in the medical field have remained unmined. Breadth of hand is being used as a unit of measurement, which is an inexpensive and always available method during routine clinical examination of patients in absence of sophisticated measuring instruments. It is being used in measuring symphysial fundal height while doing per abdomen examination to assess the growth of foetus in obstetrics, in assessment of the size of visceral organs and in various diagnostic and surgical procedures like surface marking of underlying structures etc. For accurate clinical assessment and thus clinical management of the patients, both practitioner as well as paramedical staff should be aware of the breadth of their hand accurately. Most of the times, they are not aware of their hand breadth but aware of their height and hand length. Moreover, if average height of a

person or hand length; in that particular region is known, can breadth of hand be predicted? Keeping all these facts in mind, the present study was undertaken to find out the correlation of the height and hand length with the breadth of a person so that if the height or hand length is known, breadth of hand can be predicted from it.

2 Materials and Methods

After getting permission from institutional ethics committee, the present study was conducted on 141 subjects (85 male and 56 female) in the age group of 20-40 year. Subjects were the consenting attendant of patients attending the out patient department of the hospital of this institution, enrolled between 08:30-10:00 hours. Individuals with apparent physical deformity and growth and developmental defects were excluded from the study. The aims and objectives of the study along with the procedure were informed and explained to the subjects in their own local language and a written consent was taken from them. The primary tool in this study was predesigned and pretested interview and examination schedule. Height of the subjects was measured with the help of an anthropometric rod. Hand length and breadth of the subjects were measured with the help of a sliding caliper capable of measuring to the nearest 0.01mm, at a fixed range of time to eliminate the diurnal variation. Data collected were analysed statistically by using "Systat software version 12".

Table 1. showing mean height, length and breadth of hand in males and females with SD and range in brackets, in cm.

Parameter	Male		Female		
	Right	Left	Right	Left	
Height	170.07±6.52 (148.00-182.00)		155.92±6.38(143.00-178.30)		
Hand length	18.77±1.01 (17.0-22.0)	18.86±1.03 (17.0-22.0)	17.34±0.78 (15.7-19.5)	17.41±0.84 (15.8-19.8)	
Breadth of hand	PHB	8.59±0.45 (7.5-9.6)	8.53±0.49 (7.2-9.8)	7.86±0.78 (6.3-9.1)	7.76±0.38 (6.9-8.6)
	DHB	8.36±0.41 (7.4-9.4)	8.25±0.38 (7.2-9.0)	7.65±0.37 (6.9-8.7)	7.56±0.39 (6.7-8.5)

Table 2. Showing RE for estimation of hand breadth from height and hand length in males and females.

Correlation of HB	Male					Female			
	RE	p	r	t	RE	p	r	t	
R PHB with H	(Hx0.02) + 5.26	0.00	0.28	2.65	(Hx0.03) + 3.50	0.01	0.37	2.90	
I PHB with HL	(HLx0.02) + 4.22	0.00	0.52	5.46	(HLx0.04) + 1.03	0.00	0.64	6.04	
G DHB with H	(Hx0.02) + 4.92	0.03	0.32	3.06	(Hx0.02) + 4.01	0.02	0.39	3.18	
H DHB with HL	(HLx0.02) + 4.47	0.00	0.51	5.37	(HLx0.03) + 2.04	0.00	0.68	6.72	
L PHB with H	(Hx0.03) + 3.77	0.00	0.37	3.62	(Hx0.02) + 4.83	0.02	0.31	2.38	
E PHB with HL	(HLx0.03) + 3.45	0.00	0.56	6.21	(HLx0.03) + 3.34	0.00	0.55	4.78	
F DHB with H	(Hx0.02) + 4.76	0.00	0.35	3.37	(Hx0.02) + 4.57	0.02	0.31	2.38	
T DHB with HL	(HLx0.02) + 4.26	0.00	0.57	6.24	(HLx0.03) + 1.49	0.00	0.75	7.99	

H = height, HL = hand length, r = regression coefficient

2.1 Measurements

- Height was measured as vertical distance from the vertex to the floor with the help of an anthropometer rod. Measurement was taken by making the subject to stand erect bare footed on a horizontal plane, with the head held in Frankfort horizontal plane (SINGH and MEHTA, 2009). Movable horizontal piece of the anthropometer was brought in contact with the vertex in the mid sagittal plane and height was recorded;
- For the hand length the subjects were asked to place their hand extended on the flat surface of table with the palm facing upwards, fingers adducted and thumb abducted; and the hand length was measured with the help of a sliding caliper as a straight distance between distal crease of wrist and the tip of middle finger (SINGH and MEHTA, 2009);
- Hand breadth was measured, at two levels with the help of sliding caliper as straight distance. First, from the inferior margin of base of thumb to the ulnar border of the hand (PHB) and second, between radial side of second and ulnar side of fifth metacarpophalangeal joint (DHB).

2.2 Statistical analysis

Collected data was expressed as mean ± standard deviation (SD), Pearson correlation test was used to look for the association of hand breadth of subjects with their height and hand length.

The mean with SD and range of height, hand length and breadth for male and female are presented in Table 1. Linear regression analysis was also performed to generate predictive

regression equations to predict the breadth of hand from height and length of the hand of subjects.

3 Results

Regression equations (RE) for estimation of hand breadth from height and hand length of individual were formulated (Table 2) with a confidence level of 95%.

Formulated RE for hand breadth estimation from the height and hand length was checked for their accuracy by comparing the estimated hand breadth and the actual hand breadth. The correlation coefficient (r) for estimating hand breadth from height was ranging from 0.28-0.35 and 0.31-0.39 in males and females respectively. Whereas the r-value for estimating hand breadth from hand length was ranging from 0.51-0.57 and 0.55-0.75 in males and females respectively. The results showed that: 1. Hand length provides a reliable means in predicting the hand breadth than the height and 2. DHB was having the highest r-value with hand length on the left side (0.57 and 0.75, respectively) as compared to right side, both in males and females. Rastogi, Nagesh and Yoganarasimha (2008); in Indian population and Hossain, Begum, Banu et al., (2010) in Bangladeshi females estimated the height from length and breadth of the hands. They also found that there is weak correlation coefficient between height and hand breadth similar to our study.

4 Conclusion

In present study, though there was positive correlation of hand breadth at both the levels with height and hand length but left hand length (r>0.5) was found to be the best estimate of left hand breadth at DHB.

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