



**ORIGINAL RESEARCH PAPER**

**Anatomy**

**MORPHOMETRIC STUDY OF THE ORBIT IN ADULT DRY SKULLS OF SOUTH INDIAN POPULATION**

**KEY WORDS:** Bony Orbit, Orbital Height, Orbital Breadth, Orbital Index

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**ABSTRACT**

**Introduction:** The bony orbit which lodges the Eye ball is significant not only for anatomists but also for oral and maxillofacial surgeons, forensic experts, ophthalmic surgeon. The orbital cavities are four walled, quadrilateral pyramidal cavities with their apices directed posteromedially and their bases directed anterolaterally. **Materials & Methods:** The study was conducted on 50 dry adult skulls, obtained from Department of Anatomy GITAM Institutes of Medical Sciences and Research, Visakhapatnam. Measurements of Orbital Height, Orbital Breadth, Orbital Rim Perimeter, Orbital Index, Bi Orbital Distance and Inter Orbital Distance are recorded with the use of digital vernier calipers and were tabulated. **Results:** We found that the Mean and SD of Orbital Height in Right side  $33.14 \pm 1.74$  and Left side  $33.03 \pm 1.85$ , Orbital Breadth in Right side  $39.03 \pm 2.02$  and Left side  $39.15 \pm 2.37$ , Rim Perimeter Right side  $125.57 \pm 2.96$  and Left side  $125.73 \pm 2.63$ , Orbital Index in Right side  $84.58 \pm 5.09$  and Left side  $85.14 \pm 5.33$ , Bi Orbital Distance is  $95.34 \pm 4.26$  and Inter Orbital Distance is  $20.78 \pm 2.69$  **Conclusion:** The present study provides baseline measurements of both the orbits in South Indian population and concludes that there were no significant differences in all parameters between the right and left side orbits, which demonstrated the symmetry of the two orbits in the same individual. This study specifies useful orbital morphometric reference facts of the South Indian population that are very important for Maxillofacial Plastic Surgery, forensic neurosurgery and ophthalmological procedures.

**Introduction:**

The eyes speak without words which enhance the beauty of face. The word eye constitutes eye ball and orbital cavity. The orbital cavities are intended as a socket for eyeballs, muscles and fascia which keeps the eyeballs in position, nerves and vessels associated with vision, orbital pad of fat and lacrimal apparatus.

The orbital cavities are four walled, quadrilateral pyramidal cavities with their apices directed posteromedially at the optic canal and their bases directed anterolaterally at the orbital opening in the face bounded by orbital margins. The medial walls of the orbital cavities are parallel to each other with the distance of 25mm apart. The ethmoidal air sinuses are present between the medial walls of both orbital cavities. The lateral walls of the orbital cavities are inclined at an angle of  $90^\circ$ .

Morphological knowledge of the orbit is also essential in several surgical procedures like ophthalmological, maxillary surgeries and reconstructive cosmetic surgeries of face and in assessing syndrome such as Down syndrome. The present study was aimed toward documenting standard values of orbital indices during a south Indian group and comparing it with available data from other populations of world.

**Materials & Methods:**

The study was conducted on 50 dry adult skulls, obtained from Department of Anatomy GITAM Institutes of Medical Sciences and Research, Visakhapatnam. Skulls with craniofacial malformations or fractures were excluded from the study. A total 6 parameters are measured by using digital vernier caliper.

**Following parameters were measured.**

**a) Orbital Height:** The orbital height was measured as the distance between the marked points on supraorbital margin and infraorbital margin.

**b) Orbital Breadth:** The orbital breadth was measured as the

distance between the marked points on the medial orbit margin and the lateral orbital margin.

**c) Orbital Rim Perimeter:** Orbital rim perimeter was measured by placing the thread continuously along the orbital margins without any overlapping. The thread was taken out and its length was measured by vernier caliper after placing it over flat surface.

**d) Orbital Index:** Orbital index was calculated as orbital length/orbital breadth  $\times 100$ .

**e) Bi Orbital Distance:** Biorbital distance was measured as the distance between the marked points on the lateral orbital margin of right and left orbital cavities.

**f) Inter Orbital Distance:** Inter orbital distance was measured as the distance between the marked points on the medial orbital margin of right and left orbital cavities.

**Results:**

A total of fifty adult dry skulls orbital morphometry were studied. Statistical analysis was carried out and various parameters thus obtained have been compared. The following results were obtained-

**a)Orbital Height:**The mean and standard deviation of orbital height for right and left orbital cavities were  $33.14\text{mm} \pm 1.74\text{mm}$  and  $33.03\text{mm} \pm 1.85\text{mm}$  respectively.

**b) Orbital Breadth:** The mean and standard deviation of orbital breadth for right and left orbital cavities were  $39.03\text{mm} \pm 2.02\text{mm}$  and  $39.15\text{mm} \pm 2.37\text{mm}$  respectively.

**c) Orbital Rim Perimeter:** The mean and standard deviation of orbital rim perimeter for right and left orbital cavities were  $125.57\text{mm} \pm 2.96\text{mm}$  and  $125.73\text{mm} \pm 2.63\text{mm}$  respectively.

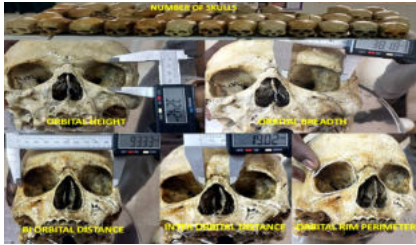
**d) Orbital Index:** The mean and standard deviation of orbital

index for right and left orbital cavities were  $84.58 \pm 5.09$  and  $85.14 \pm 5.33$  respectively.

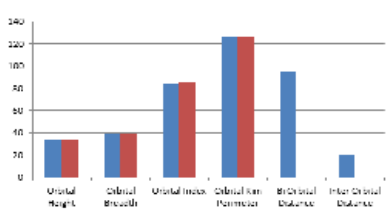
**e) Bi Orbital Distance:** The mean and standard deviation of bi orbital distance of fifty adult dry skulls was  $95.34 \pm 4.26$  mm.

**f) Inter Orbital Distance:** The mean and standard deviation of inter orbital distance of fifty adult dry skulls was  $20.78 \text{ mm} \pm 2.69$  mm.

**Figure :1**



**Chart: 1**



Various Orbital Parameters Measurements in mm on Right and Left sides

**Discussion:**

The quantitative orbital morphometry is most importance for planning reconstructive surgeries of orbital cavity. Since the orbital cavity showed regional, racial and ethnic variations the knowledge of quantitative morphometry of orbital cavity is mandatory for each individual population.

Fetouh FA (2014) reported that the average orbital height in Egyptian male and female was  $35.57 \text{ mm} \pm 1.37 \text{ mm}$  and  $35.12 \text{ mm} \pm 1.10 \text{ mm}$  respectively. Kaur (2012) reported that for north Indian population, the mean orbital height was  $31.9 \text{ mm} \pm 2.2 \text{ mm}$  and  $32.2 \text{ mm} \pm 1.8 \text{ mm}$  for right and left sided orbital cavity respectively. Divya C(2018) reported that for South Indian population the mean orbital height for the right and left sides were  $31.6 \pm 1.8 \text{ mm}$  and  $31.8 \pm 1.8 \text{ mm}$ . But our study orbital height for right and left orbital cavities were  $33.14 \text{ mm} \pm 1.74 \text{ mm}$  and  $33.03 \text{ mm} \pm 1.85 \text{ mm}$  respectively.

According to the study by Tabrej Alam MD et al (2016) in Indian population, the average orbital breadth for right and left orbit was  $41.6 \pm 3.26 \text{ mm}$  and  $41.8 \pm 2.48 \text{ mm}$  respectively. But our study orbital breadth for right and left orbital cavities were  $39.03 \text{ mm} \pm 2.02 \text{ mm}$  and  $39.15 \text{ mm} \pm 2.37 \text{ mm}$  respectively.

According to the study by Patil GV et al (2014) in South Indians, the average orbital index for right and left orbit was  $81.13 \pm 0.72$  and  $82.32 \pm 0.68$  respectively. But our study orbital index for right and left orbital cavities were  $84.58 \text{ mm} \pm 5.09 \text{ mm}$  and  $85.14 \text{ mm} \pm 5.33 \text{ mm}$  respectively.

Ji Y (2010), the mean bi orbital distance was  $98.77 \text{ mm}$  and  $93.69 \text{ mm}$  in Chinese men and women respectively. Jeong HC (2015) reported that the bi orbital distance for Korean and Caucasian population was  $97.73 \text{ mm}$  and  $97.69 \text{ mm}$  respectively. In the present study, the mean bi orbital distance was  $95.34 \pm 4.26 \text{ mm}$ . This was found to be lesser than the bi orbital distance of Chinese, Korean and Caucasian population.

Ji Y (2010) observed the mean inter orbital distance as  $27.18$

mm and  $25.11 \text{ mm}$  in Chinese men and women respectively. Jeong HC (2015) reported that the mean inter orbital length for Korean and Caucasian population was  $24.05 \text{ mm}$  and  $21.96 \text{ mm}$  respectively. In the present study, the mean inter orbital distance was  $20.78 \pm 2.69 \text{ mm}$ . This was also found to be lesser than inter orbital distance of Chinese, Korean and Caucasian population.

**Conclusion:**

The present study provides baseline measurements of both the orbits in South Indian population and concludes that there were no significant differences in all parameters between the right and left side orbits, which demonstrated the symmetry of the two orbits in the same individual. This study specifies useful orbital morphometric reference facts of the South Indian population that are very important for Maxillofacial Plastic Surgery, forensic neurosurgery and ophthalmological procedures.

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