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Original Article

Anthropometric Study of Cephalic and Facial Indices among Central Indian Population

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ABSTRACT

Facial and Cephalic indices are the type of somatometric measurements in physical anthropology. These kinds of indices established the personal identity of a person on the basis of its sex and ethnic group. The aim of the present study is to establish baseline data of cephalic index and facial index of central Indian population (Indore Region) and comparison of present study with previous studies. These data will be helpful for forensic anthropologists, anatomists and related fields. The mean value of cephalic index and facial index found in the study were 70.36, 101.64 the basis respectively in male and 68.72, 100.34 respectively in female. The major head type found in the study was dolichocephalic and hyper leptoprosopic type of face.

Keywords: Cephalic index, Dolichocephalic, Facial index, Hyper leptoprosopic, Physical anthropology

INTRODUCTION

All human being present on the earth belongs to the same species i.e. Homo sapiens. No two individuals are exactly alike in their characteristics and body measurement, even in case of identical twins, they differ in some aspects. These characteristics tend to undergo changes in various aspects. Hence anthropometry is the study of quantitatively measuring this kind of characteristics. There are so many areas of anthropometry such as Osteometry, cephalometry, Somatometry and etc. all these aspects of anthropometry are utilized by anthropologists. One of these practical aspects is utilized in the field of forensic anthropology. Forensic anthropology is the sub branch of physical anthropology (the study of human remains) that involves applying skeletal analysis and techniques in archaeology to solving criminal cases [1]. Main focus of present study is on the morphological human head and face. Human head have distinct traits; one of them is Cephalic index which is very useful in determining racial differences and sex of an individual. Cephalic index is determined by calculating the ratio between maximum width and maximum length of the skull [2]. Similarly Facial index is used in anthropometry to describe the facial shape of the individual.

MATERIAL AND METHODOLOGY

Study Design: A cross sectional study was conducted on 200 persons (100 males and 100 females), aged 18-50

Classification of Human head and face based on cephalic index and facial index [2]

Cephalic index range			Facial index range		
Male	**Female**	**Scientific term**	**Male**	**Female**	**Scientific term**
X-70.9	X-71.9	Hyper Dolico cephalic	X-78.9	X-76.9	Hyper Euryprosopic
71.0-75.9	72.0-76.9	Dolico cephalic	79.0-83.9	77.0-80.9	Euryprosopic face
76.0-80.9	77.0-81.9	Mesatic cephalic	84.0-87.9	81.0-84.9	Mesoprosopic face
81.0-85.9	82.0-86.9	Brachycephalic	88.0-92.9	85.0-89.9	Leptoprosopic face
86.0-90.9	87.0-91.9	Hyper Brachycephalic	93-X	90-X	HyperleptoProsopic face
91.0-X	92-X	Ultra Brachycephalic			

years, that were randomly selected. Measurements were performed at the Shri Vaishnav Institute of Forensic Science SVVV Indore Madhya Pradesh of India which has 22.7196N latitude and 75.8577E longitude in 2019. None of subjects had any past and existing craniofacial trauma, deformities or facial scars. Measurement method was explained to each subject and written consent was obtained from each tested subject before the measurement. A cephalic and facial measurement was taken after careful examination with subjects in a relaxed condition with head and face in the anatomical position using standard somatometric landmarks. The instruments used in the study were spreading caliper, sliding caliper and measuring scale. All the somatometric landmarks were identified and marked with pen before taking the measurements. The heads of the subject were oriented in ear-eye plane or frank-furt plane i.e. a plane in which the lower margin of the orbits, orbitales, and the poria all lie in the same horizontal plane. Subjects were instructed to sit on low raise tables and should not change his/her position while taking measurements. All the measurements were taken thrice and mean was calculated to correct accuracy of the measurement taken. All the measurements have been taken following the techniques of Martin and Saller [2] and Singh and Bhasin[3].

Cephalic index is calculated as Maximum head breadth (eu-eu) / maximum head length (g-op) × 100

Maximum head length (eu-eu): It measures the maximum straight distance between the two eurya (eu) when the head is oriented in eye- ear plane.

Maximum head length (g-op): It measures the maximum distance from Glabella (g) to opisthocranion when the head is oriented in eye-ear plane.

Morphological facial index is calculated as morphological facial height (n-gn)/ Bi-zygomatic breadth× 100

Morphological facial height (n-gn): It measures the straight distance between nasion (n) to gnathion (gn) when the head is oriented in eye-ear plane.

Bizygomatic breadth (zy-zy): It measures the straight distance between the most laterally placed zygia (zy) when the head is oriented in eye-ear plane in Figure 1 and 2.

RESULTS AND DISCUSSION

Anthropometric parameters have always been of major interest to forensic anthropologist human biologists and anatomists because they provide standards and make the distinction between two ethnic groups. Current study provides valuable information about the total cephalic index and facial index in the 18-50 years age group population of the central Indian region (INDORE M.P.). The mean value of the morphological total cephalic index in male was 70.63±4.60 while the value of parameter was obtained in females, 68.72±5.95. Further the mean value of the morphological facial index in males was 101.64±6.28 while in female value of parameters was, 100.34±6.82 .It has been observed that male in the studied population of the central region have significantly higher values of both the morphological cephalic and facial index

Table 1: Classifications of subjects based on cephalic index

Gender	No.	Hyper Dolicho-cephalic	Dolicho-cephalic	Mesatice-phalic	Brachyce-phalic	Hyper Brachy-cephalic	Ultra Brachy-cephalic
Male	100	00	88	11	01	00	00
Female	100	00	86	12	02	00	00
Total	200	00	174(87%)	23(11.5%)	3(1.5%)	00	00

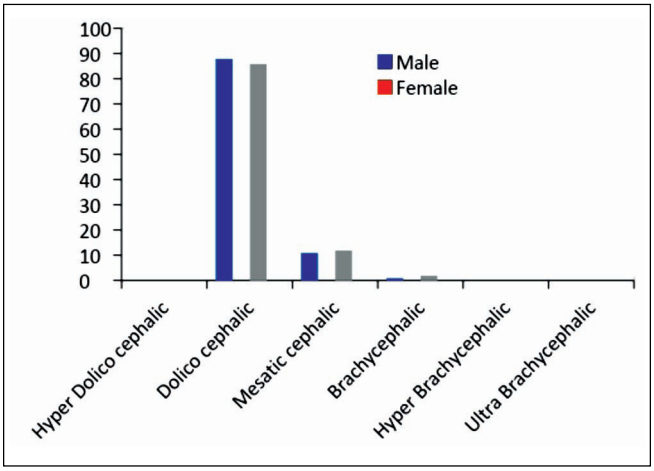

Figure 1: Bar diagram showing classification of subjects based on cephalic index

Table 2: Range of head length and head breadth of males

Head length (cm)	No. of cases	Head breadth (cm)	No. of cases
16.01-17.00	00	10.01-11.00	00
17.01-18.00	00	11.01-12.00	01
18.01-19.00	05	12.01-13.00	10
19.01-20.00	40	13.01-14.00	28
20.01-21.00	38	14.01-15.00	40
21.01-22	17	15.01-16.00	21
Total	**100**	**Total**	**100**

compared to the tested females, The dominant type of cephalic and facial phenotypes in the studied population were, respectively Dolichocephalic (long headed) and Hyperlepto Proscopic face (very long face) with an incidence of 174(87%) which is followed by with an incidence of 159(79.5%). **(Table 1 to 8),** in the studied population of the genders, other head shape and face

Table 3: Range of head breadth and head length of females

Head length (cm)	No. of cases	Head breadth (cm)	No. of cases
16.01-17.00	00	10.01-11.00	03
17.01-18.00	05	11.01-12.00	07
18.01-19.00	31	12.01-13.00	36
19.01-20.00	56	13.01-14.00	35
20.01-21.00	05	14.01-15.00	14
21.01-22.00	03	15.01-16.00	05
Total	**100**	**Total**	**100**

Table 4: Statistics of various parameters of present study

Variables	No.	Mean	Standard deviation	P value
Cephalic index (Male)	100	70.6382	4.60918	<0.001
Cephalic index (Female)	100	68.7258	5.95718	<0.001

Table 5: classifications of subjects on the basis of facial index values

Gender	No.	Hyper Euryproscopic (very broad face)	Euryproscopic face (Broad face)	Mesoproscopic face (Round face)	Leptoproscopic face (Long face)	Hyperlepto Proscopic face (Very long face)
Male	100	00	00	08	12	80
Female	100	0	0	6	15	79
Total	**200**	**00**	**00**	**14**	**27**	**159**

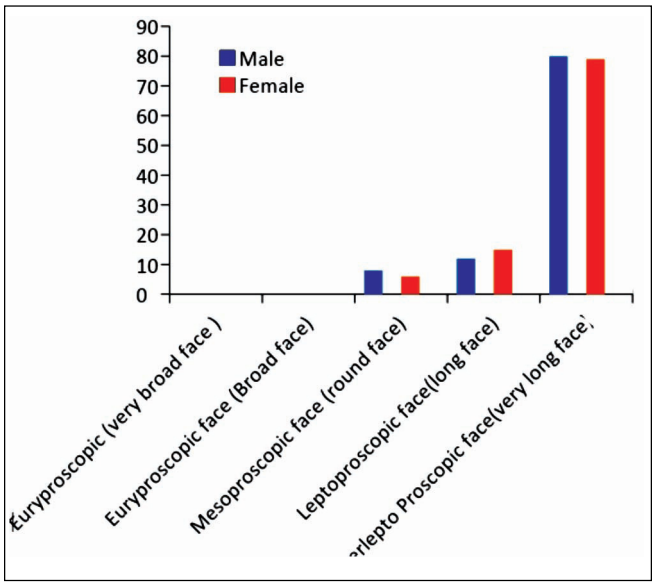

Figure 2: Bar diagram showing classification of subjects based on Facial index

Table 6: Range of face length and face breadth of male

Head length (cm)	No. of cases	Head breadth (cm)	No. of cases
9.01-10.00	01	10.01-11.00	21
10.01-11.00	20	11.01-12.00	60
11.01-12.00	44	12.01-13.00	19
12.01-13.00	30	13.01-14.00	00
13.01-14.00	05	14.01-15.00	00
14.01-15.00	00	15.01-16.00	00
Total	**100**	**Total**	**100**

Table 8: Statistics of various parameters of present study

Variables	No.	Mean	Standard deviation	P value
Facial Index (Male)	100	101.6430	6.28090	<0.001
Facial Index (Female)	100	100.3496	6.82918	<0.0001

Table 7: Range of face length and face breadth of the females

Head length (cm)	No. of cases	Head breadth (cm)	No. of cases
9.01-10.00	04	8.01-9.00	00
10.01-11.00	58	9.01-10.00	06
11.01-12.00	33	10.01-11.00	52
12.01-13.00	04	11.01-12.00	39
13.01-14.00	01	12.01-13.00	03
14.01-15.00	00	13.01-14.00	00
Total	**100**	**Total**	**100**

shape characteristics were observed very low. Present study showed variation with the previous work. Some of them [5-13] showed higher value of both the indices while other showed lower value [14-15]. Previous studies were done mainly in the north and south region of Indian continent only one study was carried out in central part of the India [22]. which was showing different values of both the index because it was carried out on medical students which come from various parts of the country.

Table 9: comparison of present work with previous research

Researcher	Study	Ethnic Group	Observation
Lobo SW [5]	Cephalic Index	267 Gurung community, Nepal	Mean Cephalic Index = 83.7 Mean Cephalic Index Male = 83.1 Mean Cephalic Index Female = 84.6 Head type- Brachycephalic
Agron Rexhepi [6]	Cephalic and facial indices	754 Kosova subjects	Mean Cephalic Index Male = 83.59 Mean Cephalic Index Female = 84.79 Head type- Brachycephalic Mean Facial Index Male = 90.38 Face type - Leptoproscopic 31.2% and Hyperleptoprosopic 31.6% Mean Facial Index Female = 90.27

Table 9 contd...

Researcher	Study	Ethnic Group	Observation
Dr. Anupama Mahajan [7]	Cephalic Index	400 Punjabi medical students	Mean Cephalic Index = 85.53 Head type- Brachycephalic and Hyperbrachycephalic Mean Cephalic Index Male = 81.64 Mean Cephalic Index Female = 85.75
Zohre abatabaei [8]	Facial Index	130 Patient of Yazd	Mean Facial Index Male = 108.39 Mean Facial Index Female = 106.98 No statistical difference between both sexes
Vishal Manoharrao Salve [9]	Cephalic Index	300 Andhra region Adults	Mean Cephalic Index = 76.94 Mean Cephalic Index Male = 75.68 Head type- Dolicocephalic Mean Cephalic Index Female = 78.20 Head type-Mesocephalic
Vaishali R. Shetti [10]	Facial Index	300 Indian and Malaysian students	Mean Facial Index Malaysian Male = 85.72 face type-Euryproscopic Mean Facial Index Malaysian Female = 87.71 Mesoprosopic Mean Facial Index Indian Male = 87.19 Mesoprosopic Mean Facial Index Indian Female = 86.75 Mesoprosopic and Euryprosopic
H.A. Alvies[11]	Study of Cephalic Index	110 Male students of North and South Brazil	Mean Cephalic Index North Brazil = 80.93 Mean Cephalic Index South Brazil = 79.06 Head type- Brachycephalic
Isurani Ilayperuma [12]	Cephalic Indices	400 Sri Lankan subjects	Mean Cephalic index = 78.54 Head type- Brachycephalic
Vaishali Yagain [13]	Cephalic Index	100 Indian students	Mean Cephalic Index = 79.38 Mean Cephalic Index Male = 77.92 Head type-Mesocephalic Mean Cephalic Index Female = 80.85 Head type- Brachycephalic
Mahesh Kumar [14]	Cephalic index	600 Haryanvi baniyas	Mean cephalic index male=66.72 Mean cephalic index female = 72.25 Head shape – Dolicocephalic
Mahesh Kumar [15]	Study of Facial Index	600 Haryanvi adults	Mean Facial Index Male = 86.09 Face shape- Mesoprosopic (49.66%) Mean Facial Index Female = 84.84 Face shape- Mesoprosopic (35%)
Anil Kumar [16]	Cephalic index	80 North Indian skulls	Mean cephalic index male = 73.75 Head shape – Dolicocephalic Mean cephalic index female = 75.22 Head shape – Mesocephalic
S.D. Desai [17]	Cranial index	125 south Indian dry skull	Mean cephalic index male = 77.69 Mean cephalic index female = 79.98

Table 9 contd...

Researcher	Study	Ethnic Group	Observation
Sanjay Gupta [18]	Cephalic index	600 north Indian adult	Mean cephalic index male = 74.74 Head shape – Dolicocephalic Mean cephalic index female = 76.83 Head shape – Mesocephalic
Praveen Kumar Doni R [19]	Cephalic and facial indices	100 Male south Indian population	Mean cephalic index = 76.48 Mean facial index = 90.95
Swapnali Khair [20]	Cephalic Index	100 Mumbai subjects	Mean Cephalic Index = 78.48 Head shape- Mesocephalic Mean Cephalic Index Male = 81.28 Head shape- Brachycephalic Mean Cephalic Index Female = 75.22 Head shape-Mesocephalic
Sunita Patro [21]	Cephalic Index	1030 Odisha patients	Mean Cephalic Index = 77.75 Head shape-Mesocephalic Mean Cephalic Index Male = 77.28 Mean Cephalic Index Female = 78.38
Shema K Nair [22]	Cephalic index	480 Medical students of central India	Mean Cephalic Index male=81.24 Mean Cephalic Index Female=80.31 Head shape-Mesocephalic in both the gender
K. Lakshmi Kumari [23]	Cephalic index	280 Visakhapatnam people	Mean Cephalic Index male = 80.21 Head shape-Mesocephalic Mean Cephalic Index Female=79.25 Head shape-Brachycephalic
Twisha Shah[24]	Cephalic & facial indices	901 gujrati and 300 non- gujrati adults	Mean Cephalic Index of gujrati = 77.2 Mean Facial Index of gujrati= 75 Mean Cephalic Index of Non- gujrati=75.8 Mean Facial Index of non - gujrati = 75.5
Present work	Cephalic & facial indices	200 central Indian people Indore region	Mean Cephalic Index of male = 70.63 Mean Cephalic Index of female = 68.72 Head type = Dolicocephalic Mean Facial Index male = 101.64 Mean Facial Index female =100.34 Dominant face type = Hyperlepto Proscopic face

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