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Original article

The cephalofacial characterization in humans: The study using igbo tribe in Nigeria

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ABSTRACT

Background: Cranial and facial indices are among the most important craniofacial parameters most useful racial classification, categorization and forensic examination. In this, cranial and facial parameters serve as bio-anthropological tools for both biometric and crime scene purposes in the developed nation. Despite the rise in crime scenes and body mutilations in Nigeria, very little information is available on anthropometric variables using head and face of Igbo extractions.

Aim: Aim of this study is to establish facial and head anthropometry in the bio-anthropological database for the South-Eastern Nigerians.

Materials and methods: A total of 189 healthy individuals without cranial or facial deformities in Urban Secondary School, Abakaliki in Ebonyi State were recruited for the study.

Results: The results of the study showed that male facial parameters had significantly higher dimensions than those of the female participants. The association between cranial and facial dimensions, sex and age using Pearson's correlation analysis was done. Linear regression analysis was applied to determine strength of relationship of the facial dimensions and age. The level of statistical significance was determined at $P < 0.05$ with confidence interval at 95%.

Conclusion: the study characterized anthropometrics of face and head of Igbos in the South-Eastern region of Nigeria. From this study, Igbo ethnic group fall under the platyrrhine type of nose. Igbo males and Igbo females are mesocephalic from this study. On the average from this work, the mean C.I. in the Igbo tribe belongs to mesocephalic or medium headed population.

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1. Introduction

Anthropometry means the measurement of human beings, whether living/dead. Cephalometric variables have been of help in forensic and biological anthropology especially using head length, bizygomstic distance, nasal length and total facial height [1,2]. Recent study observed facial heights among tribes to be associated [2,3]. The human face and head are widely recognized as a biological feature that distinguishes individuals [1–3,5]. Anatomically, the anterior part of the head includes the forehead, eyes, nose, mouth and chin and it extends from the chin to the hairline [2,4]. With a degree of accuracy, research work using reconstruction from craniofacial dimensions has worked for human race and identification [5,6]. Also, in a recent study of anthropometric presentations with some tribes in Nigeria in comparative study of anthropometric profiles have been established [6,7]

In Africa, beauty is a tool. Meaning it is culturally used for both tribal and marital recognitions. With knowledge on standard facial traits, an individualized norm can be established to optimize facial attractiveness. Deformities and congenital formations could effectively affect the anthropometric measurement of individual [8]. In order to treat congenital facial and head disorders of ethnic group successfully, clinicians require access to craniofacial baseline data base on accurate anthropometric records [8,9]. Other works have discovered facial features for distinguishing various races and ethnic groups using anthropometric methods [10,11]. Again, findings emerged on the growth in cranial and facial dimensions exerting epigenetic pressure on other parts such as height [11]. Anthropometric profiles of cranium and face among Idomas were so reliable and accurately calculated [7]. Craniofacial indices are among the most important anthropometric study useful in inter-racial and intra-racial morphological classifications [7,8]. These indices are useful in the description of the facial and nasal morphological characterization of human populations in different regions [12].

The anthropometric study of the face is an important step for patients undergoing craniofacial surgery and reconstructions

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[8,12]. Sexual dimorphic reviews of anthropometric measurements have indicated significant differences existing between the sexes and races [9]. These differences must be identified and used in the design of ergonomics and clothing for both men and women. Here, ergonomics is a field to study people's working efficiency in relations to environment e.g. the sunglasses and reading chairs designs. This includes physical ergonomics in relation to human anatomy, physiological and biomechanical characteristics [9]. Also, cognitive ergonomics in relation to perception, memory, reasoning, motor response including human–computer interaction, mental workloads, decision making, skilled performance, human reliability, work stress, training, and user experiences [4,9]. Previous research findings put it that when anthropometry is combined with clinical methodology had produced knowledge on craniofacial framework and features that existed in various ethnic groups [12]. The importance of this study for reconstruction, forensic investigation and establishing ethnic differences among human population and geographical locations cannot be over emphasized.

In summary, the objectives of the studyincludes

- To identify the head and facial dimensions among males and females
- To establish facial and head anthropometry in the bioanthropological database for the South-Eastern Nigerians
- To correlate the facial dimension differences between males and females.

2. Aim

To establish facial and head anthropometry in the bioanthropological database for the South-Eastern Nigerians.

3. Materials and methods

3.1. Study area and participants

The Igbos belong to the ethnic group in West Africa. It is believed to be the second largest group of people living in southern part of Nigeria. The tribe Igbo popularly called Ndigbo occupies states such as Abia, Anambra, Ebonyi, Enugu, Imo and Delta. It is as well as having this peopling population in some parts of Bayelsa and Rivers States. Other populations are found living in other parts of Nigeria while a larger portion also lives in Diaspora. They have one language which is spoken in many dialects. Igbo nation by indigene of the Igbos has a total land area of about 15,800 square miles (about 41,000 square kilometers) with a population of over 20 million.

Originally, many Igbos were farmers and blacksmiths, but the present day Igbos are found in all forms of professions and businesses. Clan, lineage, village affiliation and dialect have formed the basis of socio-cultural relationships among them. Also in the political world, they are fragmented into groups. This study was a descriptive cross-sectional study conducted from February 2016 to January 2017 in the Department of Anatomy and Anthropology, Faculty of Medicine, Federal University Ndufu Alike Ikwo. A total of 449 healthy individuals were recruited for the study. The participants were Urban Secondary School students between 15 and 19 years of age. Also, they must be residents of the 5 South-Eastern Nigeria and belong to Igbo extraction. Ethical approval and informed participant consent were given to secondary school authority and subjects. Here, the original proposal FUNAI/RE/FBMS/A2345 "THE CEPHALOFACIAL CHARACTERIZATION IN HUMANS: THE STUDY USING IGBO TRIBE IN NIGERIA" was approved by Ethic and Research Committee, Federal University Ndufu Alike Ikwo in Ebonyi State, Nigeria. Participants whose parents and grandparents did not have inter-tribal marriages were considered homogenous and were included in the study. Again, individuals with no physical deformities, cranial and facial trauma were included in this work. Data collected in the study included sex, age, tribe, and craniofacial parameters. To avoid errors, all the measurements were taken by 3 researchers. All data taken were documented in a log book. All anthropometric measurements of the face were performed with participants under anatomical position (Frankfurt Plane).

3.2. Anthropometric measurement

Using venier calipers (sliding and gliding), 8 facial anthropometric indices were measured: head length, head width, bizygomatic distance, total facial height, and nasal length and height. Also, cephalic and nasal indices were measured.

Total face height: measured as the straight distance from the nasal root (nasion) to the lowest point on the lower border of mandible in the mid-sagittal plane.

Bizygomatic distance: Measured as the maximum distance between the most lateral points on the zygomatic arches/

Head length: measured to the nearest millimeters (mm) using gliding and sliding caliper with subject seated and head positioned in an upright direction. The head length was measured from the two extreme ends of the sagital axis of the head region using the Anatomical Standard Record of Position such as Frankfurt.

Head width: measured from the subject using gliding caliper measured into the nearest millimeters (mm) when the head is in anatomical position using the Frankurt plane placed from the two extreme ends of parietal axis around the skull

Nasal length: measured when the subject is seated with the head placed in anatomical position and raised to a certain comfortable degree where sliding caliper was used to nearest millimeters (mm) from the two extreme lower base of the nose and to the root of nose.

Nasal width: measured as the distance between two alae of the nose using sliding graded transparent ruler to the nearest millimeters (mm). Nasal width is the total distance between two alae of nose.

3.3. Statistical analysis

Results and data analysis was carried out using the IBM Statistical Package for Social Sciences (SPSS) software (SPSS 16.0 version, Inc., Chicago, IL, USA). The measurements were expressed in means ± standard deviation. The association between cranial and facial dimensions, sex and age using Pearson's correlation analysis was done. Linear regression analysis was applied to determine strength of relationship of the facial dimensions and age (Table 3). The level of statistical significance was determined at $P < 0.05$ with confidence interval at 95%.

4. Result

The means of total facial height for male and female Igbo participants were recorded as 87.35 ± 0.17 and 87.52 ± 0.15 cm respectively (Tables 1 and 2). For the Igbo participants the mean head lengths were 73.08 ± 0.18 and 72.91 ± 0.20 cm while head widths were 55.23 ± 0.27 and 55.12 ± 0.26 cm respectively. Within the tribe, there was a statistically significant difference ($P < 0.05$) between the male and female participants (Table 3). The mean nasal lengths were 6.48 ± 0.18 and 6.94 ± 0.20 while nasal heights were 8.92 ± 0.13 and 8.97 ± 0.23 cm respectively. The mean nasal indices (NI) were 80.77 ± 0.65 and 81.62 ± 0.57 while cephalic indices were 79.49 ± 0.46 and 79.08 ± 0.42 cm respectively

Table 1
shows simple correlation of anthropometric parameters of Igbo participants in Nigeria.

Parameters	Bizygomatic distance	Cephalic index	Head length	Head width	Total facial length	Nasal length	Nasal height	Nasal index
Mean ± SEM	64.45 ± 0.28	79.49 ± 0.46	73.08 ± 0.18	55.23 ± 0.27	87.35 ± 0.17	6.48 ± 0.17	8.93 ± 0.13	80.77 ± 0.65
	64.36 ± 0.20	79.08 ± 0.42	72.91 ± 0.20	55.12 ± 0.26	87.52 ± 0.15	6.94 ± 0.20	8.97 ± 0.23	81.62 ± 0.57

Table 2
shows simple correlation of age and anthropometric parameters of Igbo participants.

Bizygmatic distance	Cephalic index	Head length	Head width	Total facial length	Nasal length	Nasal height	Nasal index
−.030	−.022	.003	−.057	−.003	.096	.105	−.007
−.036	.045	−.152	.014	.032	.106	−.083	.166
.719	.656	.130	.888	.749	.293	.411	.097
	−.066	−.063	−.031	−.071	.169	.026	.097
	.513	.533	.762	.482	.091	.794	.335
		−.071	.029	−.015	−.106	−.413**	.418**
		.482	.773	.881	.291	.000	.000
			.106	−.621**	−.223*	.031	−.295**
			.292	.000	.025	.757	.003
				.136	−.478**	−.748**	.112
				.175	.000	.000	.264
					−.342**	.150	−.292**
					.000	.135	.003
						.276**	.619**
						.005	.000
							−.545**

Table 3
Shows simple regression analysis using anthropometric parameters of Igbos participants.

Parameters	R	R^2	SEE	P
Age + NI	0.16	0.02	40.91	0.09
Age + HL+HW + NW+TFL	0.79	0.62	25.70	0.00

(Table 1). Also, Table 2 showed age, bizygomatic distance, and head length with nasal index was correlated at 0.007, 0.166 and 0.97. There was no statistical significant different in the variables. Again, head length and width were correlated with total facial length and nasal height and expressed a weak and negative correction except height as: 0.063, 0.031 and 0.026. In Table 3, age and nasal indices showed standard error of estimate of 40.91 while head length, width, nasal width, and total facial length of 25.70. Age with head width, length and total facial length were significant (P < 0.00).

5. Discussion

From the study, understanding of craniofacial indices to evaluate sex, tribe and geographical locations using Igbo ethnic group of Nigeria was determined. This is in agreement with the work [7] in which cephalic indices among Igede and Idoma was mexocephalic (medium headed population). Results of the present work using anthropometric parameters namely the head length, head width, bizygomatic distance, total facial length, nose width and nasal height were measured. The variables can be successfully used to predict craniofacial indices among ethnic groups [13,14]. Some of the parameters studied showed statistical significant difference between sexes ethnic group. This work indicated that the human body dimensions are affected by ecological, biological and geography. Also, gender, age and ethnic groups are major determining factors for head and facial dimensions [14,15] the present craniofacial characterization among Igbo participants in the Eastern region of Nigeria was compared and agreed with some literatures as follows: comparison of craniofacial indices among tribes of Gombe state, Nigeria with higher head length, width and nasal length [2]. Also, [2,12] in morphological evaluation of head and face shapes in a North-Eastern Nigerian population show similarities in nasal indices. [16] Studied the cephalofacial indices among adult Bini tribe in Nigeria. Again, determination of stature was obtained from cephalofacial dimensions in a Northern Indian population [17]. Also the anthropometric measurement of external ear among medical students in Uttarakhand region was previewed [18]. The total facial length in the study agreed with other works, especially the relations of the angles of face and anthropometric values according to sex distinction among tribes [19].

Other reviews in comparison with the present study were craniofacial indices in Lagos Western region of Nigeria [3,10] but with higher values in total facial length than that obtained in Igbos. The reason here may not be far from the effect of climate and environment to biological structures among human populations. Again, the study of craniofacial indices in Maiduguri, Northern part of Nigeria [2] was higher than the present work. This also agreed with the fact that environment and nutrition affect the morphological presentations of peopling populations. Also, the comparative study of Cephalic and nasal indices among Ibibios and Efiks were close in values with the present study. This may be that for the fact they belong to the same geographic region in the southern Nigeria, which is possible in the mixture of genetic pooling effects. There existed the same cephalic and nasal indices as forms of head and face among Igbos ethnic group in Nigeria, which agreed with work Kano indigenes [5,10].

The nose can be classified into three forms based on nasal index, as; Leptorrhine or fine nose (nasal index of 69.9 or less), Mesorrhine or medium nose (nasal index of 70.0–84.9) and platyrrhine or broad nose (nasal index of 85 and above). In the present study (Table 1), the nasal index of the Igbo ethnic group place them under the platyrrhine nose type. This is in conformity with some works that places the nose type of Africans into platyrrhine type [21]. Oladipo [22] also reported a platyrrhine nose type in an analysis of the nasal indices of Ijaws, Yoruba ethnic groups in southern Nigeria [11]. In another study carried out among Serbians in the Central region reported their anthropometric study of the facial index that agreed with this study [22]. The result obtained showed that the Igbo males had a mean cephalic index (CI) of 79.49, Igbo females 79.24. This agreed with work of Oladipo [11,22], where Igbo males were 79.04 and Igbo females 76.83 respectively. Igbo

males and Igbo females are mesocephalic from this study. On the average from this research, the mean C.I. in the Igbo tribe was 79.48 belong to the mesocephalic or medium headed population. However, analysis using the student's *t*-test indicated there was no significant difference between the sexes ($p > 0.05$). This also agreed with anthropometric study of some basic nasal parameters of three major tribes in Kogi, Nigeria [20].

6. Conclusion

From this study, Igbo ethnic group fall under the platyrrhine type of nose. Also, the study showed the existence of sexual dimorphism in all the nasal and facial parameters with males having significantly higher values than females. Also, Igbo males and Igbo females are mesocephalic from this study. On the average from this work, the mean cephalic index (C.I) in the Igbo tribe was 79.48 in the mesocephalic or medium headed population. Again, this work on Igbo participants supported the preposition that climate, environment and nutrition influence biological organs in characteristics. The face and nose of the subjects used were similar in anthropometric variables. From the results gotten in the study can become not a documented data for Igbo extraction in the Eastern region of Nigeria but also valuable information to classify tribes along geographical and biological factors. Hence, the crime scene during forensic study will use these anthropometric variables for investigations.

Author's contributions

While study conception and design was done by Obaje Godwin Sunday and Uzomba Godwin Chinedu acquisition of data was by Obaje Godwin Sunday and, analysis and interpretation of data by Uzomba Godwin Chinedu. Also, the drafting of manuscript was done by Obaje Godwin Sunday while critical revision of the manuscript was by Uzomba Godwin Chinedu and Obaje Godwin Sunday.

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References

[1] Zahra H, Hamid-Reza MS, Mohammad-Hosein NM. Morphological evaluation of head and face in 18–25 years old woman in south-east of Iran. J Med Sci 2006;6:400–4.
[2] Raji JM, Garba SH, Numan AI, Waziri MA, Maina MB. Morphological evaluation of head and face shapes in a North-Eastern Nigeria population. Aust J Basic Appl Sci 2010;2010(4):3338–41.
[3] Oluwole OS, Osah T. Morphological evaluation of head and face shapes in a South-Western Nigeria population. J Basic Med Sci 2009;4:41.
[4] Golalipour MJ, Haidari K. Effect of ethnic factor on cranial capacity and brain weight of male child in Northern Iran. Neuroembryol Aging 2006;5:146–8.
[5] Taura MG. Cephalometry of Hausa tribe of Kano State of Nigeria-a preliminary study [A PhD thesis proposal]. Ahmadu Bello Universsity Zaria; 2004.
[6] Oladipo GS, Joy Olotu E. Anthropometric comparison of cephalic indices between the Ijaw and Igbo tribes. Global J. Pure Appl. Sci. 2006;12(1):137–8.
[7] Obaje SG, Hamman WO, Ibegbu AO, Waitieh- Kabehl AK. Anthropometric study of cephalometric indices among Idoma and Igede ethnic groups of Benue State, Nigeria. Int. J. Med. Biomed. Res. 2015;4(1):21–34.
[8] Sinnatamby CS. Last's anatomy: regional and applied: Elsevier Health Sciences; 2011.
[9] Jason DR, Taylor K. Estimation of stature from the length of the cervical, thoracic, and lumbar segments of the spine in American whites and blacks. J Forensic Sci 1995;40(1):59–62.
[10] Umar MBT, Ojo AS, Asala SA, Hambolu JO. Comparison of cephalometric indices between the Hausa and Yoruba ethnic groups of Nigeria. Res J Med Sci 2011;5:83–9.
[11] Oladipo GS, Olutu EJ, Osah T, Osunwoke EA, Hart J, Ordu K. A comparative study of cephalic indices of Nigerian Ibibios and Efiks. J Arts Cult 2009;4:62–5.
[12] Maina MB, Mahdi O, Kalayi GG. Craniofacial forms among three dominant ethnic groups of Gombe state, Nigeria. Int J Morphol 2012;2:10.
[13] Raymond Saa-Eru Maalman, Chrissie Stansie Abaidoo, JoshuaTetteh, Nancy Darkoa Darko, Obed Ohene-Djan Atuahene, Atta Kusi Appiah, Thomas Diby. anthropometric study of facial morphology in two tribes of the upper west region of Ghana. Int J Anat Res 2017;5(3.1).
[14] Oladipo GS, Isong EE, Okoh PD. Facial, nasal, maxillary, mandibular and orofacial heights of adult Ibibios of Nigeria. Aust J Basic Appl Sci. 2010;4(12):6306–11.
[15] Farkas LG, Katic MJ, Forrest CR. International anthropometric study of facial morphology in various ethnic groups/races. J Craniofac Surg 2005;16(4):615–46.
[16] Omotoso DR, Oludiran OO, Sakpa CL. Nasofacial anthropometry of adult Bini tribe in Nigeria. Afr J Biomed Res 2011;14(3):219–21.
[17] Krishan K, Kumar R. Determination of stature from cephalo-facial dimensions in a North Indian population. Leg Med 2007;9(3):128–33.
[18] Deopa D, Thakkar HK, Prakash C, Niranjan R, Barua MP. Anthropometric measurements of external ear of medical students in Uttarakhand region. J Anat Soc India 2013;62(1):79–83.
[19] Kim S Il, Cho KJ. Relations of atd angles and anthropometric values of palms according to sex distinction. Korean J Phys Anthropol 2009; 22(2):117–25.
[20] Oluwayinka Paul, Olatunji Sunday Yinka, Adelodun Stephen Taiye, Amlabu Mana Gift. An anthropometric study of some basic nasal parameters of three major ethnic groups in Kogi State, Nigeria. Am J Clin Exp Med 2015; 3(2): 62–67.
[21] Risely, H.H. (1915). The People of India. 2nd ed. Delhi: Oriental books. ReprintCorporation, 1969, pp. 395–399.
[22] Jeremiæ D, Kociæ S, Vuloviæ M, Sazdanoviæ M, Sazdanoviæ P, Jovanoviæ B, et al. Anthropometric study of the facial index in the population of central Serbia. Arch Biol Sci. 2013;65(3):1163–8.