Global Scientific JOURNALS

GSJ: Volume 11, Issue 11 November 2023, Online: ISSN 2320-9186
www.globalscientificjournal.com

Craniofacial Anthropometry: Estimation of Facial and Nasal Index for Adult Imo Indigenes, Nigeria

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Abstract

The craniofacial complex is measured in cranial anthropometry. It is crucial for research on population variance, human growth, and medical care. In Nigeria, craniofacial data are crucial for creating the forensic database needed to identify age, gender, and racial variations in modern and prehistoric humans as well as to diagnose certain developmental disorders. Very little data on anthropometric characteristics involving head and face of Igbo extractions is accessible, despite the surge in crime scenes and corpse mutilations in Nigeria. Data was gathered using a variety of measurement tools, including tape, sliding calipers, rulers etc. Using SPSS computer software, the data were calculated and evaluated, and the findings were displayed in tables as means and standard deviations to condense the anthropometric measurements. Cephalic index was used as the dependent variable in the development of straightforward linear regression equations for estimating the face and nasal indices. The bulk of the indigenous people were classed as having a Hyperleptoscopic face phenotype. Most participants had a platyrrhiny nose type (86%), while 7.1% had a leptorhiny nose type and 6.9% had a mesorrhiny nose type. The majority of the males were hyperleptoscopic (87.9%), followed by leptoscopic, while the majority of the females were hyperleptoscopic (47.0%) followed by hypereuryoscopic(28.7%). According to this study, males have a greater nasal index than females.

Introduction

Anthropometry is a branch of anthropology that deals with the comparative measurement of the human body and its parts (Weinberg, 2019). Craniofacial anthropometry involves measurement of the craniofacial complex. It is important for studies of human growth, population variation and clinical treatment (Weinberg, 2019). Craniofacial morphometric study is a constituent of both cranial and facial parameters such as; Facial and Nasal Indices; Cranial Height, Cranial Length, Cranial Breadth, Maximum Facial Diameter, Bi-zygomatic Diameter, Bi-pisorbital Diameter, Total Facial Length, Upper Facial Length, Nasal height, Nasal Breadth (Oladipo,2018).

Measurement has been an important part of skeletal biology since the earliest osteological analyses. Accurate measurement of the skeleton is essential in many fields of anthropology, forensic science, anatomy, and medicine (Ukoha, 2016). Cranial and postcranial measurements have typically been used to describe individuals and to compare groups. Before 1960, comparisons were usually based on single measurements evaluated independently or on indices that combined two dimensions as an indicator of shape (Yesmin,2019). The recent availability of computers has facilitated the use of multivariate statistics and encouraged the development of increasingly sophisticated research designs.

The human face and head are widely recognized as a biological feature that distinguishes individuals. With a degree of accuracy, research work using reconstruction from craniofacial dimensions has worked for humans and identification. (Ukoha, 2014). Also, in a recent study of anthropometric presentations with some tribes in Nigeria, comparative study of anthropometric profiles has been established (Oladipo, 2019). To treat congenital facial and head disorders of ethnic groups successfully, clinicians require access to craniofacial baseline data based on accurate anthropometric records (Oladipo,2019). Other works have discovered facial features for distinguishing various races and ethnic groups using anthropometric methods but none for Imo indigenes as at the time of this research. Craniofacial indices are among the most important anthropometric studies useful in inter-racial and intra-racial morphological classifications (Wong, 2018). These indices are useful in the description of the facial and nasal morphological characterization of human populations in different regions. The anthropometric study of the face is an important step for patients undergoing craniofacial surgery and reconstructions (Williams, 2016). 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 (Williams, 2015).

The importance of this study for reconstruction, forensic investigation and establishing ethnic differences among human population and geographical locations cannot be over emphasized. In Nigeria, there seem to be little or no data for the National Forensic Database (Oladipo, 2019). The anthropometric measurements of various craniofacial indices will ensure the generation of a suitable forensic database. The measurements of the Cranial Height, Cranial Length, Cranial Breadth, Maximum Facial Diameter, Bi-zygomatic Diameter, Bi-pisorbital Diameter, Total Facial Length, Upper Facial Length, Nasal height, Nasal Breadth will help deduce these craniofacial indices in other to get usable data for future forensic studies.

In Nigeria, craniofacial data are of great importance, to build the forensic database in order to help in future skeletal identification of age, gender, racial differences in recent and ancient humans and also in the diagnosis of certain developmental disorders of the skull such as; Craniosynostosis (premature fusion of the cranial bones), hydrocephalus (rapid head growth resulting from cerebrospinal fluid blockage) and postural deformation (as may occur from preferred sleeping position during infancy) (Kenneth ,2017). 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. For it is from studying the normal that we detect the abnormal. This study intends to provide suitable data that will help provide solutions to these problems.

This study aims at determining the facial index of Adult Imo Indigenes. Determining the nasal index of adult Imo indigenes and deriving an equation for estimation of facial and nasal index of adult Imo indigenes. The values of Total Facial index were used to determine the incidence of certain facial types (according to Martin-Saller's scale) (White, 2001). Based on the total facial index (TFI), the facial phenotype was classified as: hypereuryprosopic (TFI ≤ 78,9), euryprosopic (79,0 < TFI <83,9), mesoprosopic (84,0 < TFI < 87,9), leptoprosopic (88,0 < TFI <

92,9) and hyperleptoprosopic (TFI ≥93,0) (White, 2001). The nose is one of the best clues to racial origin (Ukoha, 2014). The nasal index is very useful in anthropology, and it is one of the clinical anthropometric parameters recognized in nasal surgical and medical management. Nasal index is related to regional and climatic differences (Farkas,2016). Various studies have indicated racial and ethnic differences in nasal index amongst different populations (Oladipo,2016). Most Caucasians are leptorrhine, having long and narrow nose with nasal index of 69.9 or less. The Indo-Aryan is also like the Europian, possessing a fine nose (Yesmin, 2019). In Jingpo people in China are mesorrhine (Wong, 2011). Indo-Africans and Afro-American (Oladip,2019) have platyrrhine nose type.

Materials and Methods

Bizygomatic distance

This was taken when the subject was seated with the head position upward and raised to a certain comfortable degree were sliding caliper or flexible tape will be used to the nearest millimeters (mm) from the two extreme lateral ends of the zygomatic bones around the face. Bizygomatic distance is the facial distance or width which is the maximum distance between the two lateral sides of zygomatic bones as it is shown below.

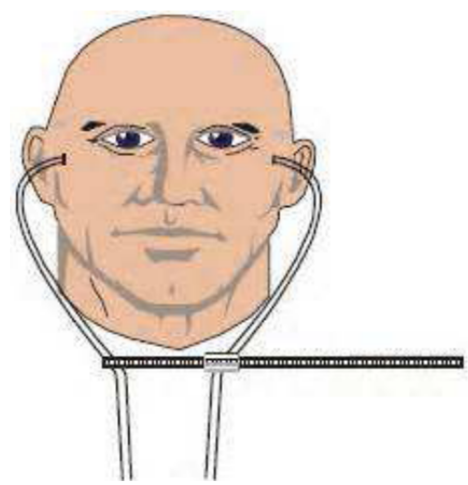

Figure 1. Image showing bizygomatic distance (Obaje et al, 2015).

Upper facial height

This was measured using sliding caliper, flexible rule or steel rule when the head of the subjects was placed upright in tilted neck so that the caliper or rule will measure to the root of the nose from lower portion of zygomatic bones in both sides all was measured to the nearest millimeters (mm). Upper facial height is the measurement also called nasal length which is the distance from the root of the nose to the base of the nose.

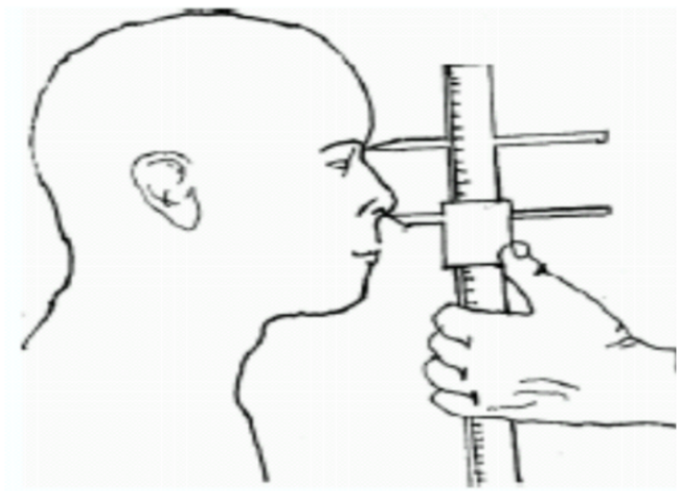

Figure 2. Image showing upper facial height (obaje et al, 2015).

Lower facial length

This was measured to nearest millimeters (mm) using sliding caliper or steel meter measured from the lower jaw region at the point of mentalis prominence to the root of the nose as shown in Figure 3. Lower facial length is the measurement of the distance from the root of the nose to mental portion on the lower jaw (mandible).

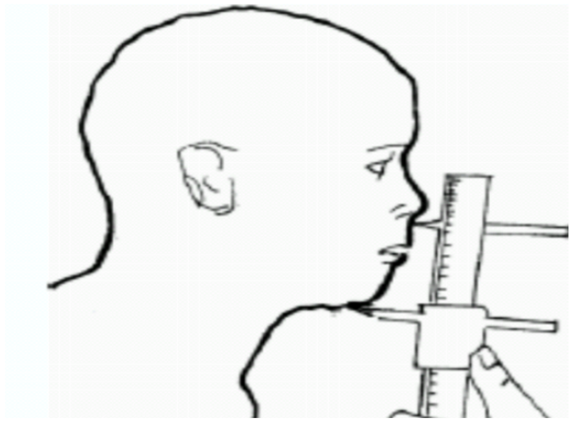

Figure 3. The lower facial length (Obaje et al, 2015)

Facial Height

This was measured to the nearest millimeters (mm) using sliding caliper or steel rule when the head is in anatomical position at Frankfurt Plane from the lower portion of the mandible to the root of the nose as shown in Figure 4 Facial height (total) is the total distance from the root of the nose to the lower border of jaw (mandible).

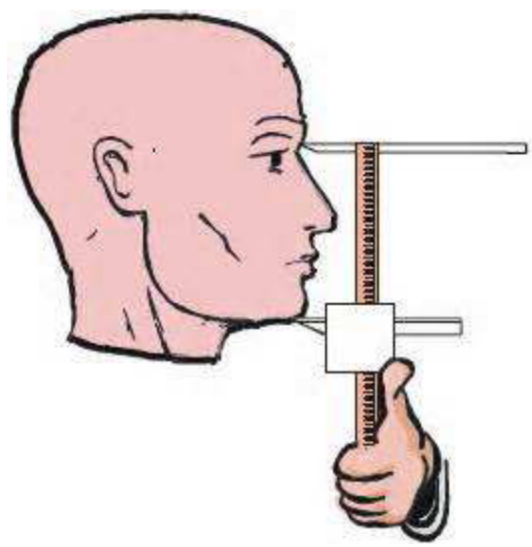

Figure 4: Image showing the total facial length (Obaje et al, 2015)

Nose width

This was measured as the distance between two alae of the nose using sliding graded transparent ruler or steel rule to the nearest millimeters (mm). Nose width is the total distance between two alae of the nose.

Nose length

This was taken when the subject was seated with the head placed in anatomical position and raised to a certain comfortable degree were sliding caliper or steel rule was used to nearest millimeters (mm) from the two extreme lower base of the nose and to the root of nose. Nose length is also called upper facial length which is the maximum distance from the root of the nose.

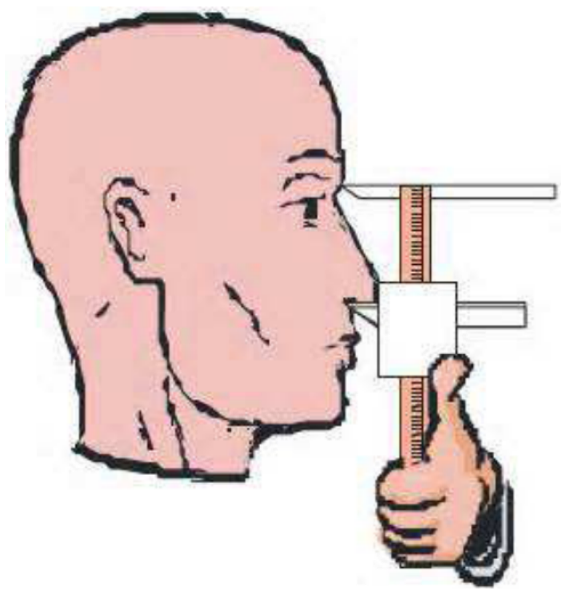

Figure 5. Image showing the nose length (Obaje et al, 2015).

Cranial Length

This was measured to the nearest millimeters (mm) using gliding, sliding caliper or flexible tape with subject seated and head positioned in an upright direction. The cranial/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 Plane. Head/cranial length is the maximum point on the sagital axis of the skull as shown in Figure 6.

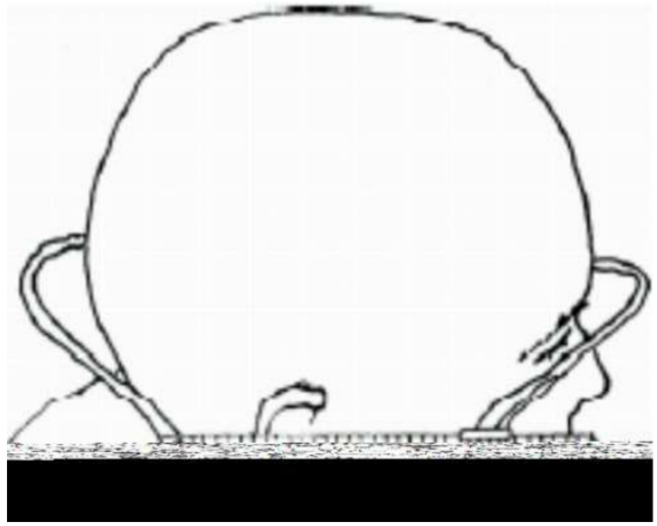

Figure 6. Image showing the cranial length (Obaje et al, 2015).

Cranial width/breadth

This was taken from the subject using gliding caliper or flexible tape, measured to 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. Head width is the maximum point of biparietal axis around the skull as shown below.

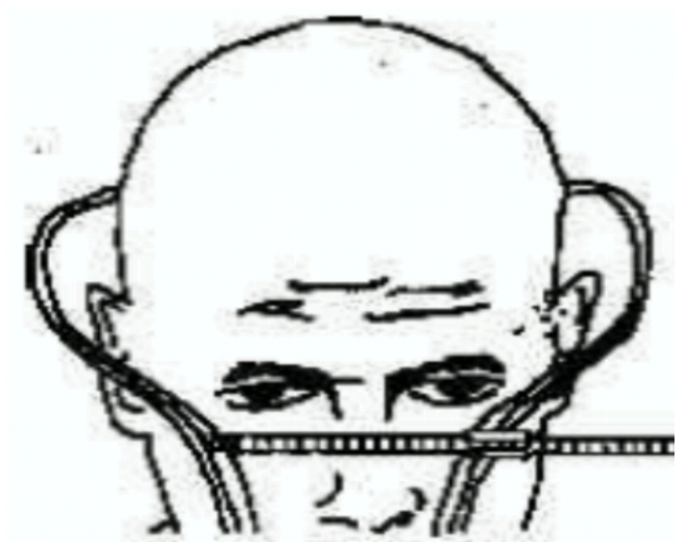

Figure 7. Showing the Cranial breadth/ width (Obaje et al, 2015).

The calculations for the facial and nasal index are as follows: Cephalic Index: cranial breadth/cranial length x 100.

Upper Facial Index: upper facial Height/bizygomatic x 100.

Total Facial Index: total facial height/bizygomatic x 100.

Nasal Index: nasal breadth/nasal height x 100 (Basu, 2020)

The data obtained in this study were computed and analyzed using SPSS (statistical package for social sciences version 20) computer software, the results were presented in tables as means, standard deviations to summarize the anthropometric measurements. An independent sample t-test was used to test the differences between males and females for each variable. Pearson's correlation coefficient was calculated to test the strength of correlation of the various indices. Simple linear regression equations for facial and nasal indices estimation were developed using cephalic index as the dependent variable. Simple linear regression equation for estimation of facial and nasal indices was formed for some of the significant parameters as Y (dependent variable) = a (constant) – (regression coefficient) X (individual variable). The accuracy of these equations was validated by determination coefficients and standard error of estimate (SEE) (Sharaf, 2016). Independent paired sample t-test was used in assessing the sex diffeences in the measured parameters. The level of significance was fixed at 5% (0.05) and the difference between them was considered significant at $p<0.05$.

Results and Discussion

This study comprises of 1158 subjects including 579 males and 579 females. An equal number of subjects (386) were randomly recruited from each of the following zones - Okigwe, Orlu and Owerri. The age of participants in this study ranged from 18 to 52 years.

Table 1. Mean Values of Craniofacial Anthropometric Parameters

Parameter	**Mean** ± SD
Cranial length	172.34 ± 92.89

Bizygomatic distance	82.73 ± 13.48
Upper facial length	53.86 ± 11.31
Facial height	86.74 ± 21.73
Nasal length	53.87 ± 11.31
Age	33.6 ± 88.82
Cranial breadth	160.46 ± 27.65
Lower facial length	51.92 ± 15.35
Lower facial length	51.92 ± 15.35
Nasal width	43.05 ± 16.77

The mean values of the various craniofacial anthropometric parameters measured among adult Imo indigenes are presented in Table 1. The standard deviation (SD) from mean was also recorded.

Table 2. Craniofacial Indices of Adult Imo Indigenes

Parameter	**Category**	**Frequency *n* (%)**	**p-value**
Cephalic Index	Dolichocephalic	139 (12.0)	<0.001
	Mesaticephalic	64 (5.5)	
	Brachycephalic	955 (82.5)	
Facial Index	Hypereuryprosopic	184 (15.9)	<0.001
	Euryprosopic	50 (4.3)	
	Mesoprosopic	60 (5.2)	
	Leptoprosopic	83 (7.2)	
	Hyperleptoprosopic	781 (67.4)	
Nasal Index	Leptorrhiny	82 (7.1)	<0.001
	Mesorrhiny	80 (6.9)	
	Platyrrhiny	996 (86.0)	
Age (years)	18-29	438 (37.8)	<0.001
	30-39	403 (34.8)	

40-52	317 (27.4)

In Table 2, the classification and distribution of adult Imo indigenes into different cephalic, facial, and nasal types and age categories are presented. The most prevalent cephalic type among Igbo adults in Imo state is brachycephalic (82.5%). The other cephalic types include dolichocephalic (12%) and mesaticephalic (5.5%). Five facial types were identified; the most common include hyperleptoproscopic (67.4%) followed by hypereuryproscopic (15.9%), leptoproscopic (7.2%), mesoproscopic (5.2%) and Euryproscopic (4.3%). According to nasal type, Igbo adults were classified into three groups, the most prevalent being platyrrhiny (86.0%). The other two groups are leptorrhiny (7.1%) and mesorrhiny (6.9%). For convenience's sake, participants in this study were grouped into three age categories. The majority were in the age range 18-29 years (37.8%). Others were within 30-39 years (34.8%) and 40-52 years (27.4%).

Table 3. Craniofacial Indices of Adult Imo indigenes (continued)

Variable	**Category**	**Frequency *n* (%)**	**p-value**
Craniofacial Index	Criptozygy	1138 (98.3)	<0.001
	Phenozygy	20 (1.7)	
Upper Facial Index	Hypereuryene/very wide/low	90 (7.8)	<0.001
	Euryene/wide/low	52 (4.5)	
	Mesene/medium	94 (8.1)	
	Leptene/narrow/high	138 (11.9)	
	Hyperleptene/very narrow/high	784 (67.7)	

Total Facial Index	Sthenometopia/narrow forehead Metriometopia/middle face Eurymetopia/wide forehead	47 (4.1) 13 (1.1) 1098 (94.8)	<0.001

In Table 3, the distribution of adult Imo indigenes according to the various indices accessed are presented. The most prevalent craniofacial type among Imo adults is Cryptozygy (98.3%). Upper |Facial Index Hyperleptene (67.7%) and Total facial index Eurymetopia (94.8%).

Table 4. Craniofacial Anthropometric Parameters of Adult Imo Males and Females Indigenes

Parameter	**Sex**	**Mean** ± SD	**p-value**
Cranial length (mm)	Male	172.92 ± 18.79	0.002
	Female	171.76 ± 30.06	
Cranial breadth (mm)	Male	161.05 ± 17.21	<0.001
	Female	159.88 ± 35.11	
Bizygomatic distance (mm)	Male	89.08 ± 14.54	<0.001
	Female	76.37 ± 8.59	

Cranial height (mm)	Male	166.74 ± 15.42	<0.001
	Female	114.12 ± 28.88	
Upper facial length (mm)	Male	60.40 ± 9.14	0.012
	Female	47.32 ± 9.31	
Lower facial length (mm)	Male	64.62 ± 8.66	0.343
	Female	39.21 ± 8.55	
Facial height (mm)	Male	101.49 ± 16.69	0.001
	Female	71.98 ± 15.19	
Nasal width (mm)	Male	39.27 ± 5.67	<0.001
	Female	46.83 ± 12.84	
Nasal length (mm)	Male	60.41 ± 9.15	0.013
	Female	47.32 ± 9.31	
Bipisorbital distance (mm)	Male	73.88 ± 12.09	<0.001
	Female	74.80 ± 10.03	
Age (years)	Male	33.48 ± 8.83	0.998
	Female	33.88 ± 8.82	

The mean values of some anthropometric parameters measured among adult imo males and female indigenes are shown in table 4 above. Mean values were compared to assess for differences, hence sexual dimorphism. Result of analysis showed significant difference in mean values of cranial length (male = 172.92 ± 18.79mm; female = 171.76 ± 30.06mm; $p = 0.002$), cranial breadth (male = 161.05 ± 17.21mm; female = 159.88 ± 35.11mm; $p < 0.001$), bizygomatic distance (male = 89.08 ± 14.54mm; female = 76.37 ± 8.59mm; $p < 0.001$), cranial height (male = 166.74 ± 15.42mm; female = 114.12 ± 28.88mm; $p < 0.001$), upper facial length (male = 60.40 ± 9.14mm; female = 47.32 ± 9.31mm; $p = 0.012$), facial height (male = 101.49 ± 16.69mm; female = 71.98 ± 15.19mm; $p = 0.001$), nasal width (male = 39.27 ± 5.67mm; female = 46.83 ± 12.84mm; $p < 0.001$), nasal length (male = 60.41 ± 9.15mm; female = 47.32 ± 9.31mm; $p = 0.013$), and bipisorbital distance (male = 73.88 ± 12.09mm; female = 74.80 ± 10.03mm; $p < 0.001$). There was no significant difference in mean values of lower facial length (male = 64.62 ± 8.66mm; female = 39.21 ± 8.55mm; $p = 0.343$) and age (male = 33.48 ± 8.83years; female = 33.88 ± 8.82years; $p = 0.998$).

Table 5. Craniofacial Indices of Adult Imo Males and Females Indigenes

Parameter	**Sex**	**Mean** ± SD	**p-value**
Cephalic index (%)	Male	100.23 ± 26.23	<0.001
	Female	94.29± 14.94	
Facial index (%)	Male	50.03 ± 16.71	<0.001
	Female	46.46 ± 9.45	
Cranio-facial index (%)	Male	55.97 ± 11.14	<0.001
	Female	51.00 ± 16.25	
Upper facial index (%)	Male	69.05 ± 13.05	0.001
	Female	62.74 ± 14.27	
Total facial index (%)	Male	116.29 ± 24.22	0.064
	Female	95.47 ± 22.83	
Nasal index (%)	Male	102.56 ± 25.56	<0.001
	Female	66.31 ± 13.01	

Results of comparison of various craniofacial indices between adult imo males and females indigenes is presented in table 5 above. Significant difference in mean value was found in cephalic index (male = 94.29 ± 14.94%; female = 100.23 ± 26.23%; p < 0.001), cranio-facial index (male = 55.97 ± 11.14%; female = 51.00 ± 16.25%; p < 0.001), upper facial index (male = 69.05 ± 13.05%; female = 62.74 ± 14.27%; p = 0.001), and nasal index (male = 66.31 ± 13.01%; female = 102.56 ± 25.56%; p < 0.001). There was no significant difference found in total facial index (male = 116.29 ± 24.22%; female = 95.47 ± 22.83%; p = 0.064).

Table 6. Association of Cephalic Index Category and Gender among Imo Indigenes

Cephalic Index Category	**Sex *n* (%)**		**X^2**	**p-value**
	Male	**Female**		
Dolichocephalic	37 (6.4)	102 (17.6)		
Mesaticephalic	39 (6.7)	25 (4.3)	36.182	<0.001
Brachycephalic	503 (86.9)	452 (78.1)		

As shown in Table 6, a significant difference in prevalence of various cranial types between males and females was seen (X^2 = 36.182; p <0.001). Brachycephalic cranial type was significantly more prevalent among males (86.9%) than females (78.1%). Similarly, mesaticephalic cranial type was observed more among males (6.7%) than females (4.3%). Dolichocephalic cranial type was more common among females (17.6%) than males (6.4%).

Table 7. Association of Facial Index Category and Gender among Adults Imo indigenes

Facial Index Category	**Sex *n* (%)**		**X^2**	**p-value**
	Male	**Female**		
Hypereuryprosopic	18 (3.1)	166 (28.7)		
Euryprosopic	16 (2.8)	34 (5.9)	240.240	<0.001
Mesoprosopic	7 (1.2)	53 (9.2)		

Leptoprosopic	29 (5.0)	54 (9.3)		
Hyperleptoprosopic	509 (87.9)	272 (47.0)		

Table 7 shows the relationship between facial type and gender. A significant difference in prevalence of various facial types was found between male and female adults in Imo state (X^2 = 240.240; $p < 0.001$). Hyperleptoprosopic facial type was more common among males (87.9%) than females (47.0%). The other facial types were seen more among females. Hypereuryprosopic (28.7%) facial type was significantly associated with females, while hyperleptoprosopic facial type was associated more with males (87.9%).

Table 8. Association of Nasal Index Category and Gender among Imo Indigenes

Nasal Index Category	**Sex *n* (%)**		**X^2**	**p-value**
	Male	**Female**		
Leptorrhiny	46 (7.9)	36 (6.2)		
Mesorrhiny	56 (9.7)	24 (4.1)	15.791	<0.001
Platyrrhiny	477 (82.4)	519 (89.6)		

The distribution of various nasal types among adult males and females in Imo state is presented in table 8 below. A significant difference in prevalence of different nasal types was found (X^2 = 15.791; $p < 0.001$). Platyrrhiny nasal type was more common among females (89.6%) than males (82.4%). Leptorrhiny and mesorrhiny nasal types were seen more in males than females.

Table 9. Distribution of Various Upper Facial Index Categories among Males and Females

Upper Facial Index Category	**Sex *n* (%)**		**X^2**	**p-value**
	Male	**Female**		
Hypereuryene/very wide/low	13 (2.2)	77 (13.3)	95.056	<0.001
Euryene/wide/low	13 (2.2)	39 (6.7)		

Mesene/medium	45 (7.8)	49 (8.5)	
Leptene/narrow/high	48 (8.3)	90 (15.5)	
Hyperleptene/very narrow/high	460 (79.4)	324 (56.0)	

The prevalence of various upper facial index groups among males and females was significantly different ($X^2 = 95.056$; $p < 0.001$). Hyperleptene/very narrow/high type was the most prevalent, but significantly seen more among males (79.4%) than females (56.0%). The other types were more common among females.

Table 10. Relationship between Cephalic Index Category and Facial Index Category among Imo Indigenes

Facial Index Category	**Cephalic Index Category *n* (%)**			**X^2**	**p-value**
	Dolichocephalic	**Mesaticephalic**	**Brachycephalic**		
Hypereuryprosopic	25 (18.0)	7 (10.9)	152 (15.9)		
Euryprosopic	9 (6.5)	2 (3.1)	39 (4.1)		
Mesoprosopic	12 (8.6)	4 (6.3)	44 (4.6)	17.261	0.028
Leptoprosopic	17 (12.2)	3 (4.7)	63 (6.6)		
Hyperleptoprosopic	76 (54.7)	48 (75.0)	657 (68.8)		

As presented in Table 10, there was no significant association between facial Index and cephalic Index among adult Igbos in Imo state ($X^2 = 17.261$; $p = 0.028$). The occurrence of various facial types was similar following the different cranial types.

Table 11. Relationship between Cephalic Index Category and Nasal Index Category among Imo Indigenes

Nasal Index Category	**Cephalic Index Category *n* (%)**			**X^2**	**p-value**
	Dolichocephalic	**Mesaticephalic**	**Brachycephalic**		
Leptorrhiny	6 (4.3)	5 (7.8)	71 (7.4)		
Mesorrhiny	10 (7.2)	7 (10.9)	63 (6.6)	3.640	0.457
Platyrrhiny	123 (88.5)	52 (81.3)	821 (86.0)		

Following the result presented in table 11 below, no significant association was found between nasal type and cephalic type among adult igbos in Imo state ($X^2 = 3.640$; $p = 0.457$). The distribution of nasal types was similar between the various cephalic type groups**.**

Table 12. Relationship between Cephalic Index Category and Upper Facial Index Category among Imo Indigenes

Upper Facial Index Category	**Cephalic Index Category *n* (%)**			**X^2**	**p-value**
	Dolichocephalic	**Mesaticephalic**	**Brachycephalic**		
Hypereuryene/very wide/low	20 (14.4)	4 (6.3)	66 (6.9)		
Euryene/wide/low	9 (6.5)	9 (14.1)	34 (3.6)	29.464	<0.001
Mesene/medium	14 (10.1)	5 (7.8)	75 (7.9)		
Leptene/narrow/high	16 (11.5)	5 (7.8)	117 (12.3)		

Hyperleptene/very narrow/high	80 (57.6)	41 (64.1)	663 (69.4)		

The relationship between Cephalic Index and Upper Facial Index is shown in table 12, no significant association was found between the two (X2=29.46, P- 0.001), the distribution of Upper facial Index was similar between the various cephalic index type.

Table 13. Relationship between Cephalic Index Category and Total Facial Index Category among Imo Indigenes

Total Facial Index Category	Cephalic Index Category *n* (%)			X^2	p-value
	Dolichocephalic	**Mesaticephalic**	**Brachycephalic**		
Sthenometopia/ narrow forehead	2 (1.4)	0 (0)	45 (4.7)		
Metriometopia/ middle face	2 (1.4)	2 (3.1)	9 (0.9)	8.767	0.067
Eurymetopia/ wide forehead	135 (97.1)	62 (96.9)	901 (94.3)		

The relationship between Cephalic Index and Total Facial Index is shown in table 13, no significant association was found between the two (X2=8.767, P- 0.067), the distribution of Total facial Index was similar between the various cephalic index type.

Table 14. Estimation of Cephalic Index from some Craniofacial Indices among Imo Indigenes

Predictor	Equation	t	p-value
1. FI	CeI = 139.492 – 0.875(FPI)	72.245	<0.001
2. CFI	CeI = 146.344 – 0.918(CFI)	73.970	<0.001
3. TFI	CeI = 104.458 – 0.068(TFI)	39.057	<0.001
4. NI	CeI = 92.293 + 0.059(NI)	65.533	<0.001

CeI = cephalic index; FI = facial index; CFI = craniofacial index; TFI = total facial index; NI = nasal index.

The equations presented in table 14 below can be used in estimation of cephalic index among the studied population. The significant estimators include facial index (FI), craniofacial index (CFI), total facial index (TFI) and nasal index (NI).

Table 15. Estimation of Cephalic Index from some Craniofacial Indices among Male Imo Indigenes

Predictor	Equation	t	p-value
1. FI	CeI = 120.037 – 0.554(FPI)	41.059	<0.001
2. CFI	CeI = 120.02 – 0.46(CFI)	40.083	<0.001

CeI = cephalic index; FI = facial index; CFI = craniofacial index.

The equations presented in table 15 below can be used in estimation of cephalic index among males in the studied population. The significant estimators include, facial index (FI), and craniofacial index (CFI).

Table 16. Estimation of Cephalic Index from some Craniofacial Indices among Female Indigenes

Predictor	Equation	t	p-value
1. Age	CeI = 91.99 + 0.243(Age)	21.283	<0.001
2. FI	CeI = 152.073 – 1.036(FI)	58.687	<0.001
3. CFI	CeI = 157.349 – 1.12(CFI)	60.716	<0.001

The equations presented in table 16 below can be used in estimation of cephalic index among females in the studied population. The significant estimators include Age, Facial index (FI), and craniofacial index (CFI).

Table 17. Relationship between Cephalic Index Category and Facial Index Category among Female Imo Indigenes

Facial Index Category	Cephalic Index Category *n* (%)			X^2	p-value
	Dolichocephalic	Mesaticephalic	Brachycephalic		
Hypereuryprosopic	25 (24.5)	4 (16.0)	137 (30.3)		
Euryprosopic	8 (7.8)	1 (4.0)	25 (5.5)		
Mesoprosopic	11 (10.8)	4 (16.0)	38 (8.4)	8.434	0.529
Leptoprosopic	13 (12.7)	1 (4.0)	40 (8.8)		
Hyperleptoprosopic	45 (44.1)	15 (60.0)	212 (46.9)		

As shown in Table 17, no significant association between facial type and cranial type among adult females in Imo state was found (X^2 = 8.434; p = 0.529). The occurrence of various facial types was not different following the various cranial types.

Table 18. Relationship between Nasal Type and Cranial Type among Male Adults in Imo State

Nasal Index Category	**Cephalic Index Category *n* (%)**			**X^2**	**p-value**
	Dolichocephalic	**Mesaticephalic**	**Brachycephalic**		
Leptorrhiny	0 (0)	4 (10.3)	42 (8.3)		
Mesorrhiny	5 (13.5)	6 (15.4)	45 (8.9)	5.847	0.520
Platyrrhiny	32 (86.5)	29 (74.4)	416 (82.7)		

Following the result presented in table 18 below, no significant association was found between nasal type and cranial type among adult males in Imo state ($X^2 = 5.847$; $p = 0.520$). The distribution of nasal types was similar between the various cranial type groups.

Table 19. Relationship between Cephalic Index Category and Nasal Index Category among Female Imo Indigenes

Nasal Index Category	**Cephalic Index Category *n* (%)**			**X^2**	**p-value**
	Dolichocephalic	**Mesaticephalic**	**Brachycephalic**		
Leptorrhiny	6 (5.9)	1 (4.0)	29 (6.4)		
Mesorrhiny	5 (4.9)	1 (4.0)	18 (4.0)	0.434	0.919
Platyrrhiny	91 (89.2)	23 (92.0)	405 (89.6)		

As presented in table 19 below, no significant association was found between nasal type and cranial type among adult females in Imo state ($X^2 = 0.434$; $p = 0.919$). The distribution of nasal types was not different between the various cranial type groups.

Table 20. Relationship between Facial Index Category and Nasal Index Category among Adult Males Imo Indigenes

Facial Index Category	**Nasal Index Category *n* (%)**			**X^2**	**p-value**
	Leptorrhiny	**Mesorrhiny**	**Platyrrhiny**		
Hypereuryprosopic	6 (13.0)	0 (0)	12 (2.5)		
Euryprosopic	4 (8.7)	0 (0)	12 (2.5)		
Mesoprosopic	1 (2.2)	1 (1.8)	5 (1.0)	30.373	0.003
Leptoprosopic	0 (0)	1 (1.8)	28 (5.9)		
Hyperleptoprosopic	35 (76.1)	54 (96.4)	420 (88.1)		

As observed in Table 20 below, a significant difference in prevalence of various facial types following the different nasal type groups was seen among adult males in Imo state (X^2 = 30.373; p = 0.003). Hyperleptoprosopic facial type was most prevalent among those who had mesorrhiny nasal type (96.4%), followed by platyrrhiny nasal type (88.1%) and then leptorrhiny type (76.1%). Hypereuryprosopic facial type was seen most among those who had leptorrhiny (13%) nasal type. Euryprosopic and mesoprosopic facial types were seen most among those who had leptorrhiny nasal type (8.7% and 2.2% respectively). Leptoprosopic facial type was most common among the platyrrhiny nasal type (5.9%).

Table 21. Relationship between Facial Index Category and Nasal Index Category among Adult Females in Imo State

Facial Index Category	Nasal Index Category *n* (%)			X^2	p-value
	Leptorrhiny	**Mesorrhiny**	**Platyrrhiny**		
Hypereuryprosopic	12 (33.3)	6 (25.0)	148 (28.5)		
Euryprosopic	1 (2.8)	1 (4.2)	32 (6.2)		
Mesoprosopic	6 (16.7)	1 (4.2)	46 (8.9)	11.408	0.530
Leptoprosopic	3 (8.3)	6 (25.0)	45 (8.7)		
Hyperleptoprosopic	14 (38.9)	10 (41.7)	248 (47.8)		

As seen in table 21 below, there was no significant difference in occurrence of various facial types following the different nasal type groups among adult females in Imo state ($X^2 = 11.408$; p = 0.530). Distribution of various facial types was statistically similar among the different nasal type groups.

Conclusion

This study was aimed at estimating the facial and nasal index of Adult Imo indigenes. The result obtained from this study indicates that anthropometric parameters can be obtained by measurement of individual cranial, facial, and nasal parameters. This study shows how the face phenotype was classified and majority of the indigenes were Hyperleptoscopic with a total facial index of 105.88±25.73. Majority of the males were Hyperleptoscopic (87.9%), followed by Leptoscopic, while majority of the females were Hyperleptoscopic (47.0%) followed by Hypereuryoscopic(28.7%). This shows that males have a greater facial Index than females. This may be due to the hormone testosterone which causes the changes in shape of the face in males. The Nasal Index has a great Value in anthropological studies because it is one of the anthropometric indices acknowledged in nasal surgery as well as management. In this study, majority of the participants had platyrrhiny nose type (86%), while 7.1% had Leptorhiny nose type and 6.9% mesorrhiny nose type. This study showed that nasal Index is higher in males than in females. This can be of clinical and surgical interest in Rhinology. This study has contributed in establishing a data base for Imo indigenes. It is hoped that results gotten from this study will play a role in forensic identification when only the cranial, nasal, or facial remains are found. In addition to the medico-legal implications of this study, it will be useful for clinicians in plastic and reconstructive surgery, anatomists, archeologists, and anthropologists.

References

Basu A.(2013). Anthropometry of the Kayasthas of Bengal. J Anat Soc India. 3:20-25.

Farkas LG, Katić MJ, Forrest CR, Alt KW, Bagic I, Baltadjiev G. (2015). International Anthropometric Study of Facial Morphology In Various Ethnic Groups/Races. The Journal of craniofacial surgery. 16:615-46.

Farkas LG, Hreczkota, Deutsh CK. (2013). Objective Assessment of The Nostril Type – A Morphometric Study. Anatomy Plastic Surgery, 11:381-9.

Farkas L G, Hajniš K, Posnick J C. (2016). Anthropometric and anthroposcopic findings of the nasal and facial region in cleft patients before and after primary lip and palate repair. Cleft Palate Craniofac J. 30(1):1–12

Farkas L, Munro I. Springfield, IL: Charles C. Thomas Publisher; (2017). Anthropometric facial proportions in medicine.

Farkas L G. New York, NY: Raven Press; (2014). Anthropometry of the Head and Face. 2nd ed.

Kenneth YL, Tombari GJ. (2017). Head length, head breadth and cephalic index: A Craniometric Study Amongst The Urhobo Ethnic Group In Delta State Of Nigeria. European Journal of Biomedical and Pharmaceutical Sciences. ;4:157-160.

Obaje S.G,Hamman W.O, Ibegbu A.O and Waitieh-Kabehl A.K.(2015) 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.

Oladipo G.S and E. J. Olotu, (2016). “Anthropometric Comparism Of Cephalic Indices Between The Ijaw And Igbo Tribes,” Global Journal of Pure and Applied Sciences, vol. 12, no. 1, pp. 137–138.

Oladipo GS, Fawehinmi HB, Suleiman YA. (2019b). The Study Of Nasal Parameters (Nasal Height, Width And Nasal Index) Among The Yorubas Of Nigeria. Int J Biol Anthropol ; 3:1-19.

Oladipo GS, Coker T, Anugweje KC, Abidoye AO.(2013). Study Of Some Anthropometric Parameters Of Itsekiri And Okpe Ethnic Groups Of Delta State,South-South Nigeria. Int J Com Re. 2:77-80.

Oladipo GS, Okoh PD, Hart JS.(2011). Anthropometric Study of Some Craniofacial Parameters: Head Circumference, Nasal Height, Nasal Width and Nasal Index of Adult Ijaws of Nigeria. Asian J Med Sci 2:111-3.

Oladipo GS, Eroje MA, Fahwehinmi HB.(2019a) Anthropometric Comparison of Nasal Indices Between Andoni And Okrika Tribes Of Rivers State, Nigeria. Int J Med Med Sci 1:135-7.

Oladipo GS, Ipigansi UN, Alabi AS, et al.(2017). Measurements of Head Circumference, Intercanthal Distances, Canthal Index and Circumference Interorbital Index of Children and Adolescents in Bayelsa State in Nigeria. World J Pharmaceu Res. 6:207–218.

Salter E M, Kolar J C. Thousand Oaks, CA: Sage Reference; (2007). Anthropometry; pp. 35–38.

Ukoha Ukoha Ukoha, Kosisochukwu Emmanuel Umeasalugo, Onochie Okwudili Udemezue, Henry C Nzeako1, Godwin U Ndukwe, Perpetua C Nwankwo (2014); Anthropometric Measurement Of Infraorbital Foramen In South-East And South-South Nigeria. National Journal Of Medical Research. print ISSN: 2249 4995. Retrieved 2021-05-26.

Ukoha U Ukoha, Ogugua A Egwu, Godwin U Ndukwe, Lotanna S Akudu, KosisochukwuUmeasalugo (2016)Anthropometric Study Of The Nose In A Student Population.http://www.bioanthrojournal.org/

Weinberg S.M, N.M Scot, K.Neiswaggner, C.A Brandon, M.I. Marazita, (2019). Anthropometric precision and Accuracy of digital three dimensional photogrammetry: comparing the Genex and #dMD imaging system with one another and with direct anthropometry Cleft palate-craniofacial Journal, 41()5(214),PP.507-518

White, T.D. (2001). Human osteology. Academic Press, Inc. San Diego, CA.

Willams P, Dyson M, Dussak JE, Bannister LH, Berry MM, Collins P, et al.(2015). Gray's Anatomy: Skeletal System. 3rd ed. Edinburgh: Churchill Livingstone; p. 609-12.

Williams, B. A. and Roger, T. L. (2016). Evaluating the accuracy and precision of cranial morphological traits for sex determination. Journal of Forensic Sciences, 51(4): 729-735

Williams, B. A. and Roger, T. L. |(2016). Evaluating the accuracy and precision of cranial morphological traits for sex determination. Journal of Forensic Sciences 51(4): 729-735

Wong J Y, Oh A K, Ohta E. et al. (2018). Validity and reliability of craniofacial anthropometric measurement of 3D digital photogrammetric images. Cleft Palate Craniofac J.45(3):232–239.

Yesmin T, Thwin SS, Urmi SA, Wai MM, Zaini PF et al. (2019). A study of facial index among Malay population. Journal of Anthropology. 2014;726974:1-5.