J. Dhaka National Med. Coll. Hos. 2021; 27 (02): 15-18

Original Article

Estimation of stature from Arm span-An anthropometric study on adult Bangladeshi women

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Abstract

Background: Upper limb is the most movable part and main working tools of human body. Anthropometry is used in identification of individuals, criminals and a person in accidental death like fire, ship & air accidents, etc. and prevention of impersonation in Forensic criminology.

Objectives: To measure the individuals stature, arm span and assess the relationship between them.

Methods: This is descriptive and analytical type of study which was carried out in the department Anatomy, Sir Salimullah Medical College, Dhaka from July 2010 to December 2011. The ethical permission was taken from Institutional Ethics Committee (IEC) of SSMC. The number of subject was 100 right handed adult Bangladeshi women belonging to age group of 25 to 45 years. Arm span along with stature were measured directly from the subjects by direct physical method. The data were then statistically analyzed by computation to find out its normative value. Regression analysis was done to see the correlation between stature and this variable.

Result: Arm span showed significant positive correlation with the stature.

Conclusion: Stature estimation is an important tool in various departmental sciences.

Key words: Anthropometry, Arm span, Stature.

Introduction

Anthropometry is the science that deals with the measurement of size, weight and proportion of the human body. This was adapted by medical scientists to estimate the body size the measurement of the human individual for the purposes of understanding human physical for over a hundred years.[1] Anthropometry, literally meaning "measurement of humans", refers to variations.[2,3] It is used to assess health, survival of individuals and reflect the economic and social well being of populations. Anthropometry is a widely used, inexpensive and non-invasive measure of the general nutritional status of an individual or a population group.[4] Stature is a component of measurement of body mass index (BMI).[5] Arm span is equal to stature and can be used to measure BMI in deformed lower limb persons. Process of measurement of upper limb is called upper limb anthropometry which includes measurement of shoulder, arm, forearm and hand region of human body.[2]

Materials & Methods

The study was a descriptive and analytical type. This study was carried out on 100 adult Bangladeshi women in the Department of Anatomy, Sir Salimullah Medical College (SSMC), Dhaka and was conducted from July 2010 to December 2011. Measurement of stature was taken by a stadiometer. To measure the stature the subject was said to stand with her heel together and her back as straight as possible so that her heels, buttocks, shoulders and the head pressed against the upright position of the instrument. The arms were hung freely by the sides with the palm facing the thighs. The subject's head was positioned in the Frankfort horizontal plane, and the head plate was brought in contact with vertex in the mid saggital plane [Figure 1(A)+I(B)] and then readings were taken to the nearest 0.1 cm.[6]

Figure-I(A): Procedure for measuring stature

Figure-I(B): Procedure for measuring stature

Arm-span was measured with a flexible measuring steel tape from the tip of the middle finger on one hand to the tip of the middle finger on the other hand with the tape passing in front of the clavicles with the individual standing with her back to the wall with both arms abducted to 90º, the elbows and wrists extended and the palms facing forwards.[7] All the readings were taken to the nearest 0.1 cm (Figure-II).

Regression formula is used for estimation of the stature from anthropometric measurements of body:

Stature = value of constant + regression coefficient x variable.

Value of the constant and the regression coefficient for each variable was calculated using SPSS version 16.0 program.

Data processing and analysis

The data were put into the computer. Then the data were analyzed with the help of SPSS version 16.0 for Windows program keeping in view the objective of the study. Pearson's correlation coefficient test was performed to measure the relationships between the variables and two-sample Z-test was performed to compare between means.

Figure-II: Procedure for measuring the arm-span using a measuring steel tape

Result

The stature of the 100 Bangladeshi adult women subjects ranged from 141.00 to 160.00 centimeters, as shown in Table-I. More than 65% of them measured between 147.5 and 157.5 cm (Figure-III).The table-I also reveals that measured arm span varied from 142.5 to 169.0 centimeters with constant 64.36 and regression co-efficient 0.55. In more than 65% of the subjects, the arm span was between 147.5 and 162.5.00cm (Figure-IV). Table-II shows the range & mean (± SD) calculated stature from physically measured variable and their difference with the measured stature. No significant difference was found between the measured & calculated stature from arm span (Table-II). The measured arm span also showed significant positive correlation (r=0.774, p=0.000) with the measured stature (Figure-V).

Table-I: Stature and physically measured arm span with corresponding constant & regression co-efficient

Variables	Range (cm)	Mean (cm) ± SD	Constant	Regression Co-efficient
Stature	141 – 160	149.61 ± 5.07		
Arm span	142.5– 169	153.89 ± 7.08	64.36	0.55

Data are expressed as mean ± SD

Table-II: Calculated* stature and their relationships with the measured stature

Variables	Range	Mean ± SD	Significance of difference between calculated stature and physically measured stature (Z-value)
Stature	141.00 – 160.00	149.61 ± 5.07	
Calculated stature (cm)			
Arm span	142.72-157.29	148.98 ± 3.89	0.000 (NS)

NS= Non-significant at 5% level of significance on two-sample Z-test.

n=100 for each variable

* The calculated stature against each variable was obtained by using regression equation (stature= constant+ regression co-efficient x variable)

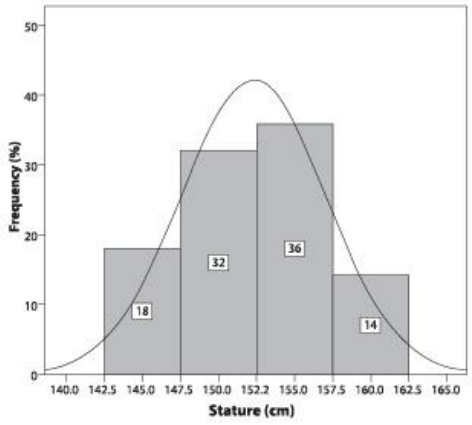

Figure-III: Histogram showing the frequency distribution of stature (n=100).

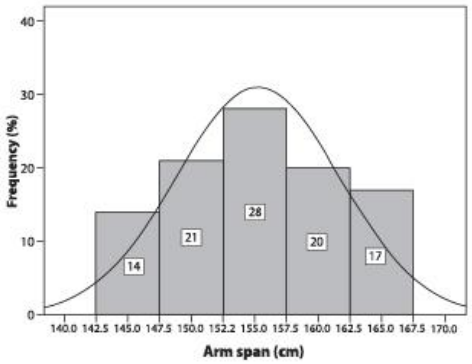

Figure-IV: Histogram showing the frequency distribution of arm span (n=100).

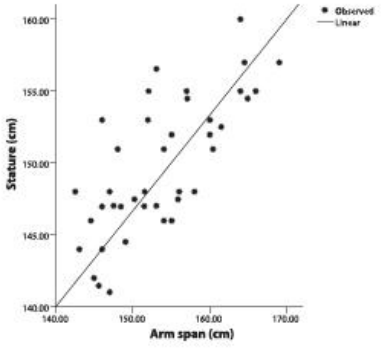

Figure-V: Scatter diagram with regression analysis showing significant positive correlation between the measured stature and arm span (r=0.774 and p= 0.000).

Discussion

The present study was conducted on arm span of one hundred adult Bangladeshi women. The stature, arm span were measured by direct physical methods. The study was designed to get normative values of the variables for the adult Bangladeshi women, to observe the possible correlation between physical measurements with the stature. Regression co-efficient and constant of all the physical variables for estimating the stature were also tried to be estimated from the obtained measurements of the physical variables. Significance test was done between calculated and observed values. The arm span of South Indian,[7] North Indian,[8] American,[6] Malawian,[9] Ethopian,[10] Thai[11] were higher than that of the present study population. The present study was compared with the women of Bangladesh, Gujarat, West Bengal, South India, North India, Malaysia, Jordan, Thailand, Ethiopia, South Africa, America, Germany, Mauritius, and similarities, dissimilarities were found when compared with the mean values.

Conclusion

This study provides the direction to construct baseline data of arm span anthropometry of Bangladeshi adult women. Arm span showed significant positive correlation with the stature. It would be useful in the field of anatomy, anthropology, archeology, ergonomics, forensic medicine and nutritional science.

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