

STATURE ESTIMATION OF THE INDIVIDUAL USING ARM SPAN MEASUREMENT IN JALGAON REGION OF NORTH MAHARASHTRA

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ABSTRACT

Height is one of the important parameter for identification of the individual. The study was undertaken to estimate height of individual from arm span by regression equation and to compare it with measured height. The study was carried out on 50 adult males and 50 adult females from Jalgaon, Maharashtra over a period of three months from February to April 2018. The population was randomly selected for this study. In present study, correlation coefficient between height and arm span in males is 0.73 while in females it is 0.69. The Regression equation derived from arm span in male is Height = 47.26 + (0.72 X arm span) and in females Height = 57.32 + (0.64X arm span). The derived equations were tested and difference between measured and estimated height was found non-significant.

KEY WORDS: Height, Arm Span, Regression Equation.

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INTRODUCTION

Anthropometry has been widely used in forensic medicine and toxicology for identification purposes. The important parameters used for identification of individuals are sex, age, race and stature. Amongst these, sex and stature are important [1]. Height is important measurement of body size and nutrition. It is also used for prediction and standardization of physiological variables such as lung volumes, muscle strength, glomerular filtration and metabolic rate etc [2-4].

The exact body height can't be determined in various conditions like amputations especially of lower limbs, surgical spine procedures, spine

deformities like kyphosis and scoliosis, disproportionate body growth, skeletal dysplastic syndromes etc. The height of individual is directly correlated with different parameters like hand and foot length, sitting height and knee height, length of sternum, vertebral column length, arm span, scapular length etc. in different studies all across the world [5].

The association of arm span varies from race to race. Different formulae are required to calculate height of different population. Keeping this in mind, study was undertaken in Jalgaon region of north Maharashtra to correlate arm span and height and to determine height from arm span in both sexes using statistical formulae.

MATERIALS AND METHODS

This observational, cross sectional and descriptive study was carried out on 50 adult males and 50 adult females from Jalgaon, Maharashtra over a period of three months from February to April 2018. Informed verbal consent was obtained.

Inclusion Criteria: Normal subjects with age groups 18-23 years of both sexes.

Exclusion Criteria: Subjects having physical disabilities, skeletal deformities, past history of skeletal injuries or diseases affecting bones and joints. Subjects who are on any form of hormonal medicines were also excluded from the present study.

Materials: Anthropometric rod, sliding and spreading calliper

Method: The subjects were said to stand with his/her heel together and his/her backs straight as possible so that her heels, buttocks, shoulders and the head touched the wall. The arms were hung freely by the sides with the palm facing the thighs. After asking the subject to take a deep breath and holding it, a measuring scale (steel plate) was placed against the head and wall to determine maximum height on the wall, and this was marked. The subject was then told to breathe out and to step away from the wall. The height was then measured from the floor to the mark on the wall with steel tape which represents the stature in centimeters to the nearest 0.1 centimeters.

For measurement of arm span, subject was instructed to stand with his/ her back touching to the wall with both arms abducted upto 90°. Elbows and wrists were also extended and the palms were facing directly forward. Arm span was measured with a flexible steel tape from the tip of the middle finger of one hand to the tip of the middle finger of the other hand.

The Statistical analysis was carried out using a computer based programmed (SPSS version-11.5 & MS Excel). Mean and standard deviations were obtained for both anthropometric variables. The relationships between body height and arm span were determined using simple correlation coefficients. Then a linear regression analysis was performed to examine the extent to which arm

span can reliably predict body height. Finally, these relationships were plotted as scatter diagram.

All parameters were measured by same individual at fixed period of the day to eliminate subjective and diurnal variations.

Aim and objective – The present study was aimed at

1. To correlate height and arm span.
2. To estimate height from arm span.
3. To correlate the estimated height and actual height of an individual.

OBSERVATIONS AND RESULTS

Table 1: Correlation coefficient and regression equation for estimation of height from arm span.

Subjects	Variable	Correlation coefficient	Regression equation
Male	Arm span	0.73	HEIGHT=47.26+(0.72*ARM SPAN)
Female	Arm span	0.69	HEIGHT=57.32+(0.64*ARM SPAN)

Fig. 1: Scatter diagram and regression line demonstrating relationship between arm span and measured height of male subjects.

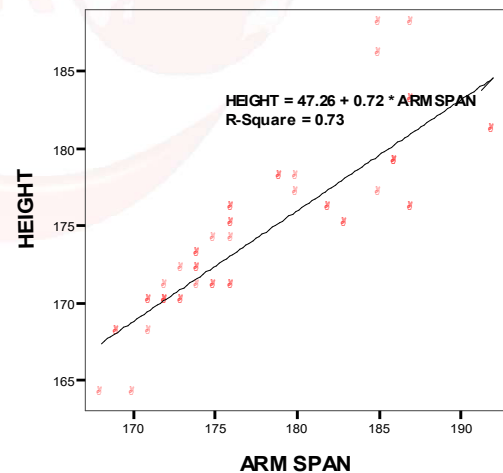


Fig. 2: Scatter diagram and regression line demonstrating relationship between arm span and measured height of female subjects.

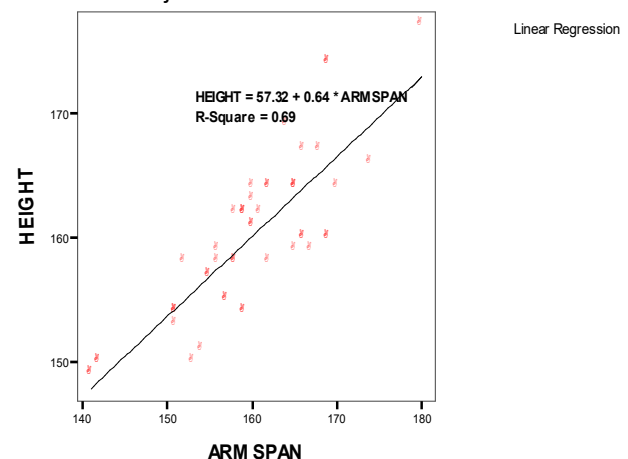


Table 2: Comparison of measured height with estimated height from arm span in males (in cms.)

Variable	Estimated height		Measured height		p value	t value
	Range	Mean \pm S. D.	Range	Mean \pm S. D.		
Arm span	164.57-181.93	174.54 \pm 4.47	164-188	174.58 \pm 5.41	0.9679	0.0403

Table 3: Comparison of measured height with estimated height from arm span in females (in cms.)

Variable	Estimated height		Measured height		p value	t value
	Range	Mean \pm S. D.	Range	Mean \pm S. D.		
Arm span	147.56-172.52	159.44 \pm 5.27	149-177	159.80 \pm 6.36	0.7586	0.3082

DISCUSSION

Different physical measurements have been used in the past to estimate the height by many authors. It is important to emphasize that arm span has been derived the most reliable indicator for predicting the body height of the individual [3,6]. The individual and ethnic variation with arm span is already observed in European [7] and African [8] populations. The arm span and height relationship varies in different ethnic groups [9]. There is a significant difference in arm span and height relationship in afrocaribbean and asian males. Keeping this in mind, separate studies should be conducted in different parts of world. To form a baseline data, this study was conducted in Jalgaon region of Maharashtra.

Unlike ethnicity, age of individual also plays a crucial role in this relationship. Especially in females, arm span remains same throughout the life but height goes on decreasing. So such studies should be conducted in different age groups [10]. Considering above fact, we included young individuals of age group 18-23 years in this study. Similarly regression equation derived from present study should not be applied for perimenopausal and post menopausal females even of same ethnicity and region.

In present study, correlation coefficient between height and arm span in males is 0.73 while in females it is 0.69. The Regression equation derived from arm span in male is Height = $47.26 + (0.72 \times \text{arm span})$ and in females Height = $57.32 + (0.64 \times \text{arm span})$. The derived equations were tested and difference between measured and estimated was found not significant.

CONCLUSION

It is found that arm span can be used in estimation of height in males and females. The

regression equation can be used to determine height in conditions like amputations of lower limbs, surgical spine procedures, spine deformity with fairly accurate results. This can be used in medicolegal cases and anthropology studies.

Conflicts of Interests: None

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