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Full Length Research Paper

Facial Anthropometry of Adult *Tiv* and *Idoma* Tribes of Nigeria

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The facial indices are among the most important cephalometric parameters for ethnic morphological classification and categorization. This study was carried out to determine the facial index in the target population and compare it in both sexes and with result of other similar studies. The sample consisted of 600 youths aged 18-32 years. Data were collected through self-administered questionnaire to establish ethnic background. Facial length and facial breadth were measured using spreading calipers and facial index calculated according to standard formula. Statistical analysis was done using SPSS for windows version 20 (IBM Corporation, New York, USA). Statistical significance was considered at p ≤0.05. The mean facial length of *Tiv* was 10.3±0.63 cm and the mean facial breadth was 12.3±0.79 cm. The mean facial length of *Idoma* was 10.6±0.60 cm and the mean facial breadth was 12.5±0.76 cm. There was statistically significant mean difference in facial length and facial index between the two ethnic groups with *Idoma* having higher mean values (p<0.05). In addition, both ethnic groups exhibited sexual dimorphism with males having significantly higher mean values than females (p<0.05). The mean facial index of *Tiv* was 83.9±4.79 while that of *Idoma* was 85.2±5.66. Based on facial index, it was concluded that the face type in *Tiv* was mesoproscopic while the face type in *Idoma* was leptoproscopic.

Keywords: Anthropometry, facial index, mesoproscopic, leptoproscopic, *Tiv* and *Idoma* ethnic groups.

INTRODUCTION

An important phenomenon occurring in human population is the variation in their physical morphology which is influenced by ecological, geographical, racial, age and gender factors (Golalipour *et al*., 2003). By applying anthropometric methods, it has become possible to quantify diversity of human phenotypes and specific features that differentiate individuals and ethnic groups (Farkas *et al*., 2005; Franco *et al*., 2013). The facial indices are among the most important cephalometric parameters useful in inter- racial and intra- racial morphological classification and categorization. They are useful in the description of the facial characteristics of human population in different geographical location.

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There are five categories of face based on the facial index namely: hypereuryproscopic, euryproscopic, mesoproscopic, leptoproscopic and hyperleptoproscopic (William *et al*., 1995; Salve *et al*., 2012; Franco *et al*., 2013). Hypereuriproscopic (very broad face): facial index below ≤79.9; Euryproscopic (broad face): facial index of 80-84.9; Mesoproscopic (round face): facial index of 85-89.9; Leptoproscopic (long face): facial index of 90-94.9; and Hyperleptoproscopic (very long face): facial index above ≥95 (Williams *et al*., 1995).

Outside Nigeria, anthropologists have used facial indices in many ethnic groups for categorization and gender discrimination (Novita, 2006; Salve *et al.* 2012; Jeremic *et al*., 2013 and Shah *et al*., 2015). Within Nigeria, facial anthropometric studies of some ethnic groups have also been done (Omotoso *et al*., 2011; Oludiran *et al*., 2012; Eliakim-Ikechukwu *et al*., 2012; Ogah *et al*., 2014; Oria *et al*., 2018). Extensive literature

search revealed paucity of published studies on facial anthropometry of *Tiv* and *Idoma* people of Benue State. The *Tiv* people are said to be of Bantu origin from the Central African continent, in the *Shaba* area of the present Democratic Republic of Congo (Shii, 2011), while the *Idoma* people reportedly migrated from *Apa* in Kwararafa Kingdom after her disintegration (Udo, 1970). These two ethnic groups constitute the major population blocks in Benue state of north-central Nigeria. The state derives its name from River Benue, the second largest river in the country and the most prominent geographical feature in the state. It geographical coordinates are longitude 7^0 47' and 10^0 0' east. Latitude 6^0 25' and 80 8' and shares boundaries with five other state namely; Nasarawa to the north, Taraba to the east, Cross river to the south, Enugu to the south-west, and Kogi the west. The state also shares common boundaries with Cameroun on the south-east. Benue has a population of 4,780,389 (2006 census) and occupies a land mass of 32,518 square kilometres (Oria *et al*., 2018).

This study was, therefore, done to describe the facial morphological characteristics and indices of the two ethnic groups. The observations and findings of this study would possibly provide platforms for similar extended studies in other ethnic groups for comparison and categorization.

SUBJECTS AND METHODS

The study was carried out in Makurdi from May to November, 2015. A cross sectional sample of 600 subjects (300 Tiv and 300 Idoma with half of the subjects in each ethnic group being males and the remaining being females) was randomly selected for the study. Participants were informed of the procedure and purpose of the study and written informed consent was obtained from each participant. Demographical data including age, local government of origin, ethnicity, duration of stay in the land of origin, parental and grandparental origin was taken. Subjects within the age range of 18-32 years were selected for this study. The subjects were made to sits comfortably on a chair with the head held out straight in the anatomical position. Facial length and facial width were measured in centimetres using spreading callipers from which facial index was later calculated. Each measurement was taken twice and the average taken.

Anthropometric Landmarks

The measurements were taken with standard anthropometric instrument (spreading callipers) using recognized skeletal landmarks according to Ross and Marfell-Jones (1991) as follow:

i. Nasion: The point on the root of the nose where the midsagittal plane cuts the nasofrontal sutures.
ii. Gnathion: The lowest point on the mandible where the lower margin of the lower jaw is intersected by the mid-saggital plane.
iii. Zygion: The most laterally placed point on the zygomatic arch.

Measurement Technique

i. Facial Length**:** Distance between nasion and gnathion measured with spreading calliper to the accuracy of 0.1 cm.
ii. Facial Breadth: Distance between the two zygions (zygomatic arches) measured with spreading calliper to the accuracy of 0.1 cm.

Facial Index (FI) was calculated according to Williams *et al*., (1995) and Novita (2006) as Nasion-Gnathion height/bi-zygomatic distance x 100.

Inclusion Criteria

The subjects considered for this study all belonged to either *Tiv* or *Idoma* ethnic group with two generations of indigenization. They were born and brought up in Nigeria to harmonize effects of environmental factors on the subjects. The subjects were healthy individuals free from any apparent facial deformity.

Exclusion Criteria

Subjects who did not meet the inclusion criteria, specifically, those that did not belong to *Tiv* or *Idoma* ethnic groups, those below or above the stipulated age range, those with nasofacial trauma, those with obstructive facial hairstyle, and those not willing to participate were excluded from the study.

Ethical Approval

In line with the Helsinki Declaration of 1975, as revised in 2000, ethical approval was obtained from Ahmadu Bello University Health Research Ethics Committee (HREC). The objectives of the study were explained to the subjects and only those who gave informed consent were included in this study.

Data Analysis

The statistical methods used to analyze the data included: 1). Descriptive statistics to describe measurement data such as means and standard deviations (SD). 2) Student t-test to compare mean values in males and females of the two ethnic groups. All data were analyzed using a statistical package SPSS for windows version 20 (IBM Corporation, New York, USA). Statistical significance was considered at $p \leq 0.05$.

RESULTS

Table 1. Descriptive Statistics for Facial Length, Facial Height and Facial Index of Tiv ethnic group

Variable	Male	Female	t	p
Facial length				
N	150	150		
Range (cm)	9.0-11.8	9.0-11.9	5.504	0.001*
Mean ±SD	10.4±0.63	10.1±0.57		
Facial breadth				
N	150	150		
Range (cm)	11.0-13.9	10.1-13.6	4.906	0.001*
Mean ±SD	12.6±0.78	12.1±0.73		
Facial index				
N	150	150		
Range	71.6-93.6	68.2-96.1	0.344	0.731
Mean ±SD	84.0±4.82	83.8±4.77		

p≤0.05

Table 2. Descriptive Statistics for Facial Length, Facial Height and Facial Index of Idoma ethnic group

Variable	Male	Female	t	p
Facial length				
N	150	150		
Range (cm)	9.4-12.4	9.5-11.8	6.169	0.001*
Mean ±SD	10.8±0.64	10.4±0.48		
Facial breadth				
N	150	150		
Range (cm)	10.0-13.6	10.3-13.6	4.013	0.001*
Mean ±SD	12.6±0.67	12.3±0.81		
Facial index				
N	150	150		
Range	72.0-99.2	74.1-100.0	1.202	0.230
Mean ±SD	85.6±5.73	84.8±5.58		

p≤0.05

Table 3. Descriptive Statistics of the study parameters according to ethnicity

Parameter	Tiv	Idoma	t	p
Facial length (cm)	10.3±0.63	10.6±0.60	4.991	0.001*
Facial breadth (cm)	12.3±0.79	12.5±0.76	1.896	0.058
Facial index	83.9±4.79	85.2±5.66	2.960	0.003*

P≤0.05

Table 4. Classification of face type according to facial index of *Tiv* and *Idoma* ethnic groups

Ethnicity	Facial index	Classification
Tiv	83.9±4.79	Mesoproscopic (round face)
Idoma	85.2±5.66	Leptoproscopic (long face)

Six hundred (600) subjects were recruited for this study; three hundred (300) each from *Tiv* and *Idoma* ethnic groups. From each ethnic group, half of the number (150) was males and the remaining half (150) was females. The age of this sample ranged from 18-32 years. The mean age of the study sample was 24.3 ± 3.5 years with a mean of 25.1 ± 3.6 years and 23.4 ± 3.1 years for male and female subgroups respectively. The age difference between the sexes was statistically significant ($p<0.05$). The *Tiv* ethnic group had mean age of 25.5±3.7 years for male and 24.0±3.1 years for female subgroups respectively, while the *Idoma* ethnic group had mean age of 24.7±3.5 years for male and 22.8±3.0 years for female subgroups respectively.

The mean facial length in male and female *Tiv* subjects was 10.4±0.63 cm and 10.1±0.57 cm respectively while the mean facial breadth or bizygomatic distance was 12.6±0.78 cm and 12.1±0.73 cm respectively. The mean facial indices in male and female *Tiv* subjects were 84.0±4.82 and 83.8±4.77 respectively. Thus the *Tiv* sample exhibited sexual dimorphism with respect to facial length and facial breadth with males having higher mean values than females and the difference was statistically significant (facial length: t=5.504, p=0.001 and facial breadth: t=4.906, p=0.001). Summary of facial length, facial breadth and facial indices of *Tiv* ethnic group is displayed on Table 1.

The mean maximum facial length in male and female *Idoma* subjects was 10.8±0.64 cm and 10.4±0.48 cm respectively while the mean facial breadth or bizygomatic distance was 12.6±0.67 cm and 12.3±0.81 cm respectively. The mean facial indices in male and female *Idoma* subjects were 85.6±5.73 and 84.8±5.58 respectively. Thus the *Idoma* sample exhibited sexual dimorphism with respect to facial length and facial breadth with males having higher mean values than females and the difference was statistically significant (facial length: t=6.169, p=0.001 and facial breadth: t=4.013, p=0.001). Summary of facial length, facial breadth and facial indices of *Idoma* ethnic group is displayed on Table 2.

The mean facial length of Tiv was 10.3±0.63 cm and that of Idoma was 10.6±0.60 cm. The mean facial breadth of Tiv was 12.3±0.79 cm and that of Idoma was 12.5±0.76 cm. The mean facial indicex of Tiv was 83.9±4.79 and that of Idoma was 85.2±5.66. Whereas no statistical difference existed in the mean facial breadth of the two ethnic groups (p=0.058), there was statistically significant mean difference in facial length (p=0.001) and facial index (p=0.001) with Idoma having higher mean values as shown in Table 3. Table 4 shows the classification of face type according to facial index in the two ethnic groups.

DISCUSSION

Studies have indicated racial and ethnic differences in the mean value of total facial index in different populations of people. Nigeria as a heterogeneous entity comprises of many ethnic nationalities. The mean value of the total facial index (TFI) observed in this study showed that the Idoma are leptoproscopic (TFI: 85.2±5.66) and the Tiv are mesoproscopic (TFI: 83.9±4.79). The result of this study differed from that of Oria *et al*., (2018) who classified the Idoma as hyperleptoproscopic with facial index (FI) of 96.94 and 95.00 for male and female respectively. When compared with studies in other ethnic groups in Nigeria, our findings differed from those of Eliakim-Ikechukwu *et al*., (2012) who classified the Ibos and Yorubas as hypereuryproscopic (Ibo:75.49 and 73.76; Yoruba:77.60 and 73.72 for male and female respectively). With respect to the Yorubas, Ogah *et al*., (2014) differed from Eliakim-Ikechukwu *et al*., (2012) and posited that they were mainly euryproscopic. On the other hand, our findings are similar with those of Omotoso *et al*., (2011) who reported mesoproscopy as the predominant face type among the Binis (TFI: 86.11). Parallel could also be drawn with the work of Oludiran *et al*., (2012) who similarly reported mesoproscopy as the predominant face type among South-south Nigerians.

Sexual dimorphism, a condition where the two sexes of the same species exhibit different characteristics beyond the differences in their sexual organs, was apparent in our study. Facial length and facial breadth both showed sexual dimorphism in the two ethnic groups with males having significantly higher mean values. This is consistent with findings of previous studies (Novita, 2006; Omotoso *et al*., 2011; Salve *et al*., 2012; Oludiran *et al*., 2012; Eliakim-Ikechukwu *et al*., 2012; Jeremic *et al*., 2013; Ogah *et al*., 2014; Shah *et al*., 2015 and Oria *et al*., 2018). In contrast, the mean facial index showed no significant statistical difference between sexes in the two ethnic groups.

The mean facial height values obtained in our study (10.5±0.63 cm and 10.2±0.57 cm for male and female Tiv subjects; 10.8±0.64 cm and 10.4±0.48 cm for male and female Idoma subjects) were lower than the values obtained from anthropometric research in the population of North-eastern part of Nigeria (141.15 mm±7.5 in males and 141.29 mm±7.6 in females) (Maina *et al*., 2011), the population of Bini (11.24±0.46 cm in males and 11.12±0.58 cm in females) (Omotoso *et al*., 2011), Nigerian population (120.2 mm) (Didia and Dapper, 2005), the Egyptian population (111.5 mm±0.68) (Muhammad and Hazem, 2011), the population of Serbia (121.42 mm±5.79 for males and 110.84 mm±5.61 in females) (Jeremic *et al*., 2013), the Caucasian population

(the white race) (120.9 mm) (Farkas *et al*., 1989), but higher than those in the population of Non-Gujarati (8.653±1.4542 cm in males and 10.389±0.9831 cm in females) and Gujarati (9.853±1.3680 cm in males and 8.542±1.4680 cm in females) (Shah *et al*., 2015).

Based on the findings of this research, it was concluded that the dominant facial phenotype in Tiv population is mesoproscopic while that in the Idoma population is leptoproscopic. The data obtained in our study may be useful in anthropological, forensic and genetic research, as well as in reconstructive surgery.

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