Original Article

Maximum Cranial Length, Maximum Cranial Breadth and their Correlation with Stature in Bangladeshi Adult Garo Male

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Abstract

Objectives: *This cross-sectional descriptive type of study develops a standard for Bangladeshi Garo male regarding maximum cranial length & maximum cranial breadth. The study also evaluates stature & find out the correlation of cranial length & cranial breadth with stature.*

Methods: *The study was carried out at different areas of Mymensingh, Bangladesh from January 2016 to June 2016, on the cranium of Garo Male within the age of 25-45 years. The linear measurements were taken by spreading caliper. Data were tabulated and statistically analyzed using Microsoft excel and SPSS software. Correlation between cranial length and cranial breadth with stature was observed by using Pearson's Correlation Coefficient test.*

Results: *The mean (±SD) maximum cranial length and maximum cranial breadth were found 19.44 (±0.91) and 14.85 (±0.88) cm respectively. The mean (±SD) stature was 160.17 (±6.86) cm. The maximum cranial length (r = 0.44) and the maximum cranial breadth (r = 0.26) both had significant positive correlation with stature (p <0.001).*

Conclusion: *The stature has significant positive correlation with cranial length and cranial breadth.*

Key words: *Stature, Garo, Glabella, Opisthocranion, Euryons, Vertex, Maximum cranial length and Maximum cranial breadth.*

Introduction

Estimation of stature is a very important indicator of growth and development and is used in clinical settings for nutrition and health research. Stature is an important parameter to calculate basal energy expenditure, body mass index, basal metabolic rate, body composition and estimations of nutrient requirements[1]. To estimate approximate structure of an unknown individual from any single bone is always a difficult task for an anthropologist and forensic examiner. Every part of human body is unique in itself as every part of the body in different in its own way from a similar part in another part of body though there is relationship between each part of the body and whole body. In this aspect, cranial length and cranial breadth provides an opportunity for estimating stature of an unknown individual. In 1984, very first time, Dwight estimated stature from skeleton by anatomical way[2].

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[3].

Glabella is the most prominent point in the median sagittal plane between the supraorbital ridges of the face. Opisthocranion is the most prominent posterior point of the occiput. Euryon is the most lateral point on the head, located in the parietal region. Vertex is the height point of the skull held in the Frankfort horizontal plane. Maximum cranial length, the straight distance between the glabella and the opisthocranion. Maximum cranial breadth, the distance between the euryons on the parietal bone on each side of the head [4].

Many studies have already done showing correlation of stature with long bone. The present study is designed to establish standard measurements of cranial length, cranial breadth and correlate them with stature of Bangladeshi adult Garo male.

Methods

The study was observational and cross-sectional in nature with both descriptive and analytical components. The study was carried out at different areas of Mymensingh (Mymensingh Sadar, Haluaghat, Madhuopor) and the period was from January, 2016 to June, 2016. The participants were 25-45 years aged 121 Bangladeshi Garo male residing in different areas of Mymensingh. They were without any history of acquired or genetic craniofacial anomalies.

Measurements were taken from the front of the participant, sits in erect posture with head oriented in the Frankfort Plane and arm hanging at sides. The tips of the spreading caliper were held between the thumb in front and the index fingers behind, with the curved arm resting on the flexed middle and fourth fingers.

For measuring the maximum cranial length, the tips of the spreading caliper were held between the tips of researcher's thumb and index fingers, with the curved arm resting on the flexed middle and fourth fingers. The tip of the anterior arm of the caliper was applied to the glabella. The tip of the posterior arm of the caliper was applied to the most prominent part of the occiput (opisthocranion) and moved it up and down until the maximum reading was obtained then reading taken[5].

A B

Figure 1. Procedure of measuring the maximum cranial length (A) and cranial breadth (B)

For measuring the maximum cranial breadth, subject sits erect with head oriented in the Frankfort Plane and arm hanging at sides, the tips of the spreading caliper were placed in the region of the most prominent point of the parietal eminences (euryon) and then maximum reading was taken [5].

Stature is the vertical distance from a standing surface to the vertex of the head. Measured with a stadiometer. The subject stands erect with the head in the Frankfurt plane**.** The heels are together with the weight distributed equally on both feet. The shoulders and upper extremities are relaxed. The measurement is taken at the maximum point of quiet respiration. Data were tabulated and statistically analyzed using Microsoft excel and SPSS software, version 21. Correlation between cranial length and cranial breadth with stature was observed by using Pearson's Correlation Coefficient test. P-value <0.05 was considered as statistically significant.

Results

Table I: Measurements of the cranium of Garo male

Variable(cm)	range		Mean	(±SD)
	maximum	minimum		
Maximum cranial length	21	17	19.44	0.91
Maximum cranial breadth	16	13	14.85	0.88

The Maximum cranial length of 121 Garo male of 25 to 45 years age ranged from 17 cm to 21 cm. More than 85% respondents were measured within the range of 19 cm to 21 cm shown in figure 2

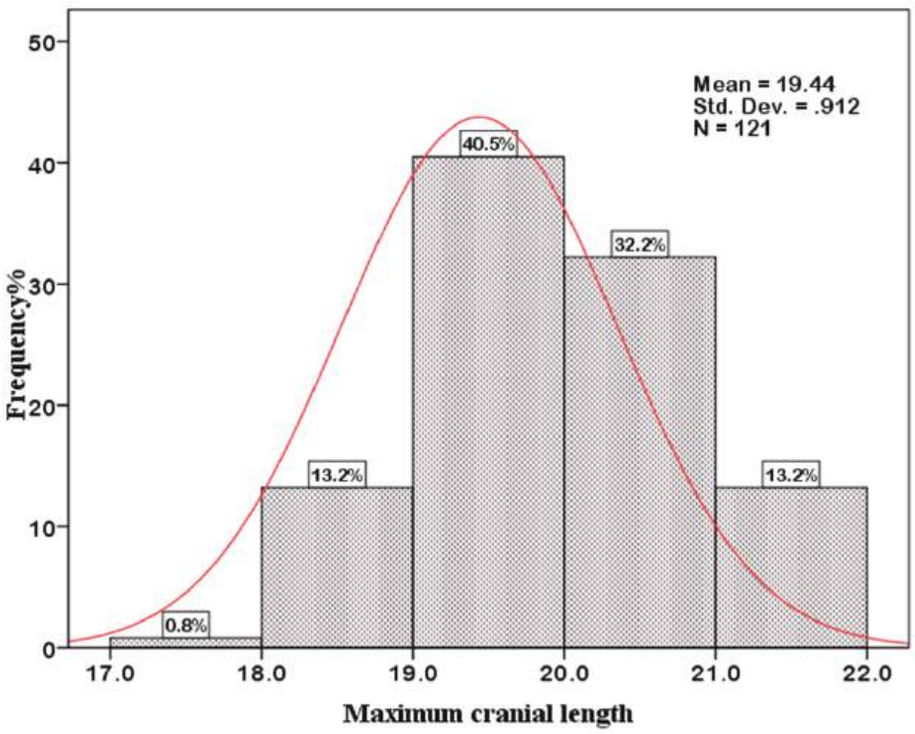


Figure 2: The frequency distribution of maximum cranial length (n=121)

The Maximum cranial breadth of 121 Garo male of 25 to 45 years age ranged from 13 cm to 16 cm. More than 94% respondents were measured within the range of 14 cm to 16 cm as shown in figure 3.

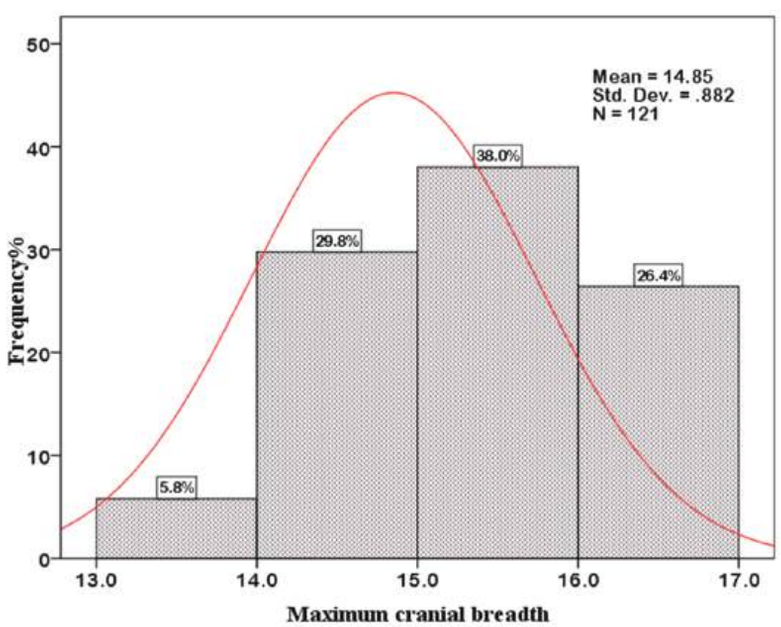


Figure 3: The frequency distribution of maximum cranial breadth (n=121)

Table II: Measurements regarding stature of Garo male

Variable(cm)	range		Mean	(±SD)
	maximum	minimum		
Stature	178	144	160.17	6.86

The stature of 121 Garo males of 25-45 years age ranged from 144 cm to 178 cm. More than 86% of the respondents measured between 150 cm to 170 cm as shown in figure 4.

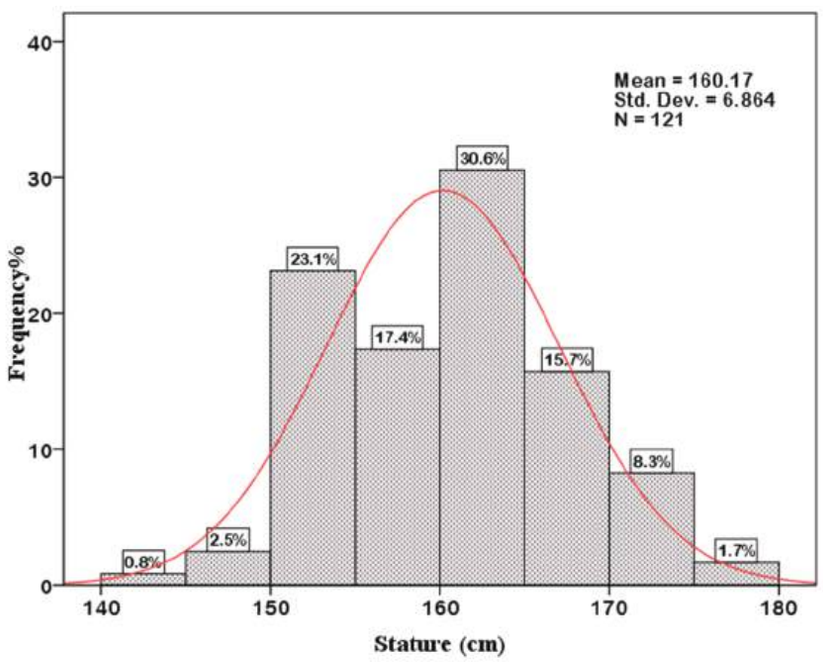


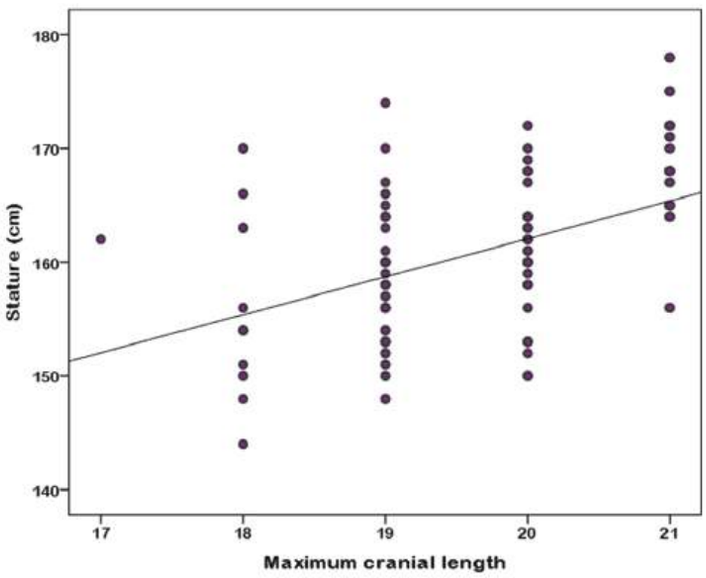
Figure 4: The frequency distribution of stature (n=121)

Table III: Result regarding correlation between stature with cranial length and cranial breadth

Variables	Measurements Mean ±SD (Range)	Correlation with stature	
		r	p-value
Maximum cranial length (cm)	19.44 (17-21)	0.44^{S}	0.0001
Maximum cranial breadth (cm)	14.85 (13-26)	0.26^{S}	0.003

S = Significant
r = Pearson's correlation
$p \leq 0.05$ is considered as significant

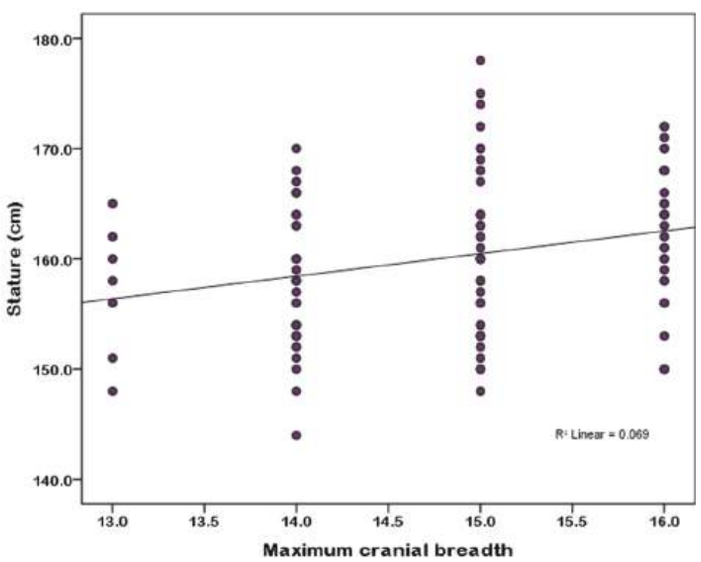
Maximum cranial length showed a significant positive correlation (r=0.44, p=0.0001) with the stature in Garo male (Figure 5).



- Observed value
— Fit line at total

Figure 5: Scatter diagram showing significant correlation between the stature and the maximum cranial length in Garo male.

Maximum cranial breadth also showed a significant positive correlation (r=0.26, p=0.003) with the stature in Garo male (Figure 6)



- Observed value
— Fit line at total

Figure 6: Scatter diagram showing significant positive correlation between the stature and the maximum cranial breadth in Garo male.

Discussion

According to the current study, in Garo male, the minimum value of mean maximum cranial length was 17 cm and the maximum value was 21 cm. The mean maximum cranial length 19.44(±0.91) cm. The mean maximum cranial length of the present study population is almost identical to Fulani, Tangale & Tera indigenous group of Nigeria[6] & the study of Gronthola[7] in the students of Boston University. While it is higher than population of Gujjars of north India[8], Haryanvi adults[9] & Punjabi population[10]. The mean maximum cranial length of Bangladeshi Garo male is lower than Hausa and Yoruba populations[11].

The present study Garo male has minimum value of mean cranial breadth is 13 cm and the maximum value was 17 cm. The mean value is 14.85(±0.88) cm. The mean cranial breadth is higher in Latvian residents[12], students of Boston University[7], Punjabi population[13], Nigerian population[14] but lower in Haryanvi adults[15], Gujjars of north India[8], Fulani, Tangale, Tera indigenous group of Nigeria[6] than the value of present study group. The current study is almost similar to Onges population in India[16].

The minimum value of stature is 144 cm and the maximum value is 178 cm in Garo male of the present study. The mean value of stature is 160.17(±6.86). The mean value of stature of the present study is lower than the populations of Native America[17], Onges, India[16] but higher than North Indian Adult population[18]. The current study is almost similar to Hausa and Yoruba population[11] in Nigeria.

The result of present study shows some similarities and dissimilarities with the result of other researchers which may be due to the selection of study population of same sex, ethnicity, age, race or geographical location. Dissimilarities also might be due to use of different techniques of measurement.

Conclusion

In Bangladesh stature estimation from craniofacial dimensions for personal identification is not established. If it is established in Bangladesh, it will become an important tool for forensic department. The measurements of cranial length, cranial breadth & stature would be useful in the field of anatomy, anthropology, archeology, sports science and ergonomics.

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