

Anthropometric Study of Correlation between the Selected Craniofacial Measurements with the Stature in Adult Bangladeshi Manipuri Males

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ABSTRACT:

Cephalofacial anthropometry can be useful for racial identification, 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 has a proportional biological relationship with every parts of the human body like head, face, trunk, extremities and vertebral column. In this study, our main goal is find out the correlation between the selected craniofacial measurements with the stature in Adult Bangladeshi Manipuri males. 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, Bangladesh. Descriptive statistics and testing of hypotheses were used for the analysis using SPSS software (version 22.0). Here non- significant positive correlations of the stature with the mandible height and significant positive correlations of the stature with mandible breadth was found. The Mean (\pm SD) of Mandible height (sto-gn) was 4.44 (\pm 0.69), Mandible breadth (go-go) was 11.45 (\pm 0.57). 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: Anthropometry, Craniofacial measurement, Stature, Manipuri male.

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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 to take the measurements of human body.² Cephalometry is one of the important divisions of anthropometry, which is a

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measurement of the head and face. Facial anthropometry provides a suggestion of the variation in facial shape in a population. Facial features and facial dimensions 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. Moreover, cephalofacial parameters are useful in forensic scientist, physical anthropologist for the purposes of identification of an individual 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. 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. 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. This relationship helps in calculating stature from decomposed, mutilated, and amputated body fragments in recent times due to natural disasters like earthquakes, tsunamis, floods and man-made disasters like bomb blasts, car accidents, wars, plane crashes etc. It is important both for legal and humanitarian reasons.

The human populations have been divided into divergent races based on morphological and anthropometric characters. As in Bangladesh, varieties of ethnic population groups, ecological and nutritional conditions are present; so different formulae are required for measurements of bones or body parts to identify different populations as well as various ethnic communities and sexes. Therefore, for successful treatment of any congenital or post-traumatic facial disfigurements of people of different ethnic groups, surgeons require accessing the normative craniofacial measurements of the ethnic group.³ 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 of adult Bangladeshi Manipuri males. Therefore, in this study, our main goal is find out the correlation between the selected craniofacial measurements with the stature in Adult Bangladeshi Manipuri males.

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.

Place and period of the study: The study was carried out on the healthy adult Bangladeshi Manipuri males of Madhavpur village at Kamalganj upazila of Moulvibazar district of Sylhet, Bangladesh. The period of the study was March 2017 to February 2018.

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 exclusion 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 mustache.

Selected variables studied through direct physical measurement

Stature

Stature is natural heights of subject in an upright position. It is measured as vertical distance from the vertex (height point on the head) to the floor, when the head is held in Frankfurt horizontal plane, barefooted with heels and knees kept together.⁴

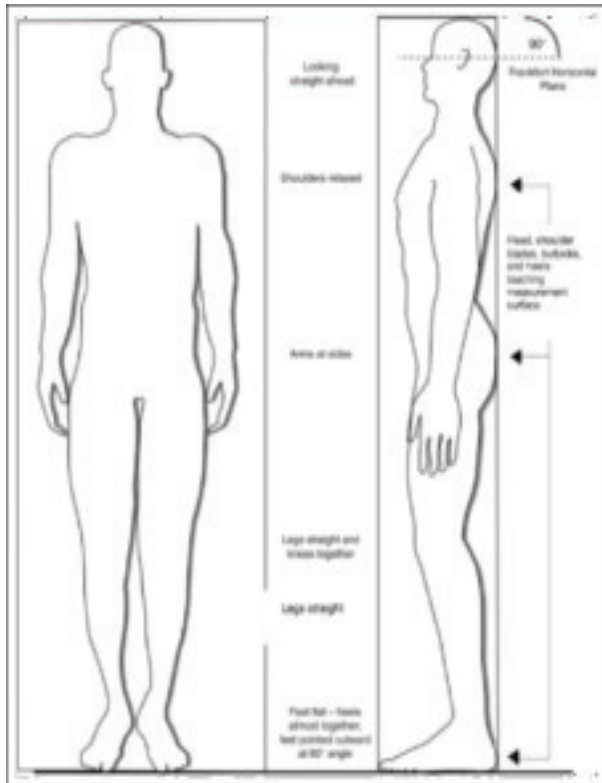


Fig. 1. Diagrammatic representation of frontal and lateral views of the stature.⁵

Craniofacial measurements

Mandible height (sto-gn): It is the linear distance between the 'stomion' and 'gnathion' (Figure-2).⁶

Mandible breadth (go-go): It is the linear distance between the left and right soft tissue 'gonions' points (Figure 2).⁷

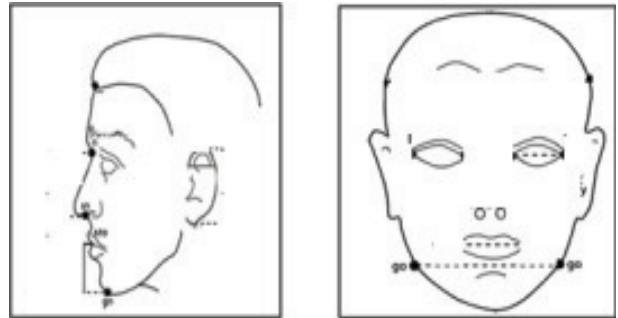


Fig. 2. Diagrammatic representation of mandible height and mandible breadth measurements.⁸

Procedure for measuring stature

The stature was taken by using steel plate and steel tape (shown in Figure 2.24B and Figure 2.24C). Then the subject stood in a position that the weight distributed equally on both feet, heel together and toes apart. Each participant's head was positioned in the Frankfurt horizontal plane and arm hung freely from the sides. After asking the participant to take a deep breath and holding it, a steel plate was placed against the head and the wall to determine maximum height on the wall, and this was marked.² The height was then measured in centimetres from the floor to the mark on the wall with steel tape.⁹ Figure 3 shows the procedure for measuring the stature.

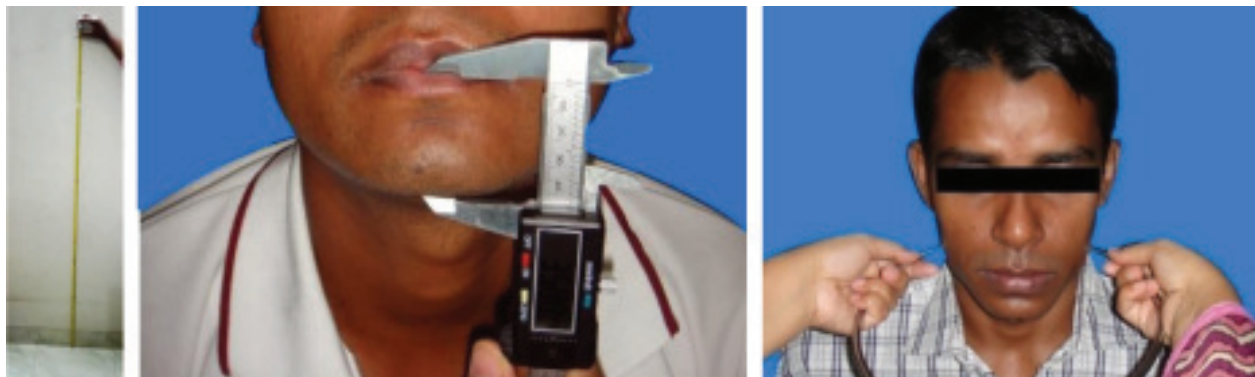


Fig. 3. Procedure of measuring (A) Stature from the marked point on the wall to the floor by using steel tape (B) mandible height (from stomion to gnathion) using a digital sliding caliper and (C) Mandible breadth (from gonion to gonion) using a spreading caliper.

Procedure for measuring mandible height

To measure the height of the mandible, the sliding caliper was vertically placed with the inner edge of the fixed arm placed to the stomion, holding it in place with the thumb and index fingers. The movable arm was slid up to the gnathion⁶ cautiously not pressing down on the lower lip (Figure 3).

Procedure for measuring mandible breadth

The Mandibular breadth was measured by using spreading caliper. To measure the Mandibular breadth, left and right gonion points were felt with the index and middle fingers. The tips of the spreading caliper were placed on the lateral aspect of the angles of the mandible,¹⁰ and gentle pressure was applied until the bone could be felt (Figure 3).

Data analysis

Data analysis was carried out in the Department of Anatomy, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. The 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.

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 (\pm SD) of Mandible height (sto-gn) was 4.44 (\pm 0.69), Mandible breadth (go-go) was 11.45 (\pm 0.57) are presented in Table I.

Table I: Values of stature, mandible height and mandible breath measurements in adult Bangladeshi Manipuri males ($n=100$)

Measured Stature and linear craniofacial measurement	Value (cm)	
	Range Minimum - Maximum	Mean (\pm SD)*
Stature	150.10 - 177.10	163.47 (\pm 7.06)
Craniofacial measurements		
Mandible height (sto-gn)	3.13 - 6.01	4.44 (\pm 0.69)
Mandible breadth (go-go)	10.00 - 12.70	11.45 (\pm 0.57)

*SD: Standard deviation

The non-significant positive correlation between the stature and mandible height, the significant positive correlation between the stature and mandible breadth are shown in Table II.

Table II: Correlation coefficients of mandible height and mandible breath 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
Mandible height (sto-gn)	+0.022	0.000	0.828
Mandible breadth (go-go)	+0.227	0.052	0.023

*p: Probability

If p value \leq 0.05 was considered as significant (S)

The mandible height showed non-significant positive correlation ($r= +0.022$, $r^2= 0.000$, $p= 0.828$) with the stature of the adult Manipuri males (Table 3.2 and Figure 3.5).

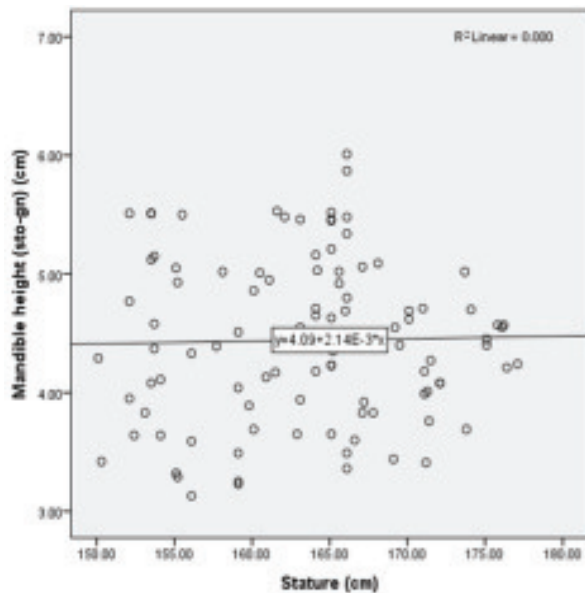


Fig. 4. Regression analysis shows non-significant positive correlation between the mandible height and the stature.

The mandible breadth showed significant positive correlation ($r= +0.227$, $r^2= 0.052$, $p= 0.023$) with the stature of the adult Manipuri males (Table 3.2 and Figure 3.6).

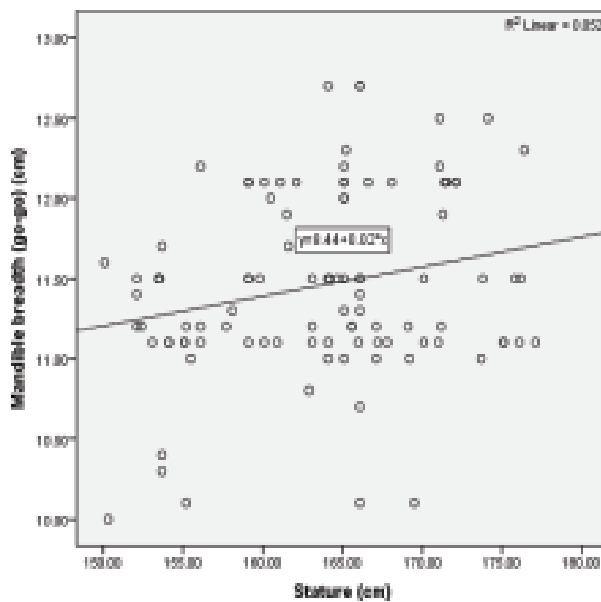


Fig. 5. Regression analysis shows significant positive correlation between the mandible breadth and the stature.

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. Manipuri belongs to the Kuki-Chin group of the Tibeto-Burman family of the Mongolian race.² The Mongolians are mostly Inhabitants of China Mongolia, Tibet, North America, Siberia, Greenland, Burma, Thailand, Malay Peninsula, Philippines, Japan and North-East India.¹¹ 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.⁹ The relationship between the stature and other craniofacial measurements are likely to differ according to age, sex, race, and ethnic background.³ 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.¹² 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 is made from the fusion of fronto-nasal and two pair of maxillary, mandibular prominence 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.⁸ 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.¹⁷

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 two 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.¹⁸ 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.¹⁹ Agnihotri et al showed that positive correlation between the stature and cranial measurements in both males and females.²⁰ Mansur et al noted that head circumference showed highly significant positive correlation with height.¹³ Shah et al. suggested that the stature and craniofacial measurements showed weak and statistically insignificant relation with each other in both males and females.²¹ Datta and Sawant found that statistically significant weak positive correlation in between stature and facial measurements in males.²²

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. 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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