

Photographic Estimation of Intercanthal Width of Bangladeshi Women

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Abstract

Background: Estimation of intercanthal width and biocular breadth from digital photography is important in the evaluation of several systemic syndromes, craniofacial abnormalities and in surgical treatments of post-traumatic telecanthus. Dysmorphologists employ canthal measurements in evaluating the degree of hypertelorism. So intercanthal width and biocular breadth values are very important for clinicians, ophthalmologists, plastic and reconstructive surgeons. The reliability of estimation of intercanthal width from biocular breadth by using multiplication factor is high. **Objective:** To make an attempt to determine the multiplication factor for estimation of intercanthal width. **Materials and method:** This is a cross sectional study conducted in the Anatomy department of Sir Salimullah Medical College, Dhaka, Bangladesh from January 2010 to June 2011. One hundred Bangladeshi 25 to 45 years old women were selected purposively for the study. **Results:** The mean±SD intercanthal width was 3.456±0.3585 cm. Multiplication factor for measuring intercanthal width from biocular breadth (9.348±0.7174 cm) was 0.369±0.0232 cm. The mean±SD of estimated intercanthal width was 3.449±0.2647 cm. No significant difference was found between the measured and estimated intercanthal width. **Conclusion:** Multiplication factor can be used to determine intercanthal width in Bangladeshi women though agreement test would have been done to generalize the finding.

Keywords: Intercanthal width; biocular breadth; multiplication factor; digital photography.

Delta Med Col J. Jul 2015;3(2):78 – 82

Introduction

Facial anthropometric studies provide a quantitative description of craniofacial complex and these studies in different populations have also stated the proportional correlations among different measurements of face.¹

Deformities of the face are most often congenital but may result from trauma, burn, neoplasm or any pathology involving the facial skeleton. Several studies have shown that values of facial dimensions are race, age and gender sensitive.²

Charles et al. noted that canthal dimensions may vary with altitude, climatic conditions or ecological habitat of one human population to another.²

Craniofacial dimensions may be determined by a single gene, gene groups or environmental factors. Facial anthropometrics has become an important tool used by genetic counselors and in reconstructive surgery. In genetic counseling it is necessary to identify dysmorphic syndromes in the

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early stage as accurately as possible. Dysmorphic characters are usually reported by clinicians in descriptive terms such as “wide set eyes”. However, such description is subjective. Anthropometric measurements can overcome these problems. The diagnosis of many dysmorphic syndromes is based on advanced cytogenetic and molecular techniques and also on recognition of subtle morphological anomalies in craniofacial region.^{2,3} In diagnosing certain anomalies and syndromes, abnormal facial features such as telecanthus, ocular hypertelorism or hypotelorism are taken under consideration by many clinicians, geneticists and maxillofacial surgeons.⁴

Measurements taken from a patient can be compared with the values obtained from the normal population and deviation from normal values can be evaluated. For evaluation of deviations in craniofacial morphology, standards of anthropometric measurements should be established for a particular population. Craniofacial dimensions are not available to the clinicians in many countries, including Bangladesh.

Identification of diversity of facial features among different population plays an important role in many facial image applications like human computer interaction, video surveillance, face detection, face recognition, facial expression classification, face modeling and face animation.⁵

This study can be useful in designing various optical equipments like spectacles, goggles, etc. by formulating standardized sizes.⁶

Several methods have been used to measure face. Digital photographic techniques potentially offer a highly practical, convenient and cost effective method which can be used together with CT scan, 3-D data collected by laser scanning or MRI for anthropometric measurements of face.

The aim of the study was to determine the multiplication factor for estimating intercanthal width and also to compare intercanthal width and biocular breadth of Bangladeshi women with women from different corners of the world.

Materials and method

This cross sectional study was carried out from January 2010 to June 2011 in the Anatomy department of Sir Salimullah Medical College, Dhaka, Bangladesh. One hundred Bangladeshi female were selected purposively. Age of the subjects ranged from 25 to 45 years.

Operational definitions

The horizontal distance from one ‘endocanthion’ (the inner corner of the eye fissure where the eyelids meet) to another ‘endocanthion’ is considered as intercanthal width. Biocular breadth is considered as horizontal distance from one ‘exocanthion’ (the outer corner of the eye fissure where the eyelids meet) to another ‘exocanthion’.⁷

The photograph was taken after the subject was seated comfortably on a chair looking straight to the camera which was fixed on its stand at the same level of the subject’s head having a distance of 120 centimeter, both eyes opened and mouth closed with a fixed focus, zoom and illumination. Intercanthal width and biocular breadth of the subjects were measured by digitizing points at endocanthion, exocanthion of both eyes and then horizontal lines were drawn on the above mentioned points and photographic measurements were recorded by using the computer programme Adobe Illustrator Version-10. The measured photographic values were multiplied by the corresponding conversion factor to estimate the actual value.

Calculation of conversion factor (CF)⁸

The conversion factor is a ratio, calculated by dividing a physically measured value of a variable, by a photographically measured value of the same variable of each subject to convert photographically measured values to actual measurements.

To calculate the conversion factor of a particular photograph, the physically measured biocular breadth of each subject was divided by the photographically measured biocular breadth of that subject. Then intercanthal width and biocular breadth of the subject measured from the photograph were multiplied by the conversion factor to know the actual measurement.

Formula for calculating conversion factor (CF)

$$CF = \frac{\text{Biocular breadth measured by physical method}}{\text{Biocular breadth measured by photographic method}}$$

Calculation of multiplication factor (MF)⁸

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

Formula for calculating multiplication factor (MF)

$$MF = \frac{\text{Intercanthal width}}{\text{Biocular breadth}}$$

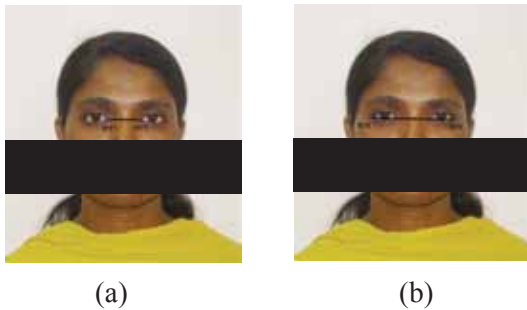


Fig 1: (a) Photographic measurement of the intercanthal width from endocanthion to endocanthion (en-en). (en indicates endocanthion) (b) Photographic measurement of the biocular breadth from exocanthion to exocanthion (ex-ex). (ex indicates exocanthion)

Ethical Clearance

The study was approved by the ethical review committee of Sir Salimullah Medical College, Dhaka, Bangladesh.

Results

Table I shows the mean±SD of intercanthal width (both measured and estimated) and biocular breadth of the study subjects. The purpose of calculating multiplication factor (0.369±0.0232) was to estimate intercanthal width from biocular breadth.

Table I: Distribution of the variables (N = 100)

Variables	Mean±SD (cm)
Intercanthal width (measured)	3.456±0.3585
Biocular breadth	9.348±0.7174
Intercanthal width (estimated)	3.449±0.2647

Paired Student's 't' test revealed no statistical significant difference between measured intercanthal width and estimated intercanthal width (Table II).

Table II: Comparison between measured intercanthal width and estimated Intercanthal width (N = 100)

Intercanthal width	Mean±SD (cm)	p value
Measured	3.456±0.3585	0.276
Estimated	3.449±0.2647	

Highly significant positive correlation (r=0.798; p=0.000) was found between intercanthal width and biocular breadth (Fig 2).

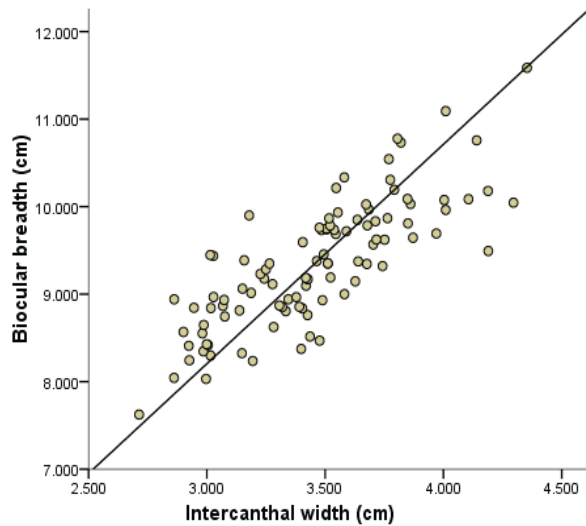


Fig 2: Scatter diagram with correlation analysis showing significant positive correlation between intercanthal width and biocular breadth (r=0.798 and p=0.000)

Discussion

In the present study the mean±SD intercanthal width and biocular breadth was measured 3.456±0.3585 cm and 9.348±0.7174 cm respectively.

Evereklioglu et al.⁴ worked on Turkish women (25-40 yrs) and Farkas, Katic and Forrest⁹ worked on Egyptian and Iranian women. Mean intercanthal width and biocular breadth of these women were 3.02 cm and 8.73 cm, 3.09 cm and 8.63 cm, 2.46 cm and 7.98 cm respectively. Their observed mean intercanthal width and biocular breadth of these Middle Eastern population groups have lower values than that of the present study group.

Le et al.¹¹ worked on Chinese, Thai and Vietnamese women and their mean±SD intercanthal width were 3.71±0.33 cm, 3.66±0.28 cm and 3.67±0.25 cm respectively. These findings are higher than that of the present study. Farkas, Katic and Forrest⁹ also worked on Thai and Japanese women of Asia. Mean values of intercanthal width and biocular breadth of Thai and Japanese women were 3.60 cm and 9.90 cm, 3.50 cm and 9.33 cm respectively. These findings are also higher than the values of the present study.

A study was undertaken by Singh and Purkait¹⁰ in the Mukarampur village in Sagar district of Madhya Pradesh, India, among two sub caste groups, Dangi and Ahirwar. The researchers found mean intercanthal width of Dangi women 2.8 cm and mean biocular breadth 8.8 cm. They also found mean intercanthal width of Ahirwar women 2.8 cm and mean biocular breadth 9.0 cm. The findings of the present study are higher than the findings of Singh and Purkait.

The findings of the study carried out by Farkas, Katic and Forrest⁹ shows that in Europe, intercanthal width and biocular breadth of Czech, Croatian, German, Italian and Polish women are lower than that of the present study. In contrast, in Africa (Angolan, Zulu, Afro-American women) values of both parameters were found higher than the values of the present study. On the other hand the result of Charles et al.² showed that mean±SD intercanthal width of South Nigerian Ijaw women of Africa was 3.9±0.3 cm and biocular breadth was 12.0±0.7 cm which are higher than that of the present study.

Evidence of positive correlation was found between intercanthal width and biocular breadth in the above mentioned different populations. Similar positive correlation has been found in this study.

It can be concluded from the findings of different studies that dissimilarities exist in results. European (Czech, Croatian, German, Italian, Polish) and Middle Eastern (Turkish, Egyptian and Iranian) women have lower values but African (Angolan, Zulu, Afro-American, South Nigerian Ijaw women) and Asian (Singaporean Chinese, Thai, Vietnamese, Japanese) women have higher values of intercanthal width and biocular breadth than the subjects of the present study. Variations are due to variation in ethnicity/race, nutritional status and measurement procedures.

Conclusion

Practicable, convenient and cost effective photographic method can be made popular in measuring facial dimensions. The method can be used to develop an anthropometric baseline data of different age groups, sex and ethnicity. This data might also help the clinicians and surgeons in diagnosing cases and planning treatment accordingly.

Limitation

Though we found non significant difference between measured and estimated intercanthal width, as agreement test was not performed the result should be interpreted for general population with caution.

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