

Study of Cephalic Index in Indian Muslim Female Students- A Study in Ajmer Zone

Praveen Chouhan^{1,*}, Anjana Mathur², Ranjana Bardjatiya³, Mohd. Amaan⁴

¹Senior Demonstrator, ²Senior Professor, ³Associate Professor, ⁴M.Sc.Student, Dept. of Anatomy, JLN Medical College, Ajmer, Rajasthan

***Corresponding Author:**

Email: praveentunwal@yahoo.com

ABSTRACT

Background: Variety of metric and non-metric measurements assess the ethnic and sex differences of skull. The non-ethnic measurements are more subjective, and the actual measurements like cephalic indices provide a metric recording of size, proportions of cranial features. Cephalic indices play a crucial role in comparison of cephalic morphometry between parents, offspring and siblings and provide information on inheritance pattern.

Material & Method: The present study was performed on 100 females Muslim students of higher school & medical college of 18-23 year age groups, anthropometric points were measured by using spreading, sliding caliper.

Result: The present study showed the head of Muslim females is monocephalic.

Conclusion: Data is utmost important in forensic medicine, anthropology and in genetics.

Keywords: Cranial indices, Females, Anthropometric points, Correlation

Access this article online	
Quick Response Code: 	Website: www.innovativepublication.com
	DOI: 10.5958/2394-2126.2015.00010.9

INTRODUCTION

All human beings occupying this globe belong to the same species. i.e. Homo sapiens.¹ No two persons are ever a like in all their measurable characters, that the latter tends to undergo changes in varying degrees from birth to death, in healthy and in diseases, and since persons living under different conditions, and members of different ethnic groups and the offspring of unions between them, frequently present interesting differences in bodily form and proportions.² Personal identification means determination of individuality of a person. It may complete (absolute) or incomplete (partial). Complete identification means absolute fixation of individuality of a person. Partial identification implies ascertainment of only some facts about the identity of the person while others still remain unknown. Age, sex and stature are the primary characteristics of identification.³

Anthropometric characteristics have direct relationship with sex, shape and form of an individual and these factors are intimately linked with each other and are manifestation of the internal structure and tissue components which in turn, are influenced by environmental and genetic factors. Anthropometric data are believed to be objective and they allow the forensic examiner to go beyond

subjective assessments such as 'similar' or 'different'. With measurement data, the examiner is able to quantify the degree of difference or similarity and state how much confidence can be placed in this interpretation.

Cephalic indices play a crucial role in comparison of cephalic morphometry between parents, offspring's and siblings and provide information on inheritance pattern. Also, it provides the roots for diagnostic comparison as in cases of Dolicocephalics (less prone to Otosis media),⁴ and in the individuals with Apert's syndrome who are hyperbrachycephalic.⁵ Human populations were characterized as either Dolicocephalic (long headed), Mesaticcephalic (Moderate headed), Brachycephalic (Short headed). These were earlier issues on the role of cephalic index in determining the race and mapping of the ancestral population. The lack of plastic evidence⁶ led to implementation of advanced techniques in 2002, 2003 and provided a genetic backdrop in head shape.⁷⁻⁹ As in Muslim Community there are less barriers in inter-cousins marriages, the genetic changes have a larger chances of occurrences. Since cultural context is considered as basic key to understanding, and proper appreciation of the problems of human evolution. Hence the physical anthropology is concerned with the communication of environmental and socio-cultural factors. Physical anthropology is important in forensic sciences. It made some significant contributions, and also age and sex have determined by individual characterization. Physical anthropology helps in the fields of dermatoglyphics, serology, osteology, osteometry, and solves the problems of forensic science.⁷⁻⁹

MATERIAL AND METHOD

The study was conducted in the Department of Anatomy, J.L.N. Medical College, Ajmer, including 100 subjects (100 females) together from Muslim Community. The participants who volunteered in the study were healthy and without any obvious craniofacial abnormalities like developmental disability, oculofacial trauma, craniofacial congenital anomaly, and had no history of plastic or reconstructive surgery. The age group of 17-23 years male volunteers was selected. Instruments used include weighing machine, measuring tape, sliding and spreading calipers. All the measurements were taken with the subject sitting in chair, in relaxed condition and head in anatomical position. The method used for assessing the cephalic index is Hrdlicka's method.¹⁰ The anatomical landmarks, glabella (g), in ion (I) and euryon (eu) were marked.

The anatomical landmarks were defined as follows:

Glabella: A point above the nasal root between the eyebrows and intersected by mid saggital plane.

Inion: The distal most point placed on the external occipital protuberance in the mid sagittal plane.

Euryon: The lateral most point placed on the side of the head. The head length was measured with a spreading caliper from glabella to Inion. Head breadth was measured as the maximum transverse diameter between the two euryons using a spreading caliper. The cephalic index was determined on the basis of international anatomical descriptive.¹¹

Depending upon this index, the types of head shapes were followed as-¹¹

S. No	Type of Skull	Cephalic Index Range
1	Dolichocephalic	70 < CI < 74.9
2	Mesocephalic	75 < CI < 79.9
3	Brachycephalic	80 < CI < 84.9
4	Hyperbrachycephalic	85 < CI < 89.9

RESULT

In the present study cephalic index was calculated using the standard formulae and determined on the basis of international descriptions. Hrdlicka's method used for the Assessing Cephalic index.¹¹ All measurements were expressed in centimeters. The data represents the mean and standard deviation of the actual values of head length, head breadth and cephalic index of all subjects. The results were computed and analyzed statistically as shown in Table 1,2,3.

Table 1: Ranges of head length, head breadth

Head Length	No of cases	Head breadth	No of cases
16.01 – 17.00	5	11.01 – 12.00	5
17.01 – 18.00	13	12.01 – 13.00	4
18.01 – 19.00	44	13.01 – 14.00	19
19.01 – 20.00	28	14.01 -15.00	55
20.01 – 21.00	10	15.01 – 16.00	14
--	--	16.01 – 17.00	3

Table 2: Cases of cephalic index

Cephalic index	No. of cases
66.01- 70.00	3
70.01- 74.00	20
74.01-78.00	35
78.01-82.00	43
82.01-86.00	6

Table 3: Distribution of head shapes

Age	Dolicocephalic heads	Mesocephalic heads	Brachycephalic heads
18	5	7	2
19	10	5	2
20	4	4	3
21	6	17	1
22	2	10	1
23	4	5	1

Covariance of head length with respect to head width-- **-0.0143**

Covariance of head width with respect to head length - -- **-0.014**

Correlation of head length with respect to head width--- **0.3713**

Correlation of head width with respect to head length --- **0.033**

Intercept of head length with respect to head width--- **-0.0480**

Intercept of head width with respect to head length --- **-0.022**

Std. Error of prediction of head length with respect to head width--- **0.795**

Std. Error of prediction of head width with respect to head length --- **0.550**

DISSCUSSION

Cephalometry is an important tool for an anthropologist and forensic expert for identification of the racial differences, sexual differences, comparison of changes between parents, offspring and siblings towards their genetic transmission of inherited characteristics and also to a great extent for the facial reconstruction of disputed identity. The cephalic index is one of the important cephalometric indices.

It may be possible to derive a regression equation for calculating cranial volume or cranial indices using head breadth, which may be of use in reconstruction of the head shape and size from

remains of an individual where only a fragment of the head or the skull with maximum head breadth is available. However further studies using larger samples of subjects of different ethnic groups may establish the usefulness of this method of deriving cranial volume and cephalic indices.

According to Stewart's classification (1935)¹³ Punjabi subjects can be called brachicephalic or Hyperbrachicephalic. Kondo et al showed that, the head breadth will reach maximum at the age of 14 and head length will increase even after the age of 14.¹⁴ He also showed brachycephalization and secular change in head length in Japanese population Kasai et al in his study showed the effect of food habits influencing the craniofacial form.¹⁵ A similar study was conducted in different Indian groups and CI was found to be different for different groups. According to Bhargava and Kher it is 76.98 (mesocephalic) for Bhils and 79.80 (mesocephalic) for Barelis¹⁶ and according to Shah and Jadav for Gujaratis the CI is 80.816.¹⁷ With the help of the above statistics, the sex as well as race of the deceased can be determined accurately with the head measurement. This knowledge can be of immense importance to anthropologists as well as forensic science experts.

Interaction of gene expression, and cranial dimensions can make the gene expression differs in various racial, and ethnic groups in geographical zones.¹⁸ Because cranial dimensions depends on gene expression. It becomes a determining factor. The first generation of Hawaii immigrants had higher cephalic index than their parents. Thus, it is an interesting factor to know that cephalic indices very significantly among populations in different geographical zones. The present study provides valuable new data pertaining to cephalic indices and the shapes of the head in individuals between 18-23 years of age; belonging to south Indian. Comparatively these following previous studies Shah GV jadhav^[18] Mean values of cephalic index is 80.42, Mahajan et al Mean is 81.34, and Anitha MRet al Mean is 79.14. Have more mean values than the present study. The present study mean is 78.27 ± 4.28 .

CONCLUSION

The results of the present survey show that can be classified as Mesocephalic heads. Since there is no published data on CI of Muslim females the data presented in the present report can be useful for experts in forensic science. The present study provides valuable new data pertaining to cephalic indices and the shapes of the head in individuals between 18-23 years of age the present study mean is 78.27 ± 4.28 .

REFERENCES

1. Krishan K. 2007. Anthropometry in Forensic Medicine and Forensic Science: Forensic anthropometry. *Int J Forensic Sci*; 2(1):1.
2. Ashley MMF. 1960. A practical synopsis of methods of measurement in physical anthropology. In: Ashley MMF & Josef. A hand book of anthropometry. USA: Charles Thomas publishers; p 1-9.
3. Krishan V. 2009. Textbook of Forensic Medicine and Toxicology. 4th ed. India: Elsevier Publishers, Reed Elsevier India private Ltd; p. 48-50.
4. Stolovitsky JP, Todd NW. Head. Shape and abnormal appearance of Tympanic membrane. *Otolaryngol Head, Neck Surg.*, 1990; 102: 322-325.
5. Cohen MM and Kreiborg S. Cranial size and configuration in the Apert's syndrome. *Journal of craniofacial genetics and developmental biology* 1994; 14:95-102.
6. Boas F and Boas HM. The head forms of the Italians as influenced by heredity and environment. *American Anthropologist* 1913; 15 (2): 163-88.
7. Holloway LR. Head to head with Boas: Did her on the plasticity of head form? *Proceedings of National Academy of Sciences* 2002; 99(23):14622-23.
8. Sparks CS and Jantz RL. A reassessment of human cranial plasticity: Boas revisited. *Proceedings of National Academy of Sciences* 2002; 99(23):14636-69.
9. Gravlee, Clarence C., H. Russell Bernard, and William R. Leonard. Heredity, Environment, and Cranial Form: A Re- Analysis of Boas's Immigrant Data. *American Anthropologist* 2003; 105 (1): 125-38.
10. Gravlee, Clarence C, Russell Bernard, William R. Leonard. Boas's Changes in Bodily Form: The Immigrant Study, Cranial Plasticity, Boas's Physical Anthropology. *American Anthropologist* 2003; 105 (2): 326-32.
11. Hrdlika. Practical anthropology. 4thed. Philadelphia: The wistar Institute of Anatomy and Biology; 1952. p 87-89.
12. Williams P, Dyson, M Dussak JE, Bannister LH, Berry MM, Collins P and Ferguson MWJ. Gray's anatomy. In: Skeletal system. 38th Ed. London: Elbs with Churchill Livingston; 1995. P 607-12.
13. Stewart TD. Anthropometric nomenclature II. The cephalic index, *American Journal of anthropology* 1935;97-140.
14. Kondo S, Wakatsuki E and Shibagaki HA. Somatometric study of the head and face in Japanese adolescence. *Okajimas Folia Anat Jpn.* 1999; 76(4): 179 – 85.
15. Bhargava I and Kher GA. A comparative anthropometric study of Bhils and Barelis of Central India. *J Anat Soc India* 1961; 10:26-33.
16. Shah GV and Jadav HR. The study of Clin students of Gujarat. *J Anat. Soc. India* 2004; 53 (1): 25 – 6.