Original Research Article

A COMPARATIVE MORPHOMETRIC STUDY OF ORBIT- IN NORTH INDIAN DRY SKULL

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ABSTRACT

Background: The bony orbit which lodges the visual apparatus is important not only for anatomists but also for ophthalmologists, oral and maxillofacial surgeons and forensic experts. The objectives of the Present study are to provide the normal reference orbital parameters for the north Indian population**.**

Materials and Methods: The study involved 215 dry skulls (83 female & 132 males) from the department of anatomy from GSVM Kanpur, KGMC Lucknow, SMC Unnao. Orbital height (OH), orbital width (OW) has been taken of both side skulls in male and female. Orbital index (OI) was calculated by OH/OW × 100= OI. All these measurements are taken by digital vernier caliper.

Result: Mean orbital height in male skull was 33.8 ± 1.27, while female skull was having 31.2 ± 0.98. Orbital width was 42.64 ± 2.16 in male and 40.85 ± 2.08 was measured in female and the orbital index was 83.45 and 77.96 in male then after in female and these all values are found to be statically highly significant. While comparing the right and left sided skull the height was 32.37 ± 1.08, 30.96 ± 0.85 while breadth was 40.31 ± 2.28 and 40.28 ± 2.02 and the orbital index was 80.75 ± 5.60 and 80.67 ± 5.31 founded only orbital height have highly significant value and width and index having nonsignifacant value.

Conclusion: We can conclude by our study that right orbit and male orbits have higher values In comparison to opposite side and sex having more value. Study also tells that male skull Is categorized under mesoseme and female in microseme categories of north Indian populations. It is recommended that further population based studies be carried out in different geographical locations.

KEY WORDS: Orbital index, Mesoseme, Dry skull.

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INTRODUCTION

The orbit is very complex structure. In forensic anthropology, sex estimation is extremely important to identity decedents. The skull is second best part of skeleton for determining sex after pelvis [1]. Orbital measurements are one

of the craniofacial parameters that are used in sexual estimation for anthropological studies [2]. Orbital index can be measured manually and radio logically. But direct measurement is of more natural perspective. Hence, this morphometric orbital skulls study is done by vernier calliper to determine orbital values (height and width) and orbital index in north Indian population between males and females. In particular the index varies with race, regions, within the same race of mankind and determines the shape of the face in different population groups and periods in evolution [3]. In each orbital cavity, the width is usually greater than the height, the relation between the two is given by the orbital index, which varies in different races [4].

Taking the orbital index as standard, three classes of orbit have been described [5]:

Megaseme (Large) – Orbital index is >89. Seen in yellow races

Mesoseme (Intermediate)– orbital index 89 - 83. Seen in white races

Microseme (Small) – Orbital index < 83 or less. Seen in black races

The knowledge of this index will be important in various aspects such skull classification in forensic medicine, anthropological studies, and in exploring the trends in evolutionary and ethnic differences.

MATERIALS AND METHODS

Adult skulls of unknown sex collected from Department of Anatomy from GSVM Kanpur, KGMC Lucknow, and SARASWATI medical college Unnao were examined. 215 normal skulls (430 orbits), Based on the morphology, were differentiated into 132 male and 83 female. Skulls were measured using digital Vernier caliper with 0.01mm accuracy. All the measurements were

recorded in millimeter. Orbital Height (OH) was measured as the maximum distance between the superior and inferior orbital margins. Orbital Width (OW) was the distance between the midpoint in medial and lateral walls of the orbits. Measurements are shown in Figure no 1 and 2 in both male and female skull. The Orbital index (OI) was calculated as OH/OW X 100. The data obtained were tabulated and analyzed statistically, Means ± Standard Deviation and range (Min. value – Max. value of each measurement) comparison of the mean values between sides was performed using the independent 't'-test, with respect to gender and side (right and left side), The results were considered significant when p value < 0.05 and was considered highly significant when p value < 0.001.

RESULTS

In male orbits the height ranges from 32.4 - 41.8mm where as in female orbits it was 29.3 - 38.6 mm. the range of breadth was 36.7 - 47.3 mm in male, and in female orbit it was 35.4 - 45.8 mm. While the OI of male and female was 83.75 and 77.96. It shows all these parameters were more in male as compare to female and all these values were found to be statically significant as shown in Table 1.

When the mean values of OH, OW, OI was calculated all these parameters of right side was more in comparison of left and significant value was found in orbital height, rest all values were nonsignificant can be seen in Table 2.

By above we might say those north Indian skulls are classified as microseme and mesoseme as OI 80.67 to 80.75. These all parameters are also described by Bar diagram 1

Table 1: Morphometry of height, breadth and index of male and female orbit.

Parameter	Side	Mean	SD	SDM	V	MD	SDE	P-Value
Orbital height	Male	33.8	1.27	0.14	1.61	2.6	0.18	< 0.0001
	female	31.2	0.98	0.11	0.95			
Orbital width	Male	42.64	2.16	0.24	4.64	1.79	0.34	< 0.0001
	female	40.85	2.08	0.23	4.33			
Orbital index	Male	83.45	5.12	0.57	26.07	5.49	0.74	< 0.0001
	female	77.96	4.23	0.47	18.32			

Table 2: Comparison among height, breadth and index of right and left orbit.

Parameter	Side	Mean	SD	SDM	V	MD	SDE	P-Value
Orbital height	left	30.96	0.85	0.134	0.73	-1.41	0.22	< 0.0001
	right	32.37	1.8	0.2	3.25			
Orbital width	left	40.28	2.02	0.23	4.1	-0.03	0.31	0.9532
	right	40.31	2.28	0.26	5.24			
Orbital index	left	80.67	5.31	0.64	28.2	-.08	0.86	0.9262
	right	80.75	5.6	0.62	31.48			

Diagram No. 1: BAR DIAGRAM showing comparison of height breadth and index in PART A of right and left side and PART B of male and female.
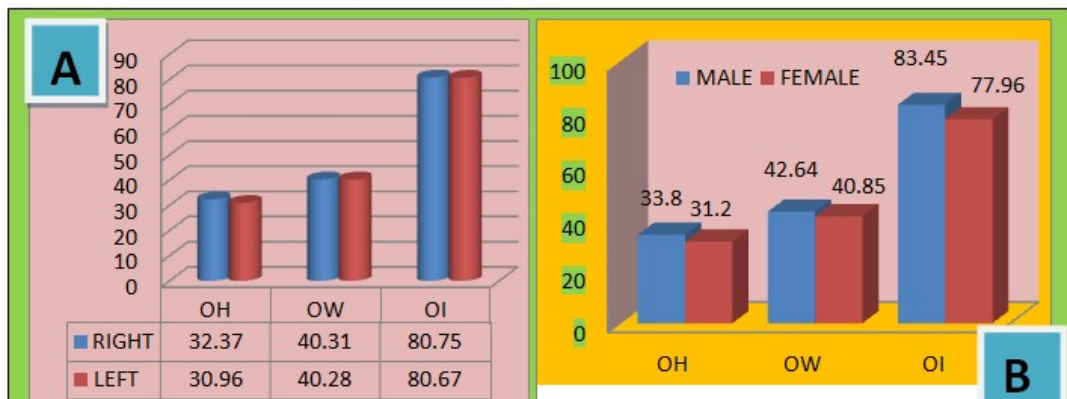

Fig. 1: Showing measurement by digital vernier caliper in mm of female skull, Breadth in **A** and height in **B**.

Fig. 2: Showing measurements by digital vernier caliper in mm of male skull, Breadth in **A** and height in **B**.

DISCUSSION

Prior knowledge of these parameters is vital to their successful application since they are different from one population to another for knowledge to determine sex in forensic medicine.

Result of present study is compared to previous study as Mekala D [6] Sanjai Sangvicichien et al [7] observed OH in male 3.62, 3.3 and in female 3.45 3.2. While OW in male was 4.29, 4.01 and in female was 4.05, 3.809. All these values were founded highly significant as in our study. OH of right side and is measured as 3.202 by Nagaraj S[8], 3.62 by Narasinga Rao [9], 3.19 by Ukoha et al [10] and Kaur J [11], 3.55 by Mekala D and left side was 3.14, 3.22 and 3.53, by Narasinga Rao [9] found it 32.89 and Nagaraj S seen 32.83. OW is measured by Narasinga Rao, Unokha, Kaur J, Mekala D and Nagraj as of right side was 36.5 3.63, 3.97, 4.17, 3.701 and of left was 3.6.4, 3.5, 3.9 , 4.18 and 3.502 these values were found to be non significant, while in our study the orbital height has significant value. Sayee Rajangam [12] measured the OH of right sided male and female was 3.5 and 3.2 and of left is 3.37 and 3.08 also the OW of male and female in right 4.17 and 3.72, that on left was 4.08 and 3.69 that as non significant. Orbital height of right side is more as compare to orbital width and this was more in male as compare to female. Orbital index was also measured in Table 3. Orbital morphology of population in geographical area is considered, factor like climate and food habit play great role. After reviewing all, we can say even in India according to different region the skull is categorized differently as north Indians comes under mesoseme but south Indians as megaseme [9].

Table 3: Showing Orbital index of various population by many authors.

Authors	Population	Male		Female	Category	
Nagaraj. S (2017)	South Indians	87.39			mesoseme	
Mekala D (2015)	South Indians	84.62		85.46	mesoseme	
Narasinga Roa (2015)	South Indians	86.13		90.69	megaseme	
Munguti Jeremiah (2013)	Kenyans	82.57		83.48	**M**	mesoseme
					F	microseme
Sayee Rajangam (2012)	Indians	rt	73.6	66.79	microoseme	
		lt	75.3	65.03		
Jaswinder Kaur et al (2012)	North Indians	81.65			microoseme	
Ukoha U et al (2011)	Nigerians	89.21			megaseme	
Sanjai Sangvicichien et al (2007)	Thais	83.5		86.61	mesoseme	
Present study	North Indians	83.45		77.96	**M**	Mesoseme
					F	microseme

Nigerians comes under megaseme while according to our study female comes under microseme and male comes under mesoseme which correlates same as the study of Munguti Jeremiah [13] in Kenyan people. The difference observed among left and right side could be attributed to the differential growth of two side of brain.

CONCLUSION

The data based on the present study, Indian skulls of Uttar Pradesh can be placed between mesoseme and microseme. Orbital dimension of particular person depend predominantly on genetic influences. The study is useful baseline and an anthropometric data will be in surgical aspects of oromaxillary surgery, orbital surgeries, and cosmetic surgeries and in medico-legal aspects of forensic medicine. The knowledge of this index is therefore important in various aspects such as in interpretation of fossil records, skull classification in forensic medicine and anthropological investigation of unknown individuals for determining gender, ethnicity, etc. Further studies are recommended to evaluate and characterize orbital parameters among different populations.

ABBREVIATIONS

SD- standard deviation
SDM- mean of standard deviation
V- Varience
MD- Mean difference
SDE- standard deviation error
Rt- right; **Lt** – left
M-male; **F-**female

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Conflicts of Interests: None

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