

# Use of Arm Span as a Predictor in Estimation of Stature

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## ABSTRACT

**Introduction:** Determination of stature by body parts is an essential task for forensic anthropologists. Arm span is one of the reliable predictor of height. This study aims to correlate arm span with stature of the person. **Materials and Method:** The data was collected from 260 asymptomatic, healthy medical students (146 males & 114 females) of 18-23 age group in department of Forensic Medicine and Toxicology, Lumbini Medical College, Palpa, Nepal. Measurements of Stature and arm span were taken using standard instruments. Regression analysis was performed to observe correlation between stature and arm span. **Results:** There was significant correlation between stature and height of the person ( $r=0.947$ ). **Conclusion:** There is significant correlation between stature and arm span. This can be applied in forensic anthropology for identification of person where only missing body parts are present at the scene.

**Key words:** Anthropometry, Arm span, Body height, Linear regression

## INTRODUCTION

Determination of height is one of the crucial issue for the anthropologists as well as forensic experts. In case of mass disasters, murders, or accidents only remnant of body parts may be recovered from the scene of incident where role of medico-legal experts in identifying the person becomes important. [1-2] There are numerous determinants like climate, hereditary, nutritional and racial factors which have influential role in development of long bones to set height of the person. [3]. A number of studies have been conducted to determine height from foot and hand. [4-6] This study aims to look for the correlation between height and stature of the person in Nepalese population.

## MATERIALS AND METHOD

A study was carried out among 260 medical students (146 males & 114 females) aged between 18-25 years who are from various regions of Nepal, in Department of Forensic Medicine, Lumbini Medical College, Palpa from August 2018 to October 2018 after getting approval from IRC. Subjects with deformities of vertebral column or limbs and with chronic illness were excluded. Informed written consent was taken from the all participants. To measure the stature the

subject was advised to stand barefoot on the stadiometer with both of feet in close contact to each other, trunk supported against the vertical board and head aligned with Frankfurt Horizontal plane. The measurement was taken in centimeters by bringing the horizontal sliding bar to the vertex. Arm span was measured by flexible steel tape from the tip of the middle finger of one hand to the tip of middle finger of another hand, both arms being abducted to 90° and palm facing the examiner. All the measurements were taken by the same observer and with the same instrument, to avoid any technical and/or inter-observer error and to maintain reproducibility. To eliminate discrepancy due to diurnal variation the measurements were taken three times and the mean value was considered. Data so collected were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 21.

## RESULTS:

Total 260 subjects were included in the study. Out of this 146 (56.15%) were males and 114 (43.85%) were females with the male: female ratio of the population being 1:0.78. The range of age for the study subjects was from 18-25 years. Mean age was 21.07 with standard deviation of 1.38. Table 1 shows the anthropometric measurements of stature and arm

span. Pooled arm span varied from 142 cm to 185cm with mean value of 162.99 cm and standard deviation (SD) of 8.23 cm. In case of male mean value of the arm span was 167.63±6.76 cm with standard deviation of 6.76 whereas female mean arm span was 157.05 cm with standard deviation of 5.77. Mean stature for male and female were 167.81±6.58 cm and 157.12±5.75 cm respectively. Pooled height of the subjects was 163.12±8.18 cm. Scattered diagram of arm span versus stature showed a strong positive correlation as shown in figure 1, 2 and 3 in pooled, male and female respectively. Table 2 presents the statistical values of regression analysis. Regression coefficient (r) was 0.947 and square of coefficient ( $r^2$ ) was 0.89 in pooled cases. Similarly, Regression coefficient (r) for male and female were 0.901 and 0.921 respectively.

### DISCUSSION:

Estimation of height may be possible for those persons who have lost their lower limbs in mass disasters or accidents using arm span as a predictor along with its use in forensic science to identify the person by remnant body parts. This study aimed to observe the correlation between stature and arm span in Nepalese populations. In the present study the stature of person is only slight more (0.13 cm) than the arm span. This study shows the similar results as study conducted by Shah RP et al in 225 Nepalese male and 175 females from Birgunj area. [7] But the study contradicts the other studies where arm span is greater than body height. [8-10] In this study, there is a strong correlation between stature and arm span of the person ( $r=0.947$ ). The study conducted by Chawla M et al in 149 healthy male students of age group 18 to 25 years in Punjabi population reported coefficient of correlation to be 0.897. [11] Patel PN et al in their study derived coefficient of correlation as 0.908 in Gujarat population. [12] Study conducted in adult Malawians showed coefficient of correlation 0.871. [13] In our study coefficient of correlation was found to be 0.901 for male and 0.927 for female. Aggarwal et al showed coefficient of correlation to be 0.971 for males in north Indian populations. [14] Previous studies have shown that measurements of stature and arm span varies among different races and ethnicity. So, further study should be done to validate the study among Nepalese population.

### CONCLUSION

From this study it can be clearly concluded that there is a strong correlation between stature and arm span. Thus arm span can be used as a better predictor of height than other body parts. For Nepalese population measurement of arm span is nearly same to the stature.

Conflict of interest: nil

Source of support: nil

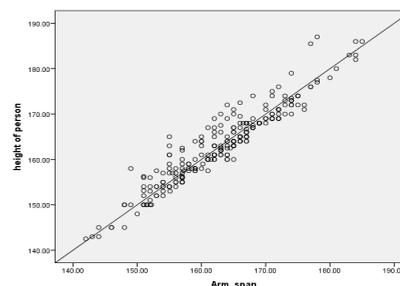
**Table 1. Measurements of stature and arm span**

Subjects	Stature Mean (cm)	Stature Standard deviation (cm)	Arm span Mean (cm)	Arm span Standard deviation (cm)
Male	167.81	±6.58	167.63	±6.76
Female	157.12	±5.75	157.05	±5.77
Pooled	163.12	±8.18	162.99	±8.23

**Table 2. Statistical values of correlation between stature and arm span**

Subjects	Regression coefficient(r)	Standard error	Square of coefficient( $r^2$ )	t- value	p-value
Male	0.901	2.87	0.811	3.52	<0.001
Female	0.927	2.16	0.859	2.16	<0.001
Pooled	0.947	2.62	0.898	2.99	<0.003

**Figure 1. Scatter plots showing relation of stature and arm span (pooled)**



**Figure 2. . Scatter plots showing relation of stature and arm span (male)**

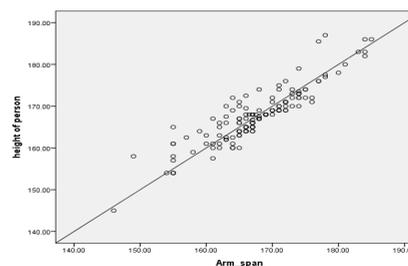
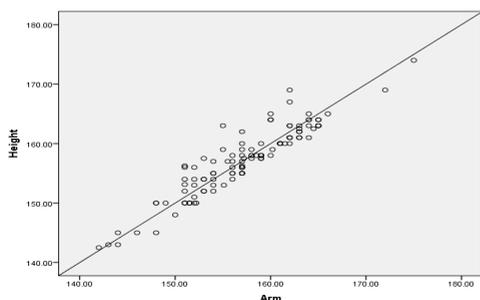


Figure 3. Scatter plots showing relation of stature and arm span (female)



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