

A comparative study of orbital morphometry in dry skulls of a district in West Bengal

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ABSTRACT

Background: Bony orbit which lodges visual apparatus is a very important area for anthropologists, anatomist, forensic experts, as well as surgeons. Orbital diameters vary according to race, age, sex, food habits, climate, etc. **Objectives:** The objectives of this study were to provide data regarding different orbital parameters in West Bengal population and also establish gender variation. **Materials and Methods:** This study involved 100 dry skulls (70 males and 30 females) from the Department of Anatomy, Burdwan Medical College, West Bengal. Orbital height (OH) and orbital breadth (OB) have been taken of both the right and left orbit in male and female skulls. Orbital index (OI) was calculated by $\text{OH/OB} \times 100$. All these measurements were taken by Vernier caliper. **Results:** Mean Orbital height in male 32.46 mm. (right), 31.86 mm.(left), in female 29.13 mm. (right), 32.57 mm. (left). Mean Orbital breadth in male 39.14 mm. (right), 38.77 mm. (left), in female 38.33 mm. (right.), 38.67 mm.(left). Orbital index in male was 82.93 mm.(right), 82.17 mm.(left), in female 76 mm.(right), 84.23 mm.(left). While comparing the right- and left-sided orbit in same skull, the OH is measured as 30.83 and 31.43 in the right and left side, respectively, OB 38.81 (rt.) and 38.75 (lt.) and OI remains 80.87 (rt.) and 81.05 (lt.) which categorizes the skulls to be microseme type. **Conclusion:** Our study shows that the left orbit and male orbit have higher values in comparison to the right orbit and female orbit. This study also states that the West Bengal population falls under microseme category of skull classification. It is suggested to do further studies in different districts of West Bengal to get unbiased solid database.


KEY WORDS: Orbital Index; Microseme Category; Morphometry

INTRODUCTION

The orbit is a very complicated yet interesting region of human body. The skull is the second best part of skeleton for the determination of sex after pelvis.^[1] The knowledge of bony orbit, in which the visual machinery is situated, is of utmost importance both for clinicians and surgeons in the field of ophthalmology, oral, maxillofacial, and neurosurgery.^[2] The study of orbital morphometry is important for a better

knowledge of the anatomical disposition of the orbital structures and for surgeries around the region. Orbital anatomy is vital for surgical correction of the bony orbit to ensure an efficient structural disposition of the visual apparatus.^[3] Reconstruction surgery for the management of traumatic or any pathological conditions related to orbit will need thorough knowledge of orbital region. Shape of face highly depends on orbital index (OI). There is definite sexual, racial, and regional dimorphism in relation to OI. Orbital height (OH), OB, and OI can be measured manually and radiologically; here, it is done manually using Vernier caliper. Taking the OI as standard, three classes of orbit have been described^[4,5] as shown in Table 1.

Many studies have been done to measure orbital cavity using radiographs and computed tomography.^[6,7] Studies on orbital morphometry are there on North Indian and South Indian population, but no studies have been done in Eastern India, so

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our study aims at finding out orbital parameters in West Bengal population. The objectives of the present study are as follows:

1. To find out the standard values of orbital indices in West Bengal population
2. To compare it with available data from other populations of the world as well as to establish that sexual variation does exist and
3. To classify the type of dry skulls of Eastern Indian origin.

MATERIALS AND METHODS

This study conducted on 100 adult dry skulls, of which 70 males and 30 females (differentiated according to morphology) collected from the Department of Anatomy of Burdwan Medical College, Burdwan, West Bengal. Skulls were measured using Vernier caliper with 0.01 mm accuracy. All the measurements were recorded in mm.

Inclusion and Exclusion Criteria

Only normal skulls were selected for the study. Skulls with craniofacial malformations or fractures were excluded from the study.



Figure 1: Measurement of orbital breadth



Figure 2: Measurement of orbital height

1. Orbital breadth: distance between midpoint of the medial margin of the orbit to midpoint on the lateral margin of the orbit Figure 1.
2. Orbital height: maximum distance between the upper and lower margins of the orbital cavity Figure 2.
3. Orbital Index: Orbital height/ orbital breadth multiplied by 100.

RESULTS

This study shows that mean OH on the right side is 30.83 mm and 31.43 mm on the left side; OB on the right side is 38.81 mm and on the left side 38.75 mm. Mean OI in West Bengal population was 80.87 mm on the right side and 81.05 mm on the left side. The findings are shown in Table 2 (of 100 dry skulls).

The measurements of male skulls show that mean OH on the right side is 32.46 and on the left side is 31.86. Mean OB on the right side is 39.14 mm and on the left side 38.77 mm and OI is 82.93 (rt.) and 82.17 (lt.). The female skull mean OH on the right side is 29.13 mm and the left side 32.57 mm. Mean OB on the right side is 38.33 mm and 38.67 mm on the left side. OI on the right side is 76 and the left side 84.23 in female. The findings are shown in Table 3.

Table 1: The classification of orbital index

Type	Orbital index	Seen in
Megaseme (large)	89 or more	Yellow races
Mesoseme (intermediate)	89–83	Caucasoid races (European 87, English 88.4)
Microseme (small)	83 or less	Negroid races

Table 2: Comparison of orbital height, orbital breadth, and orbital index between the right and left side

Parameter	Side	Mean	SD
OH	Right	30.83	4.64
	Left	31.43	2.88
Orbital breadth	Right	38.81	2.35
	Left	38.75	2.17
OI	Right	80.87	
	Left	81.05	

SD: Standard deviation

Table 3: Morphometry of height, breadth, and orbital index of male and female orbit

Parameter	Male (70)		Female (30)	
	Right	Left	Right	Left
Height	32.46	31.86	29.13	32.57
Breadth	39.14	38.77	38.33	38.67
Orbital index	82.93	82.17	76	84.23

DISCUSSION

The data of our study enunciate that all the parameters are more in male than in female and the left-sided findings are more than the right side that may be due to differential growth pattern of brain showing left predominance. This study shows that the skulls of West Bengal population fall under the microseme type.

This study reveals that OI is 80.87 on the right and 81.05 on the left side. Hence, our study population belongs to microseme category. Our study shows OI of male 82.17–82.93 and in female 76–84.23 which is very similar to the results of Divya *et al.*^[8] OH observed by Nagaraj,^[9] Rao and Padmini,^[10] Ukoha *et al.*,^[11] Kaur *et al.*,^[12] and Mekala *et al.*^[13] was 32.02, 36.2, 31.9, and 3.55, respectively. Our study reveals OH 30.83 and 31.43 in the right and left side. Orbital index (OI) was calculated by orbital height/ orbital breadth multiplied by 100. In the study done on North Indians by Joshi *et al.*^[14] showed OH in male 33.8, female 31.2; OB male 42.64, female 40.85; and OI male 83.45, female 77.96 which belongs to microseme type of orbit. Our study shows that OI in male 82.93, female 76 and other parameters also are in accordance with the study on North Indians. The study of Divya *et al.* confirms OI of South Indian population as to be 84.49 (right) and 85.48 (left) – mesoseme category, whereas in our study, it is 80.87 and 81.05 in the right and left side, respectively – microseme type.

There is no recent study on orbital anatomy on West Bengal population, rather Eastern India. Although there are racial, environmental, and dietary variation in different districts of West Bengal that might contribute to different results in this study which is done in Burdwan district, it will provide an average morphometric data for further studies in different districts of West Bengal.

Limitations of this study are that only 100 skulls could be taken for research and only one district of West Bengal chosen as the study population so there might be some change in the observation if more districts and more number of skulls are included.

CONCLUSION

This study helps to provide data needed for clinical, surgical treatment, plastic surgery, and neurosurgery and also to design eye shielding gear. This anthropometric study is also useful

in medicolegal aspects to determine gender and ethnicity in forensic medicine.

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