Original Article

Correlation Between Length Of Ulna And Stature Among Bangladeshi Garo People

Farjan S[1], Ahmed Z[2], Kabir A[3], Epsi EZ[4], Begum A[5]

Abstract

Back ground: The present study was designed to construct an anthropometric data of 20-40 years aged 104 Bangladeshi Garo people (60 male and 44 female) regarding carrying angle and an attempt has been made out to grow interest among the researchers for future study and also to compare the data with the data of the people of other races. Participants were selected through purposive sampling for this cross sectional, observational, descriptive and analytic type study which was carried out in different areas of Mymensingh district (Mymensingh Sadar, Haluaghat), Bangladesh during the period of July 2015 to June 2016. The length of ulna of both side were measured by measuring tape. Data were tabulated and statistically analyzed using Microsoft excel and SPSS software. Length of ulna was found to be higher in males but angle of inclination was higher in females. Comparison of differences of means between male and female was statistically significant. Significant positive correlation was found between the stature and length of ulna in both Garo male and female. The results of present study would be useful for Anthropologist and Forensic Medicine experts.

Key words: Anthropometry, length of ulna, Garo.

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Introduction

Anthropometry is the study of the human body in terms of the dimensions of bone, muscle and adipose tissue. The word "Anthropometry" is derived from the Greek word "anthropo" meaning human and the Greek word "metron" meaning measure. Anthropometry is a widely used, inexpensive and non-invasive measure of the general nutritional status of an individual or a population group[1].

Anthropometry provides the data used in the indirect appraisal of body composition. In the nineteenth century, anthropometry was used in the creation and validation of racial typologies. Recent studies have demonstrated the applications of anthropometry to include the prediction of who will be benefited from interventions, identifying social and economic inequity and evaluating responses to interventions[2].

An individual's anthropometry influences his interaction with his workstation. A mismatch between an anthropometry and workstation may increase the physical stresses on the body as the individual may be forced to assume awkward postures to accommodate to the workstation design[3].

Bangladesh is a pluralistic society where people from different religions, races and castes have been living together since time immemorial. Among 30 ethnic minority groups living in different parts of the country, the "Garo" is one of the larger marginalized ethnic minority groups in Bangladesh. This matriarchal community differ noticeably from the rest of the population in term of their appearance, language, religion and social organization[4].

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In the early years of the 9th century, Garo migrated to Bangladesh from 'Tibet'. They started living at the Garo hills of Mymensingh where they lived until the 13th century under the 'Garo Empire'. Still now, Garo are living in some hill areas of Mymensingh, Netrokuna, Tangail, Gazipur, Sylhet, Sunamganj, Jamalpur and some other places of the country[5].

Estimation of stature from measurements of various long bones of the extremities has been attempted by many scientists with varying degree of accuracy. 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 from their skeletal remains, regression formulae for stature estimation have been generated[6].

The present study was designed to formulate a standard for 20-40 years aged Bangladeshi Garo population and to assess the sex specific variation in the carrying angle.

Methods:

The study was carried out in different areas of Mymensingh district (Mymensingh Sadar, Haluaghat), Bangladesh during the period of July 2015 to June 2016. The study was cross sectional, observational, descriptive and analytic type. The participants were selected through purposive sampling. A total number of 104 Garo people (60 male and 44 female) were selected. All of them were 20-40 years old and dwelling in different areas of Mymensingh district. They were healthy individual and Bangladeshi by nationality.

Standing height was measured with a fixed stadiometer with a vertical board and a moveable headboard1. The stature was measured as the vertical distance from the vertex to the floor. Measurement was taken by making the subject stand erect on a horizontal resting plane with bare foot, having the palms of the hands turned inwards and the fingers pointing downwards. The head was in the Frankfort plane ie. a horizontal plane passing through the external auditory meatus to the lower border of the orbit which is parallel to the floor and perpendicular to the vertical board. Then the moveable headboard was brought in contact with the vertex in the mid sagittal plane after removing hair ornaments from the top of the head in order to measure stature properly. The subject was instructed to take a deep breath and stand as erect as possible. Sufficient pressure was put to compress the hair.

The length of each ulna was measured from behind by using a measuring tape. The subject was asked to extend elbow when the apex of the olecranon could be felt in a transverse line with the two epicondyles. From this point a measuring tape was extended downwards along the posterior surface of the forearm to the tip of the styloid process of the ulna (Fig. 1). This measurement was recorded in centimeters following Laila (2008)7.

Fig. 1 Procedure of measurement of length of ulna using measuring tape

Result:

Present study showed that mean value of stature male and female were 163.275(±6.1044) cm and 150.511(±5.2512) cm respectively (table I).

Table I: Stature and length of ulna in the Garo males and females

Variable		Sex	Range	Mean (±SD)
Stature (cm)		Male	151.0 - 176.2	163.275(±6.1044)
		Female	138.0 - 162.0	150.511(±5.2512)
Length of ulna (cm)	Right	Male	22.3 - 28.4	25.163(±1.2847)
		Female	21.1 - 25.4	23.518(±1.0617)
	Left	Male	22.6 - 28.3	25.132(±1.2504)
		Female	21.2 - 25.4	23.498(±1.0626)

The stature of Garo males of 20-40 years age ranged from 151 cm to 176.2 cm. More than 76% of the respondents possessed stature between 155 cm to 170 cm. Besides, the stature of 44 Garo females ranged from 138 cm to 162 cm. More than 86% of the respondents had stature between 145 cm to 160 cm (fig. 2)

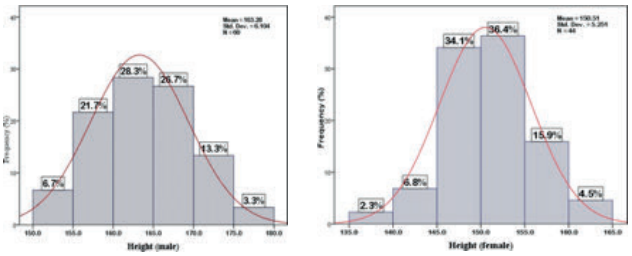
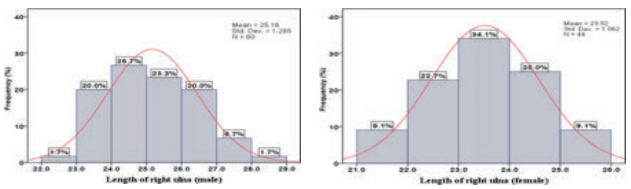


Fig. 2 Frequency distribution of the stature of Garo male and female

The length of right ulna of 60 Garo males of 20-40 years ranged from 22.3 cm to 28.4 cm. More than 89% of the respondents possessed between 23 cm to 27 cm. Besides, the length of

right ulna of 44 Garo females of 20-40 years ranged from 21.1 cm to 25.4 cm. More than 81% of the respondents measured between 22 cm to 25 cm (fig. 3).

The length of left ulna of 60 Garo males of 20-40 years ranged from 22.6 cm to 28.3 cm. More than 90% of the respondents measured between 23 cm to 27 cm. Also, the length of left ulna of 44 Garo females of 20-40 years ranged from 21.2 cm to 25.4 cm. More than 81% of the respondents were between 22 cm to 25 cm (fig. 3).



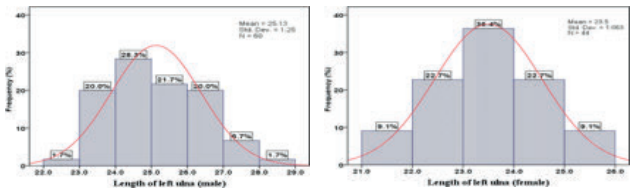


Fig. 3 Frequency distribution of length of ulna of Garo male and female

Table II: Comparison of means of length of ulna between Garo males and females

Variable	Mean difference	Std. error	'P' value
Length of ulna(cm)	1.645152	0.237334	0.000[HS]

HS= Highly-significant at 5% level of significance on two-sample independent t- test.

Mean length of ulna of right side was found to be greater in Garo males than females among 20-40 years age and statistical analyses showed that the differences between the two sexes were found to be highly significant (fig 4).

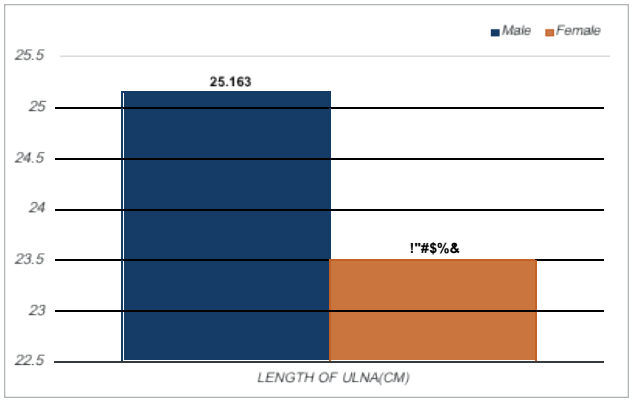


Fig. 4 Bar diagram showing comparison of means between Garo males and females regarding length of ulna right side (p= 0.000, highly significant).

Table III: Correlation and regression analysis between stature and Length of ulna in Garo males and females:

Variable		Sex	Constant	B	Correlation with stature	
					r	P-value
Length of ulna (cm)	Right	Male	85.573	3.087	0.649[S]	0.000*
		Female	63.121	3.716	0.751[S]	
	Left	Male	83.497	3.174	0.650[S]	
		Female	65.279	3.627	0.734[S]	0.000*

*= Correlation is significant at the 0.01 level (2-tailed). B = Regression co-efficient
S = Significant r = Pearson's correlation

The length of right ulna showed a significant positive correlation with the stature in both Garo male (r= 0.649, p= 0.000) and female (r= 0.751, p= 0.000). The constant and regression co-efficient value regarding length of right ulna are 85.573 and 3.087 in Garo male and 63.121 and 3.716 in Garo female respectively for estimating the stature (table III).

The length of left ulna showed a significant positive correlation with the stature in both Garo male (r= 0.650, p= 0.000) and female (r= 0.734, p= 0.000). The constant and regression co- efficient value regarding length of left ulna are 83.497 and 3.174 in Garo male and 65.279 and 3.627 in Garo female respectively for estimating the stature (fig 5).

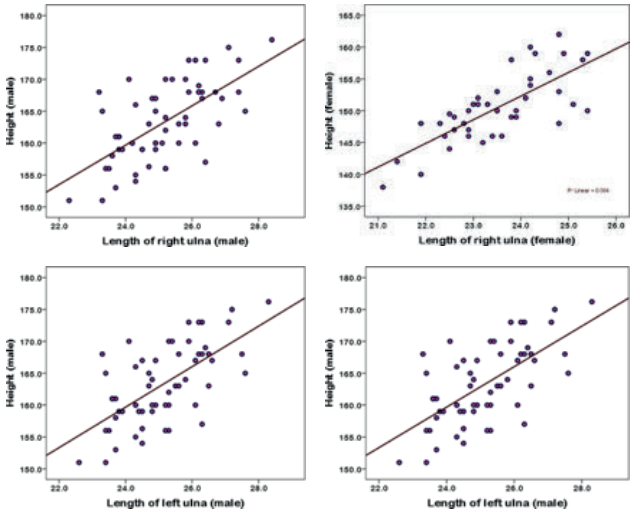


Fig. 5. Scatter diagram showing significant positive correlation between the stature and length of ulna in both Garo male and female.

Discussion

According to the present study, in Garo male, the minimum value of length of right ulna was

22.3 cm and the maximum value was 28.4 cm. The mean length of right ulna was 25.163(±1.2847) cm. Also, the minimum value of length of left ulna was 22.6 cm and the

maximum value was 22.6 cm in Garo male. The mean length of left ulna was 25.132(±1.2504) cm.

On the other hand, in Garo female, the minimum value of length of right ulna was 21.1 cm and the maximum value was 25.4 cm. The mean length of right ulna was 23.518(±1.0617) cm. Also, the minimum value of length left ulna was 21.2 cm and the maximum value was 25.4 cm in Garo female. The mean length of left ulna was 23.498(±1.0626) cm.

There was a significant (p=<0.001) positive correlation between the stature and the length of ulna on either side of both Garo male or female.

Thummar et al. (2011) mentioned that mean ulnar length in Gujarat for right ulna of male was

28.48 cm, of female was 25.99 cm and combined length of right ulna was 27.35 cm. Thummar et al. (2011) also mentioned that mean ulnar length in Gujarat for left ulna of male was 28.39 cm, of female was 25.54 cm and combined length of left ulna was 27.38cm. The current study shows that Bangladeshi Garo male and female possess shorter ulna than Gujarati people8. Green and Gabriel (2014) stated that mean ulnar length of adult male was 27.69 ± 2.44 cm and that of female was 24.66 ± 2.42 cm among Canadian population which was higher than the present study on Bangladeshi Garo population[9].

Shah, Saiyed and Patel (2012) performed a study on 'A Study of relation of stature and percutaneous ulnar length' and observed that mean ulnar length of adult male was 27.22 ± 1.40 cm and that of female was 24.93 ± 1.38 cm in Ahmedabad. But the current study figure out that Bangladeshi Garo people have a lower ulnar length than that of people of Ahmedabad10. Mohanty et al. (2013) stated that mean ulnar length of adult male was 23.69 ±1.01 cm and that of female was 23.66 ±0.632 cm in population of Eastern India. But the present study shows that Bangladeshi Garo male have a longer ulna than Eastern Indian male. Besides, Eastern Indian women have similar ulnar length to that of Bangladeshi Garo female[11].

Chittawatanarat et al. (2012) stated that the mean length of the non-dominant ulna was 25.0±2.3 cm in adult male and was 23.2±2.0 cm in adult female in Thai people which are similar to that of Bangladeshi Garo people as shown in the present study[12].

Bansal et al. (2014) described that mean ulnar length in Gujarat for right ulna of male was 27.81±2.02 cm and of

female was 24.80±1.92 cm. Bansal et al. (2014) also stated that mean ulnar length in Gujarat for left ulna of male was 27.79±2.03 cm and of female was 24.70±1.80 cm. But, the present study figured out that Bangladeshi Garo people have smaller ulnar length.

Ebite et al. (2007) observed that mean length of ulna in male was 30.33±1.53 cm and in female, it was 28.50±1.87 cm among people of Uromi, Edo state, Nigeria. Bangladeshi Garo people have a smaller ulnar length than Nigerian people as found in the present study[13].

Mondal et al. (2012) described that the means of the left and the right ulnar lengths are calculated as 24.46±1.18 cm and 24.55±1.17 cm in adult female of West Bengal, India which was higher than the findings on the current study among Bangladeshi Garo population[14].

Fallahi and Jadidian (2011) mentioned that mean length of ulna of dominant upper limb of athlete was 26.86±1.84 cm and that of non-athlete was 25.76±2.05 cm. But Bangladeshi Garo people own a smaller ulna than athlete and similar ulnar length like non-athlete as found in the present study[15].

Madden, Tsikoura & Stott (2012) conducted a study in a gender-stratified sample of 60 Asian, 69 Black and 65 White healthy volunteers, aged 21–65 years and described that mean length of ulna was 26.6 ±1.0 cm in Asian men, 29.3±1.5 cm in Black men, 27.5±1.2 cm in White men, 24.7±0.7 cm in Asian women, 26.3±1.8 cm in Black women, 24.7±1.4 cm in White women. According to the present study, both Bangladeshi Garo male and female possess shorter ulna than Asian, Black and White people[16].

Bamne et al. (2014) stated that mean length of ulna of right side was 27.90 ± 1.20 cm and of left side was 27.75 ± 1.17 cm in male. Bamne et al. (2014) also stated that mean length of ulna of right side was 27.90 ± 1.20 cm and of left side was 27.75 ± 1.17 cm in female among Maharastrian population. The present study figures out that Bangladeshi Garo individual have a smaller length of ulna than Maharastrian population[17].

Ruparelia et al. (2010) mentioned that the mean length of ulna of right limb in adult male was 22.70±1.21 cm and that of left limb was 22.69±1.22 cm among asymptomatic healthy students of Nursing School in Gujrat which was lower than the length of the length of Bangladeshi Garo male. Ruparelia et al. (2010) also stated that the mean length of ulna of right limb in adult female was 24.96±1.30 cm in Gujrat. Thwas finding was higher than the length of ulna of Bangladeshi Garo female[18].

As per current study individual from Maharashtra, Ahmedabad, Gujrat, Canada, Nigeria, Black & White Asia have longer ulna than Bangladeshi Garo individual. But, individual from West Bengal, Thailand, Eastern India have almost similar length of ulna in comparison to Bangladeshi Garo individual (fig 5).

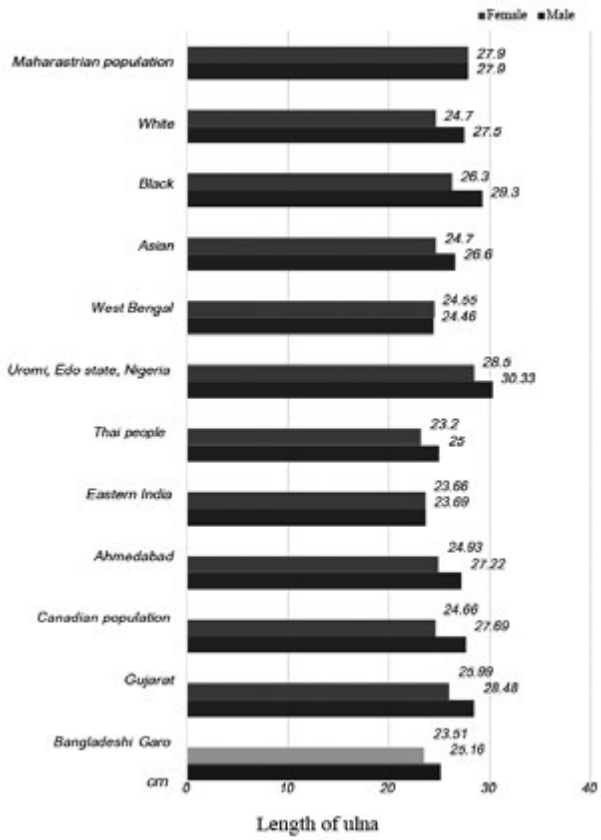


Fig. 6 Length of ulna of Bangladeshi Garo and Other population of different country

Conclusion:

Findings of the present study indicate that different anthropometric measurements between men and women is different. The length of ulna among 20-40 years aged Garo male were larger than females.

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