

Original Article

A Study of the Correlation between Hand Length and Foot Length among Bangladeshi Adults

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Abstract:

Human beings are considered to be bilaterally symmetrical. However, there is an asymmetry in the length of the feet irrespective of sex or handedness. The hand length could predict bodyweight and body surface area independent of the sex of the individual. But there was no data available in the literature showing the relationship between hand length and foot length. The present study was therefore undertaken to determine the correlation between the hand length and foot length. One hundred normal subjects (50 males and 50 females) between the ages of 19 and 25 years with no obvious deformities or previous history of trauma to the hands or feet were selected for the study. Their hand length and foot length were measured using the standard points mentioned by the previous authors and data was analysed statistically for correlation. The results showed a significant correlation between hand length and foot length. It is therefore concluded that if the hand length is known, the foot length can be predicted and vice versa. This could be of help in medico-legal cases for the identification of body parts as well as in cosmetic surgery.

Key Words: hand length, foot length, hand length versus foot length.

Introduction:

There are many studies undertaken to emphasize the importance of the measuring the hand length as well as foot length. Levy et al.¹ has shown that there is asymmetry in the length of the feet irrespective of sex or handedness. Ashizawa et al.² studied the correlation between foot length and general body size. Similarly, Peker et al.³ studied the relationship between foot length and the circumference of the ankle and the calf. Chong et al.⁴ found correlation between body weight and foot size. Amir sheybani et al.⁵ found that hand length can be a good predictor of the body surface area independent of the sex of the individual. Although the relationships of hand length and foot length with various body part measurements have been studied, there is no information in the available literature regarding the correlation between hand length and foot length.

Materials and Methods:

One hundred normal subjects (50 males and 50 females) without any physical deformities or previous history of trauma to the hand or foot were selected for the study from the first and second year MBBS students of Dhaka Medical College, Dhaka. After taking informed and written consent, the following measurements were taken from the subjects:

Hand Length:

Each subject was asked to place his/ her hand on a white paper with the palm facing upwards keeping the fingers close together with the thumb lying comfortably but not tightly against the radial aspect of the hand and index finger. A tracing of the hand was made with a lead pencil. The tracing proceeded from the radial styloid process to the ulnar styloid process. A line was drawn joining the two styloid tips. This line is designated as the interstyloid line (Fig.1). The distance between the midpoint of the interstyloid line and the tip of the middle finger in extension was measured as the length of the hand as described by Amir Sheybani et al.⁶

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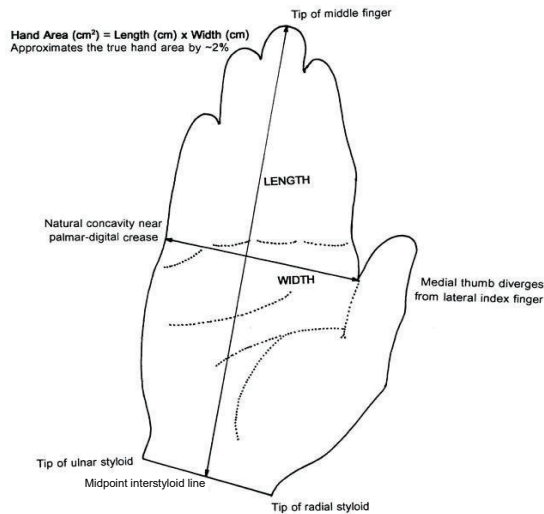


Fig-1: Land marks for measuring Hand length.

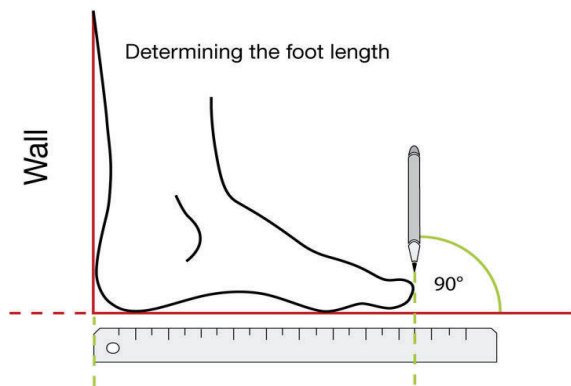


Fig-2: Determination of foot length.

Foot Length: Each subject was made to stand on a calibrated foot board with his/her back against the wall in such a manner that the posterior most point of the heel will gently touch the wall. A vertical stop was placed against the anterior most point of the foot. The distance between the posterior most point of the heel and the anterior most point of the foot was measured as the foot length as described by Peters et al.⁷. All the measurements were taken on both sides in each subject. The measurements were taken in centimeters. The results were analysed statistically.

Result:

The correlation between hand length and foot length were studied on both sides in males as well as in females. The correlation co-efficient was determined using the Carl Pearson's formula (Table-1). There results showed a highly significant correlation ($p < 0.0001$) between hand length and foot length on both sides and in both sexes. The data was also used to make a standard table showing the predicted values of hand length versus foot length. (Table II). The range, mean and standard deviation of foot length and hand length in males (Table III) and females (table IV) were also determined. When the values of the hand length and foot length were compared between the right and left sides, there was no significant difference in the males, while the females showed a significant difference ($t < 0.05$).

Table - I: Correlation between hand length and foot length

	Male		Female	
	Right Hand	Left Hand	Right Hand	Left Hand
Right Foot	0.859	0.875	0.758	0.760
Left Foot	0.618	0.617	0.770	0.768

$p = < 0.0001$.

Table-II: Hand length versus foot length (Predicted Values in cm)

Foot Length	Male (Hand Length)		Female (Hand Length)	
	Right	Left	Right	Left
21-22	16.47-16.97	17.70-17.98	15.61-16.23	15.59-16.20
22-23	16.97-17.47	17.98-18.25	16.23-16.85	16.20-16.80
23-24	17.47-17.97	18.25-18.53	16.85-17.47	16.80-17.40
24-25	17.97-18.47	18.53-18.81	17.47-18.09	17.40-18.00
25-26	18.47-18.97	18.81-19.09	18.09-18.71	18.00-18.60
26-27	18.97-19.47	19.09-19.30	18.71-19.33	18.60-19.20
27-28	19.47-19.97	19.37-19.65	-	-
28-29	19.97-20.47	19.65-19.92	-	-
29-30	20.47-20.97	19.92-20.20	-	-

Table-III: Analysis of foot length and hand length in males

	Minimum	Maximum	Range	Mean	Std. Deviation
F.L.R.-Foot length right	23.10	29.80	6.70	26.2180	1.27914
F.L.L.-Foot length left	19.70	29.60	9.90	26.0000	1.56192
H.L.R.-Hand length right	17.30	21.80	4.50	19.0600	.73734
H.L.L.-Hand length left	17.20	21.80	4.60	19.0620	.71995

Table- IV : Analysis of foot length and hand length in females

	Minimum	Maximum	Range	Mean	Std. Deviation
F.L.R.-Foot length (right)	21.40	26.40	5.00	23.7560	1.12688
F.L.L.-Foot length (left)	21.40	26.40	5.00	23.6880	1.14172
H.L.R.-Hand length (right)	15.40	19.50	4.10	17.3280	0.89967
H.L.L.-Hand length (left)	15.40	19.30	3.90	17.2460	0.87929

Discussion:

Hand has been used as a tool for estimating the area of burn injury. The area of palmar surface of one's hand has been estimated to be 1% of the body surface area Amir sheybani et al.⁶. When the growth of the hand is studied between the ages of 2 and 17 years, the length of the hand increases more proportionately than the width of the hand. When hand length was compared with the body weight for both males and females there was a curvilinear relationship which was not far from being linear Amir sheybani et al.⁵. The hand length has therefore been considered as an excellent predictor of body surface area and body mass. Change of foot length and width with age has been reported in a few anthropometric studies in literature Chong et al.⁴. The foot length and width were found to be increasing significantly on weight bearing between 3 and 18 years of age and in both genders Chang et al.⁴ and Peker et al.⁷ in their study found a significant relationship between foot length, toe length, ankle circumference and calf circumference in students aged between 17 and 25 years. In another study conducted by the same authors Anil et al.⁸, they found a significant correlation between foot length and height of the person. Even though the hand length and foot length has been studied in relation to various body parameters, the correlation between the hand length and foot length has not been studied. The present study has shown that there is a significant correlation between hand length and foot length ($p < 0.0001$). The results, therefore, indicate that if the hand length is known, foot length can be predicted

and if the foot length is known, hand length can be predicted and viceversa. From the data obtained, we have tried to establish a normal range for the hand length as well as foot length when one parameter is known. This can be of tremendous use in medico-legal cases especially in the identification of severed body parts. The data can also be of help in plastic and reconstructive surgery.

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