ORIGINAL RESEARCH ARTICLE

MEASUREMENT OF CEPHALIC AND FACIAL INDICES AMONG STUDENTS OF KUSMS

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ABSTRACT

Background: The description of the human face has been a major concern since long time. Individual identification is one such field where anthropometric parameters, especially cephalo-facial measurements, are an important tool in determining the various shapes of head and face. Hence the objective of the study was to determine the shapes of head and face.

Methods: The present study was a cross-sectional and observational type which consisted of 222 individuals (115 female and 107 male). It was conducted from January to June, 2019 after receiving ethical approval. The cephalic and facial indices were derived after measuring length and breadth of head and face. The collected data was entered in excel and analyzed with SPSS (22.0).

Results: The present study observed that the most common type of face was hyperleptoprosopic 168 (75.68%) followed by leptoprosopic 43 (19.37%), mesoprosopic 10 (4.50% female only) and euryprosopic 1 (0.93% male only). Similarly, the most common type of head was dolicocephalic 165 (74.33%), followed by mesocephalic 51 (22.97%), and brachycephalic 6 (2.70%).

Conclusions: This study concluded that the hyperleptoprosopic face was most common type and the least common type was euryprosopic face. The most common type of head was found to be dolicocephalic and the least common type was found to be brachycephalic.

INTRODUCTION

Nepal is a nation with complex and varied ethnic composition of population where the shape of human face and head is often used for identification of individual. The shape of human face and head is affected by several factors like age, gender, race, ethnicity, climate and genetic factors.[1] Cephalo-facial morphometry reviews the anatomical complexes of the head and face of human being living within a similar geography.[2]

It provides considerable information about physical conditions and development during growth. The cephalo-facial indices are generally considered as indicators of shape of human head and face respectively which may provide a clue to genetic transmission of inherited characters.[3,4] It has also a great importance for the evaluation of genetic transmission, congenital and traumatic deformities.[1,5] It would also provide information on inheritance patterns such as dolicocephalic type of head are less prone to Otitis media and in the individuals with Apert's syndrome are hyperbrachycephalic type.[4,6]

The researchers are very much interested in studying of cephalo-facial morphology of individual among different population[7] which has been shown variations based on ethnicity, races and geographical location.[8] Hence, the aim of the present study was to evaluate the shape and size of head and face among Nepalese population which may provide useful data to the clinicians and researchers during their applications.

METHODS

The present study was a cross-sectional and observational study conducted in Department of Anatomy, Kathmandu University School of Medical Sciences (KUSMS), Dhulikhel, Nepal. The study was conducted from January to June, 2019 obtaining ethical approval from Institutional Review Committee (Ref. No. 113/19) and verbal consent from the participants.

Sample size was calculated as:

$n = z^2 \times p\,(1-p)\,/\,e^2$ where,

n= minimum required sample size

z= 1.96 at 95% confidence interval

p= prevalence, 50%

q= 1-p

e= margin of error, 7%

Calculated sample size was 196 and then study was conducted in 222 individuals (115 female and 107 male) from various program under KUSMS. The individuals with physically fit and age group 18-25 years were included for this study. The individuals with any traumatic and congenital cephalo-facial deformities were excluded from the study.

The facial length was measured as the distance from nasion to gnathion and breadth was measured as the distance between two zygomatic prominences with the spreading caliper in centimeter. The cephalic head was measured as the distance from glabella to inion and breadth was measured as the distance between two parietal prominences with the spreading caliper in centimeter. All the measurements have been taken following the techniques of Martin and Saller. Facial Index was measured as the ratio of facial length to facial breadth multiplied by 100 and cephalic Index was measured as the ratio of head breadth to head length multiplied by 100.[9]

All the measurements were taken with the individual sitting in a relaxed condition and head in Franfort's horizontal plane. The collected data was entered in excel and analyzed with SPSS version 22.0.

The type of head and face were classified as given by Martin and Saller[9]

Type of face	Facial index	Type of head	Cephalic index
Hypereuryprosopic (very broad face)	<79.9	Dolicocephalic (long head)	<75.9
Euryproscopic face (broad face)	80–84.9	Mesocephalic (round head)	76–80.9
Mesoproscopic face (round face)	85–89.9	Brachycephalic (broad head)	81–85.9
Leptoproscopic face (long face)	90–94.	Hyperbrachycephalic (very broad head)	86–90.9
Hyperleptoproscopic face (very long face)	>95	Ultrabrachycephalic	>91

RESULTS

The study was done in 222 individuals (115 female and 107 male) from various program under KUSMS. The present study revealed the facial index and cephalic index cephalic index as 96.95±4.29 and 72.52±3.9 respectively (Table 1).

The study evaluated the length of face of male was found to be significantly higher than that of female whereas the breadth of female face was found to be significantly higher than that of male as shown in table 2. There was a highly significant (0.00) difference in the mean value of facial index between male and female.

Table 1: Descriptive statistics of face and head in centimeter (n=222)

	Face			Head		
	Length	Breadth	Facial Index	Length	Breadth	Cephalic Index
Min.	10.4	11	82.09	16.4	11.9	64.21
Max.	13.1	13.4	114.91	20	15.1	82.51
Mean±SD	11.51±0.37	11.89±0.36	96.95±4.29	18.13±0.79	13.13±0.6	72.52±3.9

Table 2: Descriptive statistics of face and head in centimeter (n=222)

		Female			Male			p-value
		Min.	Max.	Mean±SD	Min.	Max.	Mean±SD	
Face	Length	10.4	12	11.44±0.29	11	13.1	11.59±0.43	0.002
	Breadth	11.3	13.2	11.95±0.35	11	13.4	11.82±0.35	0.004
	Facial Index	85.95	100.85	95.78±3.29	82.09	114.91	98.21±4.89	0.00
Head	Length	16.4	19.2	17.86±0.72	17.1	20	18.42±0.75	0.00
	Breadth	11.9	14	12.71±0.42	12.9	15.1	13.58±0.42	0.00
	Cephalic Index	64.21	82.35	71.35±4.38	66.49	82.51	73.78±2.78	0.00

The average length and breadth of female head was found to be lower than that of male as shown in table 2. There was a highly significant (0.00) difference in the mean value of cephalic index between male and female.

The present study observed that that the most common type of face phenotype was hyperleptoprosopic with a prevalence of 75.68% (70.43% female and 81.31% male), which was followed by leptoprosopic with a prevalence of 19.37% (20.87% female and 17.76% male), mesoprosopic with a prevalence of 4.50% (8.70% female only) and euryprosopic with a prevalence of 0.93% (0.45% male only). It was also noted that hyperleptoprosopic facial type was more common in male as compared to female. In contrast, leptoprosopic type was more common in female than that of male. Furthermore, mesoprosopic facial type was seen only in female but not in male and euryprosopic facial type was observed only in male but not in female as illustrated in Table 3.

Table 3: Face classification

Type	Female No. (%)	Male No. (%)	Total No. (%)
Hypereuryproscopic	0 (0)	0 (0)	0 (0)
Euryproscopic	0 (0)	1 (0.93)	1(0.45)
Mesoprosopic	10 (8.70)	0 (0)	10 (4.50)
Leptoproscopic	24(20.87)	19 (17.76)	43 (19.37)
Hyperleptoproscopic	81 (70.43)	87 (81.31)	168 (75.68)
Total	115 (100)	107 (100)	222 (100)

According to the value of cephalic index, dolicocephalic was found to be the dominant type of head in which male was 74 (69.16%) and female was 91 (79.13%). It was followed by mesocephalic in which male was 20 (28.97%) and female was 30 (17.39%) and brachycephalic in which male was 2 (1.87%) and female was 4 (3.48%). It was also found that the dolicocephalic and brachycephalic type of female head were higher than that of male but mesocephalic type of female head was lower than that of male as shown in Table 4.

Table 4: Cephalic type

Type	Female No. (%)	Male No. (%)	Total No. (%)
Dolicocephalic	91 (79.13)	74 (69.16)	165 (74.33)
Mesocephalic	20 (17.39)	31 (28.97)	51 (22.97)
Brachycephalic	4 (3.48)	2 (1.87)	6 (2.70)
Hyperbracyce-phalic	0 (0)	0 (0)	0 (0)
Total	115 (100)	107 (100)	222 (100)

DISCUSSION

Variation in physical morphology is an important occurrence in the description of human population. Many of inherited features have developed due to replication during evolutionary processes as well as result of adaptation to the environment.[10] It has been confirmed that the development and growth of humans are affected by different factors such as age, sex, race and geography.[11]

A study was done by Jeremic et al in Serbian population and found the mean facial index of male and female was 94.04±7.00 and 92.38±6.70 respectively[12] which were almost similar to that of Nepalese population. A study was done by Prasanna et al[14] and observed that the facial index was 101.04±1.95 in male and 107.7±7.69 in female among North Indian population; 100.28±1.77 in male and 85.39±6.33 in female in South Indian population which were higher than the values of this study.

The most common type of face among Nepalese population was found to be the hyperleptoprosopic in both genders. Likewise, the most common of type of face was recorded hyperleptoprosopic among Iranian population[15] and Albanians of Kosovo population.[16] A study done in Kathmandu reported the hyperleptoproscopic to be the second most common type of face.[17] However, a study done in the mid-part

of Nepal concluded that it was the least common occurrence among both genders.[18] Similarly, Yesmin et al studied among Malaysian population and observed the hyperleptoprosopic type to be least common which accounted for 5% for both genders.[19] A study done among Gujarati (Indian) female also reported the hyperleptoprosopic (8.3%) type of face to be least common which was also disagreed with this study.[2]

The leptoproscopic was recorded as the second common type of face in the present study. Whereas a study recently done in Nepal reported that it was the most common among dental students.[17] Similarly, it was also the second common type of face for male among Malaysian population.[19] In contrast, Mamun et al noted that the most common type of face was leptoproscopic for Japanese male (26.1%) and female (30.7%).[3] A study among Chinese ethnic population of Indonesia demonstrated leptoproscopic type in male to be most common which was inconsistant to the present study.[11]

The mesoproscopic type of face was found to be the least common among Nepalese female with a prevalence of 8.70%. However, it was the most common type among Tibeto-Nepalese, and indigenous population of Eastern Nepal.[20] It was also the most common type of face for Malaysian as well as Iranian population (Sistani and Baluch groups).[18,19]

Euryproscopic type of face was found only among male (0.93%) but not among female in the present study. In contrary, a study done by Ghosh et al reported the hypereuryproscopic and euryproscopic present in the highest and equivalent percentages in Santhals.[7] Heidari et al[21] conducted a study in southeast of Iran and reported the most common type of face was euryproscopic among female which was different from the present study. Similarly, hypereuryproscopic was the most common type of face followed by euryproscopic in Gujarati (Indian) population.[2] Variations in these findings may be due to environmental affect on their facial morphology.

Variations in cephalic index of different populations have been certified to a complex interaction between genetic and environmental factors.[22] Of course, the index varies from individual to individual but its amplitude can remain within certain limits in a given population. This peculiarity made the index suitable as a racial character.[10]

A study done by Eroje et al[23] reported cephalic index for Obia male and female as 73.7 and 72.2 respectively which were almost similar to the present study. In contrast, the mean cephalic index for the male and female were 81.81 and 82.99 respectively among Thai population.[24]

Dolicocephalic was found to be the most common type of head in the present study. A study done in indigenous Tharu community of Biratnagar, Nepal reveled dolicocephalic head to be the most common which was comparable to the present study.[25]A study done by Saini et al in North Indian state, Uttar Pradesh also reported dolicocephalic type of head to be the most common type.[10] In contrast it was recorded as the least

common type among Nepalese Medical students of all the three ethnic groups namely Brahmin, Newar and Chettri.[26] It was the least common among (4.32%) Thai[24] and Japanese populations as well.[3]

A study done among Colombian population found that the mesocephalic was the second common type of head[27] which was comparable to the present study. But a study conducted in Romanian population and reported the dominant cranial type in their study as mesocephalic.[28] A study in Nepal also claimed the mesocephalic type of head to be the most common among Medical students.[29]

A study was conducted by Rao et al in Gujarat (India) reported the least type of head was the brachycephalic among their population which was in accordance to the present study.[30] Similarly, Setiya et al[31] did a study in Madhya Pradesh (India) and the reported the least type to be brachycephalic in male (1.11%) and female (4%). In contrast, it was recorded the most common type among Brahmin, Newar and Chettri of Nepalese population.[26] It was also the most common among Albanians of Kosovo[16] and Srilankan population.[32]

The present study did not record hyperbrachycephalic type of head which was similar to the study done by Setiya et al.[31] So it is obvious that hereditary factor is primarily responsible for this variability in head shape in various ancestries, ethnicities and geographical regions, however environment has secondary effect on it.[33] There is an established relationship between the variation in cranial phenotypes and geographical distances.[34]

The individuals chosen for study were from different parts of Nepal. However, due to a relatively small sample size it cannot be generalized. This study has just focused on the measurement of anthropometric data but has not focused on the factors which might be responsible for this anthropometric presentation.

CONCLUSION

The present study concluded that the majority of people of Nepal having hyperleptoproscopic type of face followed by leptoprosopic. Similarly, common type of head was found to be dolicocephalic followed by mesocephalic. The data obtained in this study may be useful in clinical and medico-legal practices; and further researches of anthropology and genetics.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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