

Original Research Article

Estimation of Cephalic index in 17-20 Years old population of Nimad region of Madhya Pradesh

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Abstract

Identification is determination of the individuality of a person based on certain physical characteristics and is of importance in solving criminal as well as civil cases on a regular basis. Examination of fragmentary remains by a doctor can aid the police in complete identification of an individual. Cephalic index is one such parameter that can help in identification of the individual. Cephalic index (CI) and head shape are greatly affected by geographical, sex, age and racial factors. Such data is of great medico legal and forensic importance which indicates that cephalic index can be used as marker of ethnicity. There have been various instances where the race of the individual bone has to be ascertained in solving issues related to forensic or archaeological importance where Cephalic index is an important tool to determining the race and sex of an individual whose identity is unknown. This study was carried out to determine Cephalic index of 400 healthy individual, including 200 Male and 200 Female individuals between 17 years to 20 years the of age, from the Nimad region of Madhya Pradesh.

Key Words: *Cephalic Index, Race, Identification, Craniofacial, Anthropometric assessment*

Introduction

The human body dimensions are affected by ecological, biological, geographical, racial, sex, and age factors¹. All the factors are an adaptive change brought by natures to adapt to the living environment. The study of the craniofacial relations and variations in man has long been used to differentiate various racial groups in physical anthropology. Morphological features of different races and ethnic groups are not randomly distributed but appear in geographic clusters.² Anthropometric assessment aids in determination of geographic distribution of different races and helps in identifying the ethnicity of an individual by means of accurate measurements from

the human remains. On the basis of cephalic index, head shapes are grouped into four international categories, which are dolichocephal, brachycephal, mesocephal and hyperbrachycephal.³

The study is carried out in Nimad region of Madhya Pradesh as there is no data available on the racial features of the people who belong to this region of the country. The data can be used for identification of race in solving issues of forensic and legal importance.

Materials and Methods

The present study conducted on 400 healthy subjects including 200 males and 200 females, age ranging from 17years to 20 years. All the measurements were taken with the subject sitting on chair, in relaxed condition and the head held in anatomical position.

The head measurements were recorded by using the Martin spreading calliper. The length of the head

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i.e. the maximum antero-posterior diameter was measured from Glabella to Inion, and the breadth of the head was measured as maximum transverse diameter i.e. the bi-parietal diameter between the two parietal eminences.

Cephalic index was calculated using the following equation⁴.

$$\text{Cephalic Index} = \frac{\text{Head width}}{\text{Head length}} \times 100$$

Depending upon this index, the types of head shapes are as in Table- 1.

The data were collected and analyzed using student t-test.

Observations and Results

Male Cephalic index is found to be 77.69 ± 4.40 ,

while female Cephalic index is found to be 76.23 ± 4.13 . The difference in Cephalic index between male and female was significant (p value < 0.05). **Table-2** shows incidence of cephalic index. **Table-3** shows relationship of sex with cephalic index.

In males length of head varies from 172 mm to 211 mm, the mean length of head is 191.25 mm and standard deviation is 6.88. In female the length of head varies from 166 mm to 197 mm, the mean length of head is 178.72 mm and standard deviation is 5.57. **Table- 4** shows incidence of Head lengths of males and females.

In male breadth of head varies from 129 mm to 160 mm, the mean breadth of head is 145.61 mm and standard deviation is 5.90. In female the breadth of head varies from 122 mm to 154 mm, the mean breadth of head is 138.74 mm and standard deviation is 6.12. **Table- 5** shows incidence of head breadth of males and females.

Table-1: Types of head shapes depending upon cephalic Index

Head shape	Range of Cephalic index (CI) %
Dolichocephalic	< 74.9
Mesocephalic	75 - 79.9
Brachycephalic	80 - 84.9
Hyperbrachycephalic	85 -89.9

Table – 2: Incidence of cephalic Index

Cephalic Index	No. Observed	Cephalic Index	No. Observed
66-67.99	4	80-81.99	46
68-69.99	6	82-83.99	27
70-71.99	38	84-85.99	12
72-73.99	50	86-87.99	9
74-75.99	68	88-89.99	-
76-77.99	81	90-91.99	-
78-79.99	58	92-93.99	1

Table – 3: Relationship of sex with Cephalic Index

Cephalic Index	Male	Female	Cephalic Index	Male	Female
66-67.99	3	1	80-81.99	18	28
68-69.99	5	1	82-83.99	8	19
70-71.99	22	16	84-85.99	4	8
72-73.99	31	19	86-87.99	4	5
74-75.99	35	33	88-89.99	-	-
76-77.99	42	39	90-91.99	-	-
78-79.99	27	31	92-93.99	1	-

Table – 4: Head length in males and females

Head length (mm)	No Observed	
	Male	Female
166-171	0	24
172-177	4	52
178-183	22	90
184-189	50	25
190-195	68	8
196-201	44	1
202-207	10	-
208-213	2	-

Table – 5: Head breadth in males and females

Head breadth (mm)	No Observed	
	Male	Female
122-126	0	2
127-131	4	24
132-136	9	51
137-141	29	57
142-146	78	46
147-151	49	15
152-156	22	5
157-161	9	-

Table 6: Mean cephalic Index in various studies

S. No.	Worker	Race	Mean Cephalic Index
1.	Bhargava et al, 196011	Bhils of central India	76.98
2.	Shah et al 196010	Gujrat, India	80.81
3.	Bhargava et al, 19618	Barelas of central India	79.80
4.	Basu et al. 196312	K. Vanjara, India	79.50
5.	Shah et al 200411	Gujrat, India	80.42
6.	Del Sol et al, 20058	IX Region of Chile	80.42
7.	Golalipur et al., 200710	Turkman, Iran	80.40
8.	Fawehinmi et al., 200813	Port Harcourt, Nigeria	79.80
9.	Eroje, M. A et al., 201014	Ogbia, Nigerua	72.96
10.	Present study	Nimad region of Madhya Pradesh, India	76.96

Discussion

In the present study, the mean cephalic index in both sexes is ranging from 72.83 – 81.01. The cephalic index in male and female is 77.69 ± 4.13 and 76.23 ± 4.13 respectively.

The cephalic index of male is significantly higher than female (p value < 0.05).

Present study finding are closely similar to Oladipo, G. S. & Olotu et al ⁵ in which it was found that the cephalic index for Ijaw male and female as 80.98 and 78.24 respectively.

In our study, dominant type of head shape was Dolichocephalic (65.66%). This finding is similar to Bhatia et al⁶ in India which 58.5% are dolicocephalic.

Dominant type of head from this study is not similar to del Sole et al ⁷ in Chile, Bhargava et al ⁸ in central Indian.

Also, the dominant head type was reported as

brachycephalic in IX Region of Chile, del Sol et al ⁷ Turkman of Iran, Golalipour *et al*⁹, and in Gujarat, India, Shah et al¹⁰.

It is worthy to note that the percentage of head types also varies in different populations. In a study on 50 individuals in the IX Region of Chile, del Sol reported that 66% of the individuals were mesocephalic, 28% brachycephalic, 4% hyperbrachycephalic and 2% dolichocephalic.

In present study cephalic index is 76.96, very similar to Cephalic index of Bhil community of central India which is 76.98 reported by Bhargava et al, 1960¹¹.

Conclusion

Present study points out that the mean cephalic index of people belonging to Nimad region of central India including both sexes is ranging from 72.83 – 81.01, cephalic index of male and female is found to be 77.69 ± 4.13 and 76.23 ± 4.13 respectively. The cephalic index of male is also found to be significantly higher than

female (p value < 0.05). Considering the limited racial features distributed over a wide geographic area there is an obvious overlap of features among the population distributed into geographic zones. It is also noted that people of particular origin residing in a particular area have a significant similarity like the Nimad population has a Mesocephalic skull features as revealed from this study. Hence, if the subject under study is of a particular geographic location and there is a data available to compare the skull bone with the data of a particular geographic location, the identification of race is possible. This study has made a significant effort to make such data available now for the population of Nimad region of Madhya Pradesh. Similar study involving larger study group in future will help to substantiate the results and enhance the authenticity of the data.

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Ethical Clearance: All ethical parameters were taken care of in the study

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