ABSTRACT

Introduction: Cephalic Index is an essential anthropometric index used to find out sexual and racial differences. Its knowledge is helpful in the diagnosis of patients and for medico-legal cases. This knowledge is also used to evaluate patients of various medical fields like paediatrics, craniofacial surgery, and medical investigations like imaging.

Aim: To study the parameters related to cephalic index of adult male and female population of Jaunsari Tribe of Dehradun district in Uttarakhand and to analyse the sex differences in these parameters.

Materials and Methods: It was a cross-sectional study, carried on 100 adult males and 100 adult females of more than 18 years of age, belonging to Jaunsari Tribe from March 2014 to April 2018. Head Length or Maximum Glabello-occipital Diameter (g-op) (mm) and Maximum Head breadth (eu-eu) were measured. With the help of these measurements, the cephalic index was calculated.

INTRODUCTION

Cephalic index is an essential anthropometric index that is used to find out sexual and racial differences. Its knowledge is helpful in the diagnosis of patients and for medico-legal cases. This knowledge is also used while evaluating patients of various medical fields like paediatrics, craniofacial surgery, and in medical investigations like imaging. This knowledge also helps to study growth trends in different races/castes in a specific geographical area. There are various equipments that are used either as protective equipment, e.g., helmet, goggles or for other use, e.g., headphone, etc. have to be designed in specific size and shape based on the cephalic index of concerned population [1]. An individual is identified by his or her unique personality based on his or her distinguishing characteristics from other individuals. It becomes easier to investigate an individual’s death when one’s identity is known. Usually, forensic anthropologists, forensic pathologists, and forensic odontologists work in association to examine and authenticate historic and prehistoric remains. In natural calamities like tsunami, mass disasters, war casualties with substantial skeletal remains, or in conditions of mass burials, forensic anthropology is quite useful. It is also helpful in investigations, dealing with living individuals like mixing up of babies in the hospital nursery, establishing individual’s identity during immigration, thieves, burglars, robbers, and human trafficking, etc. [1].

Cephalic index forms the basis of classification of different shapes of head into dolichocephalic (cephalic index up to 74.9), mesocephalic (cephalic Index: 75-79.9), and brachycephalic (cephalic Index: 80-84.9) [2]. Importance of cephalic index and comparison of crania of different populations with many essential differences like nutritional, racial, geographic, ethnicity, etc., has been emphasised [3]. It may be used as an indicator of cranial growth, development, and abnormal cranial evaluation both in male and female paediatric cases [4,5]. Human remnants that were found in some parts of Europe were initially classified on the basis of the cephalic index but in the late 19th, and early 20th century classification became closely associated with the development of racial anthropology as a result of prehistorians attempt to use ancient remains to explain population movements in terms of racial categories [6]. Measurement of the skull for the location of specific topographical relation, the most relevant anthropometric entity is cranial index when measured on the skull and cephalic index when measured on living individuals. Many workers have measured cephalic index on the different populations without differentiating male and female heads [7,8]. The Jaunsari Tribe has got the highest number of people in the state of Uttarakhand. They have got the body features resembling that of both the Mongols and Indo-Aryan groups who have settled in the Himalayan provinces [9]. They are different than other tribal communities because of their minimal or no interaction with the external world. Because of this, they have relatively maintained their unique traditions and cultures, which have been a point of interest for researchers of different fields. The Jaunsaris [10], with their facial features, clearly distinguish them from other people of Garhwal, living close by.

The study was planned to study parameters related to the cephalic index in the adult Jaunsari Tribe of District Dehradun, Uttarakhand. With objectives: 1) To check the parameters pertaining to cephalic index of adult male and female population of Jaunsari Tribe of Dehradun district in Uttarakhand; 2) To analyse the sex differences in these parameters.

Results: Maximum number of Jaunsari males (83%) and females (45%) had dolichocephalic heads, and the second most common type of head was mesocephalic in both males (17%) and females (26%). There was not a single case of hyperdolichocephalic in males, whereas 17% of females were hyperdolichocephalic. It can also be seen that there was not a single case of even brachycephalic and hyperbrachycephalic in male population whereas the female population had 7% and 5% brachycephalic and hyperbrachycephalic cephalic index respectively and not a single person of ultrabrachycephalic type of cephalic index was reported in both male and female population. All cephalic parameters, as well as the cephalic index itself, were statistically significantly different (p-value <0.001) in the male and female population of the Jaunsari Tribe.

Conclusion: Maximum number of Jaunsari males and females had dolichocephalic heads. This data may be used as a standard for future reference for the Jaunsari population and may also be helpful for clinicians, forensic and anthropological experts.

Keywords: Anthropometry, Female, Head, Male, Skull
MATERIALS AND METHODS
A cross-sectional study was conducted on 200 adult population of Jaunsari Tribe consisting of 100 male and 100 female individuals of more than 18 years of age, after due ethical clearance and their informed consent between March 2014 to April 2018. The Institutional Ethical Committee has approved this study project via IEC/IM/03/RC02.

Inclusion criteria: Individuals of more than 18 years of age, individuals belonging to the Jaunsari Tribe of Dehradun district, apparently, healthy individuals with no visible signs of facial and bony abnormalities like kyphosis, lordosis were included in the study.

Exclusion criteria: Individuals below 18 years of age, individuals of Jaunsari Tribe other than Dehradun district were excluded from the study.

Chakrata and Kalsi, were selected, out of six tehsils of Dehradun district, for this study because Jaunsari tribes are mainly inhabiting these two tehsils of Dehradun district. Equal numbers of randomly selected male and female individuals were taken from randomly chosen villages of Chakrata (Lakhwar and Hartar) and Kalsi (Jari and Koti). The unique selection was based on the voter list available at the tehsil office of Chakrata and Kalsi.

Study Procedure
The methodology for anthropometric measurements was adopted from Singh IR and Bhasin MK (1968) [11]. Subjects were asked to sit on a low stool of about 40 cm height for taking head and face measurements. The landmarks were marked on the body by skin marking pencil. The participants were positioned to avoid any strain to their head in Frankfurt-Horizontal Plane so that their tragiion and infra orbitale are in the same horizontal plane. The subject was advised not to change his position while measurements were taken. Head Length or Maximum Glabello-occipital Diameter (g-op) (mm) and Maximum Head breadth (eu-eu) were measured. With the help of these measurements, the cephalic index was calculated. A spreading caliper was used to measure different parameters.

Head length or maximum glabello-occipital diameter (g-op): It measures the straight distance between Glabella (g) (It is point of the protuberance of lower forehead above nasal root and between eyebrow ridges intersected by mid-sagittal plane) and opisthocranion (Op) - (It is the most posterior point on the posterior protuberance of the head in the mid-sagittal plane) [11] as shown in [Table/Fig-1a].

Maximum head breadth (eu-eu): It measures the straight distance between two eurya (eu) (most laterally placed point on the side of the head). It is maximum breadth taken at the right angle to the mid-sagittal plane of the head [11] as shown in [Table/Fig-1b]. The landmark used in head breadth must lie in the horizontal plane. The subject was asked not to change his position while measurements were taken. Head Length or Maximum Glabello-occipital Diameter (g-op) (mm) and Maximum Head breadth (eu-eu) were measured. With the help of these measurements, the cephalic index was calculated. A spreading caliper was used to measure different parameters.

Cephalic Index [11]

Maximum Head breadth x 100
Maximum Head length

STATISTICAL ANALYSIS
Data of all the desired morphometric parameters were subjected to appropriate statistical tests (mean, standard deviation, range-value) by using Statistical Package for the Social Sciences (SPSS) software version 23.0 (IBM). The p-values were calculated by using mean, Standard Deviation (SD) and unpaired t-test was used.

RESULTS
[Table/Fig-2] shows that the maximum population (45% males and 46% females) was having the medium type of head length.

From [Table/Fig-3], it is evident that the maximum number of Jaunsari males (83%) and females (45%) have a dolichocephalic head, and the second most common type of head is mesocephalic in both males (17%) and females (26%).

It can be seen from [Table/Fig-4] that the majority of males (58%) and females (67%) were having a very narrow type of head.

It can be seen from [Table/Fig-5] that all cephalic parameters, as well as the cephalic index itself, were statistically significantly different in the male and female population of the Jaunsari Tribe.
DISCUSSION

Different authors have reported racial variations in the cranium [12-14]. Several factors have been attributed to variations in cephalic indices within the population and between the populations. Kasai K et al., have written the effect of food habits on the craniofacial form [15]. It has been reported that these differences are commonly resultant of a complex interplay between environmental and genetic factors [15,16].

[Table/Fig-6] shows a comparative representation of different cephalic indexes reported by several authors in various populations of different regions [1-3,7,17-23]. Bhargav I and Kher GA reported the mean cephalic index of 76.98 in Bhills [17]. In Barela’s population, it was found to be 79.80 [7]. Basu A studied the cephalic Index of K.Vangaja and found it to be 79.50 [18]. The mean cephalic index of the Gujarati population was reported to be 80.42 [19]. Basu A et al., reported the mean cephalic index to be 85.53 in both male and female Punjabi population [20]. Khair S et al., reported the mean cephalic indexes of male and female Mumbai students to be different, 81.28 and 75.22, respectively [1]. In the south Indian population, it was found to be 73.75±5.36 [21]. As it is not a representation of the whole population, it cannot be generalised. No comparison can be made between Kumaon and Garhwal population as it has focussed on a particular tribe of Garhwal.

CONCLUSION(S)

The present study has provided valuable data for this particular community which can be used for further studies and as anthropometric standards in the future to find out any changes in the existing population. All cephalic parameters, as well as cephalic index itself, were statistically significantly different in the male and female population of Jaunsari Tribe, so it should be kept in mind while designing protective equipment like helmet goggles or for other use, e.g., headphone, etc., for this population.

Acknowledgement

Authors are grateful to Dr. Vartika Saxena, Professor, Dr. Ranjeeta Kumari, Associate Professor Department of Family Medicine, and Dr. Nilotpal Choudhary, Additional Professor, Department of Pathology, AIIMS Rishikesh, for their valuable contribution to this project.
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AUTHOR DECLARATION:
Financial or Other Competing Interests: None
Was Ethics Committee Approval obtained for this study? Yes
Was informed consent obtained from the subjects involved in the study? Yes
For any images presented appropriate consent has been obtained from the subjects. Yes

PLAGIARISM CHECKING METHODS: [IThenticate Software: Jul 09, 2021 (9%)]
MANUSCRIPT TYPE: Manuscript: 2 pages
ETYMOLOGY: Author Origin

FULL PDF:
Mohd Salahuddin Ansari et al., Cephalic Index Variations among Adult Jaunsari Tribe Population of Dehradun, Uttarakhand, India

Date of Submission: Jan 12, 2021
Date of Peer Review: Mar 10, 2021
Date of Acceptance: Jun 24, 2021
Date of Publishing: Oct 01, 2021