

Comparative Study of Cranial Measurement between Bengali and Manipuri Adult Male

Kanta Sree Dutta¹, Md. Ashrafuzzaman², Pratik Chowdhury³, Sharmista Bhattacharjee⁴

Abstract:

Background: Present research work focuses to identify the differences of cranial measurements among two ethnic groups, Bengali and Manipuri male, based on different cranial parameters. This study can provide the basic framework for formulating standards of the cranial dimensions and indices for Bengali and Manipuri male.

Materials and methods: The study was cross sectional in nature with some analytical component, carried out in the Department of Anatomy, Chittagong Medical College, Chattogram, from July 2016 to June 2017. Two cranial variables were measured by physical procedure and one index was calculated from the measured values on 100 Bengali male and 100 Manipuri male, aged between 18 to 50 years. All collecting data were analyzed by SPSS-20 using unpaired student 't' test.

Results: This study showed that mean maximum cranial length of Bengali and Manipuri were 19.09 ± 1.05 cm and $19.08 \pm .92$ cm respectively; mean maximum cranial breadth were $15.08 \pm .61$ cm and $15.82 \pm .57$ cm respectively, and mean cephalic indices were 79.20 ± 4.64 and 83.01 ± 2.67 respectively. Bengali (44%) and Manipuri (42%) had very long type of head based on maximum cranial length. Based on maximum cranial breadth 71% of Bengali had medium head and 65% of Manipuri had broad type of head. Bengali had dolichocephalic (37%) and mesocephalic head (37%) whereas Manipuri had brachycephalic head (66%).

Conclusion: This study provided some base line data for comparative evaluation of cranial measurements between Bengali and Manipuri adult male.

Keywords: Anthropology, anthropometry, dolichocephalic, mesocephalic, brachycephalic,

Introduction

Anthropology is traditionally distinguished from other disciplines by its emphasis on cultural relativity, in-depth examination of context and cross-cultural comparisons.¹ Bodily measurements are the mainstay of anthropological research; however racial and sometimes ethnic variations do exist between these measurements because human body dimensions are affected by ecological, biological, geographical, racial, gender, age and nutritional

factors. Craniofacial anthropometry is a technique used in physical anthropometry comprising of precise and systematic measurement of the bones of the human skull.² Distinctions between races by geographical location, historical origins, culture, and language were usually subsumed into three major racial groups, that is, Asiatic or Mongoloid, Black or Negroid, and White or Caucasian.³

Cephalic index is also called as cranial index which is one of the important parameters that helps to differentiate between different races.⁴ Cephalometry technique summarizes the anatomical complexes of head and face of human being living within a similar geography.⁵ It is one of the clinical anthropometric parameters recognized in the investigation of craniofacial skeletal deformities and brain development because of its validity and practicability.⁶

¹Assistant professor, Department of Anatomy, Army Medical College Chattogram.

²Professor and Head, Department of Anatomy, Chittagong Medical College, Chattogram.

³Assistant professor, Department of Medicine, Chittagong Medical College, Chattogram.

⁴Associate professor, Department of Anatomy, Marine City Medical, Chattogram

Address of Correspondence: Dr. KantaSree Dutta, E-mail address: kantasreedutta@gmail.com

In our country, there are different religions and ethnic groups and these different groups have different physical characteristics. Bengali are major citizens of Bangladesh. The Bengali people have hybrid multiracial origin, including Indo-Aryan, Dravidian, Tibeto-Burman, Middle Eastern and Austro-Asiatic ancestry.⁷ The total population of indigenous ethnic minorities in Bangladesh was estimated to be over 2 million in 2010. They are diverse ethnic communities including Tibeto-Burman, Austric and Dravidian people.⁸ The Manipuri are one of the major ethnic communities of Bangladesh. The mother tongue of the Manipuri belongs to the Kuki-chin group of the Tibeto-Burman subfamily of the Mongolian family of languages.⁹

Information is scarce on the anthropometric status of various indigenous populations in Bangladesh. Present research work focuses to identify differences of cranial measurements between two ethnic groups based on different cranial parameters. This may be useful to establish the baseline measurements of these two ethnic groups and for future references to compare with same ethnic group of other regions or different ethnic group.

Materials & Methods

The study was cross sectional in nature with some analytical component, carried out in the Department of Anatomy in Chittagong Medical College from July 2016 to June 2017. 200 adult male participants were selected aged between 18 to 50 years where 100 Bengali males were from Chattogram city and 100 Manipuri male were from Kamalganj village in Sylhet. Convenience sampling technique was adopted.

Maximum cranial length and maximum cranial breadth were taken directly from the participants using traditional instruments (sliding and spreading calipers). These 'direct' measurements are reliable and inexpensive to make, and there is extensive normative database for them.¹⁰

a) Maximum cranial length: It is the straight distance between the 'glabella' and the 'opistho cranion'¹¹ (Opistho cranion is the most prominent posterior point of the occiput).



Fig.-1: Procedure of measuring the maximum cranial length using a spreading caliper.

b) Maximum cranial breadth: It is the distance between the 'euryons' on the parietal bone on each side of the head.¹¹

(Euryons is the most lateral point on the head in the parietal region)



Fig.-2: Procedure of measuring the maximum cranial breadth using a spreading caliper

a) Different head types based on maximum cranial length¹²

Short	(17.0-17.7) cm
Medium	(17.8-18.5) cm
Long	(18.6-19.3) cm
Very long	(19.4-X) cm

b) Different head types based on maximum cranial breadth¹²

- Narrow 14.0-14.7 cm
- Medium 14.8-15.5 cm
- Broad 15.6-16.3 cm

c) **Cephalic index:** It is the ratio of the maximum cranial breadth to maximum cranial length expressed as a percentage. The formula is:

$$\text{Cephalic index} = \frac{\text{Max. cranial breadth}}{\text{Max. cranial length}} \times 100$$

Depending on the cephalic index, Martin and Saller¹² classified the head as:

- Dolicocephalic (long narrow) 71.0 to 75.9
- Mesocephalic (Medium) 76.0 to 80.9
- Brachycephalic (short, broad) 81.0 to 85.9
- Hyperbrachycephalic (very short and broad) 86.0 to 90.9

Ethical approval: Ethical clearance has been taken from the ethical review committee of Chittagong Medical College. All participants were explained about the study and written consent was taken.

Results

The maximum cranial breadth of the Manipuri male is significantly higher than Bengali male (Table I). The maximum cranial length shows no significant difference between the Bengali and Manipuri ethnic group. According to cranial length most common head type in Bengali was very long (44%) followed by long type (37%) and in Manipuri most common head type was very long (42%) followed by long type (29%). According to cranial breadth most common head type in Bengali was medium (71%) and in Manipuri was broad (65%).

Table I
Comparison of cranial variables between Bengali and Manipuri adult male

Measurement	Bengali (n=35) Mean±SD (Range)	Monipuri n=35) Mean±SD (Range)	p value
Maximum cranial length in cm	19.09±1.05 (17-20)	19.08±.92 (17-22.5)	P>0.05 ^{ns}
Maximum cranial breadth in cm	15.08±.61 (14-16)	15.82±.57 (14.5-17)	<0.0001 ^s
Cephalic index	79.20±4.64 (74.74-88.23)	83.01±2.67 (74.67-87.12)	<0.0001 ^s

Comparison of values of cranial variables between Bengali and Manipuri adult male by unpaired student's 't' test, ns = Non significant, s = Highly significant

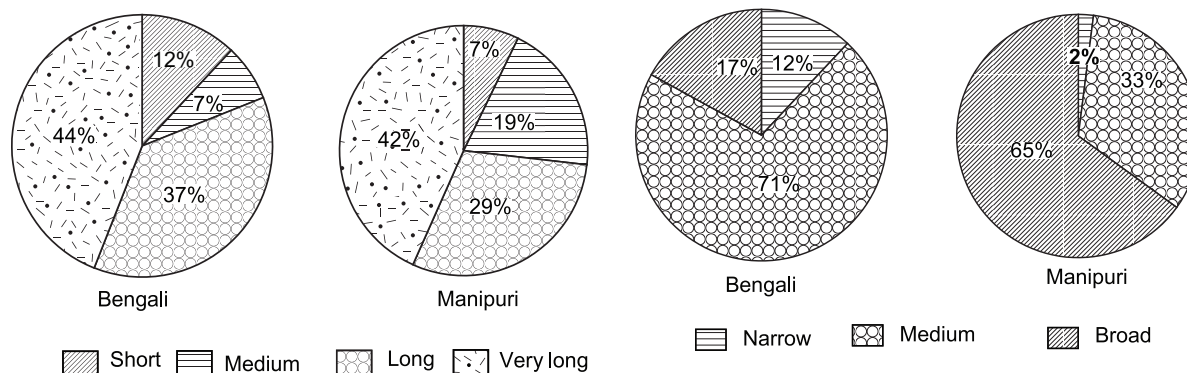


Fig.-3: Relative percentage frequencies of different head types based on maximum cranial length in Bengali and Manipuri male.

Fig.-4: Relative percentage frequencies of different head types based on maximum cranial breadth in Bengali and Manipuri male.

The cephalic index of Manipuri adult male is significantly higher than Bengali male. The frequencies of different types of head based on the cephalic index found in Bengali and Manipuri males were shown in Figure 5. The common types of head among Bengali males are dolichocephalic (37%) and mesocephalic (37%). Among Manipuri males the most common type of head is brachycephalic (66%).

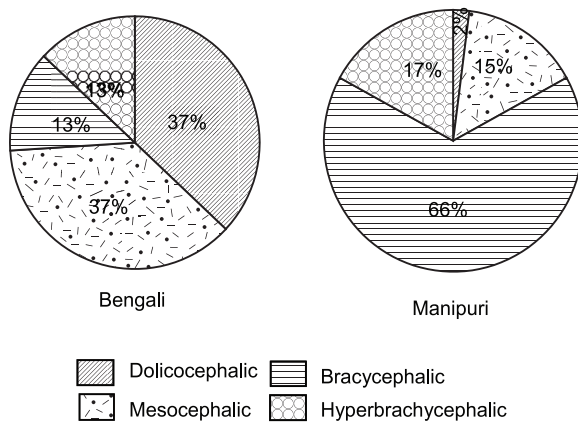


Fig.-5: Relative percentage frequencies of different head types based on the cephalic index in Bengali and Manipuri adult male.

Discussion:

Regarding maximum cranial length common Bengali head type was found very long which was similar to population of Uttara Khand in India, Multan in Pakistan, Ibibios of Nigeria and population of south eastern and north eastern of Nigeria.¹³⁻¹⁷ In this regard common Manipuri head type was found very long which was seen among non-Latvian male.¹⁸ In case of both Bengali and Manipuri, value of the present study was lower than Hausa and Yoruba ethnic group of Nigeria and was higher than Malay and Chinese ethnic group of Malaysia and Mongoloid ethnic group of Nepal.¹⁹⁻²¹

According to cranial breadth, Bengali have medium broad type of head similar to population of Multan in Pakistan, different ethnic group of Latvian, Malaysia, Mongoloid group of Nepal and Idome ethnic group of Nigeria.^{14,18,20-22} The mean value was lower than population of Beijing and Shenyang of China and Kosov-Albenian population.^{23,24} The value was higher than Gujarati male, population of

Uttara Khand in India and Tharu group of Nepal.^{5,13,21} Among Manipuri male this value belongs to broad type of head, was similar to population of Yorubu group of Nigeria and Beijing & Shenyang group of China.^{19, 23} Similar type was also found among 32.5% population in Manipur of India.¹² This value was higher than population of Uttarakhand of India and Mongoloid ethnic group of Nepal.^{13,21} Hiernaux and Froment found in their study that head breadth tends to increase with rainfall, humidity and cold temperature.²⁵ Maulavibazar is one of the rainy areas of Bangladesh, which favors the growth of broad type of head. Broad type of head is a feature of Mongoloid race.²⁶

According to cephalic index, dolichocephalic and mesocephalic head type was predominant among Bengali. Similar dolichocephalic head type was seen in Gujarat males, population of Uttara Khand of India and Haryanvi population of India.^{5,13,27} Similar mesocephalic type was seen among population of Ibibios of Nigeria, Tharu race in Nepal, Andhra Pradesh and West Bengal of India.^{15,21,28, 29} The present value was lower than population of Malay and Chinese ethnic group of Malaysia, Tiv and Idomo of Nigeria and Kosovo-Albanian population.^{20, 22, 24}

In the present study, cephalic index of Manipuri male was higher than Bengali male. Among Manipuri most predominant type was brachycephalic head, which was similar to population of Manipuri in India and Mongoloid ethnic race of Nepal.^{12,21} The present value of cephalic index was lower than population of Malay and Chinese race of Malaysia.²⁰ The value was higher than Gujarati male, population of Uttara Khand of India and West Bengal.^{5,13,29}

In respect to the variation of head shape in various ethnic groups, Golalipour³⁰ states hereditary factor primarily affects the shape of head; however, environment has secondary effect on it. Bharati et al³¹ states that hot climate condition in tropical zone is more advantageous for long head type (dolichocephalic) whereas in temperate zone under cold stress head form is more round (brachycephalic or mesocephalic) type. Incidence of mesocephalic among Bengali may be due to Mongoloid racial

element present in varying degrees.²⁶ Farley et al³² showed in their study that agriculturists have increased cephalic index which support the present study as most of the Manipuri male are farmer.

Conclusion

The result of this study revealed a clear ethnic difference in cranial parameters. The two groups that were studied belonged to same race that is Mongolo-dravidian, where Dravidian influence was more among Bengali and Mongolian influence was more among Manipuri. Both ethnic groups showed significant variation which may be due to different etiological factors like genetic, environmental, geographical, occupational, nutritional and climate.

References

1. New World Encyclopedia, Anthropology, Available at www.newworldencyclopedia.org/entry/Anthropology. 2016
2. Shah S, Koirala S. Role of Craniofacial Anthropometry in Medical Science International Invention Journal of Medicine and Medical Sciences. 2015;2(4):44-48.
3. Rizvi HM, Hossain MZ. Cephalometric norms of young adults of Bangladesh (Steiner's analysis)-preliminary report Bangladesh Journal of Orthodontics and Dentofacial Orthopedics. 2011;2(1):11-15.
4. Shema KN, Vaibhav PA, Sandeep S, Maninder B, Satpathy DK. The Study of Cephalic Index of Medical Students of Central India. Asian Journal of Biomedical and Pharmaceutical Sciences. 2014;4 (28):48-50.
5. Shah T, Thaker MB, Menon SK. Assessment of Cephalic and Facial Indices: A proof for Ethnic and Sexual Dimorphism. Journal of Forensic Science & Criminology. 2015;3(1):1-11.
6. Akinbami BO. Measurement of Cephalic Indices in Older Children and Adolescents of a Nigerian Population. Bio Med Research International. 2014;1-5.
7. Wikipedia. Bangladeshis. Available at <https://en.wikipedia.org/wiki/Bangladeshis2016>
8. Wikipedia. Ethnic minorities in Bangladesh. Available at https://en.wikipedia.org/wiki/Ethnic_minorities_in_Bangladesh
9. Bangladesh News: The Manipuri. Available at www.independent-bangladesh.com › Ethnic Groups. 2008
10. Wong JY, Oh AK, Ohta E, Hunt AT, Rogers GF, Mulliken JB, Deutsch CK. Validity and Reliability of Craniofacial Anthropometric Measurement of 3D Digital Photogrammetric Images. The Cleft Palate–Craniofacial Journal. 2008;45(3):232-39
11. Kolar JC & Salter EM. Craniofacial Anthropometry: Practical Measurement of the Head and Face for Clinical, Surgical and Research Use. Charles C Thomas Publisher, Ltd. Springfield, Illinois, USA. 1997
12. Singh TN, Devi AJ, Singh YI, Singh MM, Ajita RK, Pfoze K. Somatometric Measurement of the Meitei Population of Manipur Valley. Journal of Dental and Medical Sciences. 2015;14(10):09-14
13. Bali S. Study of Cranial Anthropometric Indices in Adult Population of Uttarakhand, International Journal of Medical Research Professionals. 2016;2(3):267-270.
14. Khan MA, Chaudhury MN, Altaf FMN. A Cephalometric Study in Southern Punjab. The Professional Medical Journal. 2015;22(9):1203-1207.
15. Oladipo GS, Okoh PD, Isong EE. Anthropometric Studies of Cephalic Length, Cephalic Breadth and Cephalic Indices of the Ibibios of Nigeria. Asian Journal of Medical Sciences. 2010;2(3):104-106.
16. Ewunonu EO, Anibeze CIP. Estimation of Stature from Cephalic Parameters in South-Eastern Nigerian Population. Journal of Scientific & Innovative Research. 2013;2(2):425-432.
17. Maina MB, Shapu YC, Garba SH, Muhammad MA, Garba AM, Yaro AU, Omoniyi ON, Assessments of Cranial Capacities in a North-

- Eastern Adult Nigerian Population. *Journal of Applied Sciences*. 2011;11(4):2662-2665.
18. Nagle E, Teibe U, Kapoka D.. Craniofacial anthropometry in a group of healthy Latvian residents. *Acta Medica Lituanica*, 2005;12(1):47–53
 19. Umar MBT, Ojo AS, Asala SA, Hambolu JO. Comparison of Cephalometric Indices between the Hausa and Yoruba Ethnic Groups of Nigeria. *Research Journal of Medical Sciences*. 2011;5(2):83-89.
 20. Thu KM, Winn T, Jayasinghe IAP, Abdullah N. The Maxillary Arch and Cephalometric Measurements: Comparing Ethnic Malays and Ethnic Chinese in Malaysia .*International Journal of Anatomy and Research*. 2015;3(2):999-1007.
 21. Koirala S, Bhattacharya S, Paudel IS, Yadav BN, Shah S, Baral P. A Comparative Anthropometric Study of Mongoloid and Tharu Ethnic Races in Eastern Nepal. *WebmedCentral*. 2016;3(6):3-22
 22. KpelaT, Danbornob, AdebisiSS, Ojo SA. Anthropometric Study of Cephalic Index of adult Tiv and Idome ethnic groups of North Central Nigeria. *Global Advanced Research Journal of Medicine and Medical Sciences*. 2016;5(4):109-115.
 23. Ball RM, Luximon Y, Chow HCE. Anthropometric Study on Chinese Head Asian Workshop on 3D Body Scanning Technologies, Tokyo, Japan. 2012;102-105.
 24. Staka, G.; Disha, M. & Dragidella, F. Cephalic and facial indices among Kosovo-Albanian Population. *International Journal of Morphology*. 2013;31(2):468-472.
 25. Hiernaux J, Froment A. The Correlations Between Anthro-Biological and Climatic Variables in Sub-Saharan Africa: Revised Estimates. *Human biology*. 1976;48(4):757-767
 26. Bhasin MK, Indian Anthropology Racial, Ethnic, Religious and Linguistic Elements in Indian Population. Available at <http://nsdl.niscair.res.in/bitstream/123456789/339/1/pdf+4.4+NISCAIR-Racial-Ethnic-Religious-Linguistic-Groups-India-Text-Revised.pdf>. 2007.
 27. Kumar M, Gopichand PVV. 2013. The study of Cephalic Index in Haryanvi population. *International Journal of Pure & Applied Bioscience*. 2013;1(3):1-6.
 28. Lakshmi Kumari K, VijayaBabu PVSS, KusumaKumari P, Nagamani M. A study of cephalic index and facial index in Visakhapatnam, Andhra Pradesh, India. *International Journal of Research in Medical Sciences*. 2015;3(3):656-658.
 29. Bhasin MK. Genetics of Castes and Tribes of India: Somatometry. *International Journal of Human Genetics*. 2006;6(4): 323-356.
 30. Golalipour, M. J. The Effect of Ethnic Factor on Cephalic Index in 17-20 Years Old Females of North of Iran. *International Journal of Morphology*. 2006;24(3):319-322.
 31. Bharati S, Som S, Bharati P, Vasulu TS. Climate and head form in India. *American Journal of Human biology*. 2001;3(5):626-634.
 32. Farely NW, Noll CJ, Blacksher LM.. Environment, Diet, and Craniofacial Development: A Study of Mixed Subsistence Strategies in the Great Lakes Watershed, AD 900-1600. *International Journal of Humanities and Social Science*. 2015;5(9):29-45.