

A Cross-Sectional Study on Craniofacial Measurements and Their Relationships with the Stature in Adult Bangladeshi Manipuri Males

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ABSTRACT

Introduction: Craniofacial anthropometry can be useful for forensic scientist, physical anthropologist, genetic counsellors as well as reconstructive surgery for the purposes of identification of an individuals and understanding human physical variation, gender and ethnicity especially with facial recognition as a tool in recent advances in biometrics. Stature is one of the important criteria for personal identification which have a proportional biological relationship with every parts of the human body like head, face, trunk, extremities and vertebral column.

Objective: In this study our main goal is to measure the selected linear craniofacial measurements from head and face region and the stature using the direct physical procedure.

Materials and Methods: This cross-sectional study was carried out in 100 healthy adult males from March 2017 to February 2018 in the Department of Anatomy, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. Descriptive statistics and testing of hypotheses were used for the analysis using SPSS software (version 22.0).

Results: Here positive correlations of the stature with the maximum cranial length, maximum cranial breadth, morphological face height, maximum facial breadth, but significant positive correlations of the stature with the maximum cranial breadth, maximum facial breadth, was found. The Mean

(\pm SD) of Maximum cranial length (g-op) was 17.73 (\pm 0.74), Maximum cranial breadth (eu-eu) was 14.27 (\pm 0.75), Morphological face height (n-gn) was 11.15 (\pm 0.86) and Maximum facial breadth (zy-zy) was 12.56 (\pm 0.59).

Conclusion: This study will be anticipated to provide baseline quantitative data on the linear craniofacial measurements and the stature of adult Bangladeshi Manipuri males and using larger samples with non-contact measurement technique will help in defining craniofacial anthropometric profiling of the adult Bangladeshi Manipuri males.

Keywords: Craniofacial, Anthropometry, Stature.

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INTRODUCTION

One of the primordial concerns is defining the physical size and shape of the human body. Measurements are the important tools for comparisons and the branch of physical anthropology that deals with measurements of different body parts is called Anthropometry.¹ Anthropometry is a Greek word, 'Anthrops' meaning human and 'metry' meaning measurement. So

anthropometry is being used in order to take the measurements of the human body.²

One of the important divisions of anthropometry is cephalometry, which is a measurement of the head and face.³ The human face is an alive reflection which creates a center of attention of charm, brighten and seduce. Facial anthropometry provides a suggestion

of the variation in facial shape in a population. Facial features and facial dimensions are vary in different races and ethnic groups. Studying of human face and the assessment of facial dimensions draw the attention of the artist, poets and scientists, genetic counsellors and takes a prime importance in medical and dental fields in both diagnosis and treatment planning such as rhinoplastic surgery, orthognathic and orthodontic surgery for any congenital or post traumatic facial disfigurements in members of local population and different ethnic groups, otherwise lose their ethnic.⁴

Moreover, Cephalofacial parameters are useful in forensic scientist, physical anthropologist for the purposes of identification of an individuals and understanding human physical variation, gender and ethnicity especially with facial recognition as a tool in recent advances in biometrics. Craniofacial anthropometry is also used for design of clothing, equipment, military and industrial helmets.⁵ Craniofacial anthropometric measurements are a major consideration in the aircraft cockpit design and layout requires the knowledge of human anthropometric dimensions to facilitate aircrew- aircraft compatibility for the local population of the country.⁶

Stature is one of the important criteria for personal identification which have a proportional biological relationship with every part of the human body like head, face, trunk, extremities and vertebral column.⁷ This relationship helps in calculating stature from

decomposed, mutilated and amputated body fragments in recent times due to natural disasters like earth-quakes, tsunamis, floods and man-made disasters like bomb blasts, car accidents, wars, plane crashes etc. It is important both for legal and humanitarian reasons.⁸

In Bangladesh, there are many people died in natural disasters like landslides, heavy rainfall and man-made disaster like Rana plaza tragedy. For this reasons, craniofacial anthropometry can play a significant role in determining the characteristics of different racial and ethnic groups.

Anthropometric studies on adult Chakma, Garo, Rakhain, Santal, Manipuri females and Bengali Muslim females of Bangladesh were done in the Department of Anatomy, BSMMU, but no study was carried out in Manipuri males. The Manipuri community is one of the oldest tribes in Bangladesh. The present study will be useful in comparing of Manipuri males features with the features of Manipuri females and different other ethnic communities of Bangladesh. Therefore, the contribution of the present study will be expected to help in setting a standard of normative value of stature, craniofacial anthropometric values, indices and estimated values of adult Bangladeshi Manipuri males. Present study has created new information and fills up the information gap regarding these indigenous people. So this study will be anticipated to provide baseline quantitative data on the stature and linear craniofacial measurements of adult Bangladeshi Manipuri males.

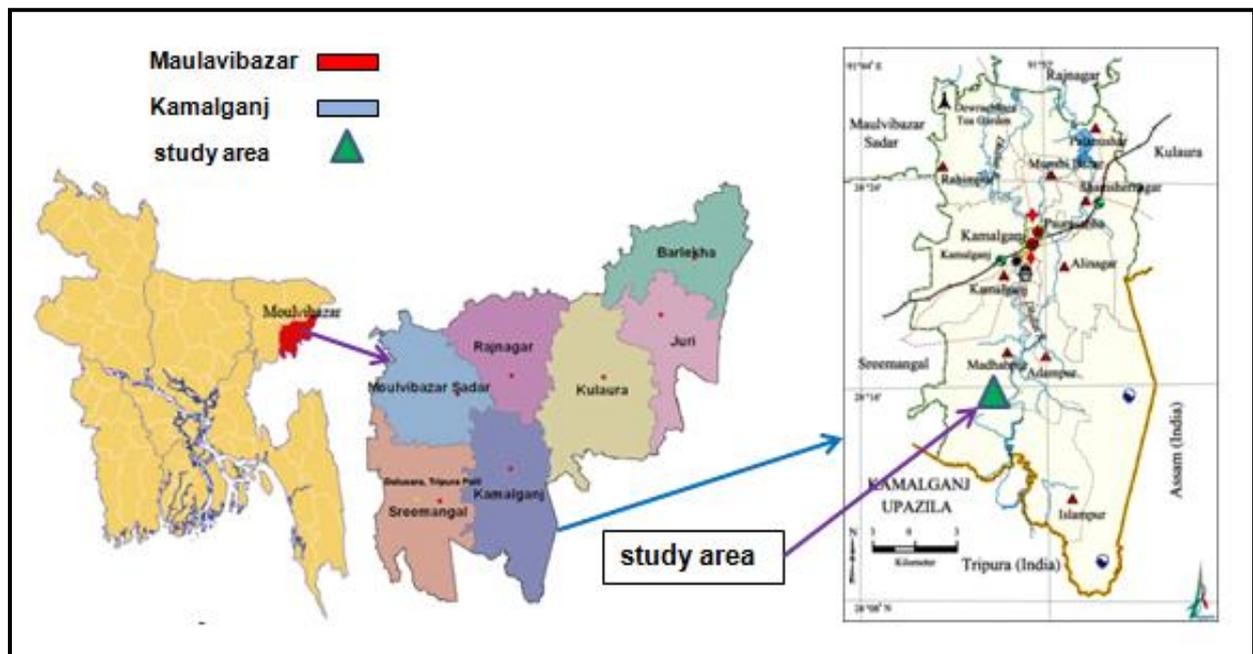


Figure 1: Geographical location of the study area; ('Kamalganj Upazila' 2015)^{9,10}

OBJECTIVES

General Objective

To measure the selected linear craniofacial measurements from head and face region and the stature using the direct physical procedure.

Specific Objective

- To identify the range and mean values of stature and selected linear craniofacial measurements in adult Bangladeshi Manipuri males.
- To determine whether there is any correlation of stature with the selected linear craniofacial measurements.

MATERIALS AND METHODS

Study Design and Participants

The study was cross-sectional with some analytical components. The study was carried out on a hundred healthy adult Bangladeshi Manipuri males residing at Madhabpur village of Kamalganj Thana of Maulavibazar district in the Sylhet division of Bangladesh.

Place and Period of the Study

The study was carried out on the healthy adult Bangladeshi Manipuri males of Madhabpur village at Kamalganj upazila of Maulavibazar district of Sylhet, Bangladesh (Figure 2.1). The period of the study was March 2017 to February 2018. Data analysis was

carried out in the Department of Anatomy, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh.

Inclusion Criteria

Each participant was selected who met the following criteria:

- a) Aged between 25 to 45 years
- b) Bangladeshi by nationality
- c) Manipuri by ethnicity
- d) Male by sex

Exclusion Criteria

The following criteria were used to screen out the ineligible participants through history taking and physical examinations:

- a) Mixed ethnic origin- if there was any history of marriage of last three generation of participant with Bengali people or with any other ethnic minority
- b) History or evidence of congenital craniofacial anomalies, major craniofacial trauma, orthodontic treatment or craniofacial

reconstructive surgery that might affect craniofacial measurements.

c) History of recent respiratory distress or common cold (as they might hamper the measurement process).

d) Malocclusion of teeth that might affect craniofacial measurements.

e) Common genetic, endocrine or neurological disorders that might affect craniofacial measurements and stature (Down's syndrome, acromegaly, myxedema, facial palsy).

f) Baldness or presence of beard or moustache.

Data Analysis

During the study all the data were checked and edited after collection. Then the data were entered into computer and statistical analyses of the results were obtained by using window-based computer software devised with Statistical Packages for Social Sciences (SPSS version 22.0) and Microsoft Excel.

Table 1: Values of stature and selected linear craniofacial measurements in adult Bangladeshi Manipuri males (n= 100)

| Measured Stature and linear craniofacial measurement | Value (cm) | |
|--|-----------------|----------------|
| | Range | Mean (±SD)* |
| Stature | 150.10 – 177.10 | 163.47 (±7.06) |
| Craniofacial measurements | | |
| Maximum cranial length (g-op) | 16.00 – 19.20 | 17.73 (±0.74) |
| Maximum cranial breadth (eu-eu) | 12.10 – 16.20 | 14.27 (±0.75) |
| Morphological face height (n-gn) | 7.94 – 13.09 | 11.15 (±0.86) |
| Maximum facial breadth(zy-zy) | 11.00 – 13.50 | 12.56 (±0.59) |

*SD: Standard deviation

Table 2: Correlation coefficients of selected linear craniofacial measurements with the stature in adult Bangladeshi Manipuri males (n= 100)

| Linear craniofacial measurement | Correlation coefficient (r) | Coefficient of determination (r ²) | Significance (p)* of correlation with the stature |
|---|-----------------------------|--|---|
| Maximum cranial length (g-op) | +0.041 | 0.002 | 0.682 |
| Maximum cranial breadth (eu-eu) | +0.217 | 0.047 | 0.030 |
| Morphological face height (n-gn) | +0.001 | 0.000 | 0.991 |
| Maximum facial breadth(zy-zy) | +0.229 | 0.052 | 0.022 |

*p: Probability; If p value ≤ 0.05 was considered as significant (S)

RESULTS

The range, mean values and standard deviations of different variables related to the stature and selected linear craniofacial measurements of 100 adult Bangladeshi Manipuri males were obtained through direct physical procedure. The Mean (±SD) of Stature was 163.47 (±7.06), Maximum cranial length (g-op) was 17.73 (±0.74), Maximum cranial breadth (eu-eu) was 14.27 (±0.75), Morphological face height (n-gn) was 11.15 (±0.86) and Maximum facial breadth (zy-zy) was 12.56 (±0.59) are presented in Table 1.

The positive significant results of the correlation between the stature and each of the selected linear craniofacial measurements

are shown in Table 2. The maximum cranial length showed non-significant positive correlation (r= +0.041, r²= 0.002, p= 0.682) with the stature of the adult Manipuri males (Table 2 and Figure 2).

The maximum cranial breadth showed significant positive correlation (r= +0.217, r²= 0.047, p= 0.030) with the stature of the adult Manipuri males (Table 2 and Figure 3).

The morphological face height showed non-significant positive correlation (r= +0.001, r²= 0.000, p= 0.991) with the stature of the adult Manipuri males (Table 2 and Figure 4).

The maximum facial breadth showed significant positive correlation (r= +0.229, r²= 0.052, p= 0.022) with the stature of the adult Manipuri males (Table 2 and Figure 5).

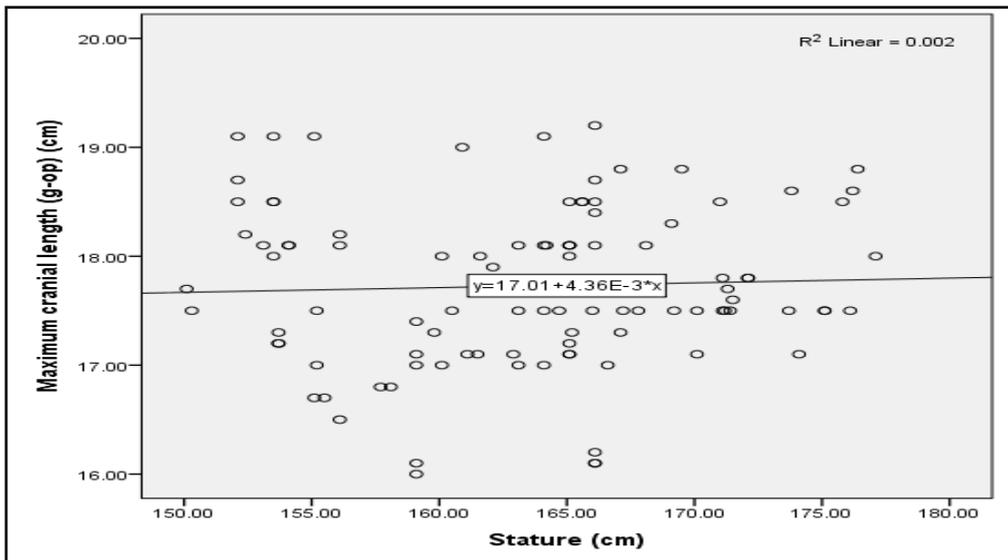


Figure 2: Scatter diagram showing non-significant positive correlation between the maximum cranial length and the stature in regression analysis.

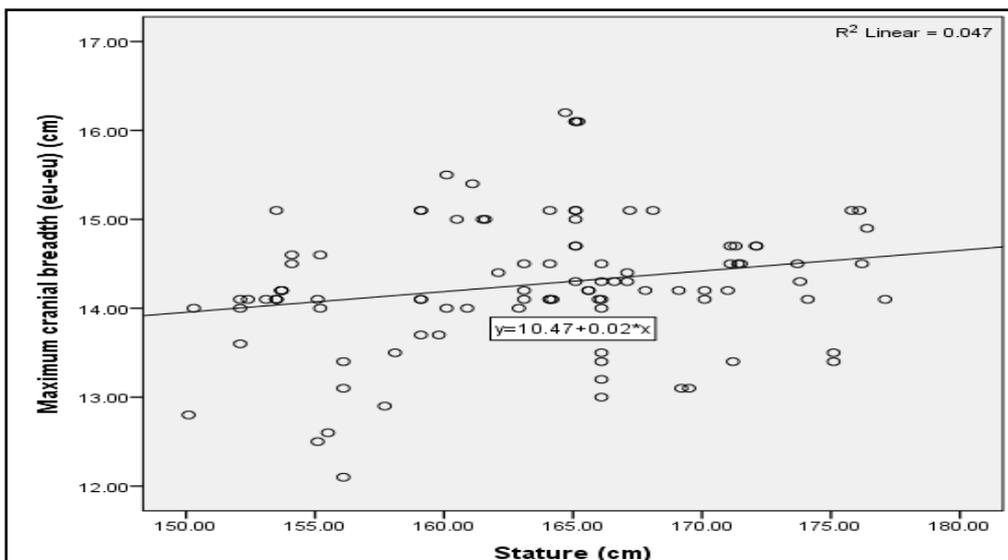


Figure 3: Scatter diagram showing significant positive correlation between the maximum cranial breadth and the stature in regression analysis

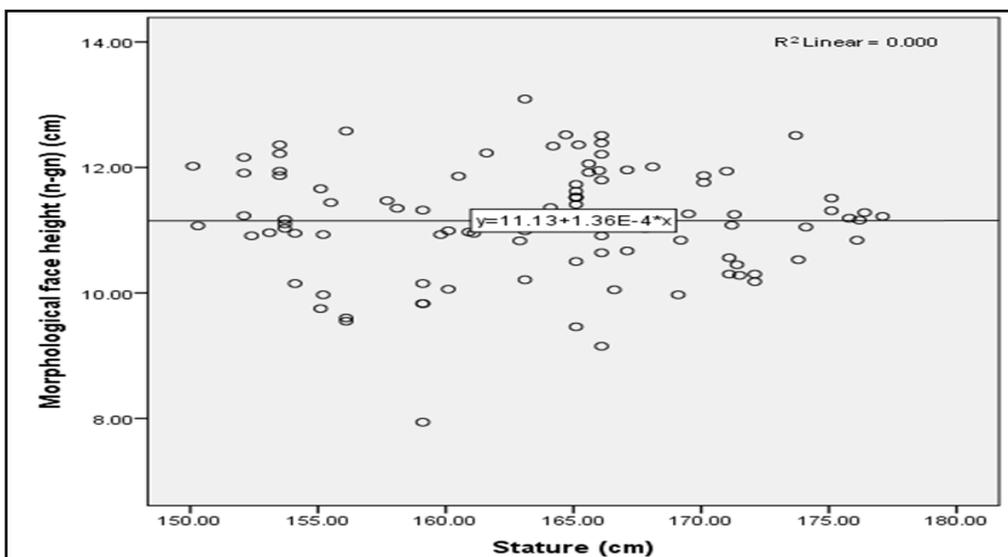


Figure 4: Scatter diagram showing non-significant positive correlation between the morphological face height and the stature in regression analysis

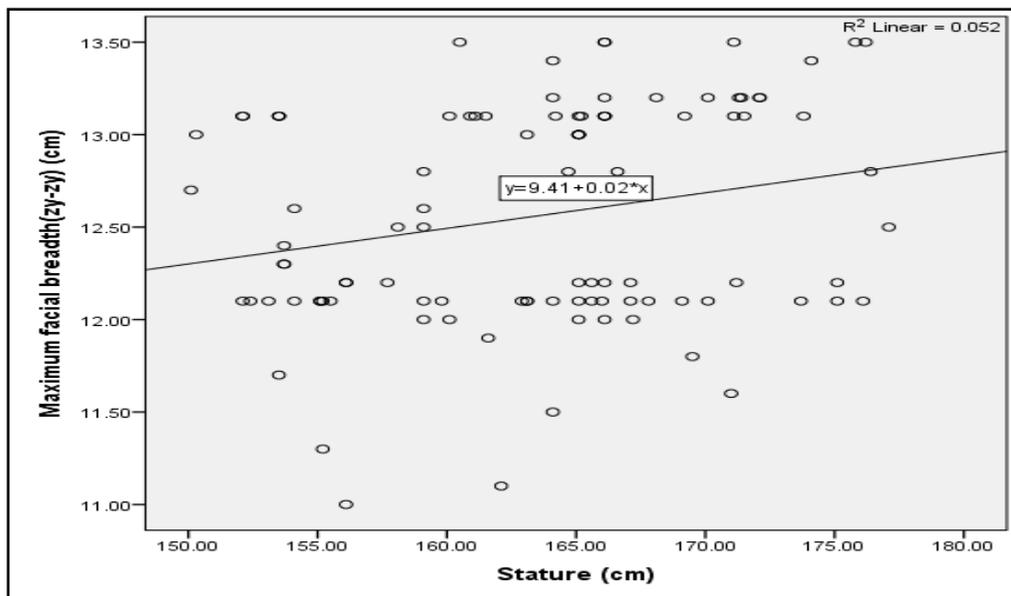


Figure 5: Scatter diagram showing significant positive correlation between the maximum facial breadth and the stature in regression analysis.

DISCUSSION

The present anthropometric study was carried out in 100 adult Bangladeshi Manipuri males which provide new data pertaining to the selected craniofacial measurements and stature by means of physical procedures. It also looked for any correlation between the stature and each of the selected craniofacial measurements.

Manipuri belong to the Kuki-Chin group of the Tibeto-Burman family of the Mongolian race.¹¹ The Mongolians are mostly inhabitants of China Mongolia, Tibet, North America, Siberia, Greenland, Burma, Thailand, Malay Peninsula, Philippines, Japan and North-East India.¹² Craniofacial anthropometric studies have been carried out by various researchers on different Negroid and Caucasoid populations as well as on the Mongoloids residing in different geographical regions of the world.

The age range of the Manipuri study participants was kept between 25 to 45 years. This age limit was based on the concept that anthropometric measurements in adults should be standardized normative values at such an age when the development of the respective body parts is complete).

The relationship between the stature and other craniofacial measurements are likely to differ according to age, sex, race and ethnic background.

The physical changes occur in the human body at every stage of life. Most of the physical body dimensions reach their peak forms within 20 to 35 years of age. This is because bone length and stature are related to ossification and epiphyseal fusion with diaphysis and both these events are age dependent. Body height increases with age from childhood to adulthood. Ossifications of the long bones are completed by the age of 20 to 25 years.¹³

On the other hand, the normal growth and development of human head and face is one of the most attractive fields of anatomical and anthropological implication to determine the time, duration and prognosis of malocclusion. Facial skeletons are made from the fusion of fronto-nasal and two pairs of maxillary, mandibular prominences from 4th to 10th weeks of development.¹⁴ Paranasal sinuses also reach their maximum size during puberty and fully developed at 17 years of age and contribute to the definitive

shape of the face.¹⁵ According to Datta the growth of base of the skull continues until synostosis of the cartilaginous joint between the occipital and sphenoid bone occurs. This joint is replaced by bone usually after 25 years.¹⁶

Moreover, a loss of height begins about 45 years of age that continues steadily throughout the rest of the life of an individual.¹⁷ The loss of body height occurred due to diminution of bone mineral density, compression of cartilage, loss of elasticity and shrinkage of intervertebral disc, osteoporotic vertebral collapse and anatomical distortion of the skeleton. Thus it can be a misleading index of stature.¹⁸ The above mentioned observations and descriptions keeping in mind; the age of the participants of the present study was limited between 25 and 45 years. In order to keep the effects of the age related changes on the stature and craniofacial features could be kept to the minimum.

It is apparent from Table 2 that the values of the four craniofacial measurements found to be positively correlated with stature.

Devi and Singh found a positive correlation between stature and cranial measurements with each other in males.¹⁹ Ilayperuma recommended that the stature and cranial measurements were found to be statistically significant and positively correlated with each other in both males and females.²⁰ Agnihotri et al. showed that positive correlation between the stature and cranial measurements in both males and females.²¹ Mansur et al. noted that head circumference showed highly significant positive correlation with height.²² Shah et al. suggested that the stature and craniofacial measurements showed weak and statistically insignificant relation with each other in both males and females.²³ Ghosh and Sawant found that statistically significant weak positive correlation in between stature and facial measurements in males.²⁴ Chandrakala Agarwal et al. concluded that comparatively, more head length and breadth occurs in males in comparison with females which exhibit sexual dimorphism.²⁵

CONCLUSION

The results of the present anthropometric study of the adult Bangladeshi Manipuri population can provide the basic framework

for formulating standards of linear craniofacial measurements and the stature for Bangladeshi Manipuri male population. It will help in medico-legal cases in establishing identity of an individual when only some remains of the body are found as in mass disasters, accidents etc. It will also help in establishing identity in certain civil cases.²⁶ However, using larger samples with non-contact measurement technique will help in defining craniofacial anthropometric profiling of the adult Bangladeshi Manipuri males.

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