

Comparative Study of facial Measurement between Bengali and Manipuri Adult Male

Kanta Sree Dutta^{1*} Pratik Chowdhury² Md. Ashrafuzzaman³ Md. Habib Khan⁴ Nurun Nahar⁵

Abstract

Background: From the human face, we can identify their gender, age group, ethnicity etc. So facial morphometric study can be taken as part of anthropometric evaluation and it is an important parameter in observing inter population of faces among the same ethnic group or different group. If we can calculate the different craniofacial variables of different ethnic groups these can be used in future research or clinical purposes. To measure the facial variables among Bengali and Manipuri adult male and to compare these variables between two ethnic group.

Methods and materials: A cross sectional, observational and analytic type of study was conducted on 200 sample which were collected by convenience sampling where 100 were Bengali adult male and remaining 100 from Manipuri adult male, aged between 18 to 50 years. Data for Bengali and Manipuri adult male were collected from Chattogram city and Kamolgonj, Sylhet respectively. The study was carried out in the Department of Anatomy, Chittagong Medical College from July 2016 to June 2017.

Results: This study showed that mean morphological face height of Bengali and Manipuri were respectively 11.46 cm \pm .53 and 11.82 cm \pm .49, mean maximum facial breadth respectively 13.04 cm \pm .48 and 13.62 cm \pm .45, mean facial index respectively 87.93 \pm 2.58 and 86.89 \pm 2.09. According to facial height, most common type in Bengali was low type (47%) and in Manipuri was medium type (39%). According to facial breadth most common type in Bengali was narrow type (63%) and in Manipuri was medium type (53%). Bengali have leptoprosopic (Narrow face) 53% followed by mesoprosopic face (Medium face) 43%. Manipuri have mesoprosopic face 59% followed by leptoprosopic type 31%.

1. Assistant Professor of Anatomy
Army Medical College Chattogram.
2. Assistant Professor of Medicine
Cox's Bazar Medical College, Coa's Bazar.
3. Professor of Anatomy
Chittagong Medical College, Chattogram.
4. Professor of Anatomy
Chattogram International Medical College, Chattogram.
5. Assistant Professor of Anatomy
Ad-Din Women's Medical College, Dhaka.

***Correspondence:** Dr. Kanta Sree Dutta

Cell : 01814 47 82 26

E-mail: kantasreedutta@gmail.com

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Conclusion: The results of the present anthropometric study on the adult Bangladeshi population can provide the basic framework for formulating standards of the facial dimension and indices for adult male of the Bengali and Manipuri population.

Key words: Anthropometry; Anthropology; Ethnicity; Facial index; Leptoprosopic; Mesoprosopic.

Introduction

Craniofacial anthropometry, as an important part of anthropology and medicine, is used for the determination of the morphological characteristics of the head and face. Face shape depends on many factors, such as gender, race and ethnicity, climate, socio-economic, nutritional and genetic factors.¹

Anthropometric studies document differences in craniofacial features as well as in body characteristics among the different race.² During craniofacial growth and development, each face obtains individual characteristics. Though the human face displays a wide variety of appearances, this variability stays within certain limits, so that the face is recognizable as typical human. There has been some controversy whether genetic factors or environmental factors are responsible for growth and development. It seems plausible that both factors are involved in the regulation of craniofacial growth. The dimensions of the human body are affected by ecological, biological, geographical, racial, age and sex factors. On the basis of these factors, studies about intra- and inter population variations have long been an interest and have been conducted on the age, sex and racial groups.³ 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.⁴

Plastic Surgeons, Oral and Maxillofacial Surgeons and Orthodontists dealing with clinical cases for treatment of congenital, cosmetic and post traumatic esthetic facial reconstruction.⁵ Comparison of changes in facial index between parents, offspring and siblings can give a clue to genetic transmission of inherited characters.⁶

Accurate facial analysis is essential for diagnosis of genetic and acquired anomalies, for study of normal, abnormal growth and for morphometric investigation.⁷

The aim of this study was to compare the facial parameters in the population of Bangladesh between two ethnic groups that is Bengali and Manipuri adult male, which is important for anthropological research, research in forensic medicine and clinical practice (Reconstructive surgery).

Materials and methods

The study was observational and cross sectional in nature with analytical component, carried out in the Department of Anatomy in Chittagong Medical College from July 2016 to June 2017. 200 adult male sample were collected where Bengali were 100 and Manipuri were 100, aged between 18 to 50 years, selected through convenience sampling.

Traditional anthropometric measurements are taken directly from living subjects using traditional instruments (e.g sliding and spreading calipers) during the examination.

Sliding caliper and spreading caliper used for this direct physical procedure. Maximum facial breadth, Morphological face height and facial index were measured.

● Maximum Facial Breadth

For measuring the maximum facial breadth, the maximum convexity of the zygomatic arch was felt with the tips of the index fingers and the caliper was placed on the arches with enough pressure to feel the bone. The caliper was moved back and forth, up and down until the scale showed the maximum reading.

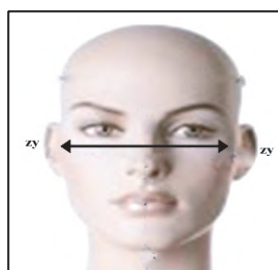


Fig 1 (A) The maximum facial breadth manikin



Fig 1 (B) Procedure of measuring the maximum facial breadth in a volunteer using a spreading caliper

Breadth of Bizygomatic Arch (BBA) use by Lebzelter and Saller⁸

Very narrow (X-12.7)

Narrow (12.8-13.5)

Medium (13.6-14.3)

Broad (14.4-15.1)

Very broad (15.2-X)

● Morphological Face Height

For measuring the morphological face height, the inner edge of the fixed arm was placed under the chin at gnathion, holding it in place with thumb and index fingers, with the scale to the side of the participant's nose. The movable arm was slide up to the nasion.

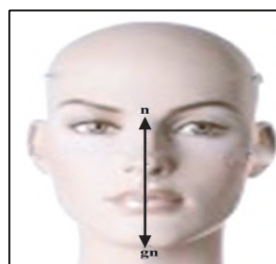


Fig 2(A) The maximum facial height in manikin



Fig 2(B) Procedure of measuring the maximum facial height in a volunteer using a sliding caliper

Morphological Facial Height (MFH) use by Lebzelter and Saller⁸

Very low (X-11.1)

Low (11.2-11.7)

Medium (11.8-12.3)

High (12.4-12.9)

Very high (13.0-X)

Facial index: It is the ratio of the morphological face height to the maximum facial breadth expressed as a percentage.⁸ The formula is:

$$\text{Facial index} = \frac{\text{Morphological face height}}{\text{Maximum facial breadth}} \times 100$$

Depending on the facial index, Martin and Saller classified the face as⁸

Hypereuryprosopic	(Very broad face)	≤78.9
Euryprosopic	(Broad face)	79.0 to 83.9
Mesoprosopic	(Medium face)	84.0 to 87.9
Leptoprosopic	(Narrow face)	88.0 to 92.9
Hyperleptoprosopic	(Very narrow face)	≥9

Ethical clearance has been taken from the ethical review committee of Chittagong Medical College. All subjects included in the study will be informed and explained about the study and written consent will be taken.

Results

The Morphological face height and maximum facial breadth is significantly higher in Manipuri than Bengali male. According to facial height, most common type in Bengali was low type (47%) and in Manipuri was medium type (39%). According to facial breadth most common type in Bengali was narrow type (63%) and in Manipuri was medium type (53%).

Table I Results regarding the facial variables in the Bengali and Manipuri adult male

Measurement	Group	Mean (±SD)	Significance of difference
Linear measurements (cm)			
Morphological face height	Bengali	11.46 ± .53	p < 0.001
Highly significant	Manipuri	11.82 ± .49	
Maximum facial breadth	Bengali	13.04 ± .48	p < 0.001
Highly significant	Manipuri	13.62 ± .45	
Index			
Facial index	Bengali	87.93 ± 2.58	p < 0.05
significant	Manipuri	86.89 ± 2.09	

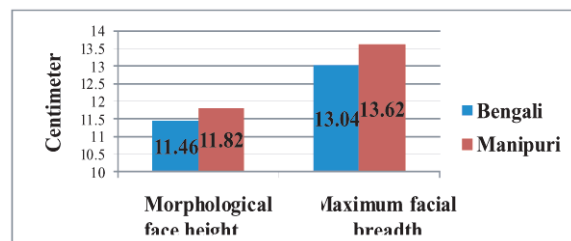


Fig 3 Comparison of facial variables between Bengali and Manipuri male

Facial index is significantly higher in Bengali male than Manipuri. The frequencies of different types of face based on the facial index found in the Bengali and Manipuri males are shown in Figure. The most common type of face of Bengali is leptoprosopic (Narrow face) 53% followed by mesoprosopic face (Medium face) 43%. Among Manipuri, most common type is mesoprosopic 59% followed by leptoprosopic type 31%.

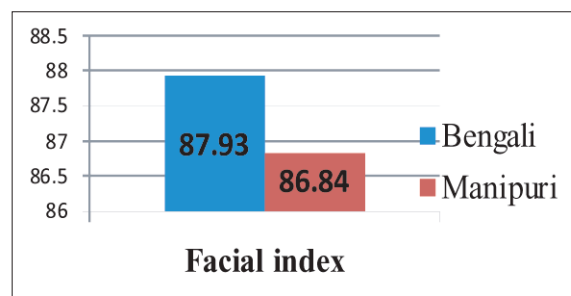


Fig 4 Comparison of facial index between Bengali and Manipuri male

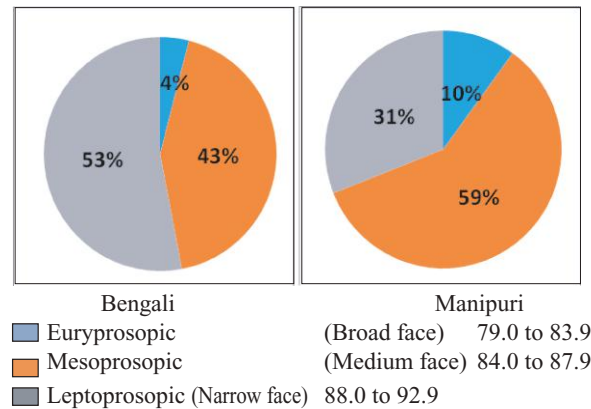


Fig 5 Relative percentage frequencies of different face types based on the facial index in Bengali and Manipuri adult male. The values within parentheses represent the ranges of facial index defining different types of the face

Discussion

The mean of morphological facial height of Bengali 11.46 cm was similar to Caucasoid German 11.60 cm, Slovak male 11.50 cm, Indo-Mauritian male 11.58 cm and Tibeto-Nepalese group of Nepal 11.55cm.⁹⁻¹¹ According to Facial height most common type of face in Bengali was Low variety, similar type was seen among Indian 11.25 cm and Egyptian male 11.64 cm, Malay male 11.74cm.^{9,12} The mean value was lower than Serbia 12.14cm, Northern India 12.36 cm, Iran 12.83 cm and Pakistan 11.83 cm, Kosovo-Albanian 12.58 cm, Nigerian 12.59 cm.^{1,13-16} The mean value was higher than Tonga 10.95cm, Assam 11.09 cm and Gujarati male 9.85 cm.^{9,17-18} The mean morphological facial height of Manipuri 11.82 cm was similar to Croatian 11.98 cm, Indigenous male of Nepal 11.93 cm, South Indian male 11.97 cm and Malaysian Indian 11.64 cm.^{9,11,13,19} According to facial height, Manipuris have medium (39%) to low (34%) variety of face, which was almost similar to the findings of Singh et al and Devi et al.^{8, 20} In their study Meitei male of Manipur of India had medium (29%) to low (39%) variety of face. The mean value was lower than other mongoloid group such as Singaporean Chinese 12.36 cm, Thai male 12.35, Caucasoid American 12.13 cm, Kosovo-Albanian 12.58 cm and Negroid from Eastern Nigeria 12.59 cm.^{9,15-16} However, the value was higher than Tonga 10.95 cm, Assamese male 11.09 cm and Gujarati 9.85 cm.^{9, 17-18}

In the present study morphological facial height of Manipuri male was higher than Bengali. Increasing facial height among Manipuri is because of the impact of many exogenous factors like better nutrition, improved socioeconomic condition, better health care and changing living conditions acting on intrinsic factor.²⁰

The mean value of maximum facial breadth 13.04 cm was similar to Serbian 12.91 cm, Zulu male 12.93 cm, Malay 12.99 cm, Dera Ghazi Khan of Pakistan 13.11 cm, Gujarati 13.07 cm and Sisaala ethnic groups of Ghana 13.09 cm.^{1,9,12,14,18,21} The mean value was lower than Indian 13.58 cm, Caucasoid American 13.33cm and Negroid Angolan male 13.98 cm, South-East of Nigeria 13.50 cm where the mean value was higher than North and South Indian and Qazvin of Iran 12.83 cm.^{9, 12-14} According to facial breadth, Bengalis have narrow (63%) type of face.

The mean value 13.62 cm was similar to Indian 13.58 cm, Malaysian Indians 13.63 cm.^{9, 19} The present value was higher than Portuguese 12.51 cm, North 12.22 cm and South Indian 11.93cm, Qazvin of Iran 12.83cm and DeraGhazi Khan of Pakistan 13.11 cm.^{9,13,14} The mean value was lower than Singaporean Chinese 14.46 cm, Vietnamese 14.40 cm, Thai male 14.47 cm and Indo-Mauritian 14.39 cm.^{9,10} According to Facial breadth, Manipuri have medium (53%) type of face, which was similar to the finding of Singh et al among Meitei people of Manipur of India (Medium type 50.8%).⁸

In the present study maximum facial breadth of Manipuri male was higher than Bengali. Hiernaux and Froment found in their study that facial breadth tends to increase with rainfall and less hot temperature whereas face tends to be narrower in hot and dry climate.²² Farley et al found in their study agriculturalists with an increased reliance on domesticates have wider facial breadth.²³ This observation supports the present study.

The most common type of face among Bengali was leptoprosopic (Long face) type. Similar leptoprosopic face was seen among Serbian male, North Indian male, DeraGhazi Khan of Pakistan and Sindhi population.^{1,13,14,24}

The mean value of facial index of Bengali 87.93 was similar to Sikkim 87.75 cm, Tamil Nadu 87.63 cm and ethnic group of East India 87.95.²⁵ However, the value was lower than Serbian 94.04,

Dera Ghazi Khan of Pakistan 90.55 and Sindhi male 92.89.^{1, 14, 25} The value was higher than Malaysian Indian 85.5 and Gujarat 83.99, Bihar 86.84 and Orissa 84.88.^{19, 25}

Mesoprosopic (Medium face) was common type of face among Manipuri. Similar type was seen among Meitei population of Manipur in India and Malay male.^{8,12} The mean value of Manipuri 86.46 was similar to Bihar 86.74, South India 86.61.²⁵ Where the value was lower than Sikkim 87.75, West Bengal 88.43, South-Eastern Nigerian 90.02.^{25,16} Higher than Assam 85.29, Andrapradesh 84.39 and Malaysian Indian 85.5.^{25,19}

The mean facial index in two ethnic groups varies significantly depending on genetic factor, nutritional growth and habitat. This differences leads to ethnic determination.¹⁸ Statistically significant differences observed between Bengali and Manipuri male, which could be explained on the basis of genetic and environmental influences on facial morphology. Bhasin in his study found people who involve in agriculture having facial index 86.21 and in trade and commerce having facial index 87.51 which was similar to present study.²⁵

Limitation

i) The participants were chosen through convenience sampling, not through simple random sampling. Besides this, sample size was also relatively small. So, the results obtained in this study may not be fully representative of the norm for the whole population of adult Bengali and Manipuri male

ii) The assessments of whether the participants had any genetic, endocrine or neurological disorders affecting craniofacial measurements were done only by history taking and physical exam. This might have failed to identify some participants who could have revealed some features of the above mentioned disorders

iii) As the anthropometric measurements were obtained from the landmarks identified on the skin, which is a yielding tissue, the values obtained tend to lack the reproducibility when another investigator makes the same measurements

iv) Gross physical methods were used for taking linear measurements. Direct contact method might have produced minor errors that could have been avoided if non-contact methods such as laser scanning, stereo-photogrammetry, ultrasound, infrared imaging, computed tomography of MRI was used.

Conclusion

From the results of the present study the two treated groups showed statistically significant differences in mean values of all the measured facial variables namely facial height and facial width which successfully predict anthropometric relationships between two ethnic groups. The present study provides new and valuable data pertaining to facial indices and the types of face in Bengali and Manipuri adult male. This result is of great importance in medico-legal and forensic science and in reconstructive surgery as marker of ethnicity.

Recommendations

- Studies on larger samples are required to confirm the findings of this study.
- For increasing the reliability of the findings further studies with more extensive anthropometry may be done using non-contact methods such as laser scanning, stereophotogrammetry, ultrasound, infrared imaging, computed tomography and MRI.
- Similar study should be conducted on other age groups of the Bengali and Manipuri population to reveal the differences in craniofacial norms across ages
- Further studies may be done to compare the Bengali and Manipuri people with various religious groups to detect any influence of religious habits on craniofacial development
- Further studies may be of interest to compare the Manipuri and Bengali people living in the hill tracts with those living in the plains to assess the influence of high altitude on craniofacial anthropometrics
- Similar studies should be conducted in other ethnic groups of Bangladesh like Marma, Tippura, Santhal, Rakhain and so on. This could form a basis for comparison and to continue examining variations within and between populations to expand overall understanding of human variations.

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Contribution of authors

KSD-Conception, design, acquisition of data, manuscript writing and final approval.

PC-Data analysis, interpretation of data, critical revision and final approval.

MA-Interpretation of data, critical revision and final approval.

MHK-Design, critical revision and final approval.

NN-Acquisition of data, manuscript writing and final approval.

Disclosure

All the authors declared no competing interests.

References

1. Jeremi 2. D, Koci 3. S, Vulovi 4. M, Sazdanovi 5. M, Sazdanovi 6. P, Jovanovi 7. B et al. Anthropometric Study of the Facial Index in the Population of Central Serbia Arch. Biol. Sci., Belgrade. 2013;65 (3): 1163-1168.
2. Durtschi RB, Chung D, Gentry LR, Chung MK, Vorperian HK. Developmental craniofacial anthropometry: Assessment of Race effects. Clin Anat. 2009; 22 (7): 800-808.
3. Elzaki MM. Characterization of Craniofacial Bones and Nasal Parameters for Adult Sudanese Using Computed Tomography. PhD Thesis, Sudan University of Science & Technology, College of Medical Radiologic Sciences. 2016.
4. Rizvi HM, Hossain MZ. 2011; 2(1)11-15.
5. Shah S, Koirala S. Role of Craniofacial Anthropometry in Medical Science International Invention Journal of Medicine and Medical Sciences. 2015; 2 (4):44-48.
6. Pandey N, Gogoi P, Budathoki D, KC G. Anthropometric study of facial index of medical students. Journal of Kathmandu Medical College. 2015; 4(14):131-134.
7. Kumar M & Lone MM. The Study of Facial Index among Haryanvi Adults. International Journal of Science and Research (IJSR). 2013; 2 (9):51-57.
8. 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.
9. Farkas LG, Katic, MJ, Forrest CR. International Anthropometric Study of Facial Morphology in Various Ethnic Groups/Races, The Journal of Craniofacial Surgery. 2005; 16 (4) : 615-646.
10. Agnihotri AK, Kachhwaha S, Googoolye K, Allock A. Estimation of stature from cephalo-facial dimensions by regression analysis in Indo-Mauritian population. Journal of Forensic and Legal Medicine. 2011; 18 (4):167-172.
11. Shah S, Koirala S. Morphological variation of head and face shapes in 17-25 years old adult population of Nepal. Journal of Morphology and Science. 2015; 32 (3):121-123.

12. Yesmin T, Thwin SS, Urmi SF, Wai MM, Zaini PF, Azwan K.A Study of Facial Index among Malay Population. *Journal of Anthropology*. 2014; Article ID 726974: 1-5.
13. Prasanna LC, Bhosale S, D'souza AS, Mamatha H, Thomas RH, Sachin KS. Facial indices of North and South Indian Adults: Reliability in Stature Estimation and Sexual Dimorphism. *Journal of Clinical and Diagnostic Research*. 2013; 7 (8):1540-1542.
14. Azizi M, Hassanzadeh G, Barbarestani M, Sadr M, Dehbashipour A, Alaghbandha N. et al. Comparative Anthropometric Analysis of Facial Dimensions and Types in Qazvin, Iran and DeraGhazi Khan, Pakistan, *Anatomical Sciences*.2014 ;11.(3):119-125.
15. Staka, G.; Disha, M. & Dragidella, F. Cephalic and facial indices among Kosovo-Albanian Population. *International Journal of Morphology*. 2013;31 (2): 468-472.
16. Ewunonu EO, Anibeze CIP. Anthropometric study of the Facial Morphology in a South-Eastern Nigerian Population. *Human Biology Review*. 2013; 2 (4):314- 323.
17. Sarma R, Sarma S, Baruah T . Somatometric study of a Mogoloid Community-“The PlainTiwas”of central Assam. *International Journal of Pure and Applied Bioscience*. 2014;2 (2):142-148.
18. 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.
19. Ngeow WC, Aljunid ST. Craniofacial anthropometric norms of Malaysian Indians. *Indian Journal of Dental Research*. 2009;20 (3):313-319.
20. Devi TB, Singh TN, Singh SJ, Tamang BK. Facial Morphology And Facial Index: A Study On Secular Trend Of Meitei Male Population Of Bishnupur District, Manipur, India.. *International Journal of Anatomy and Research*. 2016;4 (4):3279-3283.
21. Maalman RS, Abaidoo CS, JoshuaTetteh, Darko ND, Atuahene OOD, Appiah AK Anthropometric Study of Facial Morphology in Two Tribes of The Upper West Region Of Ghana. *International Journal of Anatomy and Research*. 2017;5(3):4129-4135.
22. Hiernaux J, Froment A. The Correlations Between Anthropobiological and Climatic Variables in Sub-Saharan Africa: Revised Estimates. *Human biology*. 1976; 48(4):757-767.
23. 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.
24. Kataria SK, Sharma P, Kataria KR. Comparative study of Prosopic (Facial) Index of Sindhi Community of Jodhpur District of Rajasthan and other Communities and Races. *International Journal of Anatomy and Research*. 2011;1(3):171-173.
25. Bhasin MK. Genetics of Castes and Tribes of India: Somatometry *International Journal of Human Genetics*, 2006; 6(4):323-356.