

Morphological Evaluation of Head and Face Shapes in a North - Eastern Nigerian Population

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Abstract: Anthropometric measurements such as cranial and facial forms provide important results that are important in orofacial surgery and in diagnostic comprehension between patient and normal populations. There is no published literature about the types of head and face shapes in the adult north eastern Nigerian population, hence, this study was undertaken to document the various cranial and facial forms of adult Nigerians of north eastern origin resident in Maiduguri metropolis. Head length, head width, head circumference, face length and face width were measured and the prosopic and cephalic indices calculated in a total of 343 subjects (200 males and 143 females). The mean cephalic index in males and females were 71.90% and 73.92% respectively while the mean prosopic index in males and females were 99.39% and 97.54% respectively. Based on international classification, the dominant and rarest head shapes were the dolicocephalic and hyperbrachycephalic type in males and females while the dominant and rarest face type were the hyperleptoprosopic and hypereuriprosopic type in both the male and female population respectively. The result obtained from this study showed that there was no significant difference between the dominant and rare head types in both genders thus the data obtained from this study can be used as local standards for diagnostic and anthropometric evaluation.

Key words: Dolicocephalic, Hyperbrachycephalic, Hyperleptoprosopic, Hypereuriprosopic, Cephalic Index and Prosopic Index.

INTRODUCTION

Craniometric studies of prehistoric skull and face bones have enabled anthropologists to trace the gradual changes that occurred in the size and shape of the human head as it enlarges to accommodate an increased brain volume. Bodily measurements are a mainstay of anthropological research, however racial and sometimes ethnic variation do exist between these measurements because human body dimensions are affected by ecological, biological, geographical, racial, gender, age and nutritional factors (Golalipour *et al.*, 2003, Rajlakshmi *et al.*, 2001, Radovic *et al.*, 2000, Tuli *et al.*, 1995, and Okupe *et al.*, 1984). Based on this factors, age, sex and racial groups in certain geographical zones are given due consideration in anthropometric studies (Golalalipour, 2006, Del sol, 2005 and Williams *et al.*, 1995). Cephalic and prosopic indices are important parameters that are useful in anthropological studies for ascertaining the variation between different sex as well as ethnic groups. They are also useful in paediatrics, forensic medicine, plastic surgery, oral surgery and diagnostic comprehension between patient and normal populations (Williams *et al.*, 1995).

In view of differences observed in other studies based on racial and ethnic differences, this study was design to determine the types of head and face shapes present in adult males and females of north eastern Nigeria. This study will provide a data base of craniofacial measurements that will possibly provide orofacial surgeons a wide range of craniofacial dimensions which are essential in craniofacial reconstruction

MATERIALS AND METHODS

Subjects:

This study was conducted on normal male and female students of north eastern origin studying in

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University of Maiduguri, Maiduguri Borno State, Nigeria in June 2008. This study was carried out on 343 adult subjects (200 males and 143 females) with their ages ranging from 19 to 35 years and subjects showing any craniofacial injury or deformity were excluded from the study.

Anthropometric Measurements:

The subjects were asked to sit on a chair in relaxed condition with their heads in anatomical position and the measurements taken using a spreading calliper using standard anatomical landmarks (Lobo *et al.*, 2005). All the measurements were carried out after careful palpation of the head for anatomical landmarks and measurements were taken to the nearest 1mm.

Head length - From glabella to the Inion,

Head width - Distance between the parietal eminences

Face length - Distance from the nasion to the gnathion

Face width - Distance between the zygomatic arches

Auricular length-vertical distance from the external acoustic meatus to the vertex

Cephalic and Prosopic indices were determined based on standard anatomical description.

Data Analysis:

The data obtained from each subject was recorded in a special form and data was transferred into a computer and analyzed using statistical package (GraphPad Instat). Results obtained were presented as means \pm SD and percentages. Cranial index (CI) and Prosopic index (PI) were calculated by the following formulae respectively.

$$CI = \frac{\text{Head Width}}{\text{Head Length}} \times 100$$

$$PI = \frac{\text{Face Length}}{\text{Face Width}} \times 100$$

Depending upon these indices the types of head and face shapes were classified as given below (Williams *et al.*, 1995 and Panero , 1979)

Head shape	Range of Cephalic Index (CI) (%)
Dolicocephalic	< 74.9
Mesocephalic	75 – 79.9
Brachycephalic	80 – 84.9
Hyperbrachycephalic	85 – 89.9
Face Shape	Range of Prosopic Index (PI) (%)
Hypereuriprosopic	< 79.9
Euriprosopic	80 – 84.9
Mesoprosopic	85 – 89.9
Leptoprosopic	90 – 94.9
Hyperleptoprosopic	> 95

Results:

A Total of 343 subjects were studied out of which 200 were males and 143 were females and the means and SD of head length, head width, head circumference, face length, face width, prosopic and cephalic indices obtained from the subjects are presented in Table 1.

The percentage means of cephalic index in the males and females were 71.90% and 73.92% while the prosopic index in the males and female population were 99.39% and 97.54% respectively. Results obtained based on the cephalic indices showed that the subject population are predominantly dolicocephalic with 66.5 % and 51% of the males and females presenting with that of type head shape while the rarest types of head shape observed in this study were the brachycephalic and hyperbrachycephalic type. Prosopic indices indicates the hyperleptoprosopic type as the dominant face shape in both males (70%) and females (57.3%) and hypereuryprosopic type of face shape as the rarest type 1.0 and 2.1 % in the male and female population respectively (Table 2).

Table 1: Various parameters measured of head & face in males and females

Parameters Measured	Males (N=200)	Females(N=143)
Head length(cm)	19.08±0.68	18.39±0.80
Head width(cm)	13.70±1.19	13.57±1.29
Face length(cm)	11.44±0.75	10.76±0.58
Face width(cm)	11.51±1.08	11.13±1.19
Auricular height(cm)	16.69±9.60	14.10±0.87
Head circumference(cm)	57.25±4.38	57.22±2.61
Cephalic index (%)	71.90	73.92
Prosopic index (%)	99.39	97.54

Results are presented as Means ± SD

Table 2: Distribution of head and face shapes in males and females

	Parameters	Range(s)	Males	Females
Head shapes	Dolicocephalic	<74.9	133(66.5)	73(51)
	Mesocephalic	75-79.9	49(24.5)	37(25.9)
	Brachycephalic	80-84.9	16(8)	27(18.9)
	Hyperbrachycephalic	85-89.9	2(1)	6(4.2)
Face shapes	Hypereuryprosopic	<79.9	2(1)	3(2.1)
	Euryprosopic	80-84.9	11(5.5)	7(4.9)
	Mesoprosopic	85-89.9	19(9.5)	28(19.6)
	Leptoprosopic	90-94.9	28(14)	23(16.1)
	Hyperleptoprosopic	>95	140(70)	82(57.3)

Results are presented as N (%)

Discussion:

Anthropological studies based on racial changes have determined that people from Africa, India, Australia, central part of Europe and North America are dolicocephalic; The head shapes of peoples in the Pacific Ocean are of the brachycephalic type, while in the Middle East, Russia and central part of Europe are mesocephalic and most people leaving along the borders of the Atlantic Ocean are of the mesocephalic type (Golalipour *et al.*, 2003 and Chamella, 1997).

In the present study, the means and SD of cephalic index in males and females were 71.90±6.81 and 73.92±7.48. The cephalic indices obtained in this study were lower than those of other studies, in Iran it was 84.8±6.9 (Golalalipour ,2006), South Africa had 80.29±0.89(Jordaan ,1976) while it was 88.4±1.1 in India (Rajlakshmi *et al.*, 2001).

Since the north eastern part of Nigeria lies in the tropical zone, the classification of the subjects as dolicocephalic agrees with a study carried out by Bharati *et al* which concludes that head form is longer (dolicocephalic) in tropical zones and brachycephalic head forms in temperate zones (Bharati *et al.*, 2001). The result also agrees with our previous work on one day old normal neonates in Maiduguri (Garba *et al.*, 2008) and a similar study carried out in India (Tuli *et al.*, 1995) were the dominant head type was dolicocephalic and agrees with Okanlawon *et al* who stated that black Africans tends to become more dolicocephalic than their white peers within the first 2 years of life (Okanlawon *et al.*, 1990). This study has shown variations regarding to head shapes compared with similar studies in north Iran and Chile were the dominant types of head shapes were hyperbrachycephalic and mesocephalic respectively (Golalalipour, 2006 and Del sol, 2005).

The rarest head type Hyperbrachycephalic , observed in this study also confirms that variations do exist in cranial shapes because other studies have demonstrated different types of rare head shapes; dolichocephalic type in Chile and Tehran- Iran (Golalalipour, 2006, Del sol, 2005 and Abolhasanzadeh & Farahani, 2003).

Regarding facial shapes based on the prosopic indices obtained in this study the general adult north eastern Nigerian population were classified as hyperleptoprosopic in both sexes but differs significantly from our early work on neonates were the dominant facial form was the hypereuryprosopic type (Garba *et al.*, 2008). This has also shown some variations to other regions of the world were The mesoprosopic and hypereuryprosopic type were the dominant type in Turkman newborns and native Fars newborns respectively (Golalipour *et al.*, 2005).

This investigation has determined the cranial and facial forms in adult males and females of north eastern Nigerian origin and also showed that there was no significant difference between the dominant and rare head/face types in both genders thus the data obtained from this study can be used as local standards for diagnostic and anthropometric evaluation and we are suggesting that more studies should be done in other regions of Nigeria according to the sex, age, culture and environmental parameters.

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