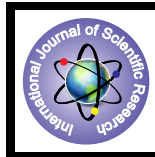


# Orbital Dimensions and Orbital Index Of Adult Human Dry Skulls: A Direct Measurement Study



## Medical Science

**KEYWORDS :** Orbital dimensions, Vernier Caliper, orbital index, Microseme category.

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### ABSTRACT

*Assessment of orbital dimensions is important for a good knowledge of the anatomical disposition of orbital structures and surgical management of orbital pathologies. Orbital dimensions of skull vary in different races of mankind. Its dimensions are better understood by the knowledge of the orbital index. This study involved 50 dry adult skulls. Orbital dimensions were measured by Vernier Caliper. The mean orbital length of the right and left sides were 34.3±2.09 and 34.4±1.68mm while, the orbital breadth were 41.6±3.26 and 41.8±2.48mm respectively. The mean orbital index was 82.68 indicating microseme category.*

### Introduction

Anthropometry aids the understanding of anatomical structures, constitutes the technique of expressing quantitatively the form of human body and skeleton. Anthropometric studies are an integral part of craniofacial surgery and syndromology [1]. For these reasons, standards based on ethnic or racial data are desirable because these standards reflect the potentially different patterns of craniofacial growth resulting from racial, ethnic and sexual differences [2].

Tanner stated that body physique is determined by numerous genes and environmental factors even though the relative contributions of these factors are not precisely known. The genetic composition of individuals varies, no matter the degree of intraspecificity of the individuals and environmental factors are diverse as ethno-racial aspects of the society differ. The human skull and cranium are essential segments of the skeleton that have received significant attention in terms of forensic research having been described as a major anthropometric tool in the analysis of ethno-racial relationships. Therefore, the features within it may give further insight into the understanding of intraspecificity of craniofacial anthropometry [3]. Some of these features that have been studied include dimensions of the nasal cavity and Paranasal air sinuses [4], dimensions of the orbital cavity including measurement of orbital volume[5,6]. Each orbital cavity is essentially intended as a socket for the eyeball and also contains associated muscles, nerves, vessels and in essence lodges the visual apparatus [3].

The two orbital cavities are situated on either side of the saggital plane of skull between the cranium and the skeleton of the face [7]. Assessment of orbital dimensions is important for several abnormalities that may occur in growth and development of the orbits in early foetal life and in cases of ocular diseases developed in later life [8]. Based on the different values obtained for orbital index, three categories of the orbits have been described.

1. Megaseme (large): The orbital index is 89 or over, seen in yellow races, except the Esquimax (Eskimos) [9].
2. Mesoseme (Intermediate): The orbital index range between 89 and 83, seen in the white races (European 87, English 88.4) [10].
3. Microseme (small): orbital index 83 or less. This type is characteristics of black races, where the orbital opening is rectangular [9]

This anthropometric study employs the use of direct measurement on dry skulls as it will present a different and a more natural perspective in assessing the orbital cavities. Also, this study will provide a deeper insight in the morphological disposition of

anatomic relationships of the orbit and also a guiding principle for surgeons who are involved in the reconstructive management of fractures due to traumas and different orbital pathologies.

### Materials and methods

This study was conducted in the Department of Anatomy, Hind institute of medical sciences, Mau, Ataria, UP. 50 adult dry human skulls were used. The skull having deformed orbit were discarded. The measurements were taken from different points of all the orbits. The measurements were taken with the help of vernier caliper calibrated in millimeters.

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

All measurements were recorded and expressed as Mean ± Standard Deviation



Fig.1. Orbital Length of Skull



Fig.2. Orbital Breadth of Skull

### Results

**Table 1: Right and Left orbital dimensions**

Orbital dimensions	Right (mean±sd)	Left (mean±sd)
Orbital length (mm)	34.3±2.09	34.4±1.68
Orbital breadth (mm)	41.6±3.26	41.8±2.48
Orbital index (mm)	82.60±4.43	82.76±6.96

The results indicate that the orbital length and breadth for left orbit was higher (34.4±1.68mm, 41.8±2.48). From the results, orbital index was calculated. A mean orbital index of 82.60 for right orbit and 82.76 for left orbit were deduced. Average of both was 82.68. Independent t test indicated that there was no significant difference between the right and left sides in all the parameters considered. (P>0.05).

**Table 2: Categories of orbit**

Category	Right	Left
Megaseme	16 (32%)	13 (26%)
Mesoseme	7 (14%)	12 (24%)
Microseme	27 (54%)	25 (50%)

The higher frequency of orbital type present in our study was microseme type for both right (54%) and left orbits (50%).

### Discussion

Each bony orbit essentially is intended as a socket for eye ball and also contains muscles, vessels, nerves and soft pad. In nutshell it lodges the visual apparatus [11]. The orbital index computed in this study was 82.68 which indicates microseme category. Our findings were in accordance with the studies done by Cassidy[9], Kaur et al.[12], Gosavi S.N. et al.[13] and Girish et al.[14]. The microseme category described for the black race by Cassidy [9] may be a product of environmental trends, invented by the influence of time, on the people involved in the study. Many factors have been implicated in the transformation of the facial skeleton into the adult form. Although the basic structure is determined in accordance with genetically regulated blueprints while in utero, that is modified pre and postnatally through functional matrices responding to environmental and epigenetic influence such as climate, activity patterns and masticatory functions [15].

The orbital index which determines the shape of the face differs in different population groups. The orbits with larger widths than height will have smaller orbital indices while those with larger orbital indices will have narrow face [16]. This index varies with race, regions within the same race and periods in evolution. The slight difference in dimensions observed between the right and left side, though not significant, could be attributed to the differential growth of the two sides of the brain [7].

### Conclusion

In our study, the orbital index was 82.68. The knowledge of this index is important in various aspects like interpretation of fossil records, skull classification in forensic medicine and in exploring the trends in evolutionary and ethnic differences. This method, provides more natural description of the skull but requires the use of many dry skulls, which are always not accessible. However, this study serves as a guide post to the expansion of normographic data as regards to the bony orbit in our immediate environment. It will also present a more indepth guide to the surgical correction of orbital pathologies and fractures.

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