Study of Cephalic Index Among the Students of Mumbai Region

Swapnali Khair	Deepika Bhandari	Swati Wavhal
Student, M.Sc. Part-I., Institute of Forensic Science, 15- Madame Cama Road, Mumbai-400032.	Assistant Professor (Forensic Science)., Institute of Forensic Science, 15- Madame Cama Road, Mumbai-400032.	Director. Institute of Forensic Science, 15- Madame Cama Road, Mumbai-400032.

ABSTRACT *Cephalometry or measurement of human head is used in personal identification, forensic medicine, plastic surgery, orthodontics, archaeology and to examine the differences between races and ethnicities. Cephalic index is important parameter for deciding race and sex of an individual whose identity is unknown. There is a lesser amount of published literature about CI of Mumbai population. Head length, head breadth and CI were determined among the 100 individuals (students ranging in age from 17-23 years) of Mumbai origin. The mean CI calculated for males was 81.283, i.e. brachycephalic and for females was 75.222, i.e. mesocephalic. The population studied is 36% mesocephalic, 26% dolicho-cephalic, 20% hyperbrachycephalic and 18% brachycephalic in the present study. On comparison with the existing literature the Mumbai community can be categorized as mesocephalic, the mean cephalic index is 78.481. The data presented will be useful for experts in forensic science and also useful in clinical, medico-legal, anthropological and archaeological scenarios.*

INTRODUCTION

Forensic anthropology is defined as the application of the science of physical anthropology to the legal process. Recently, the range of interests of forensic anthropology is being expanded, as anthropological expertise is requested in the identification and aging of living individuals. Identification of the individual is usually defined as the determination of a unique personality on the basis of entirety of characteristics distinguishing him from other persons. Investigation of the death is greatly facilitated when the identity of the person is known. Positive identification entails scientifically establishing identity through the presence of known unique characteristics. Forensic anthropologists frequently work in conjunction with forensic pathologists and forensic odontologists. These specialists are also consulted to investigate and authenticate historic and even prehistoric remains and relics. Forensic anthropology may be extremely helpful in mass disasters, military casualties with considerable skeletal remains or in cases of mass burials. As it also encompasses facial image analysis, forensic anthropology may also provide support to investigations concerning living individuals such as a mix-up of children in a hospital nursery, identification of persons involved in immigration problems or human trafficking, robbers, burglars or thieves recorded by surveillance cameras or occasional witnesses, etc.

The methods of measuring skulls for the purpose of determining certain topographical relations, the most important measurement of the skull being the cranial index, or the cephalic index in case the measurements are taken on the living. The present study is based on the measurement of the Cephalic index on the living population. Cephalic index is the percentage of breadth to length in the skull. The index is calculated from measurement of the diameters of the skull. The length of the skull is the distance from the glabella (midpoint between the brows) and the most projecting point at the back of the head. The breadth of the skull is the distance between the most projecting points at the sides of the head, usually a little above and behind the ears. The cephalic index is the breadth multiplied by 100 divided by the length.

The human body dimensions are affected by ecological, biological, geographical, racial, sex, and age factors. Comparison of changes between parents, offspring and siblings can give a clue to genetic transmission of inherited character. Anthropometric measurements especially craniofacial measurements are important for determining various head and face shapes. These anthropometrics studies are conducted on the age, sex and racial/ethnic groups in certain geographical zones. This helps in better understanding the frequency distribution of human morphologies and comparison of different races. The most important of Cephalometric dimension are height and breadth of head that is used in cephalic index determination.

Cephalic index is very useful anthropologically to find out racial and sexual differences. It is important in anthropometric indices, in diagnostic knowledge between the patient and normal populations and in the medico-legal cases of Forensic Medicine. The Cephalometric results can also be of great assistance while evaluating patients in various fields of medicine like Medical Imaging, Paediatrics, Cranio-facial Surgery and also for studying growth trends in various castes/races within a defined geographic zone. Anthropometric study of head is useful in designing various equipments of head and face like helmets, head phones, goggles etc by formulating standard sizes. The observations and findings of this study will provide platform for similar extended Cephalometric studies based on various communities/castes/races of particular geographic zones.

Different workers have studied the CI in different populations and have reported different type of cranial characteristics (Thapar *et.al.* 2012; Alves *et.al.* 2011; Jadav *et.al.* 2011; Waghmare *et.al.* 2010; Oladipo *et.al.* 2010; Vojdani *et.al.* 2009; Oladipo *et.al.* 2009; Rexhepi and Meka 2008; Golalipour *et. al.* 2007; Safikhani *et. al.* 2007; Lobo *et.al.* 2005; Balgir 2003; Tomljanovic *et. al.* 2003; Abolhasanzadeh and Farahani 2003; Nakashima 1986; Hadlock *et. al.*1981**).**

MATERIALS AND METHODS

This descriptive and cross sectional study was carried on 100 individuals (50 Males and 50 Females) of Mumbai origin. Students were selected because of the easy availability. The age of the students ranged from 17 to 23 years. All the measurements were taken with the subject sitting on chair, in relaxed condition and head in anatomical position. The method used for assessing the cephalic index is **Hrdlicka's method**.

The anatomical landmarks, **glabella** (point above the nasal root between the eyebrows and intersected by mid saggital plane), **inion** (distal most point placed on the eternal occipital protuberance in the mid sagittal plane) and euryon (lateral most point placed on the side of the head) were marked. The measurements were taken with a spreading calliper. The head length was measured from glabella to inion and head breadth was measured as the maximum transverse diameter between the two euryons.

The cephalic index was determined on the basis of international anatomical description, depending upon this index, types of head shapes are as follows:

Head shape Cephalic index (CI):

Type of skull	Cephalic Index Range
Dolichocephalic	CI < 74.9
Mesocephalic	75 < CI < 79.9
Brachycephalic	80 < CI < 84.9
Hyperbrachycephalic	85 < CI < 89.9

RESULTS

From the collected data, statistics is applied and observations and results are presented in tabular form. The minimum cephalic index is found to be 62.903 and maximum cephalic index is found to be 103.296. The mean cephalic index is 78.481.The mean cephalic index for male is 81.283 and for female it is 75.222.

Table-1 SHOWING INCIDENCE OF CEPHALIC INDEX IN MALES AND FEMALES.

CEPHALIC INDEX RANGE	NO. OF MALES	NO. OF FEMALES
	7	20
	20	16
	10	6
	13	8

In Males the head length varies from 17cm to 20.8cm, the mean head length being 18.586cm. In Females the head length varies from 15.9cm to 19.9cm with the mean head length 18.252cm.

Table-2 SHOWING HEAD LENGTH IN MALES AND FEMALES.

HEAD LENGTH (cm)	NO. OF MALES	NO. OF FEMALES
15.01-16	0	1
16.01-17	0	1
17.01-18	10	12
18.01-19	26	24
19.01-20	13	12
20.01-21	1	0

In Males, the head breadth varies from 12.8cm to 18.8cm; the mean head breadth being 15.082cm. In Females, the head breadth varies from 11.6cm to 15.7cm with the mean head breadth 13.822cm.

DISCUSSION:

Racial variations in the cranium were recorded. Variations in cephalic indices between and within populations have been attributed to a complex interaction between genetic and environmental factors.

In the present study, the mean cephalic index in both sexes is 78.481, ranging from 62.903 to 103.296. Maximum frequency is seen in the range of 78.01 to 79.

In this study, cephalic index in females was 75.222. The cephalic index of this study was lower than Nakashima (1986) study on female students with 87, Golalipour (2006a) study on native Fars group with 85, Turkman group 82.8 in Gorgan North of Iran (Golalipour, 2006b) , higher than Abolhasanzadeh & Farahani (2003) study in Tehran- center of Iran with 75, Buretic´-Tomljanovic´ et. al. (2004).

Table -3 SHOWING HEAD BREADTH IN MALES AND FEMALES

HEAD BREADTH (cm)	NO. OF MALES	NO. OF FEMALES
11.01-12	0	4
12.01-13	1	9
13.01-14	6	14
14.01-15	15	13
15.01-16	17	10
16.01-17	10	0
17.01-18	0	0
18.01-19	1	0

In the present study, cephalic index in males was 81.283. The cephalic index of this study was higher than the study in Tehran- Iran with 75 (Abolhasanzadeh & Farahani), Turkman male in north of Iran (Golalipour et. al.) and other studies such as India (Shah & Jadhav) with 80.42, Chile 80.42 (del Sol) and Buretic´-Tomljanovic´ et. al., study in Croatian with 79.37. The cephalic index reported 81.19 in European people in Mediterranean area and 79.72 in North of Europe.

CONCLUSION

The results of the present study show that the Mumbai community can be classified as **mesocephalic**. There is a significant gender difference in the CI. Since there is not much published data available on CI of the Mumbai community the data presented in the present report can be useful for comparison among the regional differences and can be used for the determination of the individuals of the region within the country.

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