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Cephalic Index And Head Shape In Western Maharashtra Students.

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ABSTRACT

Sexual determination is a very important tool for personal identification in many medico-legal and anthropological studies. Cephalic Index is ratio of the maximum breadth of the skull to its maximum length multiplied by hundred and on basis of it head shapes classified four international categories. Cephalic index is useful parameter for forensic experts, plastic surgeons, anatomists, anthropologists and oral surgeons. Aim of this study is to identify cephalic index and types of head shape in Western Maharashtra students.Total 308 students were included in this study. The age of students ranged from 18-24 years. We measured head length and breadth using a spreading caliper. After that with formula we calculated cephalic index. Study was carried out after ethical clearance from our institutional ethical committee. Mean cephalic index in male was 79.66 ± 5.02 and 77.51 ± 4.92 in female students. We observed more number of dolichocephalic head shape in 64.86% male and 49.23% mesocephalic in female students. Present study provided a valuable data related to the cephalic index and shapes of head in Western Maharashtra students which may serve as basis of comparison for future studies.

Keywords: Cephalic index, Anthropometry, Races, Head breadth, Anthropologists.

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INTRODUCTION

Physical Anthropometry is one of the tools to evaluate and measure the human body dimensions [1]. Width and length of cranial bones is increased by the post-natal craniofacial growth and development. These changes result in significant alteration in the proportions of these bones which further result in the morphologic variation in the transverse, vertical and antero-posterior plane till the skeletal maturity [2].

Cranial parameters are designed by measuring these changes which assesses the head with the help of indices associated with growth patterns. Also, helps in making more efficient and convenient orthopedic and/or orthodontic diagnosis and treatment planning [3]. There are various factors which affect the human body dimensions and they are geographical, racial, biological, ecological, sex, and age factors on human body dimensions [4].

Cephalic index (CI) is one of the most useful indexes to find out sex and racial differences [5]. Anders Rezitus was the first anatomist who recommended the CI as a useful tool for identification of types of crania. In early twenties it was used commonly to categorize human populations. Carleton used it in 1960 [6, 7]. Now a day it is most commonly used for estimating age of fetuses for legal and obstetrical reasons. Cephalometry is one of the important branches of anthropometry through which cranial dimensions are measured [8]. It is important in living person because knowledge about it is useful for comparison of crania of population with various essential differences like racial, ethnic, nutritional etc. Anthropologist conducted studies on the age, sex and racial/ethnic groups in different geographical zones [5, 9]. Such studies are helpful in better understanding of frequency distribution of human morphologies and comparison of different race.

The most important cephalometric dimension is height and breadth of head which are used in cephalic index determination [5, 8]. CI is ratio of the maximum breadth of the skull to its maximum length multiplied by hundred and on basis of it head shapes classified four international categories Doliocephalic, Mesocephalic, Brachiocephalic, Hyperbrachiocphalic [10] It can be useful in pediatrics to study the skull growth and development of abnormal crania [4, 11].Skull and pelvis has important role in identification of human for medico legal cases. Also, CI has commercial role in making helmet, spectacles, sunglasses, caps head phones etc [12]. CI may vary according to ethnicity therefore it is important to study it in each and every ethnic groups of India Aim of present study is to study the CI in Western Maharashtra students and compare this study with other similar studies. This may eventually be used to help in determining race and sex by forensic medical experts, anatomist, anthropologist and archeologist.

MATERIAL AND METHODS

Present study was carried out on Nursing and Pharmacy college students of our university. Nursing and Pharmacy college students were selected because most of these students are localized i.e. from Western Maharashtra and easy availability. Total 308 students (Male: 111 and Female: 197) were included in this study. The age of the patients ranged from 18-24 years. Measurements were taken at a fixed time to avoid any possible diurnal variations and with the subject sitting in relaxed condition and head in Anatomical position. The cranial index was measured using Hardlika's method [13]. We measured head length and breadth using a spreading caliper. Purpose of the study was explained to each participant and prior consent was obtained. The study was carried out after ethical clearance from our institutional ethical committee.

Craniometrical measurements:

Maximum head length: The maximum antero-posterior diameter or head length is measured from Glabella to Inion.

Maximum head breadth: The maximum transverse diameter between two parietal eminences.

Each measurement was taken three times and average was considered.

Cephalic Index = Head Width**/**Head Length x100

Depending upon this index the types of head shapes were classified as follows Table 1 [8]

Table 1: Various types of head shapes

Sr. No	Type of head	Cephalic Index Range
1	Dolichocephalic	70 – 74.9
2	Mesocephalic	75 – 79.9
3	Brachycephalic	80 – 84.9
4	Hyperbrachycephalic	85 – 89.9

The cephalic index was calculated and presented in tabular form as shown in table no 2.

Statistical Analysis: The data of each student was recorded on excel sheet and then transferred into SPSS 11.0 for analysis.

RESULTS

The minimum head breadth was found to be 12.54 cm and maximum was 18.33 cm in male while in females minimum head breadth was found 12.01 cm and maximum was 16.93 cm. The minimum head length was found to be 13.11 and maximum head breadth was 21.30cm. The minimum cephalic index was found to be 64.07 and maximum cephalic index was 84.02. Table 2 shows the mean with SD of head length and breadth along with CI.

Table 2: Showing means with SD of Head Length, Head breadth and Cephalic Index of students

Parameters	Male (n=111)	Female (n=197)
Head Breadth	14.5 ± 0.70	13.71 ± 0.82
Head Length	17.52 ± 1.02	16.32 ± 1.07
Cephalic Index	79.66 ± 5.02	77.51 ± 4.92

Table 3: Frequency of Head shapes according to cephalic index

	Dolichocephalic	Mesocephalic	Brachycephalic	Hyperbrachycephalic
Male (n=111)	72 (64.86%)	23 (20.72%)	14 (12.61%)	2 (1.80%)
Female(n= 197)	71 (36.04 %)	97 (49.23%)	29 (14.72%)	00
Total (n= 308)	143 (46.42%)	120 (38.96%)	43 (13.96%)	02 (1.80%)

DISCUSSION

Cephalometry is a branch of anthropometry in which the anatomical dimensions of head are measured and is a versatile technique in the investigation of the craniofacial skeleton because of its validity and practicality [14]. Cephalic index is one of the important parameter which is frequently used by anthropologists to find out the racial differences, sexual differences, and comparison of changes between parents, offspring and siblings towards their genetic transmission of inherited characteristics. Also, it has a role in the facial reconstruction of disputed identity and designing various head and face gadgets by formulating standard sizes [6].

Table 4: Showing the prevalence of cephalic indices in different Indian ethnic group

Authors	Population (n=Number)	Mean cephalic index
Bhargav and Kher(1960) [16]	Bhills (n=100)	76.98
Bhargav and Kher(1961) [17]	Barelas (n=100)	79.80
Basu (1963) [18]	K.Vangaja (n=100)	79.50
Shah and Jadhav (2004) [5]	Gujarati (n=302)	80.42
SwapnilKhair et al (2013) [19]	Mumbai	78.48
SunitaPatro et al (2014) [20]	South Odisha	77.75
Syed et al. (2017) [21]	Marathwada (n=200)	78.89
Present study (2020)	Western Maharashtra (n= 311)	77.51

As per our study the mean cephalic index in both sexes was ranging from 77.51-79.66. Therefore the head shapes could be classified as mesocephalic as the commonest head shape. The mean cephalic index in different ethnic groups varies significantly in different zones (Table no 3) [15].

Bharati et al. concluded in his study that, in tropical zones head from is longer (i.e. dolichocephalic), but in temperate zones head from is round (mesocephalic or brachycephalic). The genetic factors also influence the cranial shape. The present study classifies the sample examined as mesocephalic [22]. Shah and Jadhav studied 500 medical students, the mean cranial index in male was found to be 80.42 and 81.20 was in females [5]. Lobo SW studied Gurung community of Nepal and observed the mean cephalic index in male was found to be 83.1 and in female was 84.6 [15]. In the present study mean cephalic index of male subjects was 79.66 and of female was 77.51. In Present study, we observed dominant type of head shape in males was dolicocephalic while in female dominant type of head shape was mesocephalic. The present finding has been compared with other studies conductedin the past [23, 24]. However further studies using larger samples of subjects will be more helpful.

This study provides a data base of CI measurements useful for forensic medicine experts, plastic surgeons, orofacial surgeons in craniofacial reconstruction, anatomists, anthropologists, oral surgeons, and clinicians in research studies.

CONCLUSION

CI is an important parameter for classification of race and sex of individuals of unknown identity. Also, it has paramount importance in studying remains of the cranial bone and helps in identifying disputed identity. Present study provided a valuable data related to the cephalic index and shapes of head in Western Maharashtra students which may serve as basis of comparison for future studies.We conclude that values of CI in different genders vary but did not show much difference. This data can be utilized by anthropologists or forensic experts for various anthropological purposes

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