



Anthropometric study of facial indices among Bangladeshi women

N Farhat¹, S M N Rahman², A R Albarune³, T Alam⁴

Abstract

Background: Craniofacial anthropometric values and indices are vital for experts from different walks of science. Variations in such values are evident in racial and geographical attribute. Furthermore, anthropological classification would assist clinicians in planning regional surgeries, forensic identification and many more.

Objective: In this study we aimed to measure the head-face landmarks in a particular population and to correlate their association.

Methodology: To assess intra population variation, the fronto-occipital circumference, facial height, bizygomatic breadth, bitragion breadth, bigonial breadth, width of mouth, intercanthal width, biocular breadth and body height of 100 Bangladeshi women (age 25-45 years) were measured and craniofacial indices were calculated. Frequencies were observed while comparing the variables by ANOVA using SPSS version 17.

Result: The mean values of facial indices revealed as prosopic index 103.8 ± 12 cm, zygomandibular index 81.1 ± 7.44 cm, canthal index 36.93 ± 2.3 cm and circumference-interorbital index 2.26 ± 0.4 cm. 86% of subjects were clustered to hyperleptoprosop group (very narrow face) and 69% had wide jaw with closely placed eyes. No significant ($p > 0.05$) correlation was denoted between variables and facial indices.

Conclusion: The result of this study would provide an access to baseline data of local standards for anthropometric evaluation which might help the clinicians in planning regional surgeries and forensic experts in identification.

Key word : Anthropometry, face type, craniofacial index, forensic medicine.

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Introduction

Diversity in the body dimension of every human being is influenced by environmental factors like socio-economic and nutritional status, climatic condition along with the physical setting of habitat, and level of physical work. Therefore, human populations possess characteristics that stamp them as residents of particular areas of the world.¹

Cephalic and prosodic indices can be calculated based on physically measured craniofacial values that are important parameters useful in anthropological studies for ascertaining the variation between gender as well as ethnic groups.^{2,3}

In the clinical aspect, physicians and surgeons require access to craniofacial databases during treating congenital or post-traumatic facial disfigurements in any population which are indispensable for precise determination of the degree of deviations from normal.⁴

From a medico-legal point of view, for personal identification facial reconstructions by a forensic artist in a case of disputed identity from facial measurements and estimation of body height from disintegrated human remains are necessary.^{2,5,6}

It is established and accepted that studies on anthropometric measurements are population specific. The database developed based on geometrical variability can help to preset the various features with computer-based animation technologies.^{6,7}

In craniofacial surgery and syndromology anthropometric studies play a vital role. Ocularadenexal changes and somatometric traits of the face such as epicanthus, telecanthus, flat nasal bridge, widely spaced eyebrows, and blepharophimosis may create a deceptive error in the identification of certain craniofacial syndromes. To diagnose craniofacial anomalies acceptable and reliable techniques are

essential. Therefore, telecanthus (increased distance between the medial canthi of the eyes, while the inter-pupillary distance is normal) and post-traumatic deformities (traumatic telecanthus) are evaluated by comparing the normal values of head/fronto-occipital circumference, inner canthal distance, outer canthal distance and canthal indices which are the most important measurements. These patients can be better treated with the knowledge of normal values of the region to produce the best esthetic and functional result for proper mounting of spectacle lenses to eliminate the unwanted prismatic effect. Furthermore, all values are useful in the manufacture of spectacle frames and lenses. Suitable positioning of the medial canthal complex to maintain proper inner canthal distance is required for successful reconstruction of the medial canthal area. Standard data based on ethnicity or race is desirable as these standards reflect the potentially different pattern of craniofacial growth among different populations.⁸

Because of the difference observed in other studies, the main purpose of this study was to identify various face types in a specific population by calculating indices and to evaluate the correlation between craniofacial dimensions and height in the same population.

Materials and Methods

This cross sectional, analytical type of study was carried out from January 2018 to June 2019 in the BG Collection Garments factory of Gazipur. One hundred Bangladeshi female garments workers of garments factory were selected purposively as study subjects. Age of the subjects ranged from 25 to 45 years which was confirmed by checking national identity card. After a short briefing on the objective of the present study, the subjects were asked to give a voluntary consent on the consent form.

The body height was recorded in cm by using stadiometer following the procedure described by Jasuja and Singh. After measuring body height, the subject was requested to sit on a chair comfortably with her head in anatomical position. The landmarks of the variables were located on her face and head by careful inspection or palpation and were marked by a point on the skin surface by marker then the measurements were taken.⁹

The head/fronto-occipital circumference was measured by placing the non-stretchable flexible measuring tape on the occipital protuberance behind and supraorbital ridge in front and it was wrapped around the occiput to the anterior portion of the skull.⁸

The total facial height, Inter-canthal width, Biocular breadth and width of mouth were measured by using vernier caliper and for measuring facial height the two ends of the caliper were placed on nasion and gnathion. Inter-canthal width and biocular breadth are the horizontal distance between inner corners of right and

left eyes and between the outer corners of the right and left eyes. The width of the mouth is the horizontal distance of the two angles of the closed mouth. All the measurements were recorded in cm.^{4,10,11}

The head length, bizygomatic arch, bitragion breadth, bigonial breadth were measured by using spreading caliper. Head length is measured from glabella to inion. Distance between maximum prominences of two zygomatic arches is the Bizygomatic breadth and distance between two tragus is bitragion breadth. The bigonial breadth is the distance between two gonion. The readings were taken from the calibrations on the caliper and were recorded in cm.^{10,12,13}

Calculation of index:^{3,6,9}

Index is the ratio between two measurements which is used to estimate value of one variable from another.

Formula for calculating indices:

Prosopic index (PI) = facial height ÷ bizygomatic arch × 100³

Zygomandibular index = bigonial breadth ÷ bizygomatic arch × 100⁶

Canthal index = inner canthal distance ÷ outer canthal distance × 100⁹

Head circumference-interorbital index =

inner canthal distance ÷ fronto-occipital circumference × 100⁹

Picture showing procedure of measuring different variables

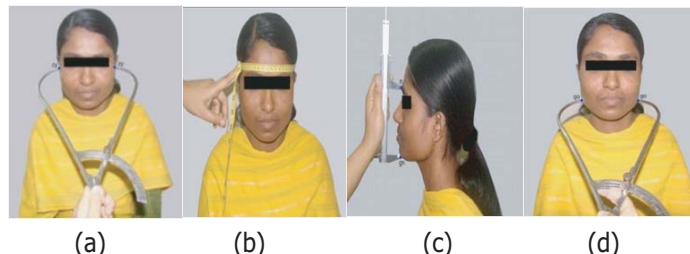


Figure 1: (a) Procedure for measuring head circumference (b) Procedure for measuring bizygomatic arch (c) Procedure for measuring facial height (d) Procedure for measuring bigonial breadth

Results

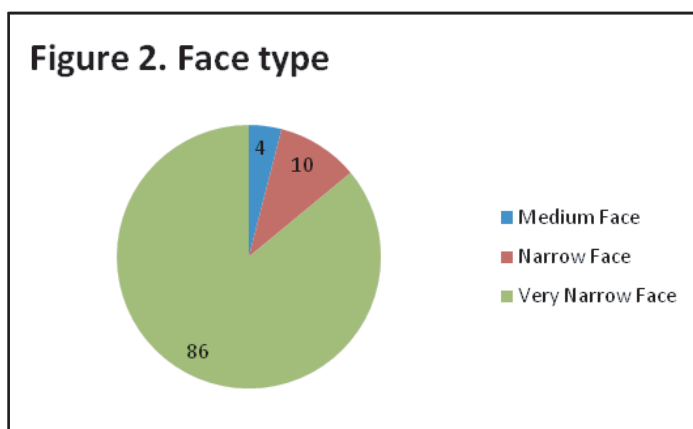
In our study we found that the mean values of (± SD) of facial indices as follows prosopic index 103.8 ± 12cm, zygomandibular index 81.1 ± 7.44cm, canthal index 36.93 ± 2.3cm and circumference-interorbital index 2.26 ± 0.4cm. (Table 1)

Table I : Measurement of Index

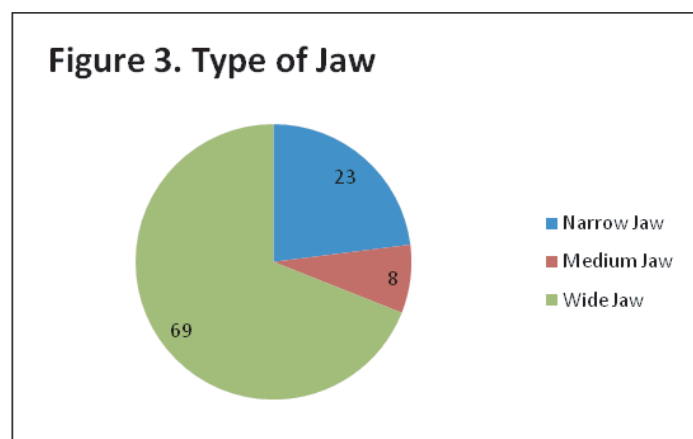
Index	Mean ±SD	Range
Prosopic Index	103.8±12	86.7-159.2
Zygomatoco Mandibular Index	81.1±7.4	61.5-110
Head Circumference-Inter orbital Index	2.3±0.3	1.3-3.2
Canthal Index	36.9±2.3	31.9-44.1

All the study subjects were reclassified according to facial indexes. In this study majority of the subjects (86%) were

clustered to hyperleptoprosopie group (very narrow face), 10% had leptoprosopic or narrow face, 4% had mesoprosopic or medium face. (Figure 2)



The study shows that 69% had wide jaw with closely placed eyes, 23% had narrow jaw, 8% had medium jaw. In the study population face shape corresponding phenotypes designated as hypereuryprosopic and euryprosopic were not observed (0%). (figure 3)



Finally, the correlations between body height and each craniofacial index were evaluated. Frequencies were observed while comparing the variables by ANOVA using SPSS 16.0. No significant ($p > 0.05$) correlation was denoted between the body height and facial indices.

Discussion

This study was aimed to find out different face types in a group of population by calculating indices and to assess the correlation between craniofacial measurements and stature in the same population. According to ethnic background, environmental factors and habitudes different populations show variations in their morphological structure of head and face. Structural differences could also be observed between the individuals in the same populations. Correlation coefficients for individuals belonging to certain head face type were evaluated as

correlation coefficients between head and face dimensions and body height can change according to different head face types. Facial types based on the prosopic index(%) are as follows, hypereuryprosopic/vary broad face < 75 and $75-79.9$, euryprosopic/broad or low face $80-84.9$, mesoprosopic/medium face $85-89.9$, Leptoprosopic/ narrow or high face $90-94.9$, Hyperleptoprosopic/vary narrow face > 95 . Facial types based on zygomandibular index(%) can be classified as follows narrow jaw up to 79.9 , Medium jaw between $76.0-77.9$ and wide jaw is above 78.0 .^{6,7,25}

Regarding face type based on prosopic indices obtained in this study majority of the study subjects (86%) belonged to hyperleptoprosopie group (very narrow face) which is similar to North Eastern Nigerian and Dangi of Madhya Pradesh India, Iranian Qazvin population, but differs from Bangladeshi Buddhist chakma, Onge (Andaman-Nicobar Island), Santhal (West Bengal of India), Ibo and Yoruba women of Southern Nigeria who are hypereuryprosopic (very broad face).^{1,3,14-17} In our study we have found that Purana population residing in Sigiriya of Srilanka and people living in central Serbia have leptoprosopic (narrow face) which are close to the study done on Bangladeshi women. On the other hand women of Dera Ghazi Khan Pakistan, Haryanvi Baniyas of India, Ahirwar of Madhya Pradesh India have medium sized mesoprosopic face which does not match with our present study. Hypereuryprosopic and euryprosopic are the rear types of face among the study population.^{1,3,7,14-19,20}

There was no previous data found in jaw type between different population around the world and in this study among the subjects 69 had wide jaw, 23 had narrow jaw and 8 had medium sized jaw.

Ocular indices of the female study subjects are dissimilar with Bangladeshi Buddhist chakma, Urhobo and Itsekiri of Nigeria, Ibibio of Nigeria, Ahirwar and Dangis of Madhya Pradesh India but similar with Indian women, Turkish women, Ijawand Igbo women of Nigeria.^{5,9,16,21-24}

Correlation between the variables, facial indices and body height were calculated. The results obtained from this study showed that there was no significant positive correlation between stature and facial indices.

The main limitation of this study was the sampling. Since the subjects were selected conveniently and from a specific locality, the results might not be replicative with the whole population of the country.

Conclusion

It became evident from this study that facial built of adult Bangladeshi females are mostly very narrow type. However, on the basis of jaw they are predominantly in the wide-jaw category. These findings could contribute not only to the life

scientist to help to decide appropriate clinical management or medico-legal identification.

Conflict of interest

None to declare.

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