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Somatometry of the Head Shape and Nasofrontal Angle of the Aborigines in Gas-Flaring and Non-Gas-Flaring Communities in Bayelsa State, Nigeria

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Abstract

A study on craniofacial indices is key to rhinoplasty planning, head shape evaluation, and ergonomics. This study emphasizes the shape of the head and nasofrontal angle in Gas-flaring and No-gas-flaring communities in Bayelsa state, Nigeria. 1500 adult volunteered participants (760 male and 740 females) between the ages of 18-45 years from seventeen ^[17] communities in Bayelsa State of Nigeria. Eight ^[8] gas -flaring such as Imiringi [Civic arean], Obuna [Playground], Brass Island, Oporoma [Town hall], Tebidaba [Open ground], Ogboinbiri [Town hall], Peremabiri [Town hall], Koluama [Open ground], and nine ^[9] Non-Gas- flaring communities which include Yenagoa, Kaiama [Park], Ekowe [UAC playground], Nangi-Ama [Town hall], Abgura [Town hall], Anyama [School field], Oweikorogha [Town hall] and Amassoma [Town hall], and Ekeremor [Open park]. The study duration is from 20TH March 2022 to 19th October 2022. Nasofrontal Angle, Head

Length, Head Breadth, and Cephalic Index were the studied parameters. The results showed, Nasofrontal angle, Head Length, Head Breadth, and Cephalic index as 128.20 ± 0.95 , 176.54 ± 1.07 , 142.71 ± 1.00 , and 124.60 ± 1.12 for males of the Gas -Flaring Communities. The mean values of their female counterparts for Nasofrontal angle, Head Length, Head Breadth, and Cephalic index are 127.21 ± 1.90 , 168.82 ± 1.20 , 137.82 ± 1.52 , and 124.17 ± 1.74 . The results of the males from the Non-Gas -Flaring Communities for Nasofrontal angle, Head Length, Head Breadth, and Cephalic index are 125.84 ± 0.77 , 173.77 ± 1.13 , 142.91 ± 1.15 , and 122.24 ± 0.99 . The female values are 121.94 ± 1.41 , 174.90 ± 1.22 , 143.91 ± 1.14 , and 121.98 ± 0.95 respectively. In conclusion, both the males and females of the Bayelsans [Ijaws] in South-South Nigeria are broad-headed [Brachycephalic].

Keywords: Nasofrontal angle, Head Length, Head Breadth, Cephalic Index

1. Introduction

Craniofacial anthropometric parameters are believed to specify the sex, age, and racial existence of an unknown person ^[1]. The study on Ekowe People showed biparietal diameter B(head breadth) as 16.50 ± 1.82 and 16.23 ± 1.73 for males and females. The mean occipitofrontal diameter (head length) was 28.03 ± 1.35 and 27.58 ± 1.04 for males and females. The cephalic index was 59.07 ± 7.17 and 58.98 ± 6.91 for males and females. Sexual dimorphism was observed in occipitofrontal diameter and the difference was statistically significant ($p < 0.0$) ^[1]. Radix or nasofrontal angle has a special concern in rhinoplasty. Minimal changes in the position of the nasofrontal angle can produce a different image of nasal and midfacial length in the profile view. In a patient with a high radix, the profile of the forehead continues into the nose in a straight line and the nose appears too long. On the other hand, the deep nasofrontal angle makes the illusion of a short nose ^[2]. The angle between the nose and the forehead. It is the angle of demarcation between the forehead and dorsum of the nose. It is an anatomic location used in the analysis of the face, especially on profile views. It is used to define the overall size and angle of the nose in comparison to the rest of the face. There are typical angles for this ^[3]. The cephalic index is used in anthropology for the determination of the head contour in the horizontal plane. When the index is under 74.9 it is called dolichocephalic; between 75.0 and 79.9, mesocephalic; and above 80.0, brachycephalic ^[4]. There is a significant ($p < 0.001$) association between low cephalic index with mentally retarded children when compared with the normal group. The mean cephalic index points to dolichocephalic among mentally retarded children while mesocephalic among normal children ^[5]. The nasofrontal angle of an idealized silhouette male Caucasian profile image was altered incrementally between 106 and 148 degrees. Images were rated on a Likert scale by pretreatment patients ($n = 75$), laypeople ($n = 75$), and clinicians ($n = 35$). The results demonstrated that a

nasofrontal angle of approximately 130 degrees is ideal, corresponding to a lower component of 60 degrees, with a range of 127 to 142 degrees deemed acceptable. Angles above or below this range are perceived as unattractive, and anything outside the range of 118 to 145 degrees is deemed very unattractive. Reduced nasofrontal angles, simulating a nasal hump deformity, of less than 115 degrees were deemed the least attractive^[6]. A carefully performed facial analysis can serve as a strong foundation for successful facial reconstructive and plastic surgeries, rhinoplasty, or orthodontics^[7]. A study of the facial features and qualities of the Igbo Nigerian adult male using photometry was conducted on 120 subjects. The frontal and right lateral view photographs of their faces were taken and traced out on tracing papers. two vertical distances [nasion to subnasal and subnasale to menton], and four angles, nasofrontal (NF), nasofacial, nasomental (NM), and mentocervical, were measured. The result showed that the Igbo Nigerian adult male had a middle face that was shorter than the lower one (41.76% vs.58.24%), a moderate glabella (NF=133.97°), a projected nose (NM=38.68°), and a less prominent chin (NM=125.87°)^[7]. This study is to evaluate the head shape and nasofrontal angle of the Ijaws in the Gas-flaring and Non-gas-flaring communities.

2. Materials and method

Materials used in this study include a sliding digital caliper, camera, notebooks, pen, and a Goniometer.

Study design

This is cross-sectional research and convenient sampling was carried out on 1500 adult volunteered participants (760 males and 740 females) between the ages of 18-45 years.

Study location / duration

The data of this research was collected from the following seventeen^[17] communities in the Bayelsa State of Nigeria. Eight^[8] gas -flaring such as Imiringi [Civic arean], Obuna [Playground], Brass Island, Oporoma [Town hall], Tebidaba [Open ground], Ogboinbiri [Town hall], Peremabiri [Town hall], Koluama [Open ground], and nine^[9] Non-Gas- flaring communities which include Yenagoa, Kaiama [Park], Ekowe [UAC playground], Nangi-Ama [Town hall], Abgura [Town hall], Anyama [School field], Oweikorogha [Town hall] and Amassoma [Town hall], and Ekeremor [Open park]. The study duration is from study 20TH March 2022 to 19th October 2022.

3. Methods

1. Nasofrontal Angle: The recorded angle between the

forehead and the dorsum of the nose using a goniometer.

2. Head Length [Occipitofrontal diameter]: The measured distance from the glabella to the inion.
3. Head Breadth [Biparietal diameter]: The measured distance between the two parietal bones.
4. Cephalic Index: Head breadth multiplied by 100 divided by Head length.

Inclusion Criteria

1. All subjects/participants were indigenes of Bayelsa State including their parents and grandparents.
2. All subjects have lived their entire life in these communities.
3. Subjects were free from facial and head deformities.

Exclusion criteria

1. Deformed subjects were excluded
2. Non-indigenes from these communities were excluded

Ethical Measures

Verbal permission to conduct this research was obtained from the authorities [Paramount Rules, Youth Leaders] of these communities before commencement. The participants were enlightened on the purpose of the research. Verbal informed consent was sought from the volunteered participants before the commencement of measurement procedures.

Statistical Analysis

The data were computed and analyzed using Statistical Package for Social Sciences [SPSS] version 22.0 software. The Mean, Standard Deviation, Standard Error, Z- Test were used to summarize the results. P- value less than (0.05) was considered significant.

4. Results

The data from this study were statistically analyzed, and the results indicate mean Nasofrontal angle, Head Length, Head Breadth, and Cephalic index as 128.20±0.95, 176.54±1.07, 142.71±1.00, and 124.60±1.12 for males of the Gas –Flaring Communities. The mean values of their female counterparts for Nasofrontal angle, Head Length, Head Breadth, and Cephalic index are 127.21±1.90, 168.82±1.20, 137.82±1.52, and 124.17±1.74. The results of the males from the Non-Gas –Flaring Communities for Nasofrontal angle, Head Length, Head Breadth, and Cephalic index are 125.84±0.77, 173.77±1.13, 142.91±1.15, and 122.24±0.99. The female values are 121.94±1.41, 174.90±1.22, 143.91±1.14, and 121.98±0.95 respectively.

Table 1: Mean values of the Anthropometric Parameters

S. No	Study area	Sex	Nasofrontal Angle	Head Length	Head Breadth	Cephalic Index
1	Gas-Flaring Communities	M	128.20±0.95	176.54±1.07	142.71±1.00	81.24± 0.73
		F	127.21±1.90	168.82±1.20	137.82±1.52	81.93± 1.072
2	Non-gas –flaring Communities	M	125.84±0.77	173.77±1.13	142.91±1.15	82.47± 0.65
		F	121.94±1.41	174.90±1.22	143.91±1.14	82.49± 0.66

Mean±Sem

M=Male

F= Female

Table 2: Test of Significance Between Males and Females of Gas-Flaring Communities

S. No	Parameter	Calculated "Z"	Tabulated "Z"	Inference
1	Nasofrontal Angle	-0.42	1.96	p>0.05
2	Head Length	0.72	1.96	p>0.05
3	Head Breadth	2.72	1.96	P<0.05 xxx
4	Cephalic Index	-0.53	1.96	p>0.05

Key: xxx = Significance

Table 3: Test of Significance Between Males and Females of Non- Gas-Flaring Communities

S. No	Parameter	Calculated "Z"	Tabulated "Z"	Inference
1	Nasofrontal Angle	-0.22	1.96	p>0.05
2	Head Length	-0.68	1.96	p>0.05
3	Head Breadth	-0.62	1.96	p>0.05
4	Cephalic Index	-0.03	1.96	p>0.05

Table 4: Significance Test of the Males Between Gas-Flaring and Non-Gas-Flaring Communities

S. No	Parameter	Calculated "Z"	Tabulated "Z"	Inference
1	Nasofrontal Angle	1.93	1.96	p>0.05
2	Head Length	1.78	1.96	p>0.05
3	Head Breadth	-0.13	1.96	p>0.05
4	Cephalic Index	-1.26	1.96	p>0.05

Table 5: Significance Test of the Females Between Gas-Flaring and Non-Gas-Flaring Communities

S. No	Parameter	Calculated "Z"	Tabulated "Z"	Inference
1	Nasofrontal Angle	2.23	1.96	P<0.05 xxx
2	Head Length	-3.57	1.96	P<0.05 xxx
3	Head Breadth	-3.21	1.96	P<0.05 xxx
4	Cephalic Index	-0.45	1.96	p>0.05

Key: xxx = Significance

Table 6: Percentage of Head Shapes

S. No	Category	Sex	Head Shape	Percentage [%]
1	Gas -Flaring	M	Dolichocephalic	24.3
			Mesocephalic	19.3
			Brachycephalic	56.4
		F	Dolichocephalic	20.8
			Mesocephalic	13.9
			Brachycephalic	65.3
2	Non-Gas-Flaring	M	Dolichocephalic	11.6
			Mesocephalic	24.8
			Brachycephalic	63.6
		F	Dolichocephalic	9.9
			Mesocephalic	26.7
			Brachycephalic	63.4

M=Male

F= Female

Table 7: Cephalic Indices of Present and Previous Studies

S. No	Author Tribe/Race	Sex	Cephalic Index	Head Type
1	Present Bayelsa Study [Ijaws] 2022	M	81.86±0.69	Brachycephalic
		F	82.21±0.87	Brachycephalic
2	Oladipo <i>et al.</i> (2009) Ogoni	M	111.18	Brachycephalic
		F	75.09	Mesocephalic
3	Jervas <i>et al.</i> (2016) Igbos	M	68.80	Dolichocephalic
		F	73.60	Dolichocephalic
4	Oladipo and Paul (2009) Itsekiri	M	94.41	Brachycephalic
		F	82.16	Brachycephalic
5	Yagain <i>et al.</i> (2012) Mongoloid	M	77.92	Mesocephalic
		F	80.85	Brachycephalic
6	Sunita <i>et al.</i> (2015) Australoid	M	77.28	Mesocephalic
		F	78.38	Brachycephalic
7	Anitha <i>et al</i> (2011) Caucasians	M	79.14	Mesocephalic
		F	80.74	Brachycephalic

M=Male

F= Female

Table 8: Nasofrontal angle of present and previous studies

S. No	Author [Tribe/Race]	Sex	Nasofrontal Angle [degree]
1	Present Bayelsa Study, 2022 [Ijaw]	M	127.02±0.86
		F	124.58±1.66
2	Chisom <i>et al.</i> , 2013. Ibo Nigeria	M	127.10±0.55
		F	131.70±0.53
3	Chisom <i>et al.</i> , 2013 Yoruba	M	127.90±0.69
		F	134.30±0.57
4	Anibor and Okumagba, 2010. Orhobo Nigeria	M	132
		F	
5	Anibor and Okumagba, 2010. Itsekiri Nigeria	M	132
		F	
6	Himachali Indian	M	134
		F	
7	North American	M	123
		F	

M=Male

F=Female

5. Discussion

Morphometric anthropometry has been useful in surgical procedures, predictive anatomy, and ergonomics. The present study has shown that there is no significant difference in the nasofrontal angle, head length, and cephalic index but a significant difference exists in head breadth ($p<0.05$) where the males possess a wider biparietal diameter between the males and females of the Gas-flaring communities [Table 2]. In this study, no significant difference was recorded in all the parameters between the males and females of the Non-gas-flaring communities [Table 3].

Inter-comparison of the males between the Gas-flaring and the Non-gas-flaring communities showed no significant difference in all the parameters [Table 4]. Consequently, the females of the Gas-flaring communities significantly possess a higher nasofrontal angle and smaller head length and breadth ($p<0.05$) which is shown in [Table 5]. The results also showed that the males of the Gas-flaring communities are 24.3 % dolichocephalic, 19.3% mesocephalic, and 56.4% brachycephalic in their head shapes. While their females are 20.8% dolichocephalic, 13.9% mesocephalic, and 65.3% brachycephalic shaped head. The males of the non-gas-flaring communities are 11.6% dolichocephalic, 24.8% mesocephalic, and 63.6% brachycephalic head-shaped. While their females possess 9.9% dolichocephalic, 26.7% mesocephalic, and 63.4% brachycephalic head shapes as shown in [Table 6]. In this study, the males possess a wider nasofrontal angle than the females. The nasofrontal angle of the Bayelsans [Ijaws] is lower compared to the Itsekiri, Orhobos, Yoruba, and the Ibos of Nigeria [Table 7].

6. Conclusion

It is evident from this study that both the males and females of the Bayelsans [Ijaws] of South-South Nigeria are broad-headed [Brachycephalic]. A clear data bank has been established, which is useful to Forensics, Surgeons, Anatomists, and Ergonomic Companies.

7. Acknowledgement

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8. Conflict of Interest

No conflict of interest.

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