



ESTIMATION OF CEPHALIC INDEX IN A REGIONAL POPULATION – AN AUTOPSY BASED STUDY.

Rakhin Kareparambil Balan*

Assistant Professor, Department Of Forensic Medicine, Govt. Medical College Kozhikode.*Corresponding Author

Prajith Thekke Madathil

Assistant Professor, Department Of Forensic Medicine, Govt. Medical College Kozhikode

ABSTRACT

Cephalic index (CI), is an important parameter for detecting the race of an individual whose identity is unknown. Due to lack of documented research on cephalic index of individuals of North Kerala, the process of establishment of identity of skeletal remains do not often meet the professional standards. The data was collected from the dead bodies brought to the Department of Forensic Medicine in Govt. Medical College, Kozhikode which generally consists of North Kerala population. It consisted of 254 males and 146 females. Length of the head and skull showed positive correlation with height, weight and age of the individual. Dolichocephalic or narrow headed skull predominated in the study population. Cephalic index showed a decreasing tendency as the age advances. No significant inference regarding sex difference in cephalic index could be made out.

KEY WORDS : Cephalic Index, Skull, Identity Of Human Remains, Anthropology, Dolichocephalic

INTRODUCTION:

The exact identity of a person these days can be fixed by DNA analysis; but before such expensive studies are undertaken, primary selection or exclusion of many suspects (as to the identity) would have to be done by fixing age, sex and ethnic subgroup/race.

Cephalic index (CI), which is the ratio of breadth to height of the head expressed in percentage, is an important parameter for detecting the race of an individual whose identity is unknown. Comparison of changes in cephalic index between parents, offspring and siblings can give a clue to genetic transmission of inherited characters.

Due to lack of documented research on cephalic index of individuals of North Kerala, the process of establishment of identity of skeletal remains do not often meet the professional standards prescribed for the same by doing away with the questions of race or the region from which the person might have originated.

MATERIALS AND METHODS:

The data was collected from the dead bodies brought to the Department of Forensic Medicine in Govt. Medical College, Kozhikode which generally consists of North Kerala population. It consisted of 254 males and 146 females. The measurements i.e. the Head length and breadth were taken directly from the intact head first and again from the cranium after reflecting the scalp and clearing the tissues underneath. The maximum head length is taken as the maximum distance between glabella and opisthocranium. The maximum head breadth is taken as the maximum biparietal diameter and is the distance between the most lateral points of the parietal bones. Then the Cephalic Index was calculated (Max. head breadth/ Max. head length x 100). Those having mixed racial parentage and nativity outside the specified area were not considered in the study. Those who had skull trauma or deformities were also excluded.

OBSERVATIONS:

The minimum CI was found to be 66.3 and maximum was 95.3 on intact head, the corresponding values after reflecting the scalp i.e. on the skull was 64.3 and 95.1 respectively. The average CI for males and females on intact head were 74.94 and 74.98 respectively. Their average on skull were 74.09 and 74.23 respectively. In both sexes dolichocephaly predominated followed by mesocephaly.

Length of the head and skull showed positive correlation with height, weight and age of the individual. The only significant

negative correlation found was for Cephalic Index with age, i.e. CI decreases with age.

DISCUSSION

The Cephalic Index of an individual being genetically predetermined and also influenced by various other factors like being an inherent characteristic, the estimate of which, together with other physical and anthropometric parameters, is considered to be an important assessment in the identification of unknown human remains. It is of use in other medical, surgical and dental specialties and also for commercial purposes.

In the present study an attempt had been made to find out the influence of various factors including age, sex, physical parameters upon Cephalic index.

Studies on Russian Jews (C.E.Guthe - 1918)", Mexican Crania (Marcus.S. Goldstein 1943) showed a greater Cephalic index in females compared to that of males. Nicholas Michelson" (1943) found that there is an excess of the cephalic index in females as compared with males, amounting to 0.7 for Negroes and 0.6 for Whites. In the present study the mean index in females exceeded by 0.04 (head) and 0.14 (skull) compared to males. But in a cephalometric study of young boys and girls in Iran (Zahra Vojdani - 2009)" found that the index was more for boys (by 1.0).

A survey done under the department of Anthropology, India by Sarkar.S.S'S et al on 'Kadar caste in Kerala showed a mean Cephalic index of 74.23 for males and 73.26 for females. In the present study, Cephalic index tends to decrease as age advances, as shown by a negative correlation (- 0.119). It agrees with observations of Nicholas Michelson in a collected data of whole lifespan of Negroes. Correlation coefficient as estimated by Chung.C.S was (-0.0344) and that of Alena Buretic' Tomljanovic' et al was (-0.09). Statistically significant values correlating height and weight of the individual with length and breadth of head was obtained in this study. Kanchan R. Patila, Rajendra N. Mody made a regression formula from radiological cephalometric data using head length as a variable for predicting stature. For males, height = 9.323724 x maximum length of skull. For females, height = 9.19782 x maximum length of skull. Kewal Krishan", in a cephalo-facial anthropometric study of adult male in a specified north Indian population, found another regression equation i.e. stature = 88.671 + 4.647 maximum head length or stature = 98.056 + 5.320 maximum head breadth. In his study head length and breadth correlates with stature by a coefficient of 0.775 and 0.682 respectively (p < 0.001). Another study

***Corresponding Author Rakhin Kareparambil Balan**

Assistant Professor, Department of Forensic Medicine, Govt. Medical College Kozhikode

by Can Pelin et al", in an attempt to estimate stature from craniofacial dimension in Turkish population, found that correlation of head length to stature is 0.229 in general and 0.268 when only brachycephalic heads are analysed. Jeremy E.C. Genovese", while analyzing Hooton's data found a significant negative correlation (-0.20) of height of an individual to Cephalic index. Ahmad Y. Abu Dalou"observed that when childhood nutrition was improved, the parameters including Cephalic index showed a significant increment. The study was conducted on adult males of North Jordan utilizing their childhood data. In the present study the parameters such as length of the head, and their difference with the underlying skull (thickness of the scalp tissues anteroposteriorly), breadth of the head and bizygomatic distance were influenced significantly by nutritional status. Kenneth.L.Beals³⁶ noted a mean Cephalic index of 78.68 (std. deviation - 3.40) in a wet hot climate, especially in Asian region. In the present study the average Cephalic indices for males were 74.94(std. deviation - 4.4) and 74.98(std. deviation - 3.4) for females, on an intact head

The difference between the head and the skull measurements were studied by many; their observations are compared with the present study in the following table. Out of 400 subjects, only 338 (84.5%) in which the index of head greater than the underlying skull is considered here¹.

Limitations of the present study

1. The sample selected does not truly reflect the general population as the dead bodies for medico legal autopsies were only taken for the study
2. As the anthropometric measurements are obtained from the landmarks identified on the skin which is a movable tissue, the values obtained tend to lack the reproducibility, when the same measurements are made by another operator.

CONCLUSIONS

254 male and 146 female dead bodies during the medico-legal autopsy examination in the Department of Forensic Medicine, Medical College, Calicut were subjected to morphometrical measurements and the data were analyzed mainly to find the type of skull prevalent in a particular geographical area.

Two anthropometrical parameters including Head length, Head breadth (of intact head and of skull after removing scalp), distance between zygoma and distance between angle of jaw were measured by using a spring caliper and scale.

The Cephalic index was calculated and all the measurements were statistically analyzed in relation to various other parameters especially age, stature, body weight, body mass index etc.

The conclusions made out are as follows

1. Dolichocephalic or Narrow headed skull predominated in the study population.
2. Cephalic Index showed a decreasing tendency as age advances.
3. No significant inference regarding sex difference in Cephalic index could be made out.

An extended study on a large scale in groups from a specific community and geographical area by using more advanced radiological methods may be attempted.

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