Original Research Article

STUDY OF CEPHALIC INDEX IN NEPALESE MEDICAL STUDENTS

Pandey N *[1], Jha CB [1], Yadav G [1], Sah SK [2], Yadav P [1], Awasthi J [1].

[*1] Department of Anatomy, BPKIHS, Dharan, Nepal.

[2] Lecturer in the Department of Anatomy, NMCTH, Biratnagar, Nepal.

ABSTRACT

Background: Anthropometry as a subject is helpful in getting measurements of living subjects for identifying various dimensions like gender, age, stature etc. related to particular individual or a race. Cephalic index is calculated as the ratio of the maximum breadth of head to its maximum length and can be helpful while investigating for gender or racial difference.

Objective: To estimate cephalic index of healthy adult students of a medical university in eastern part of Nepal.

Materials and Methods: This cross sectional study was carried on 292 adult students (158 male & 134 female) pursuing different courses at B.P. Koirala institute of Health sciences (BPKIHS), Dharan, Nepal. Head length and head breadth was measured for each student. All the measurements were taken by using standard measuring devices and applying standard anthropometric techniques.

Results: The mean cephalic index for male was 75.82and for female was 78.36. The difference between male and female heads cephalic index was 2.54.

Conclusion: Cephalic index of the female students is approximately 3.35 % higher than the male students in present study. This study may serve as basis of comparison for future studies and this data is expected to be of clinical, forensic and anthropological significance.

KEY WORDS: Anthropometry, cephalic index, head length, head breadth.

Address for Correspondence: Dr. Nivedita Pandey, MD Anatomy, Assistant Professor,Department of Anatomy, BPKIHS, Dharan, Ghopa, Sunsari 18, Nepal. Phone No: 025-525555, Ext. 2495 & 3193(R), Mobile-00-977-9804352325. **E-Mail**: niparo8@gmail.com

INTRODUCTION

Craniofascial measurements are essential for determining various head and face shapes. Craniometry is an important branch of anthropometry through which cranial dimensions can be measured. In a living person, information about the cephalic index is important in the study and comparison of the crania of populations with various essential differences like nutritional, racial, geographic, ethnicity etc [1]. This may also be helpful in paediatrics specialty as an indicator of skull development in both female and male individuals as well as for growth and development and abnormal crania evaluation [2,3]. Determination of sex is a key norm, for identification of a human being for medico-legal purposes and it's well agreed that skull and pelvis has great significance in establishing sex of a person.

Cephalic index findings help categorizing human skulls as either broad headed (brachycephalic), moderate headed (mesocephalic) or long headed (Dolichocephalic) [4]. It was initially used in physical anthropology to classify earliest

human remnants found in some part of Europe. Later on in late 19th and early 20th century the theory became closely associated with the development of racial anthropology when prehistorians attempted to use ancient remains to model population movements in terms of racial categories [5].

Cephalic index has been measured by many workers without differentiating male and female skulls [6,7]. There is a minor little difference between male and female skulls in early life but during the adulthood, female skulls are generally smaller and tender than male skulls (Gray's Anatomy 1935). In this study, an attempt has been made to estimate the cephalic index of subjects using the dimensions of the heads in 18-23 years old healthy medical university students. The purpose of the study was also to determine if it is a significant parameter for gender differentiation and hence this study was also an effort to determine the possibility of gender identification from cranial index.

MATERIALS AND METHODS

Subjects: This cross sectional study was carried on 292 adult students (158 male & 134 female) of the age group 18-23 years pursuing different courses at B.P Koirala institute of Health sciences (BPKIHS), Dharan, Nepal. Purpose of the study was explained and prior informed consent was obtained from the subjects and the study was carried out after obtaining ethical clearance from the institute ethical committee of BPKIHS.

Craniometric measurements: Cephalic index can be calculated in the living subject by two principal dimensions as following:

Cephalic index = Maximal head breadth/Maximal head length × 100.

Cranial measurements were performed with subjects in a relaxed condition with head in the anatomical position using standard anatomical landmarks. A spreading caliper was used to measure the head measurements (cranial length and width). Cranial length was described as linear length from Glabella to Inion and cranial breadth (width) was taken as linear length between parietal eminences. Each measurement was taken to the nearest millimeter at least three times and average was considered for computation. The subjects were classified into Dolicocephalic

(CI < 75), mesocephalic($75 \leq CI \leq 80$)and Brachycephalic (CI > 80).

Statistical Analysis: The data for each person was recorded on a recording sheet, and then transferred into SPSS 11.0 for analysis. The means obtained from this study were subjected to student t-test for assessment of statistical significance with a probability level of less than 0.05 considered as significant.

RESULTS

Table 1: Showing parameters of Students.

	MBBS Stream			BDS Stream			B.Sc. Stream		
	1ST Year	IInd Year	Total	1St Year	IInd Year	Total	Nursing	MLT	Total
Male (158)	67	54	121	10	16	26	0	11	11
Female(134)	22	21	43	37	21	58	29	4	33
Total (292)	89	75	164	47	37	84	29	15	44

Table 2: Cephalic index (CI) of Students.

Parameter	Minimum (in cm.)		Maximum (in cm.)		Mean (in cm.)		
	Male	Female	Male	Female	Male	Female	p- Value
Head Width	13.1	12.4	16.3	15.5	13.8±0.3	13.4±0.4	<0.05
Head Length	17.6	16.5	20.2	19.1	18.2±0.6	17.1±0.3	<0.05
Cephalic Index	74.43	75.15	80.69	81.15	75.82±4.43	78.36±5.06	<0.05

Table 3: Classification of students based on Cephalic Index (CI).

	Dolicocephalic (CI < 75)	Mesocephalic (75≤ CI≤80)	Brachycephalic (CI > 80)
Male (158)	108 (68.35%)	39 (24.68%)	11 (06.96%)
Female (134)	53 (39.55%)	68 (50.74%)	13 (09.70%)
Total (292)	161 (55.13%)	107 (36.64%)	24 (08.22%)

Results are presented in analysed tabulated form for the collected data in Table 1, 2 and 3. The minimum Cephalic index was found to be 74.43 for male and 75.15 for female subjects while maximum Cephalic index was found to be 80.69 for male and 81.15 for female subjects. The mean Cephalic index was 75.82 for male and 78.36 for female subjects. The difference between male and female Cephalic index was significant (p< 0.05 & difference 2.54). In males, the mean head length was 182 ± 6 mm and the head length varies from 176 mm to 202 mm. In females the head length varied from 165 mm to 191 mm, the mean head length being 171 ± 3 mm. The difference between male and female head length was found to be significant (p< 0.05 and difference 11mm)

In males the mean head breadth was 138 ± 3 mmand the head breadth varies from 131 mm to 163 mm. In females the head breadth varies from 124 mm to 155 mm, the mean head breadth being 134 ± 4 mm. The difference between male and female head breadth was found to be significant (p< 0.05 and difference 4 mm).

In the present study, cranial index for female skulls was found to be between 75.15-81.15 with a mean of 78.36. For male skulls it varied from 74.43-80.69 with a mean of 75.82.

Based on their cranial index subjects were classified as Dolicocephalic (CI < 75), meso-cephalic(75 ≤ CI ≤ 80)and Brachycephalic (CI>80). Out of total 292 subjects, 161 (male 108 and female 53) were dolicocephalic, 107 (male 39 and female 68) were mesocephalic and 24 (male 11 and female 13) were brachycephalic.

DISCUSSION

In past, several authors have studied the cephalic or cranial index of skulls belonging to different races [8]. In a study conducted by Shah GV at B. J. Medical College, Ahmedabad on 500 medical students, the mean cranial index in male was found to be 80.42 and 81.20 was in female and the mean cranial index for total subject was found to be 80.81 [9]. Lobo SW studied 267 persons of Gurung community of Nepal and the mean cephalic index in male was found to be 83.1 and in female was 84.6 [10]. It is a well known fact that in Negroid race brachycephaly is rare while mongoloid race has rarely been found to be dolicocephalic while facts of paleontology and available data suggest that early man was by and large dolicocephalic. Subsequently repeated mutation and other factors lead to Brachycephaly in the human being in the later stage.

In the present study mean cephalic index of male subjects was 75.82 and of female was 78.36. In our study, dominant type of head shape in males was dolicocephalic i. e. 108 (68.35%) subjects and mesocephalic 39 (24.68%) while in female dominant type of head shape was mesocephalic i.e. 68 (50.74%) and dolicocephalic i. e. 53 (39.55%) . The present finding has been compared with other studies conducted in the past in table no.4.

Table 4: Cephalic Index (CI): Studies compared.

	Name of Study	Place of Study	Sex	Head length (cm)	Head breadth (cm)	CI
1	Shah GV. [9] JASI 2004. 500 subjects Medical Students	500 Gujarat, India.	M=302			80.42
			F=198			81.2
2	Lobo SW. [10] KUMJ 2005; 267 Subjects	267 Gurungs of Kaski, Nepal	M=157	18	14.9	83.1
			F=110	17.4	14.7	84.6
3	Salve VM et al. [11] AJMS 2011; 320 subjects	320 Andhra Pradesh Medical Students	M=160	18.2	13.8	75.68
			F=160	17.2	13.6	78.2
4	Sanjay Gupta et al. [12] IJAR 2013; 600 subjects	600 North Indian Students;	M=300	18.68	13.95	74.74
			F=300	17.77	13.61	76.83
5	Present Study; 292 Subjects	292 medical Students BPKIHS, Dharan. Nepal	M=158	18.2	13.8	75.82
			F=134	17.1	13.4	78.36

In medico-legal and anthropological studies, sexual determination assumes a very important means for the personal identification in many of the cases and fact of sexual dimorphism is also somewhat established by the findings of this study.

CONCLUSION

In this study it was found that head length and head breadth were more in male than female and cephalic index was slightly more for female subjects and it confirms the sexual dimorphism. In Forensic investigation sex determination is a convincing standard for identification in various cases. Mean cephalic index of male skulls was found to be 75.82 (range74.43–80.69), while in female skulls the mean cephalic index was found 78.36 (range 75.15-81.15). Majority (68.35%) of male subjects were found to be dolicocephalic while nearly half (50.74%) of the female were found to be mesocephalic while overall slightly more than half of the total subjects (55.13%) were found to be dolicocephalic. The difference in the cranial index of male and female skulls was found to be 2.54 and this fact can be of some help for sex identification.

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Conflicts of Interests: None

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