Journal of Biosciences and Medicines, 2024, 12, 1-8
https://www.scirp.org/journal/jbm
ISSN Online: 2327-509X
ISSN Print: 2327-5081

Evaluation of Ear and Facial Indices of Ibibio and Efik Female Children of Akwa Ibom and Cross River States, Nigeria

Nsikak Michael Umoh*, Kelechi Chinkata Uruakpa, Eru Eru Mba, Michael Effiong Oku, Theresa Isamoh, Nnenna Williams, Eric Agim Agaba, Samson Omini Paulinus, John Emah, Gabriel Udo-Affah

Department of Anatomical Sciences, Faculty of Basic Medical Sciences, College of Medical Sciences, University of Calabar, Calabar, Nigeria
Email: *nsikakumoh@unical.edu.ng

How to cite this paper: Umoh, N.M., Uruakpa, K.C., Mba, E.E., Oku, M.E., Isamoh, T., Williams, N., Agaba, E.A., Paulinus, S.O., Emah, J. and Udo-Affah, G. (2024) Evaluation of Ear and Facial Indices of Ibibio and Efik Female Children of Akwa Ibom and Cross River States, Nigeria. *Journal of Biosciences and Medicines*, **12**, 1-8.
https://doi.org/10.4236/jbm.2024.127001

Received: May 20, 2024
Accepted: July 1, 2024
Published: July 4, 2024

Abstract

Background: The ear and face are indispensable and distinctive features for hearing and identification. ***Objectives***: This study was designed to generate anthropometric data of the ear and facial indices of females of Efik and Ibibio children in Cross River and Akwa Ibom States, show morphological and aesthetic differences and ethnicity. ***Methods***: A total of 600 female children (300 Efiks and 300 Ibibios) aged 2 to 10 years that met the inclusion criteria were chosen from selected primary schools in Calabar Municipality, Calabar South of Cross River State and from Uyo, Itu of Akwa Ibom State, Nigeria. Standardized measurements of face length, face width, ear length, and ear width were taken with a spreading caliper; the facial (proscopic) and ear (auricular) indices were determined. ***Results***: Efik subjects presented a mean face length of 8.36 ± 0.06 cm, face width of 11.04 ± 0.04 cm, ear length of 4.92 ± 0.02 cm, and ear width of 3.06 ± 0.01 cm. Ibibio subjects had mean values for face length, face width, ear length, and ear width as 8.17 ± 0.05 cm, 10.75 ± 0.05 cm, 4.77 ± 0.03 cm, and 2.94 ± 0.02 cm respectively. The mean facial index and ear index for Efik subjects were 75.68 ± 0.31 and 62.16 ± 0.27 respectively; while the mean facial and ear indices for Ibibio subjects were 74.79 ± 0.36 and 61.80 ± 0.34 respectively. Statistical analysis demonstrated significant differences in face length, ear length, ear width and facial index, with the Efik subjects having higher values than Ibibio subjects ($p < 0.05$), indicating some levels of ethnic variation. ***Conclusion***: The results showed hypereuryproscopic face as the prevalent face type among females of both ethnic groups, therefore can be of importance in sex, ethnic, and racial differentiation, and in clinical practice, aesthetics and forensic medicine.

Keywords

Anthropometry, Ear, Facial Indices, Identification, Nigeria

1. Introduction

Cephalometry is a branch of anthropometry that deals with the study of human head measurements [1]. It comprises of two indices; the cephalic (cranial) and the proscopic (facial) indices. These indices are important parameters, useful in anthropological studies for ascertaining variations [2].

The facial and ear indices are some of the most important cephalometric parameters useful in inter-racial classification and intra-racial categorization. Facial proportions change with age and according to sex in any given race owing to variations in skeletal dimensions and muscle development. They are also dependent on factors such as diet, health, and climatic influences, which are known to be important determinants of growth and development [3]. The face is the anterior aspect of the head from the forehead to the chin and from one ear to the other [4]. Facial measurements are useful in forensic medicine, plastic surgery, orthodontics, clinical diagnosis and treatment planning [5]. **Table 1** shows five categories of face based on the facial index namely: hypereuryproscopic, euryproscopic, mesoproscopic, leptoproscopic, and hyperleptoproscopic [6].

Table 1. Classification of face types.

Face shape	Proscopic index (Pi)	Range
Hypereuriproscopic (Very short face)	<79.9	
Euriproscopic (Broad face)	>80	80 - 84.9
Mesoproscopic (Round face)	≤85	85 - 89.9
Leptoproscopic (Long face)	>90	90 - 94.9
Hyperleptoproscopic (Very long face)	95	

The ear is a defining characteristic of the face useful in identification hence its subtle structures convey signs of age and gender that are unmistakable, though difficultly defined [7]. The shape of the ear can be referred to as type I (tapering-acute angle, where the lobe is free from the check), type II (square-right angle) and type III (pendulous-obtuse angle) according to the appearance of the lobule [8]. Various parameters have been used to establish individual identification and anthropometry of external features of the auricle is one of them [7].

Efik is an ethnic group located primarily in southeastern and South-South geopolitical zone, the southern part of Cross River State in Nigeria. The Efik people also occupy southwestern Cameroon in a place called Bakassi. Efiks speak the Efik language which is a Benue-Congo language of Cross River family. The

Ibibio people are from South-South geopolitical zone in Akwa Ibom State, Nigeria [9].

It has been noted that human head, ear, and face shapes from different ethnic groups vary remarkedly. The cause of these variations has been attributed to several environmental factors [10]. Measurements of these indices therefore become a necessity to prove any possible linkage in origin which a particular ethnic group have with another especially closely associated ethnic groups. Although studies of this type may have been carried out in children of other ethnic groups [11], no such study to the best of our knowledge has been carried out on children of Efik and Ibibio ethnic groups in Nigeria. Hence this study was carried out to help distinguish the ear and facial configurations between female children of Efik and Ibibio ethnic groups.

2. Materials and Methods

This study comprised of 300 Efiks and 300 Ibibios (600 subjects) ranging in age from 2 to 10years. The subjects were randomly selected from the following schools; St. Bernard's International Nursery/Primary School; Brotherhood Primary School; Angelic International Schools; De Wisdom International Schools; Aknes Memorial Schools; and PCN Primary School in Calabar South and Municipality Local Government Areas of Cross River State. And also from Q.I.C Group School, Ikot Oku; St. Michael A.C Primary School, Four Towns; Nuco Nursery/Primary School, Uyo Oku; Government Primary School, Ikot Ntuen Oku; Government Primary School, Ibiaku Itam II; and Government Primary School, Afaha Ube Itam in Uyo and Itu Local Government Areas of Akwa Ibom State. The parents and grandparents of subjects from Cross River State were Efiks, while those from Akwa Ibom State were Ibibios. In addition, the subjects were residents of the area. All subjects had a normal facial and auricular configuration, with no congenital facial anomaly, ear malformation, facial trauma, or facial disorder.

The materials that were used for this research work are: Spreading caliper, Biro pen, Notebook.

The ethical approval for this study was obtained from University of Calabar Teaching Hospital (UCTH), Cross River State and the Department of Personnel, Research, and Statistics (PRS), Ministry of Education, Akwa Ibom State.

The sample size was determined using the Taro Yamane's method (Yamane, 1967). Facial width was measured as the distance between the posterior ramus of one zygomatic arch to the other as shown in **Figure 1(A)**, facial length was measured as the distance between the nasion and the menton (submentum) as depicted in **Figure 1(B)** while the facial and ear parameters were measured with the aid of a spreading caliper as depicted in **Figure 1(C)**. Ear length was measured as the distance between the superaurale and subaurale (*i.e.* between superior most border of helix and the inferior most border of lobule) as illustrated in **Figure 2(A)**, **Figure 2(B)**.

Ear width was measured as the distance between the protragion and the post-aurale (*i.e.* between the base of tragus and the border posterior to the scapha) as illustrated in **Figure 2(C)**, **Figure 2(D)**.

All measurements were carried out by the researcher to avoid inter-observer variability. The subjects were age group between (2 - 10 yrs). Measurements were carried out when subjects were relaxed, breathing quietly, and sitting upright with the head supported, the investigator adjusted the lips of the spreading caliper using the adjustment knob on the caliper to reach the desired points of measurement on the subject. The measurements taken were recorded.

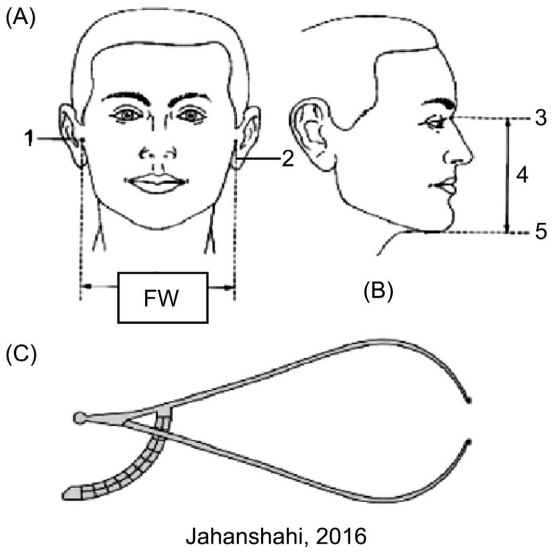

Figure 1. Sketch showing (A): points for measuring face width (1 & 2); (B): face length (3 - 5); (C): spreading caliper。

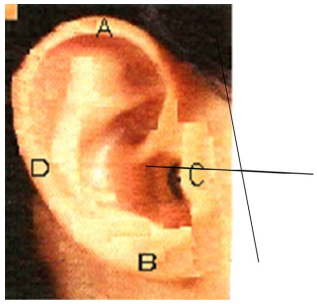

Figure 2. Picture showing points of measurement for ear length and width (12). A − B = Ear length; C − D = Ear width.

The facial indices and ear indices were calculated using the equations below [12].

$$\text{Facial Index} = \frac{\text{Facial Length}}{\text{Facial Width}} \times 100$$

$$\text{Auricular Index} = \frac{\text{Auricular Width}}{\text{Auricular Length}} \times 100$$

The data was statistically analyzed using SPSS software and the results were

compared among the two ethnic groups. Students-t-test was used for comparison between means and the statistical significance was set at $p < 0.05$.

3. Results

Ear and Face Dimensions among Ibibio and Efik Children in the Study Population

The results of ear and face dimensions in the population of Ibibio and Efik female children studied showed that the mean face length for the Ibibio female subjects, the face dimensions had values between 8.17 ± 0.05 cm to 10.94 ± 0.05 cm while the ear dimension fell within the values 4.77 ± 0.03 cm and 2.94 ± 0.02 cm (Table 2). The facial index was 74.79 ± 0.36 for females. The ear index of 61.80 ± 0.34 was for the female subjects. The result of the Ibibio population showed that hypereuriproscopic face is the prevalent face type of female children of this ethnic group based on the mean value of the facial index as shown in Table 2. For Efik subjects, the face length of females children was 8.36 ± 0.06 cm; face width 11.04 ± 0.04 cm. The ear length was 4.92 ± 0.02 cm, the ear width was 3.06 ± 0.01cm for female subjects. The facial index was 75.68 ± 0.31 for female subjects. The ear indices for female were 62.16 ± 0.27. Results obtained from Efik population showed that the prevalent face is hypereuriproscopic face type among female children of this ethnic group based on the mean facial index as shown in Table 3.

Table 2. Mean ear and facial dimensions of Ibibio female subjects.

Variable	Mean	SEM
Face Length (cm)	8.17	0.05
Face Width (cm)	10.94	0.05
Ear Length (cm)	4.77	0.03
Ear Width (cm)	2.94	0.02
Facial Index	74.79	0.36
Ear Index	61.80	0.34

$n = 144$; $p < 0.0$.

Table 3. Mean ear and facial dimensions of Efik female subjects.

Variable	Mean	SEM
Face Length (cm)	8.36	0.06
Face Width (cm)	11.04	0.04
Ear Length (cm)	4.92	0.02
Ear Width (cm)	3.06	0.01
Facial Index	75.68	0.31
Ear Index	62.16	0.27

$n = 147$; $p < 0.05$.

The predominant face type among females of the two ethnic groups was hypereuriproscopic value, which falls under <79.9 index value. As a confirmation, the facial and ear indices showed no statistical significant difference in the studied parameters between females of the two ethnic groups at $p < 0.05$. It was observed that the face length and width, ear length and width of Ibibio female subjects were 8.17 ± 0.05 cm, 10.94 ± 0.05 cm, 4.77 ± 0.03 cm, and 2.94 ± 0.02 cm respectively. The face length and width, ear length and width of Efik female subjects were 8.36 ± 0.06 cm, 11.04 ± 0.04 cm, 4.92 ± 0.02 cm, and 3.06 ± 0.01 cm respectively. These values are closely related with little numerical difference. However, statistical significant difference was found in the face length, ear length and width, with Efik females having significantly higher values than Ibibio females at $p < 0.05$ (Table 4). It was observed that the facial and ear indices of Ibibio female subjects were 74.79 ± 0.36 and 61.80 ± 0.34 respectively. The facial and ear indices of Efik female subjects were 75.68 ± 0.31 and 62.16 ± 0.27 respectively. The indices showed little numerical difference between the two ethnic groups.

Table 4. Comparison of ear, face dimensions and indices between Ibibio & Efik female subjects showing ethnic variation.

Variable	Ibibio Females n-144	Efik Females n-147	Level of Significance
Face Length (cm)	8.17 ± 0.06	8.36 ± 0.06	$p < 0.05$
Face Width (cm)	10.94 ± 0.05	11.04 ± 0.04	$p > 0.05$ (ns)
Ear Length (cm)	4.77 ± 0.03	4.92 ± 0.02	$p < 0.05$
Ear Width (cm)	2.94 ± 0.02	3.06 ± 0.01	$p < 0.05$
Facial Index	74.79 ± 0.36	75.68 ± 0.31	$p > 0.05$ (ns)
Ear Index	61.80 ± 0.34	62.16 ± 0.27	$p > 0.05$ (ns)

Data are expressed as mean ± SEM; $p < 0.05$; ns = not significant.

4. Discussion

The present study investigated and compared the ear and facial indices of Efik and Ibibio female children (2 - 10 years) in selected local government areas of Cross River and Akwa Ibom States of Nigeria. The result revealed hypereuriproscopic face (very broad face) as the prevalent face type among female children of both ethnic groups based on the mean proscopic index.

When the facial index of same sex at age groups (2 - 10 yrs) was compared between females of the two ethnic groups, it was observed that the prevalent face type for each of the three age groups between the two ethnic groups was hypereuryproscopic face (very broad face).

Facial dimensions and indices tend to increase as the age increases in both ethnic groups, indicating increasing variations with age. This may be due to the fact that body dimensions increase physiologically as one grows up, this agrees

with the documented literature that the facial indices increase as the age advances [12]. When the facial index was compared between females of the two ethnic groups, it was observed that the prevalent face type between the two ethnic groups was hypereuryproscopic face (very broad face). However, the values for Efik females were significantly different from Ibibio females ($p < 0.05$), suggesting some levels of ethnic variation. This can be attributed to their history and cultural differences as they are two different ethnic groups with a different root [13]. Data obtained have shown the ear index to be almost similar in value among females of both ethnic groups, suggesting the absence of ethnic variation. This may be attributed to environmental factors even though an author reported that when considering the ear for identification, the structures of the external ear in two individuals are always synonymous hence, hard to distinguish [8].

The results also revealed that while the other dimensions of the ear tend to increase slightly with age, the mean ear (auricular) indices were found to decrease with advancing age for Ibibio ethnic group and Efik females. The decrease in auricular indices suggests an increase in length of the ear with age, which in turn suggests a growth in the lobule of the ear. The decrease in indices may be as a result of environmental factors such as climate and nutritional intake [14]. Purkait & Singh [15] reported in their work that the mean auricular indices decrease with increasing age. When the auricular (ear) index of females were compared between the two ethnic groups, it was observed that the auricular indices of Efik females was not significantly different from Ibibio females ($p < 0.05$), indicating the absence of ethnic variation. This may be attributed to environmental factors such as dietary patterns [14].

The present study demonstrated significant differences between the two ethnic groups in terms of ear and facial dimensions and indices indicating ethnic variation.

5. Conclusion

The results showed hypereuryproscopic face as the prevalent face type among females of both ethnic groups. This result can be of importance in sex, ethnic, and racial differentiation, and in clinical practice, aesthetics and forensic medicine. This study should be carried out on males of both ethnic groups.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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