

# Hand Length and Hand Breadth and their Correlation with Stature in Bangladeshi Male Medical Students

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## Abstract:

**Background:** Dimensional relationship among various body parts and stature has been the focus of anatomists, forensic medicine specialists, anthropologists and orthopedicians. Standard radiographic measurements can provide accuracy in measurement of bony dimensions. Thus, the present study was performed to calculate hand length and hand breadth from digital radiographs of hand and wrist joints and to find out their correlation with stature.

**Objectives:** The objective of the study was to determine hand length and hand breadth from digital radiograph of hand and wrist joint (P/A view), to evaluate stature and also to find out the correlation of hand length and hand breadth with stature.

**Materials and Methods:** Digital radiographs of hand and wrist joint (P/A view) were taken from 50 male students of Sir Salimullah Medical College, Dhaka within the age of 20-25 years of age. Stature of study subjects were measured by stadiometer. Then the radiographs were imaged and transferred to computer according to scale. Finally, hand length and hand breadth were measured by using MB ruler software. Correlation between hand length and hand breadth with stature was observed by using Pearson's Correlation Coefficient test.

**Results:** The mean  $\pm$  SD of stature was  $169.72 \pm 5.06$  cm. The mean  $\pm$  SD of hand length was  $19.08 \pm 0.75$  cm (range 17.7 - 21.3 cm) and the mean  $\pm$  SD of hand breadth was  $6.89 \pm 0.40$  cm. Hand length ( $r = .414$ ) and hand breadth ( $r = .563$ ) both had significant positive correlation with stature ( $p < 0.001$ ).

**Conclusion:** Stature has significant positive correlation with hand length and hand breadth was concluded.

**Keywords:** Stature, Hand Length, Hand Breadth.

## Introduction:

Among all hand variables, hand length and hand breadth measurements are coming up as a basic

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tool in estimating age related loss of stature, in individuals where direct height cannot be measured due to physical deformities such as kyphosis, scoliosis, contractures, and missing limbs. On the other hand, hand length and hand breadth are easier to measure than other indicators used to estimate body height such as ulna length or knee height.<sup>1</sup>

Stature is a very important indicator of growth and development and is used in clinical settings for nutrition and health research. Stature is an important parameter used to calculate basal energy expenditure, body mass index, basal metabolic rate, body composition, vital capacity and estimations of nutrient requirements.<sup>2</sup> Various studies in the past have utilized various body parts such as upper and lower extremities including hand

and foot for estimation of stature.<sup>3</sup> There exist an established relationship between stature and hand measurements.<sup>4</sup>

Numerous studies within the forensic and anthropological fields have examined stature prediction from hand features. Different dimensions of hand and wrist joint can be measured by visual observations, anthropometric measures, handprint measures and radiographic measures. Among all these methods radiographic measurement is best, as other measurements are confounded by soft tissue overlying the skeletal structure of hand.

Many studies have shown the correlation of stature with long bones.<sup>5</sup> The present study was designed to provide standard radiographic measurements of hand length and hand breadth and to correlate them with stature in Bangladeshi male medical students.

#### Materials and Methods

A cross sectional analytical study was carried out in the Department of Anatomy of Sir Salimullah Medical College, Dhaka from July 2018 to June 2019 on 50 Bangladeshi male medical students aged between 20-25 years. Age and Nationality of the study subjects were confirmed by National Identity Card. Those with any type of deformity, anomaly or history of trauma or surgery of left hand were excluded from the study. According to the International Agreement for the unification of anthropometric measures on the living for paired measurements, it is recommended to operate on the left side.<sup>6</sup> So, in this study left hand of study subjects were used to take digital radiograph.

Digital radiograph of left hand and wrist joint (postero-anterior view) were taken in Radiology and Imaging Department of Sir Salimullah Medical College and Hospital. The subjects were instructed to sit at the end of radiographic table, so that their left forearm could rest on the table with the palm facing down on the cassette and fingers spreaded slightly. The X-ray beam was given perpendicularly centered on the 3<sup>rd</sup> metacarpophalangeal (MCP) joint.<sup>7</sup>



**Fig. - 1:** Photograph of digital radiograph of left hand in P/A view showing the measurement of hand length (A- tip of styloid process of ulna, B- tip of styloid process of radius, C- midpoint of interstyloid line, D- distal most point of distal phalanx of middle finger, CD – Hand length).

The digital radiograph of hand was imaged with a digital camera and was transferred to a computer and MB ruler software was used. Hand length (HL) was measured as the distance between the midpoint of the line connecting the distal styloid processes of radius and ulna and most distal point of the middle finger (Figure -1).<sup>8</sup> Hand breadth (HB) was measured as the distance between the lateral most point of 2<sup>nd</sup> metacarpophalangeal joint to the medial most point of the 5<sup>th</sup> metacarpophalangeal joint (Figure-2).<sup>8</sup>



**Fig.-2:** Photograph of digital radiograph of left hand in P/A view showing the measurement of hand breadth (A-medialmost point of the 5<sup>th</sup> Metacarpophalangeal joint & B- lateralmost point of the 2<sup>nd</sup> Metacarpophalangeal joint, AB- Hand breadth).

Stature was measured by stadiometer. Stature is the natural height of a human expressed as distance from the vertex (the highest point on the head held

in the Frankfort horizontal plane) to the sole of the foot in an upright position.

Data were collected by quantitative method and were recorded using an Excel spreadsheet (Microsoft Office 2010; Microsoft, Redmond, WA). Then the data were expressed as mean  $\pm$  standard deviation (mean  $\pm$  SD) with range. Correlation between stature and hand length and hand breadth were obtained by Pearson's Correlation Coefficient test. All statistical analyses were performed by using the statistical software SPSS (IBM SPSS Statistics Base, version 25). P-value  $<0.05$  was considered as statistically significant.

#### Ethical clearance

The study was approved by the Ethical Review Committee of Sir Salimullah Medical College, Dhaka.

#### Results

The results are shown in Table-I & II.

**Table-I**  
Stature of study subjects

Variable	Measurements
	Mean $\pm$ SD (Range)
Stature	169.72 $\pm$ 5.06
(cm)	(157.5 - 180)

N (no. of the participant) = 50 males  
SD = Standard deviation

**Table-II**  
Measurements of hand length and hand breadth and their correlations with stature

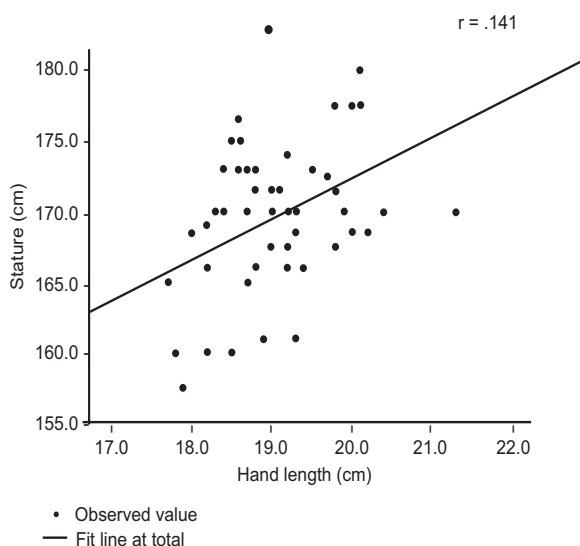
Variables	Measurements	Correlation with stature	
	Mean $\pm$ SD (Range)	r	p-value
Left hand length	19.08 $\pm$ 0.75		$<0.001$
(cm)	(17.7 - 21.3)	.414	
Left hand breadth (cm)	6.89 $\pm$ 0.40(6.2 - 7.8)	.563	$<0.001$

Pearson's correlation coefficient test was applied to assess the correlation between two variables.

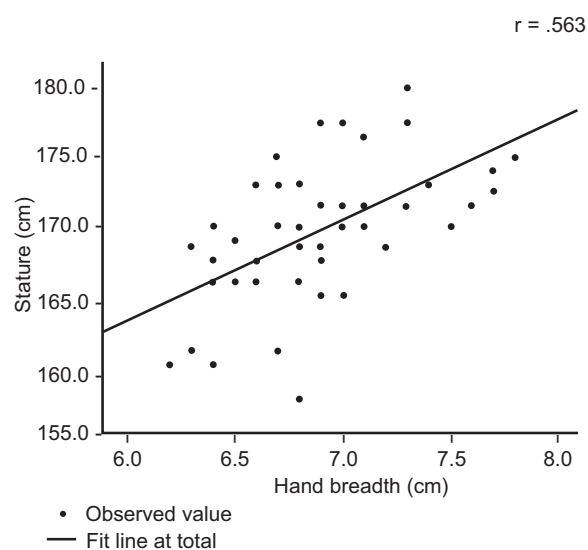
r = Pearson's correlation coefficient

p  $<0.05$  was considered as significant

The mean  $\pm$  SD of hand length was 19.08  $\pm$  0.75 cm (range 17.7 - 21.3 cm) and the mean  $\pm$  SD of hand breadth was 6.89  $\pm$  0.40 cm (range 6.2 - 7.8 cm). The mean  $\pm$  SD of stature was 169.72  $\pm$  5.06 cm (range 157.5 - 180 cm). Both hand length (r = .414) and hand breadth (r = .563) had significant positive correlation with stature (p  $<0.001$ ) (Figure-3 & 4).



**Fig.-3:** Scatter diagram showing significant positive correlation between stature and hand length of the study subjects



**Fig.-4:** Scatter diagram showing significant positive correlation between stature and hand breadth of the study subjects.

**Discussion**

The mean hand length of the present study population was similar to the people of India<sup>9</sup> and Turkey<sup>10</sup> but was higher than that of people of India<sup>3</sup> and Egypt.<sup>11</sup>

The mean hand breadth of the present study population was similar to that of Indian<sup>3</sup> population while it was lower than Saudi Arabian<sup>8</sup> Turkish<sup>10</sup> and Egyptian<sup>11</sup> population.

Similarities of the results of present study with the results of other researchers were probably due to the selection of study population of same age, sex, ethnicity, physical activities and geographical orientation. Dissimilarities might be due to different age, study groups, occupation and geographical distribution. Use of different techniques for measurement and racial factors might also be a cause of dissimilarities.

The mean stature of the present study population was similar to the people of India<sup>2</sup>, whereas was lower than the people of Saudi Arabia<sup>8</sup>, Turkey<sup>9</sup>, Egypt<sup>1</sup> and Nigeria.<sup>11</sup>

Stature was found to have significant positive correlation with hand length ( $r = .414, p < 0.001$ ) in this study. In agreement with the present study, significant positive correlation between stature and hand length was also found in Saudi Arabian<sup>8</sup>, Indian<sup>9</sup> and Turkish<sup>10</sup> population.

In the present study the stature had significant positive correlation with hand breadth ( $r = .563, p < 0.001$ ). Similarly, significant positive correlation between stature and hand breadth was also found in people of India<sup>2,3,5</sup>, Saudi Arabia<sup>8</sup> and Turkey.<sup>10</sup>

**Conclusion**

The study was conducted with the aim of establishing correlation of hand length and hand breadth with stature in Bangladeshi male medical students. Stature has significant positive correlation with hand length and hand breadth can be concluded. Further regression analysis on larger sample is recommended for mathematical estimation of stature from hand length and hand breadth with establishment of regression equations.

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