Access this Article online
Quick Response Code:

Website:
jecajournal.com
Doi:
doi.org/10.4314/jeca.v21i2.34

Original Article

Evaluation of linear facial photogrammetry of the Ibibio Ethnic Group of Nigeria, resident in Port Harcourt

[1]Amadi, M.A.; [2]Fawehinmi, H.B.; [2]Oghenemavwe, L.E.; [3]Olugbenga, M.A.; [4]Ezeuko, V.C.

Abstract

BACKGROUND AND AIM: The face plays a major role in identification of every individual. However, variations exist in facial features of various races and ethnic groups. This study aimed at using photogrammetry to assess the linear facial features of the Ibibio ethnic group of Nigeria resident in Port Harcourt.

MATERIALS AND METHOD: The study utilized a total of 500 subjects of Ibibio origin residing in Port Harcourt comprising 250 males and 250 females aged between 21 - 45 years. Linear anthropometric parameters were evaluated using a computer aided facial analysis programme, the WinImager®. Statistical analysis was done using XLSTAT software for Windows, version 2021.50. Continuous variables were presented as mean±SEM.

RESULTS: Results showed mean values for forehead height (54.48±0.13mm), midface height (57.24±0.12mm), lower face height (59.55±0.12mm), Facial width (130.62±0.05mm), eye fissure width (30.34±0.05mm), outer canthal distance (103.36±0.12mm), inner intercanthal distance (33.3±0.13mm), Nasal height (48.15±0.14mm), Nasal tip projection (12.65±0.08mm), Nasal width (38.78±0.1mm), Ear length (55.73±0.1mm) and Mouth width (52.95±0.12mm) for both sexes. For the males, the forehead height was 54.74±0.18mm, mid face height (57.50±0.18mm), nasal height (48.40±0.20mm), lower face height (59.81±0.17mm), outer canthal distance (103.60±0.16mm), inner intercanthal distance (33.54±0.18mm), nasal width (39.01±0.14mm), mouth width (53.18±0.09mm), eye fissure width (30.58±0.07mm), face width (130.83±0.07mm), nasal tip projection (12.79±0.11mm), ear length (55.95±0.13mm) while for the females, the forehead height was 52.23±0.18mm, mid face height (56.98±0.17mm), nasal height (47.90±0.20mm), lower face height (57.29±0.17mm), outer intercanthal distance (102.12±0.16mm), inner intercanthal distance (31.90±018mm), nasal width (38.54±0.14mm), mouth width (52.72±0.10mm), eye fissure width (28.10±0.08mm), face width (128.40±0.08mm), nasal tip projection (12.50±0.11mm) and ear length (53.51±0.13m). z-test was used to compare the difference in means. There was sexual dimorphism with male values being significantly higher ($p<0.05$) in most parameters except for nasal tip projection ($p>0.05$). Racial variation was observed when compared with studies in other populations.

CONCLUSION: These parameters are a good source of normative values that can be used in gross anatomical modeling, surgical as well as in forensic science.

Keywords:
Photogrammetry, Linear, Anthropometry, Craniofacial, Ibibio

Submitted: 1st December, 2024
Revised: 16th December, 2024
Accepted: 17th December, 2024
Published: 31st December, 2024

[1]*Department of Anatomy, Faculty of Basic Medical Sciences, PAMO University of Medical Sciences, Port Harcourt, Nigeria;* [2]*Department of Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, University of Port Harcourt, Port Harcourt, Nigeria;* [3]*Department of Anatomy, Faculty of Basic Medical Sciences, Ambrose Ali University, Ekpoma, Nigeria;* [4]*Department of Anatomy, School of Basic Medical Sciences, College of Medical Sciences, University of Benin, Benin City, Nigeria.*

Address for Correspondence:
Amadi, M.A.
Department of Anatomy, Faculty of Basic Medical Sciences, PAMO University of Medical Sciences, Port Harcourt, Nigeria.
michaelamadi27@gmail.com

INTRODUCTION

One of the major roles of the face is the identification of individuals. No two individuals are exactly alike (Krishan, 2007).Facial dimensions are among the most important cephalometric parameters used in the description of human morphology, identification of individuals and classification of races and sex (Ewunonu and Anibeze, 2013).

The shape of the face is determined by underlying bone, thickness and distribution of the underlying fat as well as the facial muscles (Moore and Dally, 1999). The individuality of the face results primarily from anatomical variation: variations in the shape and relative prominence of the features of the underlying cranium; in the deposition of fatty tissue; in the color and effects of aging on the overlying skin; and in the abundance, nature, and placement of hair on the face and scalp (Moore and Dally, 2006).

The quantitative analysis of the human face has always received a large attention from both scientists and artists: the face allows for communication and interaction with the environment. It is used to identify persons, and it can carry information about the health state of an individual (Hennessy *et al.*, 2005; Tollefson and Sykes, 2007; Kochel *et al.*, 2010; Sforza and Ferrario, 2010; Smeets *et al.*, 2010; Mutsvangwa *et al.*, 2010; Mutsvangwa *et al.*, 2011; Fang *et al.*,

How to cite this article: Amadi, M.A.; Fawehinmi, H.B.; Oghenemavwe, L.E.; Olugbenga, M.A.; Ezeuko, V.C. Evaluation of linear facial photogrammetry of the Ibibio Ethnic Group of Nigeria, resident in Port Harcourt. J Exp Clin Anat 2024; 21(2): 393-403.
https://dx.doi.org/10.4314/jeca.v21i2.34

2011; Ritz-Timme *et al*., 2011; Verzè *et al*., 2011).

Photographs have been used by researchers and clinicians to carry out facial morphology analysis by identifying certain landmarks on various facial structures and extracting measurements such as distances, angles, and ratios. The most common means of surgical and forensic facial comparison is by photographic identification. Farkas (1994) described a widely used set of measurements to analyse the human face, one of which is photogrammetry which can be said to be the science of extracting measurements from photographs, especially for locating the exact positions of surface points.

Regardless of the estimation of variables such as stature, age, sex with the help of anthropometric measurements of various body parts, oral and maxillofacial regions have defining regions of variability between different racial/ethnic groups (Krishan, 2006). Other studies have demonstrated variation with respect to sex, changes due to age and variations between different populations (Pazos *et a*l., 2008; Njemirovskij *et al*., 2000; Oladipo *et al*., 2014; Sah *et al*., 1991; Lee and Park, 2008; Ngeow and Aljunid, 2008; Porter, 2004; Golalipur *et al*., 2003; Porter and Olson, 2001; Baral *et al*., 2010; Du et al 2008; Grbe et al., 2007). The aim was to use photogrammetry to assess the linear facial features of the Ibibio ethnic group of Nigeria resident in Port Harcourt, Rivers State in order to generate anthropometric data.

MATERIALS AND METHOD

Research Design

The study design was cross sectional which made use of 500 subjects, comprising 250 males and 250 females of Ibibio extraction resident in Port Harcourt, Rivers State with normal head and facial configurations whose ages ranged between 21 and 45 years. Multistage random sampling was technique was used. The minimum sample size was determined using the Taro-Yamane's formula, $n = \frac{N}{1+N(e)^2}$ where n = minimum sample size, N = population size, e = degree of error expected = 0.05. Informed consent was obtained from all participants. A questionnaire which required the subjects to provide information such as age, ethnicity, ethnicity of parents and grandparents, information regarding any form of previous facial surgery or accident among others was administered to subjects. Frontal and lateral view photographs were taken.

Inclusion/Exclusion Criteria

Subjects whose parents and grandparents were of Ibibio ethnicity within the age range of 21 - 45 years were included in the study. Subjects with any facial deformity or that had had any facial surgery previously were excluded. dual ethnic origins were excluded.

Photographic set-up/Photographing

Plate 1: Photographic set-up/photography

Photographic set-up and photography were done according to the method described by Oghenemavwe et al. (2011). The photographic set-up comprised a white background 100 × 100 cm graph sheet suspended by a projector stand and a tripod (WT 3570) supporting a digital camera (Nikon COOLPIX S2800, 20.1 megapixels, x5 zoom) mounted on a camera tripod. The scales on the graph sheet enabled measurement with the software tool. Adjustment of the tripod height allowed the optical axis of the lens to be maintained in a horizontal position during the photographing. In a standing position, this was adjusted to its object height. Each subject was requested to stand in front of the graph sheet 100 cm from the tripod, then made to relax with both hands freely suspended at the side of the trunk. Standard anterior and lateral view photographs of the face were taken with the digital camera in the natural head position (NHP). It was ensured that the subjects' forehead, neck and ears were clearly visible.

Identification of landmarks

The following nineteen (19) landmarks were identified:

Trichion (Tr) is the meeting point of the hairline and the middle of the forehead, glabella (G) is a prominence between the eyebrows, nasion (N) is the midpoint on the soft tissue contour of the base of the nasal root at the level of the nasofrontal suture, subnasal (Sn) is the midpoint on the nasolabial soft tissue contour between the columella crest and the upper lip, gnathion (Gn) is the the lowest median point on the lower portion of the chin, endocanthion is this is the inner corner of the eye fissure where the eyelids meet, exocanthion is this is the outer corner of the eye fissure where the eyelids meet, pogonion (Pog) is the most anterior point on the contour of the chin, chelion (Che) is a bilateral landmark located at the outermost corner (commissure) of the mouth where the upper and lower lips meet, ala (Al.) is the cartilaginous lateral surface of the external nose that flares out to form a rounded eminence around the nostril, pronasal (Prn) is the most anterior (prominent) part of the nose, zygion (Zyg) is the most lateral point on the zygomatic arch, tragus (Tra) is a small pointed eminence of the external ear that is situated in front of the concha, and projecting backwards over the meatus, supraurale (Spa) is the most superior part of the pinna, subaurale (Sba) is the most inferior part of the pinna, stomion (St) is the point where the lips meet in the midline, menton (Me) is the most inferior point of the chin, Cervical point (C) is the point in the midline where the neck meets the submental area.

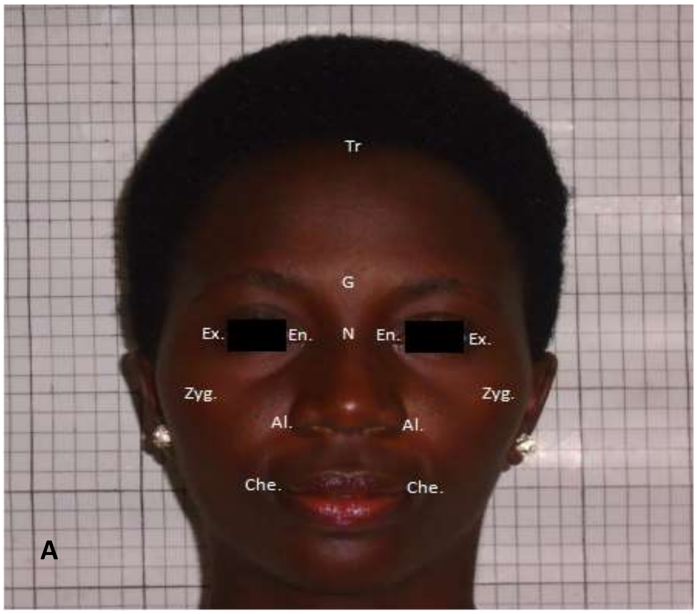

Fig. 1A: Identification of landmarks (anterior view).

Fig. 1B: Identification of landmarks (Lateral view).

With the identified landmarks, the photographs in JPG format were transferred to a laptop computer (HP Core i5) using the camera cable. Each of the transferred pictures was then opened using a computer-aided facial analysis programme, the WinImager®, a collaborative invention between the Department of Anatomy, University of Port Harcourt and Daewin Infotech Services, Port Harcourt (Fig. 2). The anatomical landmarks (Figs. 1a and 1b) were used to obtain the following parameters:

Forehead height is the vertical distance between the trichion (Th) and glabella (G), middle face height is the vertical distance between the nasion (N) and subnasale (Sn), lower face height is the vertical distance between the subnasale (Sn) and gnathion (Gn), nasal height is the vertical distance between the nasion (N) and the subnasal (Sn), outer canthal distance (OCD) is the horizontal distance from one exocanthion (ex) to the other, inner canthal distance (ICD) is the horizontal distance between the two endocanthi (en), nasal width is the horizontal distance from ala to ala, mouth width is the horizontal distance from chelion to chelion, eye fissure width is the horizontal distance between the exocanthion and endocanthion of one eye, facial width (Bizygomatic distance) is the distance from one zygion (zyg) to the other, nasal tip projection is obtained by dividing the length from the subnasale to the nasal tip by the length from the subnasale to the superior labium, ear length is the vertical distance from supraurale (sa) to the subaural (sb).

Facial indices

The canthal, nasal and facial indices were derived using endo-canthal distance, exo-canthal distance, nasal width, nasal height, facial width and facial height hence:

$$canthal\ index = \frac{endocanthal\ distance}{exocanthal\ distance} x \frac{100}{1}$$

$$nasal\ index = \frac{nasal\ width}{nasal\ height} \times \frac{100}{1}$$

$$facial\ index = \frac{face\ width}{face\ height} x \frac{100}{1}$$

Statistical Analysis

Data obtained was analyzed with the XLSTAT software for Windows, version 2021.5 by Addinsoft. Descriptive statistics was used to determine the mean and standard error of mean. Continuous variables were presented as mean±SEM. Inferential statistics was done using z test to determine the level of significance. Significant level was placed at 95% confidence interval, hence $p < 0.05$ was considered significant. Correlation analysis was done between age and some selected parameters that were significant to show relationship and the strength of the relationship, and regression equations obtained from the scatter plots. Results obtained were presented in tables and graphs.

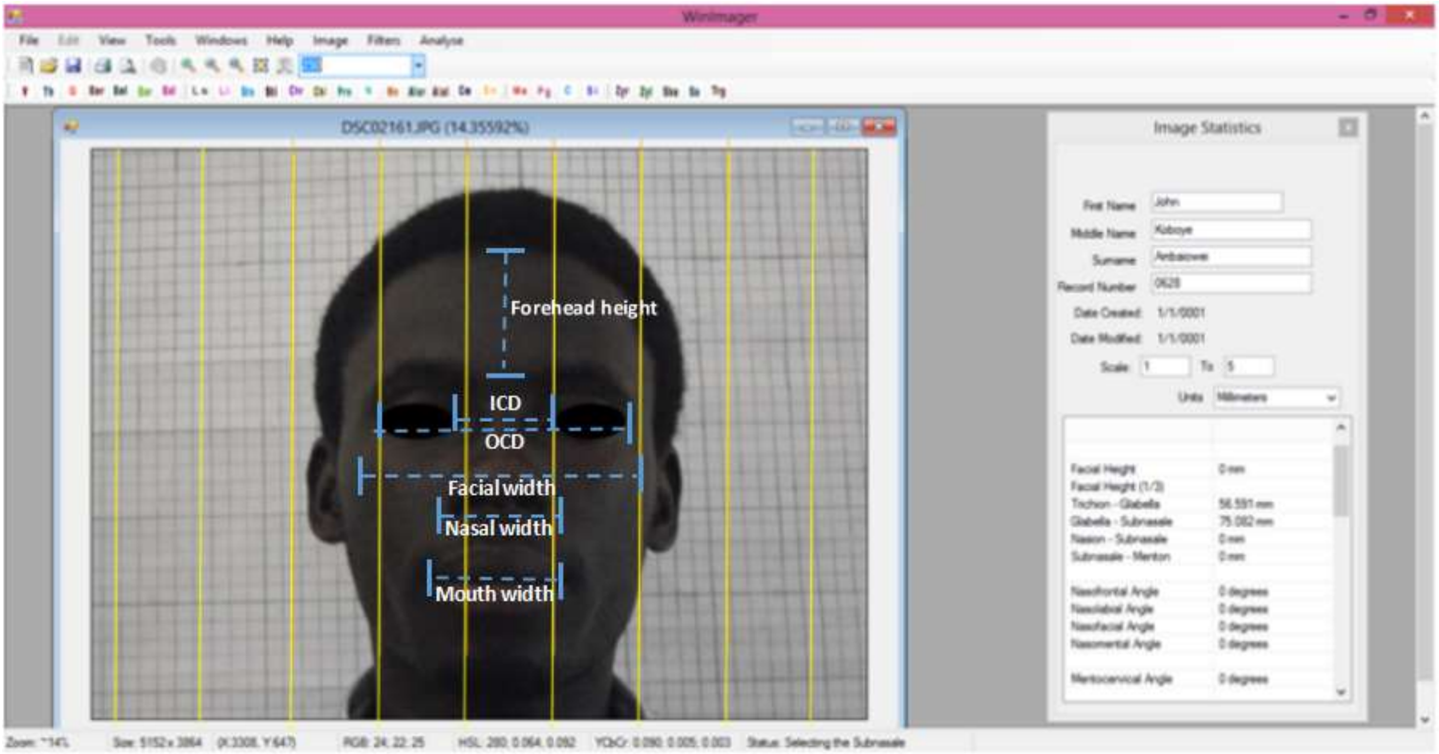

Fig. 2A: Analysis of photographic images using a computer-aided analysis programme, WinImager®, showing some linear parameters; anterior view.

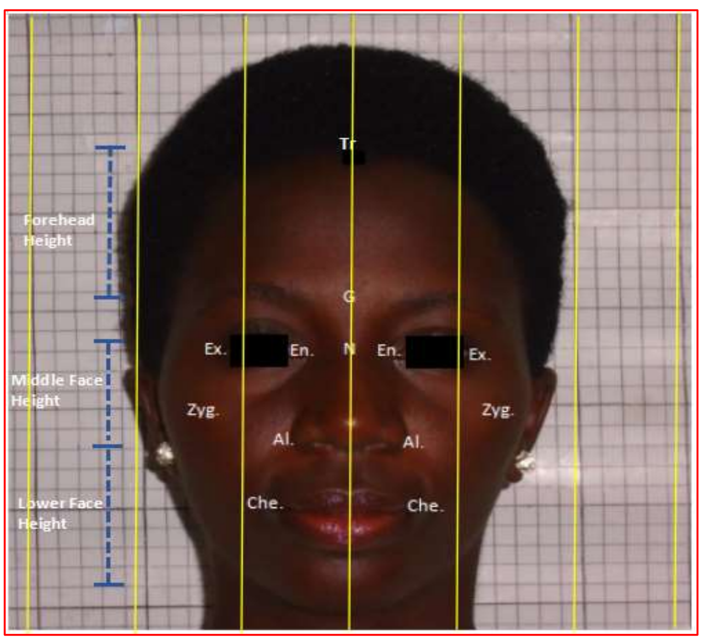

Fig. 2B: Analysis of photographic images using a computer-aided analysis programme, WinImager®, showing some linear parameters; anterior view.

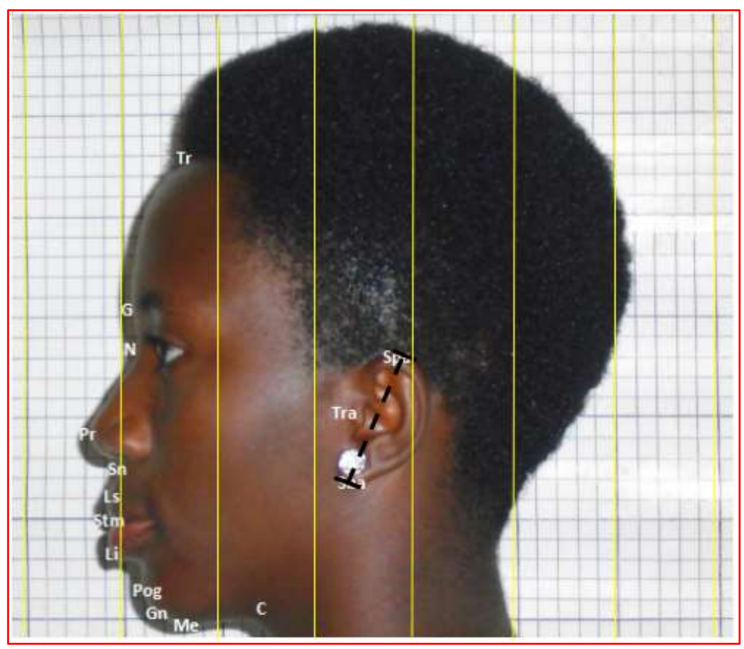

Fig. 2C: Analysis of photographic images using a computer-aided analysis programme, WinImager®, showing some linear parameters; lateral view.

RESULTS

Table 1 shows the descriptive statistics for linear facial parameters for all subjects. Forehead height was (55.35±0.13mm), middle face height (57.92±0.12mm), lower face height (59.07±0.12mm), Facial width (130.80±0.05mm), eye fissure width (30.53±0.05mm), outer canthal distance (104.99±0.12mm), inner intercanthal distance (34.61±0.13mm), Nasal height (49.37±0.14mm), Nasal tip projection (13.13±0.08mm), Nasal width (41.10±0.1mm), Ear length (55.35±0.09mm) and Mouth width (52.80±0.07mm) for both sexes. Table 2 shows a comparison of linear craniofacial parameters between both sexes. For the males, the forehead height was 55.69±0.18mm, middle face height (58.92±0.17mm), lower face height (59.10±0.18mm), facial width (130.13±0.07mm), eye fissure width (32.83±0.06mm), nasal height (52.13±0.20mm), outer canthal distance (104.98±0.16mm), inner canthal distance (33.99±0.18mm), nasal height (52.13±0.20mm), nasal tip projection (13.62±0.11mm), nasal width (41.45±0.18mm), ear length (55.75±0.17mm), mouth width (53.85±0.09mm) while for the females, the forehead height was 52.89±0.16mm, mid face height (54.89±0.15mm), lower face height (55.66±0.13mm),face width (127.35±0.08mm), eye fissure width (27.61±0.04mm), outer canthal distance (100.94±0.14mm), inner canthal distance (29.61±015mm), nasal height (47.62±0.50mm), nasal tip projection (11.34±0.16mm), nasal width (36.13±0.14mm), ear length (52.54±0.13m) and mouth width (49.53±0.10mm). The z-test reveals that with the exception of nasal tip projection, other parameters were significantly higher ($p<0.05$) in the males than in females. Table 3 shows descriptive statistics of facial indices for all subjects. Canthal index was 32.92±1.08mm, nasal index (83.25±0.71mm) and facial index (75.89±0.14) while Table 4 shows comparison of facial indices between sexes. Canthal index for the males was (32.38± 1.13), nasal index (87.04± 0.90) and facial index (74.91 ± 0.13) whereas for the females, canthal index was (29.33± 1.07), nasal index (75.87± 0.28) and facial index (70.04± 0.18). Z-test reveals that all the facial indices were significantly higher ($p<0.05$) in males than in females.

Table 1: Descriptive statistics for linear facial Parameters for all subjects

Parameter	Mean± SEM	Range
Age (year)	30.32±0.28	21.00-45.00
Forehead Height	54.48±0.13	47.47-63.22
Middle face Height	57.24±0.12	48.23-67.60
Lower face Height	59.55±0.12	51.12-67.01
Facial width	130.62±0.05	126.40-135.20
Eye Fissure Width	30.34±0.05	26.70-34.35
OCD	103.36±0.12	96.78-113.20
ICD	33.31±0.13	28.30-40.89
Nasal Height	48.15±0.14	37.93-60.80
NTP	12.65±0.08	8.69-17.56
Nasal width	38.78±0.10	33.18-49.02
Ear Length	55.73±0.09	48.70-61.99
Mouth Width	52.95±0.07	47.80-57.80

Key: OCD – outer canthal distance, ICD – inner canthal distance, NTP – nasal tip projection.
All linear measurements are in millimetres (mm)

Table 2: Comparison of craniofacial parameters between both sexes

Parameter (mm)	Sex	Mean ± SEM	Range	ρ value	Inference
Forehead Height	M F	54.74 ± 0.18 52.23 ± 0.18	48.15-63.22 47.47-62.31	ρ < 0.05	Significant
Middle face Height	M F	57.50 ± 0.18 56.98 ± 0.17	50.23-67.60 48.46-67.32	ρ < 0.05	Significant
Lower face Height	M F	59.81 ± 0.17 57.29 ± 0.17	51.18-67.01 51.27-66.05	ρ < 0.05	Significant
Facial width	M F	130.83 ± 0.07 128.40 ± 0.08	127.05-135.2 126.40-134.3	ρ < 0.05	Significant
Eye Fissure Width	M F	30.58 ± 0.07 28.10 ± 0.08	27.70-34.95 26.96-35.25	ρ < 0.05	Significant
OCD	M F	103.60 ± 0.16 102.12 ± 0.16	98.75-113.2 96.58-112.3	ρ < 0.05	Significant
ICD	M F	33.54 ± 0.18 31.90 ± 0.18	30.10-40.89 28.30-40.92	ρ < 0.05	Significant
Nasal Height	M F	48.40 ± 0.20 47.90 ± 0.20	38.45-60.80 37.93-59.30	ρ < 0.05	Significant
NTP	M F	12.79 ± 0.11 12.50 ± 0.11	9.68-17.56 8.79-17.88	ρ > 0.05	Not significant
Nasal width	M F	39.01 ± 0.14 38.54 ± 0.14	33.88-49.02 33.15-49.11	ρ < 0.05	Significant
Ear Length	M F	55.95 ± 0.13 53.51 ± 0.13	49.50-61.99 48.70-61.37	ρ < 0.05	Significant
Mouth Width	M F	53.18 ± 0.09 52.72 ± 0.10	47.90-57.80 47.96-58.10	ρ < 0.05	Significant

Table 3: Descriptive statistics of facial indices for all subjects

Parameter	Mean± SEM	Range
Canthal index	32.92±1.08	26.88-38.90
Nasal index	83.25±0.71	77.15-89.35
Facial index	75.89±0.14	70.88-80.89

Table 4 Comparison of facial indices between both sexes

Parameter	Sex	Mean ± SEM	Range	ρ value	Inference

Canthal index	M	32.38 ± 1.13	25.51-39.25	$\rho < 0.05$	S
	F	29.33 ± 1.07	23.33-35.33		
Nasal index	M	87.04 ± 0.90	84.50-89.60	$\rho < 0.05$	S
	F	75.87 ± 0.28	72.46-79.30		
Facal index	M	74.91 ± 0.13	70.95-78.86	$\rho > 0.05$	S
	F	70.04± 0.18	67.48-73.32		

Key: M - male, F - female, S - significant

DISCUSSION

DISCUSSION

Different groups of people are distinguished by anthropologists on the basis of common origin; on whether they were living or had lived in certain defined regions and had possessed different characteristic features in their appearance. Variations are observed in groups who live in different geographical areas within the single species (Bhasin, 2007).

Various human populations possess characteristics that distinguish or stamp them out as the residents of particular areas of the world. This study investigated the linear facial photogrammetric features of Ibibios resident in Port Harcourt, Rivers State. On comparison with values obtained in other populations, certain parameters from this study were found to be close while some differed considerably by being either higher or lower. The forehead height in this study for the Ibibio females (52.89mm) was lower compared to the values obtained by Hussein *et al*. (2009) in Indian American Women (54.2mm). Middle face height for the males and females were 58.92±0.17mm and 54.89±0.15mm respectively. Among the Indian American women, the middle face height was 58.1mm and 63.1mm for the North American White women (Hussein *et al.,* 2009). These values were higher than that of the Ibibio women in this study. The findings of Oghenemavwe *et al*. (2011) showed that the mean middle face height values for the Igbo males and females were 41.85mm and 43.03mm respectively whereas those of the Urhobo males and females were 42.27mm and 43.51mm respectively (Oghenemavwe *et al*., 2010). Similarly, among the Himachalis, Jain *et al.* (2004) showed that their mean value was 44.63mm while the findings of Powell and Humphreys (1984) revealed that in North Americans, 47mm was the value. These values were lower than those of the Ibibios.

The lower face height of Ibibio women (55.66mm) was lower than those of the Indian American women (57.1mm), Igbo women (56.97mm), Urhobo women (56.49mm), Hungarian women (56mm), North American White women (64.3mm), Egyptian women (57.8mm) and Japanese women (62.8mm) (Hussein et al., 2009; Farkas et al., 2005; Oghenemavwe et al., 2011). Whereas for the males, the mean lower face height of the Ibibio males (59.110mm) was higher when compared with those of the Igbo males (58.15mm), Urhobo males (57.73mm), North Americans (53mm) (Oghenemavwe et al., 2011; Oghenemavwe et al., 2010; Jain et al., 2004; Powell and Humphreys, 1984). Those of the Japanese males (69.4mm), Egyptian males (64.1mm) and Hungarian males (64.2mm) were higher than the mean lower face height value of the Ibibio males (Farkas et al., 2005).

Outer canthal distance (OCD) of Ibibio males (104.98mm) on comparison was found to be higher than those of the Igbo males (102.06mm), Japanese males (103.9mm), Egyptian males (89mm) and Hungarian males (100.4mm). The range of values for the OCD of the Ibibio males (96.75 – 113.2mm) was higher than the range of values for the Indian males (76 – 105mm). Similarly, the Ibibio females had lower OCD (100.94mm) than the Igbo females (102.09mm) while it was higher compared to those of the Japanese women (93.3mm), the Egyptian women (86.3mm) and Hungarian women (97.3mm). Also, the range of values for the OCD of the Ibibio females (91.58 – 110.3mm) was higher than those of the Indian women (71 – 105mm) (Osunwoke et al., 2010; Farkas et al., 2005; Gupta et al., 2003).

The inner canthal distance (ICD) of Ibibio males (33.99mm) on comparison was higher than those of the Egyptian males (31.8mm) and Hungarian males (31.7mm) but was lower than that of the Japanese males (37.5mm). The range of values (27.1 – 40.89mm) for the Ibibio males in this study was higher than those of the Indian males (20 – 36mm). Among the females, the ICD of Ibibio females (29.61mm) was lower than those of the Indian American women (31.2mm), North American White women (31.8mm), Egyptian women (30.9mm), Hungarian women (31.2mm) and Japanese women (35mm) (Farkas et al., 2005; Gupta et al., 2003; Hussein et al., 2009).

The facial width of the Ibibio males (130.13mm) was lower than those of the Japanese males (147.2mm), Egyptian males (139.8mm) as well as Hungarian males (142.1mm). For the females, the facial width (127.35mm) was higher than that of the Indian American women (125.9mm), however, it was lower when compared with those of the Japanese women (141.2mm), Hungarian women (131.3mm), North American White women (130mm) and Egyptian women (130.3mm) (Farkas et al., 2005; Hussein et al., 2009).

The eye fissure width for the Ibibio males (32.83mm) was higher than those of the Japanese males (30.7mm) and Egyptian males (31.5mm) but lower than that of the Hungarian males (37.7mm) whereas among the females, the eye fissure width of the Ibibio females (27.61mm) was lower than those of the Japanese women (29.2mm), Indian American women (30.6mm), North American White women (30.7mm), Egyptian women (30.8mm) and Hungarian women (34.9mm) (Farkas et al., 2005; Hussein et al., 2009).

The Nasal width of Ibibio males (41.45mm) was higher than those found by Farkas et al. (2005) among Japanese males (38.2mm), Egyptian males (32.4mm) and Hungarian males (37.7mm) while among the females, the Nasal width of the Ibibio females (36.13mm) was higher than the values obtained by Hussein et al. (2009) among Indian American women (35.6mm) and North American White women (31.4mm). The values obtained by Farkas et al. (2005) among Egyptian women (29.3mm) and Hungarian women (33.7mm) on comparison where also found to be lower than that of the Ibibio females while those of Japanese women (37.1mm) as reported by Farkas et al. (2005) was higher.

Nasal height of the Ibibio males in this study (52.13mm) was lower than the values obtained by Farkas et al. (2005) for Japanese males (56.9mm), Egyptian males (54.6mm) and Hungarian males (55mm) while for the women, the nasal height of Ibibio women (47.62mm) was higher than that obtained by Hussein et al. (2009) among Indian American women (45.6mm) as well as that of Egyptian women (47.4mm) obtained by Farkas et al. (2005), however the values for the North American White women (50.6mm), Japanese women (53.3mm) and Hungarian women (52.5mm) were higher (Hussein et al. 2009; Farkas et al. 2005).

Mouth width (53.83mm) of Ibibio males was higher than those obtained by Farkas et al. (2005) among Japanese males (48.4mm) and Egyptian males (48.3mm) but was lower than the mean value obtained among Hungarian males (57mm). Among the females, it was found that for the Ibibio women, their mean mouth width (49.53mm) was lower than those of the Indian American women (51.1mm), North American White women (50.2mm) and Hungarian women (52.5mm) but higher than those of the Japanese women (46.5mm) and Egyptian women (46.7mm) (Hussein et al., 2009; Farkas et al., 2005).

Nasal tip projection of Ibibio females (11.34mm) when compared with the findings of Hussein et al. (2009) was found to be lower than those of the Indian American women (19.1mm) and North American White women (19.7mm) a suggestion that Caucasoids which the two latter groups belong to have leptorrhine (pointed) type of nose. The nasal tip projection of Ibibio males was 13.62mm. No available literature was found to have reported the value of this parameter in males in other populations.

Ear length of Ibibio males (55.75mm) was lower than those of the Japanese males (65.6mm), Egyptian males (61mm) and Hungarian males (63.9mm). Similarly, among the females, the ear length (52.54mm) of Ibibio women was lower than those of the other populations; Indian American women (58.6mm), North American White women (59.6mm), Japanese women (61.9mm), Egyptian women (57mm) and Hungarian women (60.2mm) (Farkas et al., 2005; Hussein et al., 2009).

These racial and ethnic variations observed are possible because various human populations possess characteristics that distinguish them from the others. These distinguishing features could be as a result of the interplays between biological, ecological, environmental, genetic, nutritional, racial as well as geographical factors affecting human body morphology in a population's dynamics. According to Farkas et al. (2005) certain theories have related the effects of temperature on head shape and facial form. Environmental factors such as diet, climate and weather have been shown to have a significant effect on body height and craniofacial variability (Mibodi et al., 1996; Tuli et al., 1995; Pandey, 2008).

All measured variables showed significant gender difference in which male values were found to be higher than those of the females with the exception of nasal tip projection which showed no significant difference. This is because males have thicker eyebrows and bigger nose and mouth as compared to females, which is in agreement with studies by Farkas (1994) which showed female faces, nose, and mouth to be generally smaller than those of males. Without explicit training, anyone can easily recognize individual faces as being males or females, even when cues from hairstyle, makeup, and facial hair are minimized (Bruce et al., 1993). This suggests that differences exist in the faces of males and females, and there are exact facial soft tissue measurements which can enable us to tell each individual face gender. Sexual dimorphism refers to the differences between males and females of the same species with respect to size, appearance, and behaviour (Adam, 2024). It exists in various forms in all humans. Studies have shown that some parts of human anatomy exhibit sexual dimorphism. In this study, the male variables were seen to be significantly higher ($\rho<0.0$) than those of the females in almost all the parameters measured. This is in agreement with the findings of Farkas et al. (2005) among Japanese and Egyptians in which the mean male values were higher than those of the females in all the measured parameters however, with the exception of the nasal tip projection which was not in Farkas' study and in the present study, showed no significant difference ($p>0.05$). Oghenemavwe et al. (2011) among Igbos and Oghenemavwe et al. (2010) among Urhobos also demonstrated difference between males and females in each of the population however, they stated that certain parameters such as the mean middle face height in both populations were higher among the females than in the males; though the mean lower face height for the males were higher than those of the females in both populations.

Canthal, nasal and facial indices equally showed sexual dimorphism with male values being significantly higher (p<0.05) than the female values. This finding is in alignment with Oladipo et al. (2009) on nasal index among Adoni and Okrika ethnic groups of Rivers State and Oladipo et al. (2007) among major ethnic groups in Southern Nigeria, Esomonu et al. (2013) and Mohammed et al.(2018) among Bekwara and Hausa ethnic groups of Nigeria respectively who had reported gender difference in the nasal index. Ibibios resident in Port Harcourt were found to be both platyrrhine (49%; nasal index >85) and mesorrhine (51%; nasal index <85). This could be attributed to environmental factors and nutrition as Oladipo et al, (2007) had reported that platyrrhine type of nose to be predominant among southern Nigerians .

Facial index is one of the most widely used and reliable indices used in identifying the five types of faces as follows: Hypereuryprosopic (FI: ≤ 79.9), Euryprosopic (FI: 80.0–84.9), Mesoprosopic (FI: 85.0–89.9), Leptoprosopic (FI: 90.0–94.9), and Hyperleptoprosopic (FI: ≥ 95.0) (Gallardo et al., 2008; Trivedi et al., 2017; Novita, 2006; Dodangheh et al., 2018). Ibibios resident in Port Harcourt found to be both Europrosopic (47%) and hypereuroprosopic (53%).

Conclusion: This study has provided a photogrammetric assessment of the face of Ibibios resident in Port Harcourt. The findings could be useful in forensic medicine, oral and maxillofacial, plastic and reconstructive facial surgeries. It can also provide a diagnostic understanding between patient and normal population. We recommend that further studies be carried out in Ibibios in their state of origin in order to determine and clearly demonstrate the impact of environment and other factors on the face as well as the use of manual anthropometric technique.

REFERENCES

Adam, A. (2024). Sexual dimorphism. Biology. Available at https://www.britannica.com/science/sexual-dimorphism

Baral, P., Lobo, S. W., Menezes, R. G., Kanchan, T., Krishan, K., Bhattacharya, S., & Hiremath, S. S. (2010). An anthropometric study of facial height among four endogamous communities in the Sunsari district of Nepal. *Singapore Medical Journal, 51*(3):212

Bhasin, M. K. (2007). Racial, Ethnic, Religious and Linguistic Elements in Indian Population. *Indian Anthropology,* Gurgaon 122 002, Haryana, India.

Bruce, V., Burton, A. M., Hanna, E., Healey, P., Mason, O., Coombes, A., Fright, R., & Linney, A. (1993). Sex discrimination: how do we tell the difference between male and female faces? *Perception, 22*:131-152.

Dodangheh, M., Mokhtari, T., Mojaverrostami, S., Nemati, M., Zarbakhsh, S., Arabkheradmand, A., and Hassanzadeh. G. (2018). Anthropometric study of the facial index in the population of medical students in Tehran University of medical sciences Glasg. *Med. J. Med., 2*(1): 51-57

Du, L., Zhuang, Z., Guan, H., Xing, J., Tang, X., Wang, L., Wang, Z., Wang, H., Liu, Y., Su, W., Benson, S., Gallagher, S., Viscusi, D., & Chen, W. (2008). Head-and-Face Anthropometric Survey of Chinese Workers. *Annals of Occupational Hygiene, 52*(8):773-782.

Esomonu, U. G., Ude, R. A., Lukpata, P. U., & Nandi, E. M. (2013). Anthropometric study of the nasal index of Bekwara ethnic group of Cross River State, Nigeria. *International Research Journal of Applied and Basic Sciences, 5*(10):1262-5.

Ewunonu, E. O., & Anibeze, C. I. P. (2013). Anthropometric study of the Facial Morphology in a South-Eastern Nigerian Population. *Human Biology Review, 2*(4): 314- 323.

Fang, F., Clapham, P. J., & Chung, K. C. (2011). A Systematic Review of Interethnic Variability in Facial Dimensions. *Plastic Reconstructive Surgery, 127*:874-881.

Farkas, L. G. (1994). Anthropometry of the head and face. (2nd ed.). New York: Raven Press.

Farkas, L. G., Katic, M. J., & Forrest, C. R. (2005). International Anthropometric Study of Facial Morphology. *Journal of Craniofacial Surgery, 16*(4): 615 – 46.

Gallardo, C.A.C., Galdames, I.C.S., López, M.G.C., Matamala, D.A.Z., Coronado, G., Suazo, G., & Zavando, M. (2008). Relationship between pterygopalatine fossa volume and cephalic and upper facial indexes. *Int. J. Morphol., 26*: 393-396

Golalipur, M. J., Haidari, K., Jahanshahi, M., & Farahani, R. M. (2003). The Shapes of Head and Face in Normal Male Newborns in South-East of Caspian Sea (Iran-Gorgan). *Journal of the Anatomical Society of India, 52*(1):28-31

Grbe, D., Pezerovic-Panijan, R., Kalaya, M. N., Gorsic, I., Cavcik, A., Zura, N., & Berberovic, B. (2007). Craniofacial Characteristics of Croatian and Syrian Populations. *Collection of Antropology, 31*(4):1121–1125.

Gupta, V. P., Sodhi, P. K., & Pandey, R. M. (2003). Normal Values for Inner Intercanthal, Interpupillary and Outer Intercanthal Distances in the Indian Population. *International Journal of Clinical Practice, 57*(1):25 – 9.

Hennessy, R. J., McLearie, S., Kinsella, A., & Waddington, J. L. (2005). Facial Surface Analysis by 3D Laser Scanning and Geometric Morphometrics in Relation to Sexual Dimorphism in Cerebral-Craniofacial Morphogenesis and Cognitive Function. *Journal of Anatomy, 207*: 283-295.

Hussein, O. F., Sepehr, A., Garg, R., Sina-Khadiv, M., Gattu, S., Waltzman, J., Wu, E. C., Shieh, M., Heitmann, G. M., and

Galle, S. E. (2009). Anthropometric and Aesthetic Analysis of the Indian American Woman's Face. *Journal of Plastic, Reconstructive and Aesthetic Surgery, 63*: 1825e183.

Jain, S. K., Anand, C., and Ghosh, S.K.. (2004). Photometric facial analysis: A baseline study. *Journal of the Anatomical Society of India*, *53*(2): 11-13.

Kochel, J., Meyer-Marcotty, P., Strnad, F., Kochel, M., & Stellzig-Eisenhauer, A. (2010). 3D Soft Tissue Analysis--part 1: sagittal parameters. *Journal of Orofacial Orthopedics*, *71*: 40-52.

Krishan, K. (2006). Anthropometry in Forensic Medicine and Forensic Science-'Forensic Anthropometry'. *The Internet Journal of Forensic Science. 2*(1).

Krishan, K. (2007). Anthropometry in Forensic Medicine and Forensic Science– 'Forensic Anthropometry'. *The Internet Journal of Forensic Science, 2*(1).

Mibodi, I. M. A., & Frahani, M. R. (1996). Study of normal range of anatomical dimensions of one-day old newborn by cephalometry. *Journal of Medical Council of Islamic Republic of Iran. 14* (1): 1-8.

Moore, K. L., & Dalley, A. F. (2006). Clinically Oriented Anatomy (5th ed.). Lippincott Williams & Wilkins. pp. 933

Moore, K. L., & Dally, A. F. (1999). Clinically Oriented Anatomy (4th ed.). Lippincott Williams and Wilkins. pp. 823.

Mutsvangwa, T. E., Meintjes, E. M., Viljoen, D. L., & Douglas, T. S. (2010). Morphometric Analysis and Classification of the Facial Phenotype Associated with Fetal Alcohol Syndrome in 5- and 12-year-old children. American *Journal of Medical Genetics, 152*: 32-41.

Mutsvangwa, T. E., Veeraragoo, M., & Douglas, T. S. (2011). Precision Assessment of Stereophotogrammetrically Derived Facial Landmarks in Infants. Annals of Anatomy, 193: 100-105. New York: Raven Press.

Ngeow, W. C., & Aljunid, S. T. (2009). Craniofacial Anthropometric Norms of Malays. *Singapore Medical Journal, 50* (5):525

Njemirovskij, V., Radovic, Z., Komar, D., Lazic, B., and Kuna, T. (2000). Distribution of Craniofacial Variables in South Dalmatian and Middle Croatian Populations. *Collection of Antropology, 24* (1): 49–56.

Novita, M. (2006). Facial, upper facial and orbital index in batak, klaten and flores students of jember university. *Dent. J., 39*(3): 116-119.

Oghenemavwe, E. L., Fawehinmi, H. B., Udoaka, A. I., Oladipo, G. S., & Onyeleonu, I. (2011). Photogrammetric Analysis of Soft Tissue Profile of the Face of Igbos in Port Harcourt. *Asian Journal of Medical Sciences, 3* (6): 228-233.

Oghenemavwe, E. L., Osunwoke, A. E., Ordu, S. K., & Omovigho, O. (2010). Photometric Analysis of Soft Tissue Facial Profile of Adult Urhobos. *Asian Journal of Medical Sciences, 2*(6): 248-252.

Oladipo, G. S, Dike, U. E., Hart, J. S., Amadi, M. A. & Jumbo N. F. (2014). A Study on Some Oro-Facial Variables of Adults of Bonny Ethnic Group in Nigeria. *International Journal of Current Microbiolology and Applied Sciences, 3*(7): 926-937.

Oladipo, G. S., Eroje, M. A., & Fahwehinmi, H. B. (2009). Anthropometric comparison of nasal indices between Andoni and Okrika tribes of Rivers State, Nigeria. *International Journal of Medicine and Medical Sciences, 1*(4):135-7.

Oladipo, G. S., Olabiyi, A. O., Oremosu, A. A., & Noronha, C. C. (2007). Nasal indices among major ethnic groups in Southern Nigeria. *Sci Res Essay, 2*(1):20-2.

Osunwoke, E. A., Elekwa, A., Bob-Manuel, I. F., and Ojeka, S. O. (2010). A Study on the Normal Values of Inner Canthal, Outer Canthal, Canthal Index, Interpupillary Distance and Head Circumference of 23 – 42 Years Igbos. *Global Journal of Medical Sciences, 9*(1&2).

Pandey, A. K. (2008). Cephalo-facial Variation Among Onges. *Anthropologist, 8*(4): 245- 249.

Pazos, J. A. T., Galdames, I. C. S., Lopez, M. C., and Matamala, D. A. Z. (2008). Sexual Dimorphism in the Nose Morphotype in Adult Chilean. *Internet Journal of Morphology, 26* (3):537-542.

Porter, J. P. (2004). The Average American Male Face – An Anthropometric Analysis. *Archives of Facial Plasticic Surgury, 6*:78-81.

Porter, J.P., & Olson, K. L. (2001). Anthropometric Facial Analysis of the African American woman. *Archives of Facial Plastic Surgery, 3*:191-197

Powell, N., and Humphreys, B. (1984). Proportions of the aesthetics face. Thieme-Stratton, New York, pp. 51-55

Ritz-Timme, S., Gabriel, P., Tutkuviene, J., Poppa, P., Obertova, Z., Gibelli, D., De Angelis, D., Ratnayake, M., Rizgeliene, R., Barkus, A., & Cattaneo, C., (2011). Metric and Morphological Assessment of Facial Features: A Study on Three European Populations. *Forensic Science International,* 207:239.e1-e8.

Sforza, C., & Ferrario, V. F. (2010). Three-Dimensional Analysis of Facial Morphology: Growth, Development and Aging of the Orolabial Region. *Italian Journal of Anatomy and Embryology, 115*: 141-145.

Shah, M., Verma, I. C., Mahadevan, S., & Puri, R. K. (1991). Facial anthropometry in Newborns in Pondicherry. *Indian Journal of Paediatrics, 25*:259-63.

Smeets, D., Claes, P., Vandermeulen, D., & Clement, J. G. (2010). Objective 3D Face Recognition: Evolution, Approaches and Challenges. *Forensic Science International, 201*: 125-132.

Tollefson, T. T., & Sykes, J. M. (2007). Computer Imaging Software for Profile Photograph Analysis. *Archives of Facial Plastic Surgery, 9*: 113-119.

Trivedi, H., Azam, A., Tandon, R., Chandra, P., Kulshrestha, R., & Gupta, A. (2017). Correlation between morphological facial index and canine relationship in adults-An anthropometric study. *J. Orofac. Sci., 9*(1) (2017), pp. 16-21

Tuli, A., Choudhry, R., Agarwal, S., Anand, C., & Gary, H. (1995). Correlation between craniofacial dimensions and foetal age. *Journal of the Anatomical Society of India. 44*(1): 1- 12.

Verzè, L., Nasi, A., Quaranta, F., Vasino, V., Prini, V., & Ramieri, G. (2011). Quantification of facial movements by surface laser scanning. *Journal of Craniofacial Surgery, 22:* 60-65.