ORIGINAL ARTICLE

Studies on the Estimation of Stature from Hand and Foot Length of an Individual

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Abstract

Background: Studies on the estimation of stature from hand and foot length of an individual are essential study in personal identification. *Aim and Objectives:* This study is to find out correlation between statures with hand and foot dimensions in both sexes and gender comparison from an individual in Lautech Staff College in Ogbomoso and College ogbomoso and College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria. *Material and Methods*: A sample of 140 students and staff; 70 male and 70 female Students and staff of Lautech Staff College in Ogbomoso and College ogbomoso and College of Health Sciences, Obafemi Awolowo University, Ile-Ife, between 16-35years were considered and measurements were taken for each of the parameters. Gender differences for the two parameters were determined using Student t-test. Pearson's correlation coefficient (r) was used to examine the relationship between two anthropometric parameters and standing height (stature). All these measurements were done by using standard anthropometric instruments and standard anthropometric techniques. *Results:* The findings of the study indicated that the males mean values are not significantly difference when compared with females mean values in all measured parameters. The study showed significant ($p<0.001$) positive correlation between the stature with hand lengths and foot lengths. The hand and foot length provide accurate and reliable means in establishing the height of an individual. *Conclusion:* This study will be useful for forensic scientists and anthropologists as well as anatomists in ascertain medico-legal cases.

Keywords: Estimation, Hand length, Foot length, Individual, Stature,

Introduction:

Estimation of stature is an important parameter in identification of commingled, mutilated and skeletal remains in forensic examinations [1]. The identification of isolated extremities is an issue of great significance in the investigation of the identity of victims of mass disasters and fatal assaults. In forensic investigations, the dimensions of the hand and foot have been used for determination of sex, age and stature of an individual [2]. Stature reconstruction is important as it provides a forensic anthropological estimate of the height of a person in the living state; playing a vital role in the identification of individuals [3]. Identification of human remains is a crucial problem and is of immense importance to the forensic expert. Among the various parameters of Identification, individual's stature is an inherent characteristic, the estimate of which is considered to be important in those cases where only fragmentary or mutilated remains of an unknown person are recovered [4]. Many different body parts can be used in the estimation of stature. Certain long bones and appendages can be aptly used in the calculation of height of a person. Many studies have shown the correlation of stature with body appendages [5-7] and with long bones [8]. But there are inter-racial and inter-geographical

differences in measurements and their correlation with stature.

There is strong correlation between stature and foot and hand dimensions and if either of the measurements is known the other can be calculated. With this objective the present study was designed to correlate the hand length and foot length with stature of an individual and to compare male and female statures, male and female foots as well as male and female hand length from Lautch Staff College in Ogbomoso and College Ogbomoso and College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria.

Material and Methods:

The present study comprised of 140 (70 males; 70 females) healthy individuals, between 16-35 years of ages, studying and Staff in Lautech staff College, Ogbomoso Oyo State and College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria.

To minimize subjective errors all the measurements were taken three times and then mean was taken. The data thus obtained was subjected to statistical calculations using Correlation coefficient which was prepared on the basis of collected data. Graph Pad Prism 5 (Version 5.03, Graph pad Inc.) was the statistical package used for data analysis

Materials Used for the Research:

Improvised Standimeter (for measuring stature), Cardboard Paper, Long Transparent Ruler, Writing Materials, Flexible Tape and Sliding Caliper

Method of Data Collection:

Sampling:

A sample of one hundred (140) students comprising of fifty percent (70) males and fifty percent females (70), were randomly selected from the Lautech Staff College ogbomoso and College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria. All participant were healthy students and staff in the age range of sixteen to thirty-five (16-35) and it was ensured that none has skeletal deformity.

Stature Measurement:

The stature is measured as vertical distance from the vertex to the floor with the subject bare footed standing erect on horizontal plane using the standimeter calibrated in (cm). An improvised standimeter constructed as a straight rule starting on a base. The subjects were asked to stand erect with their feet flat on the floor with their heels together and the weight evenly distributed between both feet. The subjects stood erect with the Frankfort plane (line passing horizontally from the ear canal to the lowest point of the eye orbit) of his head parallel to the floor. Measurement was taken with an anthropometer from the ground to the highest point on the subject's head while firmly contacting the scalp. The measurement was recorded in centimeters [9].

Foot Measurement:

The foot length is measured on the plantar surface with the subject barefooted. The foot length is taking as straight distance from the forefoot at the acropodium to the heel at the pternion. The reading was in centimeters (cm).

Hand Length Measurement:

The length of each hand was measured using a sliding caliper.

Subject was asked to place his hand on a table with the fingers together and thumb abducted. The measurement was taken from the level of tip of the most distal point on the styloid process of the radius to the tip of the middle finger [10].

Statistical Analysis:

Correlation coefficient was prepared on the basis of collected data and their distributions, central tendencies and standard deviations (S.D.) were calculated. Gender differences for the two parameters were determined using Student t-test. Pearson's correlation coefficient (r) was used to examine the relationship between two anthropometric parameters and standing height (stature). Graph Pad Prism 5 (Version 5.03, Graph pad Inc.) was the statistical package used for data analysis. Significant difference was set at $p<0.05$.

Results:

In our study a significant positive correlation is found between the dimensions of Hand length and Foot length to that of the stature of an Individual. Hand length showing more correlation value of 0.5946 followed by Foot length (0.4979) in male samples (Table 1).

In female, foot length showed more correlation value of 0.5287 with stature than hand length which has correlation of 0.4274 (Table 2).

The gender comparison of all the dimensions showed higher values for male parameters except foot length as compared to females in estimating the stature from the dimensions of hand and Foot and shows a statistically not significant ($p < 0.05$) when compared the parameters (Fig. 5).

Table 1: Measurement of Height, Hand Length and Foot Length in Male, p<0.05

Measurements	Number of students	Mean Value (cm)	Standard Deviation	Correlation	P-value
Stature	70	169.20	14.93	_	_
Hand Length	70	18.68	1.63	0.59	0.0001
Foot Length	70	26.44	2.24	0.50	0.0001

Table 2: Measurement of Height, Hand Length and Foot Length in Female, p<0.05

Measurements	Number of students	Mean Value (cm)	Standard Deviation	Correlation	P-value
Stature	70	165.80	11.78	_	_
Hand Length	70	18.14	1.39	0.43	0.0002
Foot Length	70	25.78	1.67	0.53	0.0001

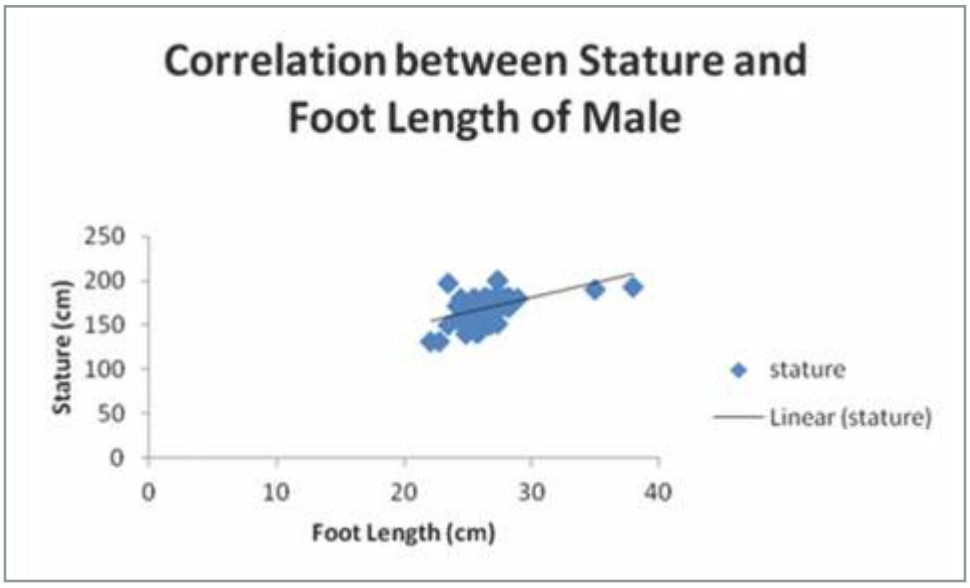

Fig. 1: Shows Correlation between Foot Length and Stature of Male, Number of Students =70 Male, p < 0.05.

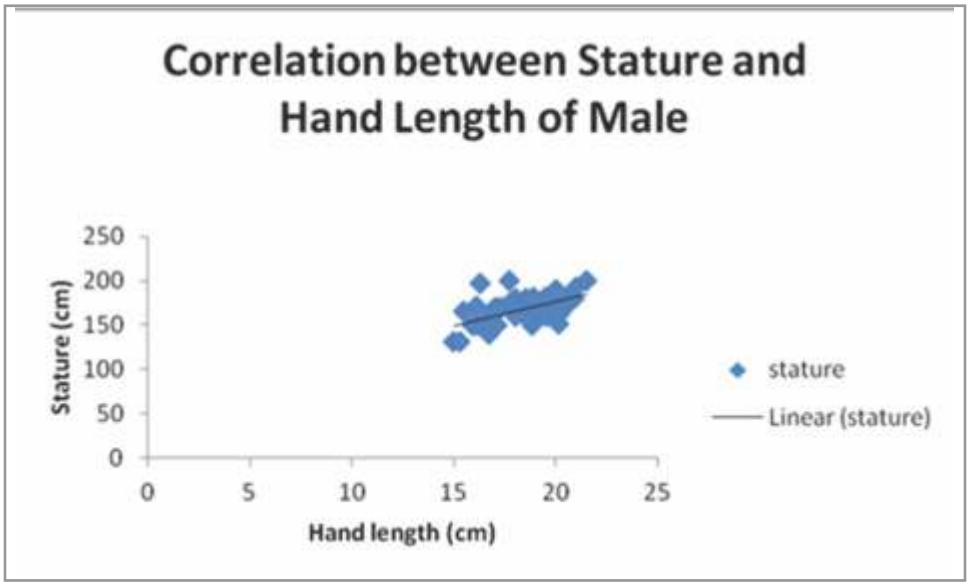

Fig.2: Shows Correlation between Hand Length and Stature of Male, Number of Students =70 Male, p < 0.05.

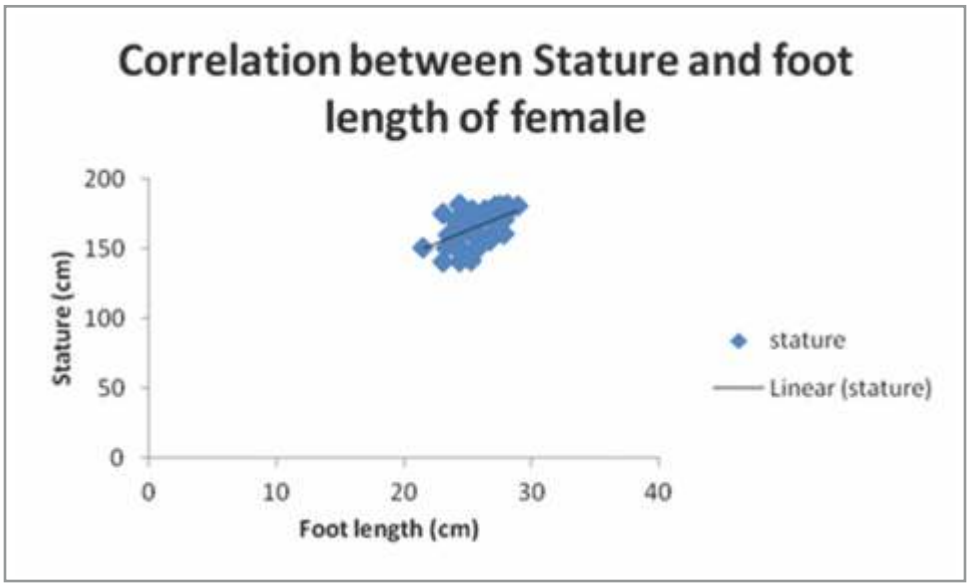

Fig. 3: Shows Correlation between Foot Length and Stature of Female, Number of Students =70 female p < 0.05.

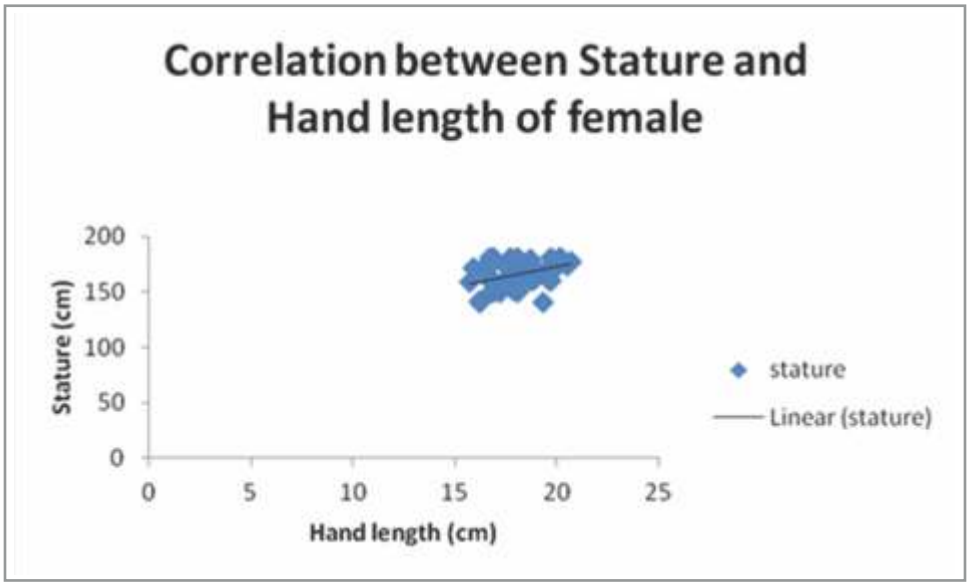

Fig. 4: Shows Correlation between Hand Length and Stature of Female, Number of Students =70 Female P < 0.05.

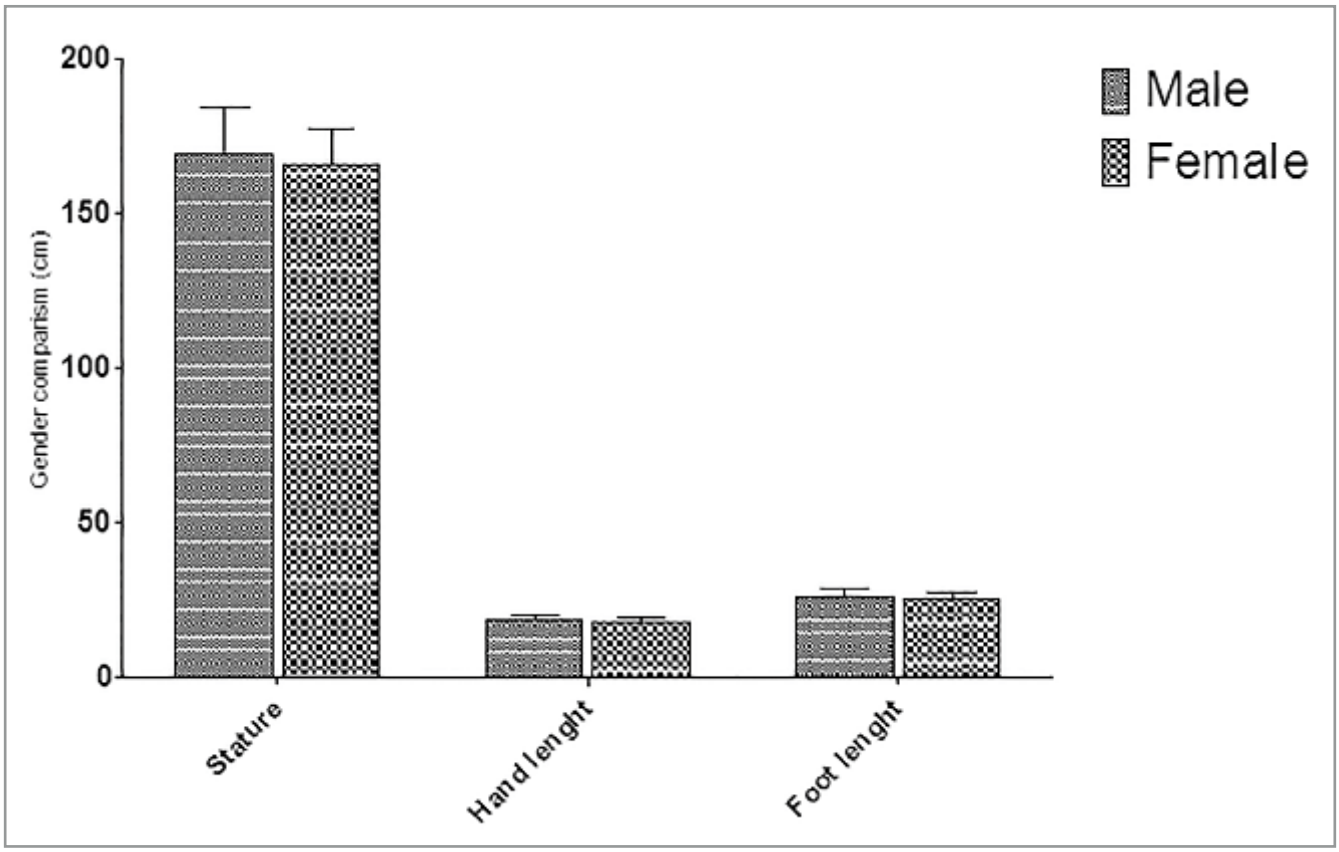

Fig. 5: Show the Gender Comparison on Statures, Hand Lengths and Foot Lengths, Number of Students =70 Males and 70 Females, P < 0.05.

Discussion:

Studies on the estimation of stature from hand and foot length of an individual were carried out on some students of Lautech Staff College Ogbomoso and College of Health Sciences Obafemi Awolowo University Ile-Ife. It was observed that there was significantly positive correlation in the dimension of both hand and foot lengths with stature. This personal identification would be a vital device for forensic scientists in medico-legal cases and anthropologist as well as anatomists in identifying an individual when only segments and fragments of unknown body part is left. The findings from this study are in agreement with other studies done by Jasuja [10].

The present study also showed similar results with the study done by Patel *et al.* [4] on a study sample of 273 living cases (138 male and 135 female students) between the ages of 17 and 23 years shows that a significant correlation between stature and hand length (r= 0.806) while hand breadth was found to show the lowest correlation (0.467). Similarly, [11] revealed that the high degree of correlation was found in hand length (r=0.597) and hand width (r= 0.482). Study on 300

medical students (153 females and 147 males) in age group of 19-23 years shows significant correlation between stature and hand length (r=0.5902) [12]. Study on 300 males and 300 females in age group 5-10 years show significant correlation between stature and Hand length (r=0.706; 0.703) [13]. Study on 501 neonates (271 males and 230 females) born to Hausa parents of Kano State origin, show significant correlation between stature and Hand length (r= 0.60) [14].

In the present study, a significant correlation of stature with hand and foot lengths has been observed in both the sexes. Measurements of the foot lengths in female were found to be greater than the foot lengths in male measurement at ages 16-35 but the difference was marginal and statistically insignificant. This was also discovered in the findings of Jitender *et al.* [15]. However, the highest coefficient correlation of dimensions in male is found in hand length (r=0.59) followed by foot length (0.50) while in female, the highest coefficient correlation was foot length (0.53) followed by hand length (0.43). These statistically significant differences may be attributed to the early maturity of girls than boys [16].

Conclusion:

The results of this study indicated that there was linear relationship between stature of an individual and hand and foot length according the correlation formula used in this study which is a reliable predictor for estimating the stature of an individual. Therefore, this study will be useful for forensic scientist, anthropologists and as well as the anatomists in ascertaining medico-legal cases.

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