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# Anthropometric measurements of the orbital contour and canthal distance in patients reporting to a tertiary centre in Kerala

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***Abstract :*** *In this era of artificial intelligence and robotic surgery we are on the verge of reconstructing a face in the best possible way based on anthropometric values. These values can act as the data for artificial intelligence in creating an algorithm for facial reconstuction surgeries. These values are useful for surgeons in facial reconstruction even today. Anthropometric values varies with each ethnic races. So it is essential to formulate the average anthropometric values for each ethnic race. In this study we are intending to find the normal average anthropometric values of orbito nasal area of people in South Kerala, India.*

***Keywords:*** *Anthropometry ,intercanthal distance, Inter Pupillary distance, Syndromic reconstruction*

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## I. Introduction

Anthropometry has developed itself into a prominent branch in recent years due to its wide range of usefulness in clinical practice. Anthropometry got its role in clinical practice from early 19th century itself. Anthropometry started in 5th century BC when the Greek sculptor Polycleitus detailed the ideal proportions of the human body in his Canon[1]. Great people like Leonardo da Vinci, Bergmuller, Dürer and Elsholts got fascinated by the idea of facial proportion [1,2]. Facial proportions play a great role in facial aesthetic surgical procedures like rhinoplasty, orthognathic surgery, otoplasty and many other craniofacial reconstruction techniques.

A craniofacial surgeon needs the average facial measurement values for reconstruction of face specific to the ethnic population he is working with. Raschke et al[3] reported that the anthropometric measurements may help the surgeons to confirm the estimations performed intraoperatively in the postoperative period. Craniofacial anthropometric parameters provide important information about optimal facial harmony in clinical practice.[4] These parameters are useful for the early diagnosis of syndromic conditions and congenital or acquired orbital or and facial deformities, for planning surgical operations and evaluating the results of craniofacial surgery. Anthropometric parameters exhibit differences from population to population. Therefore it is essential to measure and formulate the average anthrapometric values of the specific ethnic population we work with.

### Aim and Objectives

### Aim

To calculate the average anthropometric measurements of the orbital contour and canthal distance in patients reporting to the department.

### Objectives

**1.**To determine the average intercanthal distance, outercanthal distance (OCD), palpebral fissure width (PFW), palpebral fissure height (PFH), and interpupillary distance (IPD)

2. To provide normative data that could be used for clinical assessment, craniofacial surgery and anthropologic evaluation for the index population

## II. Methodology

**Study Design** : Prospective Analytical study
**Study Setting** : Govt. Dental College, Trivandrum

### Sampling Technique:

Those who are giving consent who comes under the inclusion criteria is taken up in the study .All measurements are taken with Vernier Calipers

### Sample size

Sample size for this study is 750 males and 750 females reporting to the department

### Inclusion criteria

1. Age group from 18 to 30 is included
2. Patients with no evidence of any congenital face anomalies
3. Patients with no history of eye surgeries
3.Patients with no history of trauma to the face
4. Patients of Kerala ethnicity

### Exclusion criteria

1. Those unwilling to give consent

### Data Collection Tool:

1.VERNIER CALIPERS

### Procedure

In this study the parameters of measurements are the Intercanthal Distance (ICD: en-en), Outercanthal Distance (OCD: ex-ex), Interpupillary Distance (IPD: p-p), Palpebral Fissure Width right-left (PFW: ex-en/r-l) (fig-1). The parameters of measurements were taken with the head in the Frankfurt Horizontal Plane, which is defined as a line connecting the orbitale (the lowest point of the infraorbital margin) and the porion (point at the upper edge of the external auditory meatus) or tragion (landmark on the upper edge of the tragus) of the ear parallel to the floor. The measurements were performed while the subject is in the sitting position with the pupils fixed on the center. Measurements were taken using a Vernier caliper[1].Measurements were repeated three times by a single researcher. Each measurement was recorded on a prepared chart.

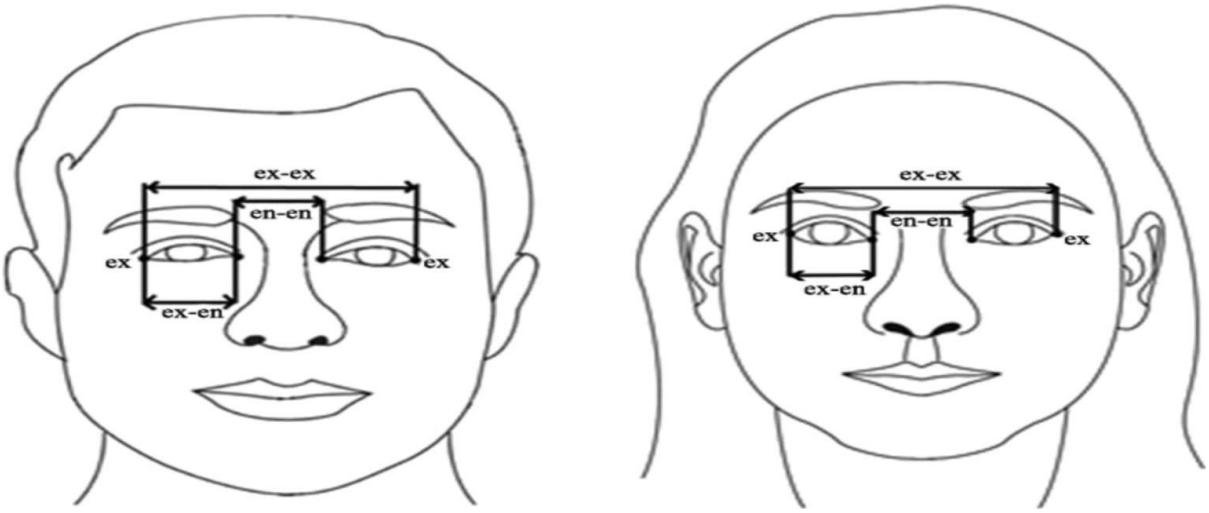



Fig-1: Diagrammatic representation of the anthropometric parameters taken for the study

## III. Result

This study was done on 1721 individuals in which 781 were females and 940 were males. Average age of the study subjects were 24.52 with a maximum age of 30 and minimum of 18.

**Palperbral fissure width and intercanthal width**

In accordance with the present study average distance from Exocanthion to endocanthion in both left and right eye is 30.5mm with a maximum value of 34mm in both eyes and a minimum value of 26mm in the right eye and 25mm in the left eye. The average Intercanthal distance (En-En) obtained in this study is 30.9 with a maximum value of 35mm and a minimum value of 25 mm.

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| r | 1721 | 26.00 | 34.00 | 30.5061 | 1.86557 |
| l | 1721 | 25.00 | 34.00 | 30.5555 | 2.10080 |
| centre | 1721 | 25.00 | 35.00 | 30.9599 | 2.28038 |
| Valid N (listwise) | 1721 | | | | |

**Outercanthal distance (OCD)**

The average outercanthal distance in this study is 91.82 mm with a maximum value of 101mm and minimum value of 67mm. The average interpupillary distance is 62 mm with a maximum value of 67 mm and a minimum value of 56 mm.

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| ex -ex | 1721 | 67.00 | 101.00 | 91.8268 | 5.90745 |
| interpupillary | 1721 | 56.00 | 67.00 | 62.0046 | 3.01700 |
| Valid N (listwise) | 1721 | | | | |

### Analysis based on age and gender

The average age of males participated in the study was 24.6 with maximum age of 30 and minimum age of 18 and average age of females was 24.4 with a maximum of 30 and minimum of 20

| sex | | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|---|
| Female | age | 781 | 20.00 | 30.00 | 24.4200 | 2.64969 |
| | Valid N (listwise) | 781 | | | | |
| Male | age | 940 | 18.00 | 30.00 | 24.6138 | 2.73089 |
| | Valid N (listwise) | 940 | | | | |

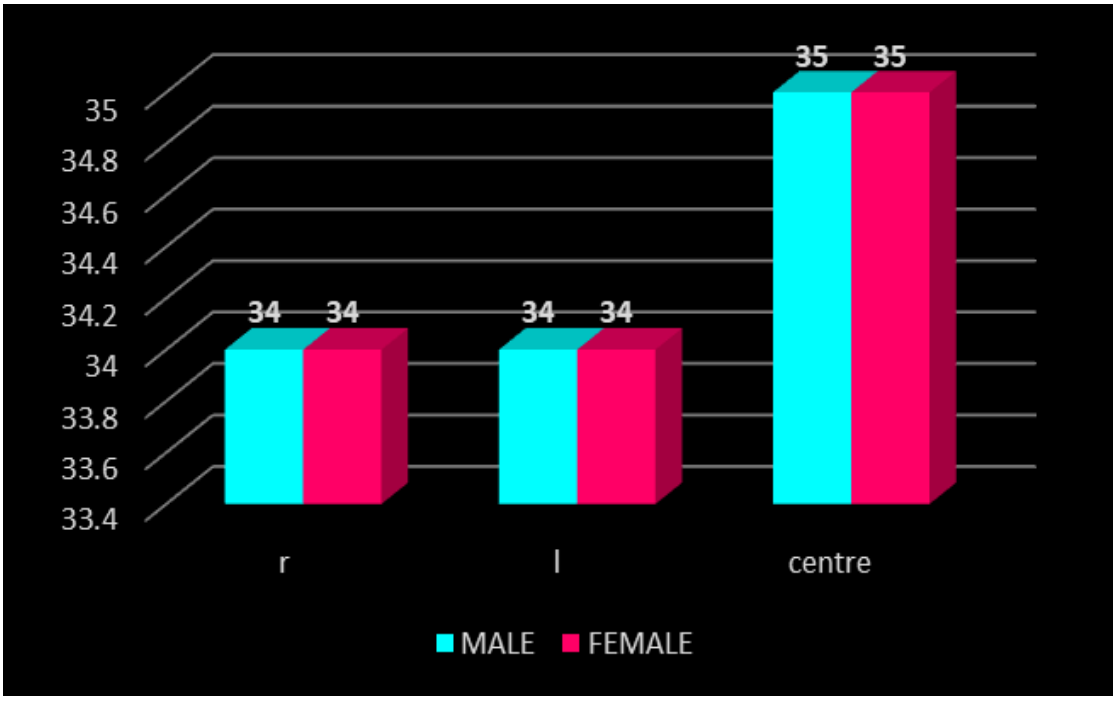
### Palperbral fissure width (Ex-En) and intercanthal width (En-En)

The average palperbral fissure width in participant females were 30.4mm in both sides with a maximum value of 34 mm and a minimum value of 25 mm on left eye. Intercanthal width average was 30 mm with a highest of 35 mm and lowest of 25 mm.

In males the average intercanthal width were 30.57mm in right eye and 30.6 mm left eye with a maximum value of 34 mm on right eye and and a minimum value of 26 mm. On left eye the maximum was 34 mm and minimum value was 25 mm.

**Descriptive Statistics**

| sex | | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|---|
| Female | r | 781 | 26.00 | 34.00 | 30.4277 | 1.86986 |
| | l | 781 | 25.00 | 34.00 | 30.4520 | 2.12417 |
| | centre | 781 | 25.00 | 35.00 | 30.9257 | 2.32039 |
| | Valid N (listwise) | 781 | | | | |
| Male | r | 940 | 26.00 | 34.00 | 30.5713 | 1.86048 |
| | l | 940 | 25.00 | 34.00 | 30.6415 | 2.07838 |
| | centre | 940 | 25.00 | 35.00 | 30.9883 | 2.24744 |
| | Valid N (listwise) | 940 | | | | |

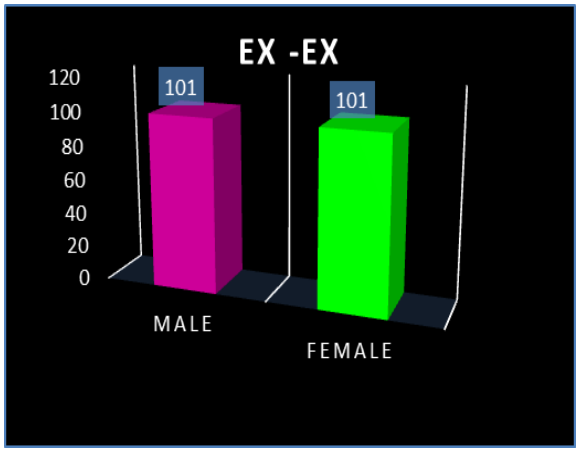


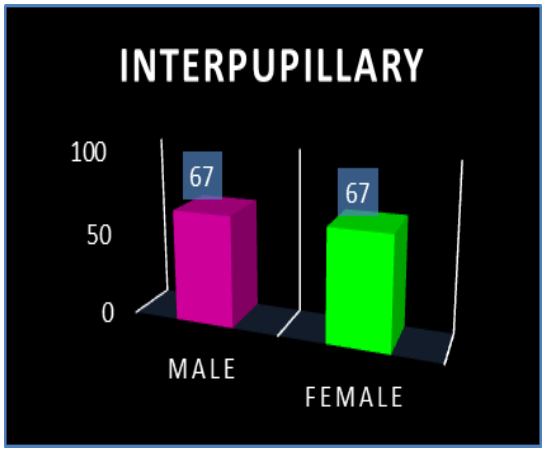

**Outer canthal distance (ex-ex) and inter pupillary width**

Mean value of outer canthal distance in females was 91.77 and that of males was 91.9. Interpupillary width mean value was 61.9 in females and 62.11 in males .Average palpebral fissure height was found to be 7.23mm in females and 7.20mm in males.

**Descriptive Statistics**

| sex | | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|---|
| Female | ex -ex | 781 | 67.00 | 101.00 | 91.7657 | 5.69166 |
| | interpupillary | 781 | 56.00 | 67.00 | 61.8771 | 3.05761 |
| | palpebral fissure height | 781 | 5.00 | 10.00 | 7.2343 | 1.12781 |
| | Valid N (listwise) | 781 | | | | |
| Male | ex -ex | 940 | 67.00 | 101.00 | 91.8777 | 6.08346 |
| | interpupillary | 940 | 56.00 | 67.00 | 62.1106 | 2.98032 |
| | Valid N (listwise) | 940 | | | | |




## IV. Discussion

Facial attractiveness depends on symmetry. The final aesthetic result depends upon the dimensions of all anatomic structures. The orbitonasal area is an aesthetically sensitive area of the face. Even a small difference can cause disharmony, asymmetry and disproportion. In facial reconstruction surgery determination of any unusual disproportion of the face with the help of indices is an invaluable tool both before and after the

operation. In case of craniosynostosis syndromic conditions like Apert syndrome, Crouzon syndrome anthropometric values of a regional population plays a key role .This value will act as a guide for the surgeon in the reconstruction of the defect as well as measuring and monitoring the growth pattern .

Interpupillary distance, intercanthal distance and outercanthal distance are significant measurements even in the reconstruction of orbito-nasal area in trauma care. Interpupillary distance is the most important parameter for measuring the distance between the eyeballs. A measurement of interpupillary distance and interorbital distance gives the true measurement of the position of the ocular apparatus which is unaffected by any soft tissue changes.[8] Intercanthal distance is also an important measurement in congenital or traumatic facial deformity[8] as well as in proper mounting of spectacle lenses to eliminate unwanted prismatic effects[5]

An abnormally wide distance between the inner canthi is termed telecanthus and may be a primary telecanthus involving only soft tissue change or secondary telecanthus associated with ocular hypertelorism[6]. A shortened palpebral fissure width has been linked to fetal alcohol syndrome[7]. Ocular and periocular anthropometric measurements were examined by several researchers. They obtained racial and ethnic differences in relation to age and gender. In this study we examined the intercanthal distance (ICD), outercanthal distance (OCD), palpebral fissure width (PFW)and interpupillary distance (IPD) in both males and females and observed no signicant differences based on gender. Wuet al[7] reported that there were significant differences in ICD, OCD, PFW right and PFW left between males and females in Han Chinese population and distinctly there were no significant differences in OH right and OH left[7] which is contradictory to our study.

## V. Conclusion

In the present study, we have reported normative anthropometric periocular measurements for patients reported to a tertiary centre in South Kerala, India .The normative anthropometric data presented in this study would be useful for clinical interpretation of periocular pathology and serve as a reference value when planning aesthetic and posttraumatic surgical interventions in this ethnic group. In this modern era of artificial intelligence and robotic surgery we are in the verge of feeding the systems with our standard measurements to get the optimal results as the chances of human error is minimal. This is bringing new dimensions to anthropometric studies in each ethnic group.

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