

RESEARCH ARTICLE

Naso-Facial Indices and Body Mass Index of Yoruba and Hausa Ethnic Groups Students in Ahmadu Bello University Zaria, Aged 18 – 25 Years

*Tanko, M., Garba, M., Sadeeq, A. A., Peter, A. S. and Aliyu, J.

Department of Anatomy Faculty of Basic Medical Sciences Ahmadu Bello University, Zaria
Correspondence to: Tanko M., Department of Human Anatomy, A.B.U., Zaria

Abstract

Background: Facial and nasal indices are important cephalometric parameters useful in inter- racial and intra- racial morphological classification and categorization. Body Mass Index is used to identify underweight, overweight and obese individuals. This study was carried out to determine the Naso- Facial indices and Body Mass Index of Yoruba and Hausa ethnic group students in Ahmadu Bello University Zaria, aged 18-25 years. **Materials and Methods:** Five hundred (500) students were used in this study, out of which two hundred and Sixty-five (265) were of Hausa ethnic group, of which 119 were females and 146 males, while two hundred and thirty-five (235) were of Yoruba ethnic group, of which 104 were males and 131 females. All the subjects in the study participated voluntarily and were previously informed of the nature and purpose of the study. A questionnaire which consisted of personal data was issued to the subjects, which they filled and submitted. The anthropometric data were measured using weighing balance, stadiometer, sliding vernier caliper and digital spreading caliper. The data obtained from the study were subjected to statistical analyses and expressed as Mean \pm SD (Standard Deviation). Independent Student T-test was used to compare the mean difference between the sexes. A one-way analysis of variance (ANOVA) was used to compare means of more than two groups. A Pearson correlation analysis was carried out to determine the degree of relationship and Linear regression analysis was carried out and regression equation formula was also generated for estimation. P-value less than 0.05 was considered statistically significant. **Results:** The Yoruba ethnic group was observed to have BMI of 22.36 ± 3.40 , platyrrhine nose, nasal index of 96.76 ± 8.14 , Mesoprosopic face and facial index of 85.99 ± 12.86 , while the Hausa ethnic group was observed to have BMI of 21.22 ± 3.77 , Mesorrhine nose type, nasal index of 80.58 ± 7.13 , Euriprosopic face type and facial index of 83.11 ± 10.19 . Sexual dimorphism existed in both ethnic groups. **Conclusion:** Prediction of naso-facial indices can be done using facial length, facial width, nasal width and nasal length. In conclusion, BMI and naso-facial indices were observed to differ among the Hausa and Yoruba ethnic groups.

Keywords: Body Mass Index (BMI), Nasal Index, Facial Index, Hausa and Yoruba.

Introduction

Facial and nasal indices are important cephalometric parameters useful in inter- racial and intra- racial morphological classification and categorization (Heidari *et al.*, 2006; Porter & Olson, 2003; Eboh, 2011). The face provides means of identification, and the basic shape of the face is determined by the underlying bones. Measurements done for the purpose of understanding physical variation has been a long-time practice. Today, this practice is known as anthropometry, (Krishan and Sharma, 2007). Differences and variation exist in human population

as a result of changes that occur in varying degrees during life, such as the dimension of bone, cartilage, soft tissue present in people of different ethnic group, (Husein *et al.*, 1972). The knowledge of nasal anthropometry is useful in forensic medicine, cosmetic surgery and physical anthropometry in identification of different races, tribes, ethnicity and gender (Esomonu *et al.*, 2013).

There is a wide variation in the shape and size of the nose and face. Ethnicity can have influence in the appearance of the face (Heidari *et al.*, 2009). Ese *et al.* (2011) conducted their study on the Isokos in Delta

State and found that the males have mean nasal width, height and index to be 4.22cm, 4.60cm and 92.35cm respectively, while the females have 3.87cm, 4.35cm and 89.51cm respectively. The Isokos ethnic group, males and females have a mean nasal index of 91.0cm. Eliakin-Ikchukwu *et al.* (2012) conducted a study on Igbo and Yoruba ethnic groups, in which they observed that the Igbo males and females have facial indices of 75.49cm and 73.76 respectively, while the Yoruba males and females have 77.60cm and 73.72cm respectively, and hypereuriprosopic face type for the two ethnic groups. A study conducted on Hausa and Yoruba ethnic groups by Adelaja, (2016) found the Hausa ethnic group to have platyrrhine and the Yoruba ethnic group to have mesorrhine nose types, while the naso-facial proportion was found to be lower in the Hausa males compared to that of the females. The values for Yoruba males and females were seen to be the same. In their study, they also found that the naso-facial proportions were lower in the Hausa ethnic group than in the Yoruba ethnic group in both males and females.

The bone area values at different sites correlates to body size, height, weight, lean mass, fat mass and body mass index (Fesster *et al.*, 2005). The study conducted by Oladipo *et al.* (2007) on the nasal index of the Igbos, Yoruba and Ijaws showed that on the average, the Igbos have a mean nasal index of 94.1 ± 0.37 cm, Yorubas 89.2 ± 0.30 cm and the Ijaws 96.37 ± 1.06 cm. A comparative study on nasal index was also carried out on subjects from Andoni and Okrikas of Rivers State in the Niger Delta Region of Nigeria by Oladipo *et al.* 2009. The Andonis were found to have 79.83 ± 4.19 cm and 83.77 ± 1.09 cm for males and females respectively, while the Okrikas males and females were found to have 86.38 ± 1.35 cm and 86.46 ± 2.37 cm respectively. The mean nasal index of the Okrikas tribe was 86.38 ± 1.35 cm and was significantly higher than that of the Andoni tribe who were found to have 81.86 ± 2.26 cm at $p < 0.05$. Thus, the Okrikas fall within the platyrrhine nose type while, the Andonis fall within the mesorrhine nose type. Oluwayinka *et al.* (2015) conducted an anthropometric study of some basic nasal parameters of three major ethnic groups in Kogi state, which was aimed at providing anthropometric data on the basic nasal parameters of the three major ethnic groups

(Ebira, Okun and Igala) in the state. The Okun males and females were found to have 97.23 ± 7.89 and 93.64 ± 8.22 respectively. For the Igala males and females, it was observed to be 97.21 ± 8.88 and 93.48 ± 8.47 respectively. As for Ebira males and females, it was 96.93 ± 8.66 and 92.99 ± 7.62 respectively. All the three ethnic groups fall under the platyrrhine nose type of Africans. Akpa *et al.* (2003) in their study, also revealed that Igbo males have a higher mean nasal width than Igbo females. Oluwayinka *et al.* (2015) conducted a study on the three major ethnic group of Kogi state, in which they found a significant sexual dimorphism in the nasal parameters in each ethnic group at $P < 0.05$.

Anas & Saleh, (2014) measured the nose of the Hausa and Yoruba ethnic groups in Nigeria, with the working hypothesis that the two ethnic groups will have the same nose type since they share the same environmental conditions. Esomonu *et al.* (2013) observed that both males and females of the Betwara ethnic group in Cross River state have platyrrhine nose type with nasal index of 94.65cm and 90.33cm respectively.

The body mass index of adolescents across the populations overtime have become a cause of concern, (Eyo *et al.* 2018). For adults, overweight and underweight categories are defined by fixed BMI cut points derived from morbidity and mortality data. Adults with low and very high BMIs are at a higher relative mortality risk compared to those with BMI of 18.5 or greater and less than 30.0 (Strawbridge *et al.*, 2000). Over the years, there has been substantial increase in overweight and obesity in developed countries with 23.8% in males and 22.6% in females and in developing countries as well, from 8.1% to 12.9% in males and from 8.4% to 13.4% in females as at 2013 (Keating, 2014). Mustapha & Sanusi (2013) conducted a study on obesity among school children in Nigeria and found the prevalence of obesity to be 18% among school children. A similar study carried out by (Senbanjo *et al.*, 2011) observed data on the prevalence of overweight and obesity in Nigeria.

Materials and Methods

This is a cross-sectional study carried out using a convenience sample of apparently healthy undergraduate students with no history of trauma, surgery or congenital anomalies of the face. The age of the students ranged between 18-25 years. Five hundred (500) students were used in this study. Two hundred and Sixty-five (265) of the subjects belong to Hausa ethnic group, from which 119 were females and 146 males, while two hundred and thirty-five (235) of the subjects belong to Yoruba ethnic group, from which 104 were males and 131 females. All the subjects in the study participated voluntarily and with their full consent. A questionnaire consisting of personal data of the subjects was given to and filled by the participants. Anthropometric data were measured using stadiometer, sliding vernier caliper, and digital spreading vernier caliper.

Samples were conveniently obtained from subjects in Ahmadu Bello University, Zaria. Weight of the subjects was measured in kilograms using weighing balance. The subjects' heights were measured using the stadiometer and the body mass index was calculated as weight (kg) divided by height (m) ². Nasal index measurements were carried out with subjects sitting on the chair in a relaxed condition and head in anatomical position (directed anteriorly). It was done by one observer to prevent inter-observer error, and each was taken twice, and an average was

taken. The measurements were done to the nearest 0.01 mm. The height of the nose was measured from the nasion to the subnasale, while the width of the nose was measured at right angle to the nasal height from ala to ala using a sliding vernier caliper. Nasal Index was then calculated as follows: nasal width divided by nasal height multiplied by hundred, as adopted from (Anas & Saleh, 2014). Face length and face width were also measured using the vernier caliper. Facial index was calculated as face length divided by face width multiplied by 100 (Williams *et al.*, 1995).

The data obtained from the study were subjected to statistical analyses and were expressed as Mean ± SD (Standard deviation). Independent Student T-test was used to compare the mean difference between the sexes. A one-way analysis of variance (ANOVA) was used to compare means of more than two groups, Pearson correlation analysis was carried out to determine the degree of relationship. A linear regression analysis was carried out and regression equation formula was also generated for estimation. P-value <0.05 was considered statistically significant.

Results

The descriptive statistics of the study population in table 1 showed anthropometric data of the subjects studied.

Table 1: Descriptive Statistics of the Subjects Studied

Variables	Mean±S.D	Minimum	Maximum
AGE (yrs)	20.89±2.18	17.00	25.00
WT(kg)	60.13±10.56	39.00	102.00
HT(cm)	1.67±0.08	1.40	1.90
BMI (Kg/m ²)	21.76±3.64	15.20	38.40
FH(cm)	10.88±1.24	8.00	14.50
FW(cm)	12.90±1.18	8.50	15.70
FI (%)	84.46±11.60	61.00	127.00
NH (mm)	44.89±4.89	30.00	60.80
NW(mm)	39.37±4.82	25.50	51.70
NI (%)	88.18±11.11	61.90	118.90

WT: Weight; HT: Height; BMI: Body Mass Index; FH: Facial Height; FW: Facial Width; FI: Facial Index; NH: Nasal Height; NW: Nasal Width; NI: Nasal Index

Table 2 showed presence of sexual dimorphism in anthropometric parameters of the subjects studied. The age, weigh, height, facial height, facial width, nasal height and nasal width were

higher in males than in females, but the body mass index is higher in females than in males.

Table 2: Sex Difference in the Anthropometric Parameters of the Subjects Studied

Variables	Male Mean±S.D	Female Mean±S.D	t-value	p-value
AGE(yrs)	21.44±2.16	20.34±2.05	5.857	.000
WT(kg)	60.63±8.90	59.62±11.99	1.067	.286
HT(m)	1.70±0.08	1.63±0.07	10.593	.000
BMI(kg/m ²)	20.97±2.79	22.54±4.19	-4.921	.000
FH(cm)	11.05±0.93	10.71±1.47	3.118	.002
FW(cm)	13.32±0.92	12.48±1.26	8.533	.000
FI (%)	83.15±7.68	85.77±14.40	-2.533	.012
NH(mm)	45.39±3.88	44.38±5.69	2.327	.020
NW(mm)	40.75±4.53	37.99±4.72	6.670	.000
NI (%)	90.10±11.31	86.27±10.57	3.908	.000

n=500; WT: Weight; HT: Height; BMI: Body Mass Index; FH: Facial Height; FW: Facial Width; FI: Facial Index; NH: Nasal Height; NW: Nasal Width; NI: Nasal Index

Table 3: Anthropometric Parameters of the Study Population

Variables	Hausa	Yoruba	t-value	p-value
AGE(yrs)	21.08±2.09	20.68±2.26	2.049	.041
WT(kg)	58.54±10.71	61.91±10.12	-3.605	.000
HT(m)	1.67±0.08	1.67±0.09	-.111	.912
BMI(kg/m ²)	21.22±3.77	22.36±3.40	-3.555	.000
FH(cm)	10.67±1.11	11.12±1.33	-4.165	.000
FW(cm)	12.88±1.02	12.93±1.33	-.535	.593
FI (%)	83.11±10.19	85.99±12.86	-2.790	.005
NH(mm)	46.24±4.57	43.36±4.79	6.866	.000
NW(mm)	37.15±3.75	41.88±4.66	-12.565	.000
NI (%)	80.58±7.13	96.76±8.14	-23.674	.000

HT: Height; WT: Weight; BMI: Body Mass Index; FH: Facial Height; FW: Facial Width; FI: Facial Index; NH: Nasal Height; NW: Nasal Width; NI: Nasal Index.

Table 3 showed differences in some anthropometric parameters between the Hausa ethnic group and the Yoruba ethnic group in the study population. The weight, body mass index, facial height, facial width

and nasal width in Yoruba ethnic group is seen to be higher than in the Hausa ethnic group. However, the height in the two ethnic groups is seen not have any differences. But the nasal height in the Hausa ethnic group is seen to be higher than in the Yoruba ethnic group.

Table 4: Anthropometric Variables among the Male Subjects of the Study Population (n = 250)

Variables	Hausa(Male) Means±S.D	Yoruba(Male) Means±S.D	t-value	p-value
AGE(yrs)	21.74±2.01	21.03±2.30	2.592	.010
WT(kg)	58.16±8.09	64.11±8.85	-5.508	.000
HT(m)	1.69±0.07	1.71±0.09	-2.089	.038
BMI(kg/m ²)	20.37±2.77	21.82±2.60	-4.205	.000
FH(cm)	10.88±0.81	11.29±1.03	-3.561	.000
FW(cm)	13.25±0.79	13.43±1.07	-1.575	.117
FI (%)	82.29±7.04	84.37±8.37	-2.127	.034
NH(mm)	46.29±3.23	44.13±4.34	4.512	.000
NW(mm)	38.31±3.07	44.19±4.00	-13.141	.000
NI (%)	82.84±6.09	100.29±8.82	-18.506	.000

WT: Weight; HT: Height; BMI: Body Mass Index; FH: Facial Height; FW: Facial Width; FI: Facial Index; NH: Nasal Height; NW: Nasal Width; NI: Nasal Index

Table 4 showed the result of anthropometric variables of males in the study population which showed the presence of differences between the Hausa and the Yoruba ethnic groups. The age and the nasal height in the Hausa ethnic group are higher than in the Yoruba

ethnic group but the weight, height, body mass index, facial height, facial width and nasal width were seen to be higher in the Yoruba ethnic group than in the Hausa ethnic group.

Table 5: Anthropometric Variables among the Female Subjects in the Study Population (n=250)

Variables	Hausa female mean±S.D	Yoruba female mean±S.D	t-value	p-value
AGE(yrs)	20.27±1.89	20.40±2.20	-.521	.603
WT(kg)	59.02±13.26	60.18±10.74	-.762	.447
HT(m)	1.63±0.07	1.63±0.06	.444	.658
BMI(kg/m ²)	22.26±4.52	22.79±3.87	-1.003	.317
FH(cm)	10.41±1.35	10.98±1.52	-3.171	.002
FW(cm)	12.43±1.09	12.54±1.39	-.718	.473
FI (%)	84.11±13.03	87.27±15.43	-1.741	.083
NH(mm)	46.17±5.82	42.75±5.05	4.973	.000
NW(mm)	35.73±4.03	40.06±4.34	-8.147	.000
NI (%)	77.81±7.37	93.95±6.31	-18.651	.000

WT: Weight; HT: Height; BMI: Body Mass Index; FH: Facial Height; FW: Facial Width; FI: Facial Index; NH: Nasal Height; NW: Nasal Width; NI: Nasal Index

Table 5 showed the result of anthropometric variables of females in the study population which showed the presence of differences between the Hausa and Yoruba ethnic groups. There is no difference in age and height between the two ethnic groups. However,

the nasal height of the Hausa ethnic group is seen to be higher than in the Yoruba ethnic group. The weight, body mass index, facial height, facial width and the nasal width were seen to be higher in Yoruba ethnic group than in the Hausa ethnic group.

Table 6: Correlation Matrix of Anthropometric Parameters in the Study Population

Variables	AGE	WT	HT	BMI	FH	FW	FI	NH	NW	NI
AGE(yrs)	1	.152**	.213***	.037	.104*	.172**	-.029	.000	.092*	.094*
WT(kg)		1	.364**	.837**	.369**	.261**	.152**	.003	.179**	.169**
HT(m)			1	-.172**	.358**	.334**	.096*	.096*	.248**	.153**
BMI(kg/m ²)				1	.186**	.082	.109*	-.062	.026	.081
FH(cm)					1	.195**	.676**	.141**	.366**	.220**
FW(cm)						1	-.486**	-.012	.125**	.115**
FI(%)							1	.135**	.208**	.086
NH(mm)								1	.404**	-.463**
NW(mm)									1	.611**
NI (%)										1

**Correlation is significant at 0.01 level (2-tailed).*. Correlation is significant at 0.05 level (2-tailed).n=500; WT: Weight; HT: Height; BMI: Body Mass Index; FH: Facial Height; FW: Facial Width; FI: Facial Index; NH: Nasal Height; NW: Nasal Width; NI: Nasal Index

Table 6 showed the result of correlation matrix of the anthropometric variables of the subjects which showed negative a correlation between all the anthropometric variables.

Table 7 showed the result of the correlation matrix of the anthropometric variables of the Hausa ethnic group which showed a negative correlation between all the anthropometric variables.

Table 7: Correlation of Anthropometric Parameters of the Hausa Ethnic Group

Variables	AGE	WT	HT	BMI	FH	FW	FI	NH	NW	NI
AGE(yrs)	1	.022	.243**	-.081	.172**	.345**	-.091	.024	.198**	.198**
WT(kg)		1	.317**	.869**	.281**	.169**	.146*	.054	.015	-.040
HT(m)			1	-.163**	.412**	.302**	.176**	.075	.122*	.040
BMI(kg/m ²)				1	.096	.024	.075	-.003	-.069	-.065
FH(cm)					1	.238**	.733**	.044	.187**	.172**
FW(cm)						1	-.478**	-.106	.032	.130*
FI (%)							1	.122*	.145*	.053
NH(mm)								1	.600**	-.387**
NW(mm)									1	.497**
NI (%)										1

** . Correlation is significant at 0.01 level (2-tailed).*. Correlation is significant at 0.05 level (2-tailed). n=265; WT: Weight; HT: Height; BMI: Bbody Mass Index; FH: Facial Height; FW: Facial Width; FI: Facial Index; NH: Nasal Height; NW: Nasal Width; NI: Nasal Index

Table 8 showed the result of the correlation matrix of the anthropometric variables of the Yoruba ethnic

group which showed a negative correlation between all the anthropometric variables.

Table 8: Correlation Matrix of Anthropometric Variables among the Yoruba Ethnic Group

Variables	AGE	WT	HT	BMI	FH	FW	FI	NH	NW	NI
AGE(yrs)	1	.333**	.188**	.208**	.080	.041	.042	-.081	.124	.270**
WT(kg)		1	.424**	.787**	.424**	.351**	.126	.053	.216**	.204**
HT(m)			1	-.189**	.323**	.360**	.033	.128	.412**	.375**
BMI(kg/m ²)				1	.234**	.136*	.110	-.034	-.053	-.032
FH(cm)					1	.162*	.622**	.356**	.425**	.093
FW(cm)						1	-.503**	.078	.199**	.153*
FI (%)							1	.234**	.189**	-.052
NH(mm)								1	.713**	-.373**
NW(mm)									1	.369**
NI (%)										1

** . Correlation is significant at 0.01 level (2-tailed). * . Correlation is significant at 0.05 level (2-tailed). n=235; **WT**: weight; **HT**: height; **BMI**: body mass index; **FH**: facial height; **FW**: facial width; **FI**: facial index; **NH**: nasal height; **NW**: nasal width; **NI**: nasal index

Table 9: Estimation of Facial Index from Anthropometric Parameters in Studied Subjects (N=500)

Y	X	Equation	r ²	SEE	p-value
FI	AGE(yrs)	FI=73.480+AGE(0.038)	-.007	.095	.687
	WT(kg)	FI=73.480+WT(.002)	.001	.104	.988
	HT(m)	FI=73.480+HT(5.390)	.038	7.425	.468
	BMI(kg/m ²)	FI=73.480+BMI(.072)	.023	.285	.801
	FH(cm)	FI=73.480+FH(7.370)	.788	.188	.000
	FW(cm)	FI=73.480+FW(-6.413)	-.650	.185	.000
	NH(mm)	FI=73.480+NH(.117)	.049	.224	.601
	NW(mm)	FI=73.480+NW(-.117)	-.049	.256	.647
	NI (%)	FI=73.480+NI(.035)	.033	.114	.760

WT: Weight; **HT**: Height; **BMI**: Body Mass Index; **FH**: Facial Height; **FW**: Facial Width; **FI**: Facial Index; **NH**: Nasal Height; **NW**: Nasal Width; **NI**: Nasal Index

Table 9 showed that only the facial height and facial width can be used for the estimation of the facial index.

Table 10 showed that only the nasal height and nasal width can be used for the estimation of the nasal index.

Table 10: Estimation of Nasal Index from Anthropometric Parameters in the Studied Subjects (N=500)

Y	X	Equation	r ²	SEE	p-value
NI	AGE(yrs)	NI=85.908+Age(.045)	.009	.038	.236
	HT(kg)	NI=85.908+ HT (-.016)	-.015	.041	.697
	WT(m)	NI=85.908+WT(1.942)	.014	2.946	.510
	BMI(kg/m ²)	NI=85.908+BMI(.068)	.022	.113	.545
	FH(cm)	NI=85.908+FH(2.946)	-.017	.152	.311
	FW(cm)	NI=85.908+FW(-.124)	-.013	.136	.364
	FI (%)	NI=85.908+FI(.005)	.006	.018	.760
	NH(mm)	NI=85.908+NH(-1.926)	-.848	.018	0.000
	NW(mm)	NI=85.908+NW(2.206)	.958	.019	0.000

WT: Weight; **HT**: Height; **BMI**: Body Mass Index; **FH**: Facial Height; **FW**: Facial Width; **FI**: Facial Index; **NH**: Nasal Height; **NW**: Nasal Width; **NI**: Nasal Index

Table 11: Relationship between Body Mass Index and Anthropometric Parameters Studied (N=500)

Variables	UW Mean±S.D	NW Mean±S.D	OW Mean±S.D	OB Mean±S.D	F	P
AGE(yrs)	20.29±1.94	20.92±2.21	21.90±1.58	19.74±2.58	7.290	.000
WT(kg)	49.03±5.31	59.33±7.48	68.92±6.83	90.26±9.99	184.479	.000
HT(m)	1.67±0.07	1.68±0.08	1.61±0.07	1.64±0.05	11.973	.000
FH(cm)	10.67±1.16	10.90±1.17	10.62±1.52	11.96±1.58	6.329	.000
FW(cm)	12.40±1.14	12.99±1.17	12.96±1.01	12.88±1.41	4.697	.003
FI(%)	86.79±12.88	83.88±10.75	82.06±11.26	94.02±17.70	6.397	.000
NH(mm)	46.30±4.42	44.72±4.75	43.90±5.91	45.80±5.32	2.873	.036
NW(mm)	38.86±4.08	39.54±4.97	39.02±4.41	38.82±5.50	.565	.639
NI(%)	84.39±10.01	88.78±11.08	89.93±11.43	85.15±11.87	3.823	.010

UW: Underweight; NW: Normal Weight; OW: Overweight; OB: Obese; HT: Height; WT: Weight; FH: Facial Height; FW: Facial Width; FI: Facial Index; NH: Nasal Height; NW: Nasal Width; NI: Nasal Index

Table 11 showed the presence of relationship between body mass index and the anthropometric parameters of the subjects studied except that there was no significant relationship between the body mass index with nasal height and nasal width.

Discussion

In this study, several anthropometric variables were studied such as height, weight, facial height, facial width, nasal height and nasal width. The anthropometric variables were used to calculate the body mass index (BMI), nasal index and facial index and their values compared between the Hausa ethnic group and the Yoruba ethnic group. In this study, it was observed that the facial indices were seen to be higher in females with a mean ± standard deviation of 85.77±14.40, which agrees with the study conducted by Shetti *et al.* (2011) which observed the facial index of females to be higher than that of the males. Although females were observed to have a higher facial index, the facial length of the males in this study was found to be higher than that of the females. Oludiran *et al.* (2012) reported that the facial and nasal indices were both higher among the male than the female. Also, nasal indices were higher in males compared to females, which agreed with the study carried out by Anas & Saleh, (2014). In this study, the naso-facial indices of the two tribes were studied and it was observed that the Hausa had a mean±S.D of 80.58±7.13 for nasal index and 83.11±10.19 for facial index. The Hausa were seen to have a mesorrhine nose type. This is in accordance with the study by Anas & Saleh, (2014) on nasal index of the Hausa and the Yoruba. They found that the Hausa possessed a Mesorrhine nose type. The result also showed that the Hausa have a Euriprosopic face type,

which was not in accordance with the study of Oludiran *et al.* (2012) on facial index of the major tribes in Nigeria: Yoruba, Hausa and Igbo who were to be prevalently mesoprosopic. This implied that there was no significant variation in the facial forms among the three tribes. The Yoruba were seen to have a platyrrhine nose type with a nasal index of 96.76 ± 8.14 which was in accordance with the study conducted by Oladipo *et al.* (2009) and Mesoprosopic face types. The naso-facial indices of the Hausa males are Mesorrhine while those of the Yoruba are platyrrhine. Those of the female Hausa are Mesorrhine, while those of the female Yoruba are platyrrhine. This refutes the findings of the study conducted by Mohammad *et al.* (2018) in which it was reported that the males Hausa have mesorrhine type of nose, while the females have leptorrhine nose types. However, the Hausa were seen to have a higher nasal height than the Yoruba who have a higher nasal width. This is not in accordance with the previous studies carried out by Risley *et al.* (1915) in which it was revealed that African people have a platyrrhine type of nose. In this study, a correlation of all anthropometric parameters studied was done to know the degree of relationship. It was seen that a significant relationship exists between some of the variables. The age did not have a significant correlation with the nasal height and the facial index. However, it does have a significant correlation with the facial height, which is in accordance with study conducted by Baral *et al.* (2010) which revealed that facial height proportions vary in different age groups.

The nasal index, the nasal width and nasal height have no significant correlation with the BMI which is in accordance with a study carried out by

Nadazdyova et al. (2017), which found out that BMI has no significant effect on some craniofacial parameters. In this study, the anthropometric parameters studied were used to estimate the facial index and it was observed that only the facial height and the facial width were significant predictors of facial index in both ethnic groups. Only the nasal width and height were significant predictors of nasal index among both Hausa and Yoruba. This was not in agreement with study by carried out Krishan, (2008) which found that there was a strong correlation between cranial parameters. In this study, the relationship between anthropometric parameters and BMI categories of the subject studied: underweight, normal weight, overweight and obese subjects were analyzed. It was observed that the obese subjects have a higher facial index than the others. This corroborated the study conducted by Raadsheer et al. (1996), which found a strong correlation between facial morphology and BMI. Furthermore, it was observed that underweight subjects have the lowest facial width value.

Conclusion

The Yoruba ethnic group were seen to have platyrrhine nose type and mesoprosopic face type, while the Hausa have mesorrhine nose types with euriprosopic face types. Sexual dimorphism exists in both ethnic groups. Prediction of naso-facial indices can be done using facial length, facial width, nasal width and nasal length.

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TM; Conceptualization, study design and drafting of the manuscript. GM; data collection, SAA; data analyses, PAS; revision of the intellectual content, AJ; data analyses.

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