INTERNATIONAL JOURNAL OF ADVANCED SCIENTIFIC AND TECHNICAL RESEARCH

Available online on http://www.rspublication.com/ijst/index.html
ISSN 2249-9954

ARTICLE INFO

Paper ID: IJASTR-6A18260B38F24
Published: 2026-06-01
DOI: https://dx.doi.org/10.5281/zenodo.20485321
Page No: 18/1-18/15

Original Article:

MORPHOMETRIC ANALYSIS OF THE INFRAORBITAL FORAMEN IN RELATION TO FACIAL LANDMARKS IN ADULT NIGERIAN SKULLS

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Cite This Paper: Gospel Uchechukwu Collins, Israel Ukie Gwunireama and Kennedy Iregbeyanse Ebhojaye(2026). "MORPHOMETRIC ANALYSIS OF THE INFRAORBITAL FORAMEN IN RELATION TO FACIAL LANDMARKS IN ADULT NIGERIAN SKULLS". *INTERNATIONAL JOURNAL OF ADVANCED SCIENTIFIC AND TECHNICAL RESEARCH (IJASTR)*, vol. 16, Issue 3, 2026, pp. 18/1-18/15. DOI: https://dx.doi.org/10.5281/zenodo.20485321

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

ABSTRACT

The infraorbital foramen is an important anatomical landmark on the maxilla that transmits the infraorbital neurovascular bundle and is routinely used for regional anesthesia and midfacial surgical procedures. Because its position, size, shape, and number may vary between individuals and populations, accurate morphometric data are essential for safe clinical practice. This study aimed to document the morphometric characteristics, shape variations, and occurrence of accessory infraorbital foramina in adult Nigerian skulls and to assess side and sex differences. A cross-sectional descriptive study was conducted on 100 dry adult human skulls (200 sides) obtained from anatomy departments in southern Nigeria. Linear measurements from the infraorbital foramen to selected facial landmarks were obtained using a digital Vernier caliper, and morphological features were recorded. Data were analyzed using descriptive statistics, paired sample t-tests for side comparison, and independent sample t-tests for sex differences, with significance set at $p < 0.05$. The infraorbital foramen was located approximately 28.5 mm from the facial midline and 7–8 mm inferior to the infraorbital margin. Bilateral symmetry was generally observed, although a small but significant right–left difference was noted for the infraorbital foramen–infraorbital margin distance. Males showed significantly larger infraorbital foramen–midline and infraorbital foramen–margin distances than females. Morphologically, the oval shape was predominant (69%), followed by round (30.5%) and rare semilunar forms (0.5%). Accessory infraorbital foramina were uncommon, occurring in 3% of sides, with rare bilateral presentation confined to males. These findings highlight sex- and side-related variations in infraorbital foramen anatomy and provide population-specific reference data relevant for anesthesia, maxillofacial surgery, and forensic applications in Nigeria

Key words: Infraorbital foramen; Morphometry; Foramen shape variations; Nigerian skulls

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INTRODUCTION

The infraorbital foramen is a paired opening on the maxillary bone located beneath the infraorbital margin, typically about 4-12 mm from the margin, and forms the anterior exit of the infraorbital canal; it is oriented inferior-medially and transmits the infraorbital nerves and vessels. Compared with the supraorbital foramen, the infraorbital foramen tends to have a larger diameter and differs in shape, precise location, and orientation (Salam, 2004; Chrcanovic et al., 2011; Oliveira-Junior et al., 2012). The orbital area above the foramen, marked by subtle wrinkles at the zygomatic-maxillary suture, is a common site for regional anesthesia targeting the infraorbital structures (Teixeira et al., 2001).

The infraorbital nerve continues from the maxillary nerve through the infraorbital canal and divides into palpebral, nasal, and labial branches that supply sensory innervation to the maxillary sinus mucosa, conjunctiva, lower eyelid skin, lateral external nose, upper lip, maxillary teeth, and adjacent gingiva (Salam, 2004; Chrcanovic et al., 2011; Gour et al., 2012). Precise knowledge of these branches and their relationship to the foramen reduces the risk of sensory deficits following surgery and improves the efficacy of regional blocks.

Morphometric studies of supraorbital and infraorbital landmarks confirm both absolute sex differences and conserved proportional relationships: Chrcanovic et al. reported mean infraorbital nerve location near 6.5 mm below the inferior orbital rim, ~25 mm from the midline, and ~43 mm below the supraorbital foramen, with many measures differing by sex but ratios to facial landmarks remaining similar between sexes (Chrcanovic et al., 2011). In a larger Nigerian sample, precise distances from the infraorbital foramen to the piriform aperture, infraorbital margin, and anterior nasal spine were documented (right: 19.36±3.54 mm, 6.94±2.57 mm, 30.02±3.55 mm respectively; left: 18.27±2.94 mm, 7.83±1.86 mm, 29.01±3.59 mm respectively) with significant side differences and a common vertical orientation toward the second premolar, underscoring local population variation (Ukoha et al., 2014).

Orish et al. found greater male distances from IOF to the infraorbital margin (7.46±0.18 mm vs 5.72±0.84 mm in females) and a predominance of oval foramina shapes (Orish et al., 2015). Contemporary studies using dry skulls and three-dimensional imaging report similar trends high frequency of oval shapes, measured landmark distances useful for surgical planning, and sex- and side-related differences detectable with advanced morphometrics (Cengiz et al., 2025; Özşahin et al., 2025).

Across populations the IOF shows shape diversity (oval, round, semilunar, triangular) with the oval form most often reported. Population, sex, and laterality effects are inconsistent: some authors report larger IOF–IOM distances in certain populations or on the right side and sex differences in localization, while others find no significant laterality effect highlighting the need for population-specific reference data for safe anesthesia and surgery. These mixed findings are reflected across multiple reports and reviews. (Ebogo et al., 2021; Ongeti et al., 2008; Ceri and Ipek, 2020; Thilakumara et al., 2021; Singh and Rabi, 2021; Mahajan et al., 2023; Saran et al., 2023; Moodley et al., 2023; Jayanthi, 2020).

Because the infraorbital foramen can vary in size, symmetry, and number of accessory foramina, documenting these variations is essential for periorbital surgical planning and for performing reliable infraorbital nerve blocks during extensive facial repairs (Salam, 2004; Chrcanovic et al., 2011; Berge & Bergman, 2001). The infraorbital nerve block remains a cornerstone for anesthesia

DOI: 10.5281/zenodo.20485321
ISSN 2249-9954
Volume16, Issue. 3, 2026

in this region (Standring, 2020; Yadav et al., 2023). Given probable regional and ethnic differences, the aim of this study was to provide morphometric data on the infraorbital foramen in relation to selected facial landmarks. this will establish a necessary anatomical and morphometric reference for local clinical and forensic applications.

MATERIALS AND METHODS

Research Design

This study employed a cross-sectional descriptive design to investigate the morphological and morphometric characteristics of the infraorbital foramen in a Nigerian population using dry adult skulls. A total of 100 adult skulls of undetermined age and ethnicity were examined, analyzing both the right and left sides, giving a total of 200 sides for measurement. The study focused on providing detailed anatomical data relevant for clinical and surgical applications.

Study Area

The research was conducted in the South-Southern and South-Eastern regions of Nigeria, with samples collected from the Anatomy Departments of selected medical schools. Only adult skulls that met the study's inclusion criteria were carefully selected to ensure reliable and representative morphometric data.

Sampling

A total of one hundred (100) adult human skulls were utilized for this study. A convenient sampling technique was employed to obtain the skulls, as this method allowed the inclusion of specimens that were readily accessible and met the study's inclusion criteria.

Selection Criteria

The following criteria were considered in the selection of samples for the study:

1. All samples were adult crania. The principal criteria used to determine adult status was the complete fusion of the spheno-occipital synchondrosis and fully erupted third molars, if available.
2. Crania without any apparent abnormality showed in the area of orbital margin, supraorbital foramen, infraorbital foramen, piriformis aperture, maxillary and zygomatic bone of skulls.

Crania that did not meet up with the inclusion criteria of the study was excluded from the study.

Data Collection

A functional digital Vernier caliper with accurate reading in millimeter (mm) of 0.01mm measurement was used to take measurements. All measurements were done bilaterally and the measurement for each parameter was taken three times and the average value was used as our measured value.

The following landmarks were measured and recorded:

1. Distance from the Supraorbital Foramen to the Infraorbital Foramen.
2. Distance from the Infraorbital Foramen to facial midline.

DOI: 10.5281/zenodo.20485321
ISSN 2249-9954
Volume16, Issue. 3, 2026

3. Distance from the Infraorbital Foramen to Infraorbital Margin.

Morphological observations

1. Shape of the infraorbital foramen.
2. Presence of accessory foramina, with the largest or most prominent considered as the primary structure for analysis.

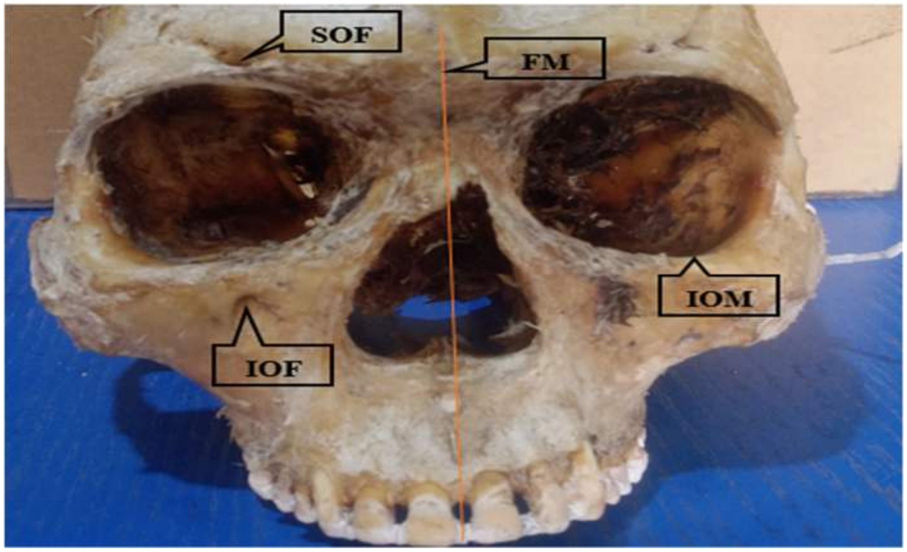

Figure 1: Bony landmarks of the face in relation to the Infraorbital foramen.
SOF= Supraorbital Foramen, IOF= Infraorbital Foramen, IOM= Infraorbital Margin, FM= Facial Midline.

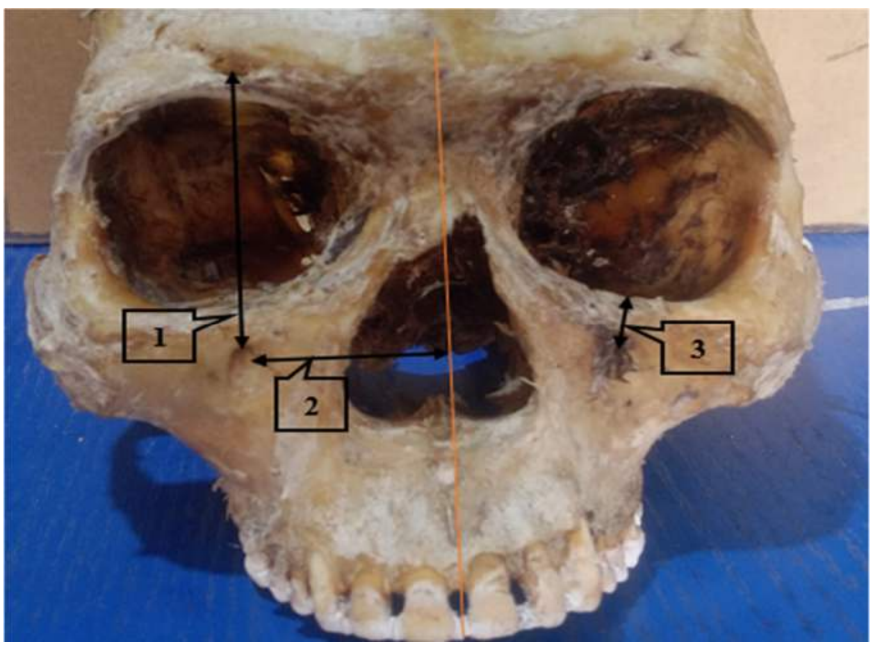

Figure 2: Measured distances. 1= From the Supraorbital foramen to the Infraorbital foramen, 2= From the Infraorbital foramen to the Facial Midline, 3= From the Infraorbital foramen to the Infraorbital Margin.

ISSN 2249-9954
Volume16, Issue. 3, 2026
Original Article

Methods of Data Analysis

The data collected in this study were analyzed using IBM's Statistical Package for the Social Sciences (IBM-SPSS) version 25. Descriptive statistics, including frequency, mean, standard deviation, and range (minimum and maximum values), were used to summarize the measurements. For the inferential statistics, paired sample t-test was used to analyze lateralization by comparing measurements between the right and left sides. Independent sample t-test was used to compare the mean values of males and females. Statistical significance was determined at a 95% confidence level, with p-values below 0.05 considered significant. Results was presented in detailed tables and figures to ensure clarity and effective communication of findings.

Ethical Approval

This study was approved by the Research Ethics Committee of the University of Port Harcourt, with the reference number: **UPM/CEREMAD/REC/MM111/150**.

RESULTS

The results of the study are presented in figures and tables, as follows:

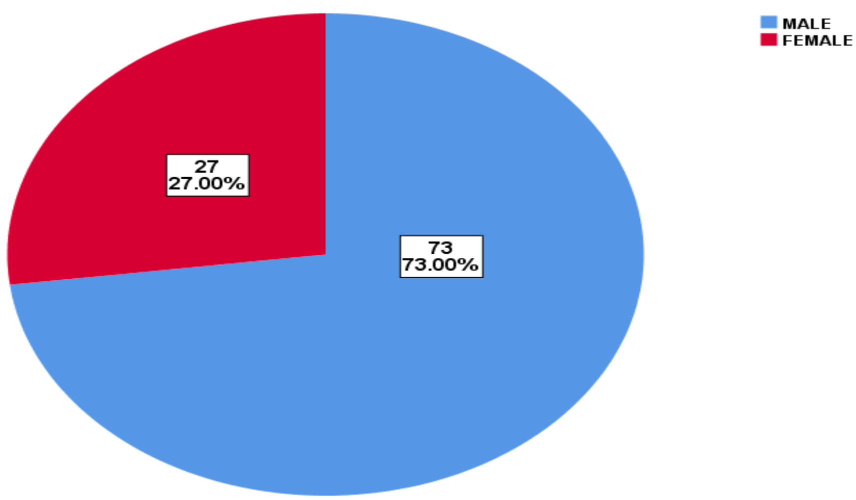

Figure 3: Demographic distribution of study specimen by sex (males and females).

Table 1: Descriptive statistics of the measured variables on the right and left sides of all samples.

	Right (n=100)			Left (n=100)		
Variables (mm)	**Min.**	**Max.**	**Mean±SD**	**Min.**	**Max.**	**Mean±SD**
SOF-IOF	37.29	48.78	43.85±3.05	37.73	50.92	43.48±3.26
IOF-FM	20.98	33.61	28.58±2.42	24.11	34.16	28.54±2.16
IOF-IOM	3.87	13.86	7.33±2.04	3.28	13.29	7.56±2.15

SD= Standard Deviation; Min= Minimum; Max= Maximum; mm= Millimeter; SOF= Supraorbital Foramen; FM= Facial Midline; IOF= Infraorbital Foramen; IOM= Infraorbital Margin; n= sample size.

ISSN 2249-9954
Volume16, Issue. 3, 2026
Original Article

Table 2: Descriptive statistics of the measured variables in male samples.

	Right (n=73)			Left (n=73)		
Variables (mm)	**Min.**	**Max.**	**Mean±SD**	**Min.**	**Max.**	**Mean±SD**
SOF-IOF	37.29	48.78	44.17±3.35	37.73	50.92	43.62±3.64
IOF-FM	23.76	33.61	29.04±2.08	24.75	34.16	29.10±2.00
IOF-IOM	3.87	13.86	7.62±2.05	3.28	13.29	7.70±2.27

SD= Standard Deviation; Min= Minimum; Max= Maximum; mm= Millimeter; SOF= Supraorbital Foramen; FM= Facial Midline; IOF= Infraorbital Foramen; IOM= Infraorbital Margin; n= Sample Size.

Table 3: Descriptive statistics of the measured variables in female samples.

Measure	Right (n=27)			Left (n=27)		
Variables (mm)	**Min.**	**Max.**	**Mean±SD**	**Min.**	**Max.**	**Mean±SD**
SOF-IOF	41.20	46.01	42.94±1.70	40.15	46.10	43.09±1.88
IOF-FM	20.98	32.80	27.31±2.83	24.11	30.89	26.91±1.76
IOF-IOM	4.28	10.10	6.53±1.82	4.25	10.01	7.13±1.70

SD= Standard Deviation; Min= Minimum; Max= Maximum; mm= Millimeter; SOF= Supraorbital Foramen; FM= Facial Midline; IOF= Infraorbital Foramen; IOM= Infraorbital Margin; n= Sample Size.

Table 4: Paired sample t-test of measured variables (mm) between the right and left sides of all samples.

				95% Confidence Interval of Difference					
	MD	**SD**	**SEM**	**Lower**	**Upper**	**t-value**	**df**	**p-value**	**Inference**
SOF-IOF	0.11	2.51	0.33	-0.55	0.78	0.34	56	0.737	NS
IOF-FM	0.06	1.66	0.17	-0.28	0.40	0.37	93	0.716	NS
IOF-IOM	-0.31	1.04	0.11	-0.52	-0.09	-2.84	93	0.006	S

SD= Standard Deviation; MD= Mean Difference; SEM= Standard Error of Mean; t= t-value; df= Degree of Freedom; SOF= Supraorbital Foramen; FM= Facial Midline; IOF= Infraorbital Foramen; IOM= Infraorbital Margin; NS= Not Significant; S= Significant.

Table 5: Paired sample t-test of measured variables (mm) between the right and left sides of male samples

				95% Confidence Interval of Difference					
	MD	**SD**	**SEM**	**Lower**	**Upper**	**t-value**	**df**	**p-value**	**Inference**
SOF-IOF	0.25	2.72	0.42	-0.59	1.10	0.61	41	0.55	NS
IOF-IOM	-0.20	1.12	0.13	-0.47	0.07	-1.48	68	0.14	NS
IOF-FM	-0.06	1.62	0.19	-0.45	0.33	-0.31	68	0.75	NS

SD= Standard Deviation; MD= Mean Difference; SEM= Standard Error of Mean; df= Degree of Freedom; SOF= Supraorbital Foramen; FM= Facial Midline; IOF= Infraorbital Foramen; IOM= Infraorbital Margin; NS= Not Significant; S= Significant.

International Journal of Advanced Scientific and Technical Research
Available online on http://www.rspublication.com/ijst/index.html
DOI: 10.5281/zenodo.20485321
ISSN 2249-9954
Volume16, Issue. 3, 2026
Original Article

Table 6: Paired sample t-test of measured variables (mm) between right and left sides of female samples.

Variables (mm)	Mean	SD	SEM	95% Confidence Interval of Difference Lower	Upper	t-value	df	p-value	Inference
SOF-IOF	-0.29	1.83	0.47	-1.30	0.73	-0.60	14	0.56	NS
IOF-FM	0.40	1.74	0.35	-0.31	1.12	1.16	24	0.26	NS
IOF-IOM	-0.60	0.74	0.15	-0.90	-0.30	-4.06	24	0.00	S

SD= Standard Deviation; MD= Mean Difference; SEM= Standard Error of Mean; df= Degree of Freedom; SOF= Supraorbital Foramen; FM= Facial Midline; IOF= Infraorbital Foramen; IOM= Infraorbital Margin; NS= Not Significant; S= Significant.

Table 7: Independent sample comparison between males and females of the study specimen.

Variables (mm)	t-value	df	p-value	MD	SED	95% Confidence Interval Lower	Upper	Inference
SOF-IOF	1.422	136	0.157	0.87	0.61	-0.34	2.07	NS
IOF-FM	5.633	190	0.000	1.96	0.35	1.27	2.65	S
IOF-IOM	2.447	190	0.015	0.83	0.34	0.16	1.50	S

SED= Standard Error Difference; MD= Mean Difference; t= t-value; df= Degree of Freedom; SOF= Supraorbital Foramen; FM= Facial Midline; IOF= Infraorbital Foramen; IOM= Infraorbital Margin; S= Significant; NS= Not Significant

Table 8: Shapes of the Infraorbital Foramen

	Oval n(%)	Round n(%)	Semilunar n(%)
All Samples (n=200)	138 (69.0%)	61 (30.5%)	1 (.5%)
All Right Sides (n=100)	63 (63.0%)	37 (37.0%)	.
All Left Sides (n=100)	75 (75.0%)	24 (24.0%)	1 (1.0%)
Male Right Sides (n=73)	39 (53.4%)	34 (46.6%)	.
Male Left Sides (n=73)	50 (68.5%)	22 (30.1%)	1 (1.4%)
Female Right Sides (n=27)	24 (88.9%)	3 (11.1%)	.
Female Left Sides (n=27)	25 (92.6%)	2 (7.4%)	.
Male Bilaterally (n=73)	35 (47.95%)	20 (27.4%)	.
Female Bilaterally (n=27)	20 (74.07%)	2 (7.41%)	.

SOF= Supraorbital Foramen; SON= Supraorbital Notch; n= Sample Size

ISSN 2249-9954
Volume16, Issue. 3, 2026
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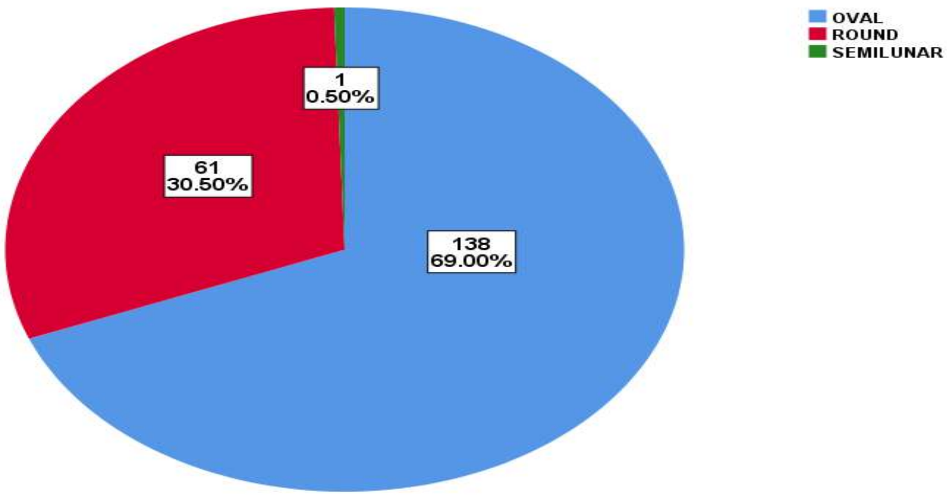

Figure 4: Frequency of the shape types of the infraorbital foramen.

Figure 5: Bilateral presence of Oval Shaped Infraorbital Foramen (OSIOF).

Table 9: Frequency of Accessory Infraorbital Foramina.

	Frequency	Percentage (%)
All Samples (n=200)	6	3
All Right Sides (n=100)	3	3
All Left Sides (n=100)	3	3
Male Right Sides (n=73)	3	4.11
Male Left Sides (n=73)	2	2.74
Female Right Sides (n=27)	0	0
Female Left Sides (n=27)	1	3.7
Male Bilaterally (n=73)	1	1.37
Female Bilaterally (n=27)	0	0

AIOF= Accessory Infraorbital Foramen.; n= Sample Size

DOI: 10.5281/zenodo.20485321
ISSN 2249-9954
Volume16, Issue. 3, 2026

DISCUSSION

Localization of the Infraorbital Foramen

The descriptive statistics indicate that the infraorbital foramen (IOF) shows general bilateral symmetry and stable relationships with the facial midline and infraorbital margin (Table 1). In the full sample, IOF–midline distances ranged from 20.98–33.61 mm on the right (mean = 28.58 ± 2.42 mm) and 24.11–34.16 mm on the left (mean = 28.54 ± 2.16 mm), while IOF–margin distances ranged from 3.87–13.86 mm on the right (mean = 7.33 ± 2.04 mm) and 3.28–13.29 mm on the left (mean = 7.56 ± 2.15 mm). Males (Table 2) consistently demonstrated larger IOF–midline and IOF–margin distances than females (Table 3), although side-to-side values were comparable within each sex. Inferential analysis (Tables 4–7) showed a small but significant right–left difference only for IOF–margin in the full sample (MD = −0.31 mm, $p = 0.006$), while IOF–midline distances were bilaterally symmetric. Paired comparisons within males and females revealed no significant side differences for either parameter, confirming intra-sex symmetry. However, independent t-tests demonstrated significant sex differences, with males showing larger IOF–midline distances in the full sample and on both sides (all $p < 0.01$), and larger IOF–margin distances in the full sample and on the right side only. Overall, these findings show that IOF placement is largely bilateral but exhibits clear and consistent sexual dimorphism in both horizontal and vertical dimensions.

Our mean IOF–margin (≈7.3–7.6 mm) is slightly larger than reported by Oliveira-Junior et al. (2012) (6.49 ± 1.68 mm right; 6.52 ± 1.82 mm left) but smaller than reported by Tungkeeratichai et al., (2013) (~9.5 mm in some groups). While Oliveira-Junior et al. (2012) found no contralateral difference, we observed a leftward increase overall and in females; Tungkeeratichai et al. (2013) reported no sex differences, whereas our data show sex-specific patterns. Such discrepancies likely reflect population and sampling differences, landmark definitions and measurement technique, and sample composition (age/sex). Other series (e.g., Chrcanovic et al., 2011) similarly report variable results.

These studies consistently reported sex-related and side-dependent differences, underscoring the difficulty of establishing a universally reliable reference point for localizing the infraorbital foramen. The evidence further suggests that such variations are strongly influenced by population-specific characteristics. In this study, Tables 10 and 11 provide a comparative analysis of Nigerian data with findings from other populations, highlighting differences between right and left sides as well as between male and female skulls, respectively.

International Journal of Advanced Scientific and Technical Research
Available online on http://www.rspublication.com/ijst/index.html
DOI: 10.5281/zenodo.20485321
ISSN 2249-9954
Volume16, Issue. 3, 2026
Original Article

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Table 10: Comparison of the measured variables of the infraorbital foramen on the right and left sides of the present study with previous studies.

S/N	Study	Population	IOF-FM			IOF-IOM			SOF-IOF		
			Right	Left	p-value	Right	Left	p-value	Right	Left	p-value
1	Boopathi et al., 2010	India				6.49±1.26	6.65±1.30	>0.05			
2	Chrcanovic et al 2011	Brazil	24.86±2.75	25.66±2.39	0.003	6.30±1.67	6.52±1.72	0.052	42.71±3.02	43.12±3.21	0.092
3	Gour et al., 2012	India				7.43±1.68	7.37±1.59	0.05			
4	Ukoha et al., 2014	Nigeria				6.94±2.57	7.83±1.86	0.023			
5	Orish et al., 2015	Nigeria				6.27±0.43	6.59±0.51				
6	Nanayakkara et al., (2016)	Sri Lanka				6.52±2.03	7.30±1.57	<0.05			
7	Ercikti et al., 2016	Turkey	29.75±2.35	30.85±3.00		8.70±1.10	8.85±0.85				
8	Martins-Junior et al 2017	Brazil				6.35±1.84	6.57±1.77	0.060			
9	Açıkgoz, 2021	Turkey	25.89±1.76	25.86±1.74	0.366	7.13±1.65	7.48±1.70	0.086	43.56±2.86	43.90±2.70	0.204
10	Thunyacharoen et al., 2022	Thailand				8.12±1.93	8.36±1.95		44.05±3.36	44.36±3.06	
11	Onashko et al., 2023	Ukraine	22.00±2.90	21.90±1.90	0.51						
12	Mahajan et al., 2023	India				5.81	6.25	0.07			
13	Cengiz et al., 2025	Turkey				8.12±1.56	8.68±1.45	0.014			
14	**Present Study, 2025.**	Nigeria	28.58±2.42	28.54±2.16	0.716	7.33±2.04	7.56±2.15	0.006	43.85±3.05	43.48±3.26	0.737

SOF= Supraorbital Foramen; FM= Facial Midline; IOF= Infraorbital Foramen; IOM= Infraorbital Margin; mm= Millimeter; p—value= Level of significance below 0.05

Table 11: Comparison of the measured variables of the infraorbital foramen in males and females of the present study with previous studies.

S/N	Study	Population	IOF-FM			IOF-IOM			SOF-IOF		
			Male	Female	p-value	Male	Female	p-value	Male	Female	p-value
1	Apinhasmit et al., 2006	Thailand	29.10±2.13	27.29±2.12	<0.001	9.53±2.23	8.71±1.51	0.004	45.41±2.88	44.15±2.94	0.002
2	Chrcanovic et al 2011	Brazil	26.48±2.58	24.37±2.41		6.63±1.75	6.35±1.67		43.43±3.24	42.67±3.03	>0.05
3	Gour et al., 2012	India				7.70±1.81	6.73±0.87	>0.05			
4	Orish et al., 2015	Nigeria				7.14±0.10	5.72±0.84				
5	Nanayakkara et al., (2016)	Sri Lanka				7.25±1.70	5.95±1.84				
6	Ercikti et al., 2016	Turkey	31.25±2.45	29.35±2.90		9.70±1.05	7.85±0.90				
7	Thunyacharoen et al., 2022	Thailand				8.55±2.06	7.94±1.83		44.85±3.45	43.56±2.97	
8	**Present Study, 2025**	Nigeria	29.07±2.04	27.11±2.29	0.000	7.66±2.16	6.83±1.76	0.015	43.89±3.49	43.01±1.79	0.157

SOF= Supraorbital Foramen; FM= Facial Midline; IOF= Infraorbital Foramen; IOM= Infraorbital Margin; mm= Millimeter; p-value= Level of significance below 0.05

DOI: 10.5281/zenodo.20485321
ISSN 2249-9954
Volume16, Issue. 3, 2026

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Accessory Infraorbital Foramina

Table 9 summarizes the frequency and distribution of accessory infraorbital foramina in 200 adult Nigerian skulls, showing that accessory infraorbital foramina were uncommon, occurring in 6 sides (3%) overall, with equal frequencies on the right (3%) and left (3%). Bilateral occurrence was rare and observed only in males (1.37%), with no bilateral cases in females. Overall, the findings indicate a low prevalence of accessory infraorbital foramina with mild side and sex differences, suggesting population-specific morphological and developmental influences, and allowing comparison with earlier reports (Gupta, 2008; Tomaszewska et al., 2012; Nanayakkara et al., 2016; Moodley et al., 2023).

The 3% incidence of accessory infraorbital foramina (Table 7) lies at the lower end of reported ranges, which vary widely across populations (Gour et al., 2012; Nanayakkara et al., 2016; Cengiz et al., 2025). Although some studies reported left-side predominance (Boopathi et al., 2010; Cengiz et al., 2025), our findings showed left-sided accessory infraorbital foramina in both sexes and right-sided ones only in males, while their lateral position agrees with reports by Iwanaga et al. (2020) and Moodley et al. (2023) but contrasts with the superomedial locations described by Cengiz et al. (2025). Collectively, these findings support a recurrent lateral anatomical pattern with clinical relevance for nerve blocks and surgery, while the marked variation in prevalence, side distribution, and bilaterality across studies underscores population-specific differences and methodological influences, highlighting the need for larger, standardized studies in Nigerian and West African populations (Ashwini et al., 2012; Boopathi et al., 2010; Cengiz et al., 2025; Iwanaga et al., 2020; Moodley et al., 2023; Nanayakkara et al., 2018).

Shape of Infraorbital Foramen

Table 8 shows clear morphological variation in infraorbital foramen shape among 200 adult Nigerian skulls, with a strong predominance of the oval form. Overall, 69% of foramina were oval, 30.5% were round, and only 0.5% were semilunar. Side-specific analysis revealed greater uniformity on the left side, where oval shapes accounted for 75%, compared with a more even distribution on the right (63% oval, 37% round); the single semilunar foramen (1%) was observed on the left. These findings indicate that the oval configuration is the dominant pattern in this population, particularly on the left side, suggesting lateral differences in infraorbital morphology.

Sex-based analysis further emphasizes these trends (Table 8). In males, the right side showed near parity between oval (53.4%) and round (46.6%) shapes, whereas the left side demonstrated a higher frequency of oval foramina (68.5%), including the only semilunar case (1.4%). Females showed a marked dominance of the oval shape on both sides (88.9% right, 92.6% left), with round forms being uncommon and no semilunar shapes observed. Bilaterally, males displayed mixed patterns, while females showed a high frequency of bilateral oval foramina. Together, these results indicate a strong population preference for the oval infraorbital foramen, particularly among females, pointing to possible sex-related developmental influences relevant to midfacial clinical procedures.

The predominance of the oval infraorbital foramen in this Nigerian sample aligns with several previous studies reporting oval shapes as the most common configuration (Orish et al., 2015; Oliveira-Junior et al., 2012; Nanayakkara et al., 2016; Cengiz et al., 2025; Moodley et al., 2023), including close agreement with the frequencies reported by Cengiz et al. (2025) and Oliveira-

ISSN 2249-9954
Volume16, Issue. 3, 2026

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Junior et al. (2012). However, contrasts exist with studies that found round or semilunar shapes to be more frequent (Jayanthi, 2020; Martins-Júnior et al., 2017; Nanayakkara et al., 2018). The near absence of semilunar forms in this study highlights possible population-specific differences and methodological factors

CONCLUSION

The infraorbital foramen is located approximately 28.5 mm from the midline and 7-8 mm below the infraorbital rim, with evidence of modest variation. Accessory infraorbital foramina were uncommon (3%) and consistently located lateral to the main exit. The infraorbital foramen is predominantly oval shaped (69%), with round shape in 31% and rare semilunar shapes. These results underscore the presence of individual, side, and sex-specific anatomical variations, highlighting the importance of careful preoperative assessment and individualized localization during orbital and midface procedures.

RECOMMENDATIONS

This study highlights important variability in the morphology and position of infraorbital foramen, which has direct implications for surgical and anesthetic procedures in the orbital and midface region. Clinicians are advised to consider the measured averages as useful guides (infraorbital foramen ≈ 28.5 mm from facial midline; infraorbital foramen ≈ 7-8 mm from the infraorbital margin) in the Nigerian population, but not as fixed landmarks, since side and sex related differences were observed. Accessory foramina, though uncommon, were always located laterally, and failure to account for them may result in incomplete nerve blocks or iatrogenic injury. Surgeons and anesthetists should therefore anticipate these variations, use careful palpation during procedures, and, where possible, incorporate imaging such as ultrasound for safer localization.

Acknowledgement

The authors want to appreciate the teaching and non-teaching staffs of the Department of Anatomy, in the Universities of Port Harcourt, Rivers State University, Niger Delta University, Bayelsa Medical University, PAMO University of Medical Science, Abia State University, and Gregory University, all situated in the south-south and south-eastern region of Nigeria, for their support by granting them (authors) access into their anatomy museum and gross anatomy dissection laboratory.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this paper.

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