

Study of Cephalic index in the population of Central Odisha

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Abstract

All living individuals are not similar in their measurable characters and differ in various parameters. Cephalic index is an important parameter used for cephalometric analysis to identify the racial and gender variations of a population. Cephalic index and head shapes are affected by gender, age, geographical, socioeconomic, genetic, environmental and racial factors. There is hardly any available literature about Cephalic Index in Central Odisha. Hence, this study was done to document the cephalometric characteristics and gender differences in this region. Head length, head breadth & cephalic index were determined for 111 individuals belonging to Central Odisha. The mean cephalic index of the sample population was 76.96. In males it was found to be 76.13 ± 4.96 and for females it was 78.25 ± 4.60 . On comparison with the different existing literatures, the population of central Odisha can be categorised as mesocephalic & the data presented can be useful for experts, anatomists, plastic surgeons, anthropologists and forensic science.

Keywords: Cephalic index, dolichocephalic, brachicephalic, mesocephalic

Introduction

All living individuals are not similar in their morphological features which differ in various parameters even among the individuals of the same species ^[1]. Anthropometry helps in measuring human body dimensions and calculating the required indices almost accurately in a scientific way ^[2]. Human body dimensions and indices are affected by many factors like socio-ecological status, geographical habitat, racial characters, environment, gender, age etc. ^[3,4]. Anthropometric studies are conducted on various body parameters taking into account the above factors i.e.

age, sex, caste and racial groups in certain geographical zones^[5,6]. One important field of Anthropometry is Cephalometry in which dimensions of head and face are easily measured ^[7,8]. Cephalometric interpretations are utilized in anatomy, forensic medicine, craniofacial plastic surgery, oral surgery, dentistry and comparison between patients and normal subjects ^[9].

An useful cephalometric tool is the Cephalic Index which can analyze racial and sexual differences in a study population and also can give information about the genetic transmission of the inherited characters between parents, off springs and siblings by

comparative index data [10,11]. Data on cephalic index is also very useful in designing various orthopaedic instruments and physiotherapeutic equipments of head and face region like cranial remodelling band (helmet), head phones, goggles etc. after fixing standard sizes [12]. The present study was designed to document the gender differences in respect to their cephalometric characteristics in the region of Central Odisha, taking into consideration the racial, ethnic and geographical factors.

Materials and methods

The present cross sectional study was carried out on 111 individuals from different pockets of Angul District which belong to Central Odisha. The sample selection criteria were that the subjects were adults (male/female) above 18 yrs and residents of Angul District of Odisha. Written consents were obtained from all subjects for taking required measurements. Subjects having any obvious physical deformity, craniofacial trauma & obstructive hairstyle affecting the results were excluded from the study. Measurements taken were cephalic length and cephalic breadth. Instrument used was Spreading Caliper. All the measurements were taken with the subject sitting on a chair, in relaxed condition with head in anatomical position. The method used in assessing the cephalic index is Hrdlicka’s method [13].

The head length was measured from **GLABELLA** (pt. above the root of nasion

between the eyebrow) to **INION** (distal most pt. placed on external occipital protuberance)

The head breadth was measured at the maximum transverse diameter between two **EURYONS** (the distance between most lateral points on parietal bone).

The measurements were taken with help of spreading caliper.

CEPHALIC INDEX =

Head breadth/Head length x 100

On the basis of International Anatomical descriptions (William et al 1995), the below mentioned indices has been classified into different types of heads [9].

HEAD SHAPE	RANGE OF CI %
➤ Dolico cephalic	<74.9
➤ Meso cephalic	75 – 79.9
➤ Brachi cephalic	80 – 84.9
➤ Hyper Brachi cephalic	85 – 89.

Statistical Analysis: The available data were analyzed statistically and represented graphically by Microsoft Excel.

Observation and results

From the available data, the mean values and standard deviations (SD) were calculated for maximum head length (MHL), maximum head breadth (MHB) and cephalic index (C.I.). After analyzing the data statistically, summary of observations and results are presented in the following tables and graphical representations.

Table 1: showing the incidence of Cephalic Index.

Range of Cephalic Index	Types of Heads	Nos. of Samples	Percentage Distribution
< 74.9	Dolicocephaly	37	33.33%
75 – 79.9	Mesocephaly	40	36.03%
80 – 84.9	Brachicephaly	28	25.25%
> 85	Hyperbrachicephaly	6	5.40%
	TOTAL	111	100%

Major Types of Head in the Study Population

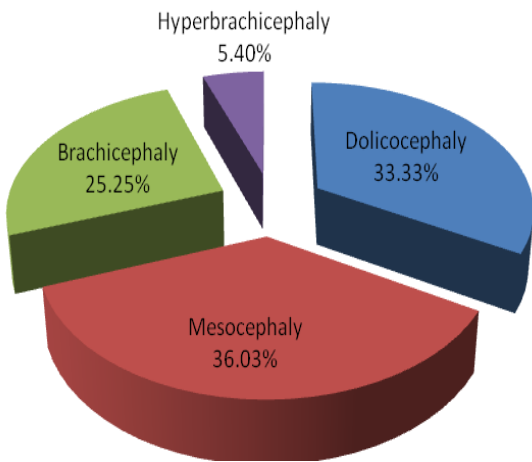


Figure 1: Percentage of Headtypes in Study Population.

GENDER ANALYSIS:

Table 2: showing distribution of headtypes in different sexes.

Types of Head	Range	Females	Males
Dolicocephaly	< 74.9	12	25
Mesocephaly	75 - 79.9	19	21
Brachicephaly	80 - 84.9	11	17
Hyperbrachicephaly	> 85	4	2

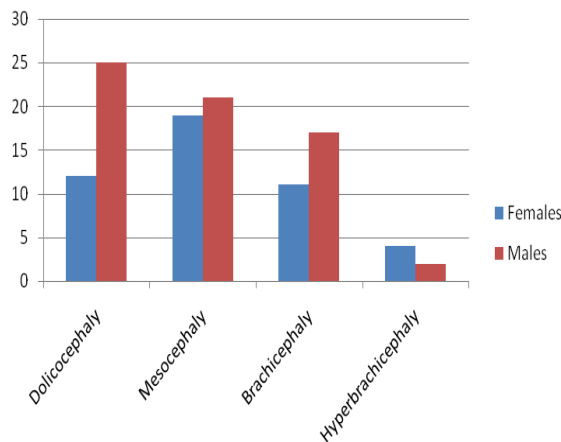


Figure 2: Showing distribution of headtypes in different sexes.

Table 3: Percentage of Male and Female Heads.

Column	Total	Percentage
Female	46	41.55%
Male	65	58.55%
Total	111	100%

Percentage of Male and Female Heads

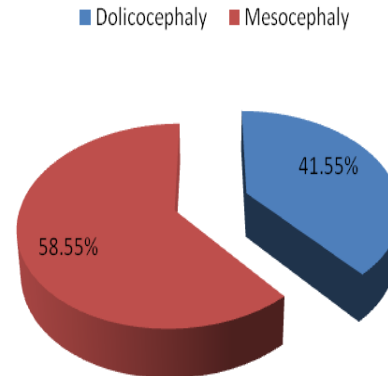


Figure 3: Showing percentage of male and female headtypes.

Table 4: Mean Cephalic Indices of Male and Female.

Category	Mean C.I.	S.D.
Male	76.13	4.96
Female	78.25	4.60

In the study population of Central Odisha, the mean cephalic breadth is 15.30 cm, and the mean cephalic length is 19.88 cm. The mean value of Cephalic Index is found to be 76.96. The mean Cephalic Index for male is 76.13 and for female it is 78.25.

Discussion

The mean cephalic index of Central Odisha is 76.96, which comes in the Meso-Cephalic range. As reported by Bharati et. al. in tropical to sub-tropical zone, the major type of head form is Dolico- & Meso-Cephalic type and in temperate zone it changes to Brachy- & Hyperbrachy-cephalic type^[14]. Since India comes in tropical zone, the cephalic index of Central Odisha is in accordance with the geographical division i.e Mesocephalic type.

Table 5: Cephalic index was found to be different for different groups.

Sl. No.	Race	Workers	Nos.	Mean CI
1	K. Vangaja	Basu (1943)	100	79.50
2	Bhils	Bhargav & Kher(1960)	100	76.98
3	Barelas	Bhargav & Kher(1961)	100	79.80
4	Gujrati	Saha GV. Jadav(2004)	302	80.42

Table 6: Showing comparison of CI in different regions of Odisha.

Region	Workers	Cephalic Index
Southern Odisha	Dr. Sunita Patro	77.75
Western Odisha	Dr. A.K. Mishra	76.98
Central Odisha	Present Study	76.96

Table 7: Comparison of CI by different study groups with different workers.

Study Groups	Name of Workers	Mean Cephalic Index of Male	Mean Cephalic Index of Female
Dangis	Priyanka Singh & Ruma Purkit	71.60	71.92
Ahirwar	Priyanka Singh & Ruma Purkit	73.40	73.70
Gujrati	Shah GV & Jadav HR	80.42	81.20
British Isles	Parson & Lukas	75.42	76.22

In 1906, the value of CI of Bhills is 72.90, as reported by Turner ^[15]. The CI of western odisha is also the same as studied by Mishra AK^[16]. However, in 1960, the value of CI in Bhills as observed by Bhargav and kher is same as that of Central Odisha i.e 76.96 ^[17]. So this shows a trend change in C.I. towards brachicephalism. This trend change in head shape from meso- to brachy-cephalic was also observed by other workers viz: Avicenna in Iranian people & Nakishima in Japan ^[18,19].

In the present study, the mean C.I. of male population is 76.13 and those of female population is 78.25. This shows female head has higher C.I. than male as observed by different workers (Table 7).

Conclusion

The cephalic index of the present study population is 76.96, which belong to Mesocephalic type showing a trend change from dolicho- to mesocephalic type. Next majority type is of Dolichocephalic type which is also major type of skull among the

whole population. Females have a higher CI compared to Males of same age group. Observations and results of this study may provide data for similar cephalometric studies of various communities / castes/ races of a particular geographical zone. CI may be affected by environment, gender, genetic, occupation, etc.

Conflict of Interest: None declared.

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