

# Morphometric Study of the Supraorbital Notches and Foramina in Adult Human Skulls in South-South Nigeria

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## ABSTRACT

**Background:** The supraorbital foramen is a bony elongated path located above the orbit (eye socket) and under the forehead. The supraorbital foramen/notch transmits the supraorbital artery, veins and nerve. This study is aimed at determining the anatomical variation in size in respect to gender and content of the supraorbital foramen.

**Methods:** A morphometric study of the supraorbital foramen/notch was carried out on 120 human skulls (72 male, 48 female) from the Departments of Anatomy of the University of Benin, University of Calabar, Niger Delta University and University of Port Harcourt all in south-south Nigeria. A pair of dividers and a meter rule were used to measure the lengths and widths of the supraorbital notch/foramen and then placed on a meter rule for readings to be taken. Statistical analysis was carried out using SPSS analyzer software.

**Results:** The result revealed that the mean length of the supraorbital foramen in males is  $1.61 \pm 0.60$ mm for right and  $1.15 \pm 0.50$ mm for the left while in females it is  $1.91 \pm 0.60$ mm for the right and  $2.00 \pm 0.09$ mm for the left. The mean width of the supraorbital foramen in males is  $3.12 \pm 1.23$ mm for the right and  $3.18 \pm 1.21$ mm for the left while for the females it is  $3.17 \pm 1.05$ mm for the right and  $3.17 \pm 0.12$ mm for the left. The mean length of the supraorbital notch in males is  $2.24 \pm 0.60$ mm for the right and  $2.34 \pm 0.65$ mm for the left while for the females it is  $3.06 \pm 1.36$ mm for the right and  $2.53 \pm 0.65$ mm for the left. The mean width of the supraorbital notch in males is  $5.21 \pm 1.65$ mm for the right and  $5.40 \pm 1.89$ mm for the left while for the females it is  $4.97 \pm 0.18$ mm for the right and  $5.00 \pm 0.20$ mm for the left.

**Conclusion:** There is no significant difference between the length and width of the supraorbital foramina/notches in both males and females ( $P > 0.05$ ).

**Key Words:** Supraorbital notch, supraorbital foramina, Skulls, Southern Nigeria.

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## INTRODUCTION

A foramen is simply a passage. The supraorbital foramen is a bony elongated path located above the orbit (eye socket) and under the forehead. It lies directly under the eyebrow.

When the opening is completely surrounded by bony cartilage, it is known as the supraorbital foramen but if it is partially covered by bone, it is known as the supraorbital notch<sup>1</sup>. The supraorbital foramen/notch transmits the supraorbital artery, veins and nerve. These vessels and nerve supply the skin of the forehead, scalp, upper eyelid and nose<sup>2</sup>. An injury to these vessels and nerve will cause paralysis to the structures being supplied by them. A morphometric study of the supraorbital foramen will therefore entail a careful topographical anatomic examination of adult human skulls in order to ascertain the normal localization and dimensions of the foramen and notches for proper analysis<sup>3</sup>. A study was carried out on the anatomical variations of the supraorbital, infraorbital and mental foramina in relation to gender and size, and results showed that of the 110 adult skulls (70 male, 40 female) studied, the average distance from the left supraorbital foramen to midline in females was significantly lower than that in males ( $2.42 \pm 0.04$  and  $2.56 \pm 0.05$ ) respectively<sup>4</sup>. The anthropometric measurements and surgical relevance of the supraorbital notch/foramen in 106 Thai adult skulls has been reported. Results revealed that the mean horizontal width of the supraorbital notch was  $4.31 \pm 1.61$ mm and that of the supraorbital foramen was  $2.81 \pm 0.62$ mm. The notch/foramen was situated  $25.14 \pm 4.29$ mm lateral to the nasal midline,  $26.57 \pm 3.92$ mm medial to the temporal crest of frontal bone and  $3.15 \pm 1.29$ mm superior to the supraorbital rim<sup>5</sup>. It has been observed that supraorbital notches are present in 37.25% of cases on the right side and 33.33% on the left side in adult Nepalese human skulls<sup>6</sup>.

Accessory supraorbital foramina have been reported in both left and right sides in a study conducted on 45 Turkish dry skulls of unknown age and sex<sup>7</sup>. In 79 adult dried Indian skulls, supraorbital foramina were found to be approximately 25mm lateral to the midline, 30mm medial to the temporal crest of the frontal bone, 2-3mm superior to the supraorbital rim and branches of the supraorbital nerve were present in 14% of skulls<sup>8</sup>. Bilateral supraorbital notches have also been found in 44.25% of the 400 north Indian skulls studied while 18.25% demonstrated bilateral supraorbital foramina and 12.55% demonstrated a notch on one side<sup>9</sup>.

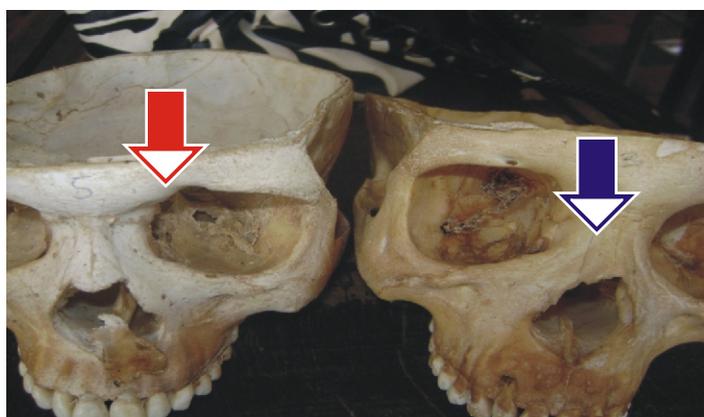
This study is aimed at determining the anatomical variation in size and gender of the supraorbital foramen/notches of skulls in our environment and to provide a data base.

## MATERIALS AND METHOD

This study was carried out using a total number of 60 dry human skulls (comprising 36 male and 24 female) which

were procured from dissecting rooms of the Departments of Anatomy, University of Benin, University of Calabar, Niger Delta University and University of Port Harcourt all in southern Nigeria. All the skulls were prepared using the standard anatomical procedures which includes: dissecting out the soft tissue as much as possible, soaking the detached heads in water at about 60°C for 12 hours to aid softening of tissues. An antiseptic (Dettol) was added into the water, covered and left to stand at room temperature for 10 days. Removal of soft tissue was done with the help of a sharp knife after thorough maceration. The skulls were collected and immersed in 20% caustic soda for 2 hours, rinsed in water and allowed to dry in the sun. The skulls were further immersed in 20% hydrogen peroxide for 3 days, rinsed in water, dried for 2 days and then polished. Measurements were obtained by using a pair of dividers to carefully span across the length and width of the right and left foramina/notches. The divider was then transferred to a meter rule for the readings to be taken.

**Fig 1. Picture showing supraorbital notch (Red arrow) / foramen (Blue arrow).**



Data was analyzed using SPSS soft ware analyzer.

**RESULTS**

The result of this study is as shown in the table below. Table 1 shows the mean length and width of the measured parameters (right and left) in both males and females. The mean showed that there was no significant difference between the supraorbital foramen and supraorbital notch in

**Table 1. Showing the mean length and width of the measured parameters in males and females.**

	Mean length (m.m) (Supraorbital foramen)		Mean width (m.m)		
	Right	Left	Right	Left	
Males	1.61±0.60	1.15±0.50	3.12±1.23	3.18±1.21	
Females	1.91±0.60	2.00±0.09	3.17±1.05	3.17±0.12	
(Supraorbital notch)					
Males	2.24±0.60	2.34±0.65	5.21±1.65	5.40±1.89	
Females	3.06±1.36	2.53±0.65	4.97±0.18	5.00±0.20	
		P>0.05		P>0.05	

N = 72 males , 48 Females.

**Table 2. Table showing the incidence of occurrence the measured parameters**

Parameter	Male	%	Female	%
Bilateral foramina	22	30.56	16	33.33
Bilateral notch	36	50.00	28	58.33
Double foramen	8	11.11	2	4.17
Absence of foramina/notch	6	8.33	2	4.17

N= 72for males, N = 48 for females.

males and females. Table 2 shows the incidence of occurrence of the measured parameters in male and female skulls.

**DISCUSSION**

A morphometric study on the supraorbital foramen/notch entails a careful topographical anatomic examination of the adult human skulls in order to ascertain the localization and dimensions of the foramen/notch<sup>3</sup>. The determination of the specific dimensions and location of the supraorbital foramina and notches are important landmarks frequently encountered in surgical operations. This study has shown that there is no significant difference between the length, width and shape of the supraorbital foramina/notches in both males and females. The notches varied in shape from broad flat designs to narrow key holes where as the foramina were ovoid in shape with longer axis lying in the horizontal plane. In one of the studies conducted, it was reported that the mean horizontal widths of the supraorbital notches and foramina obtained in Thailand were 4.31+/-1.61mm and 2.81+/-0.62mm respectively<sup>4</sup>. Also, in another study, it was reported that the mean width of the supraorbital notch/foramen was 4.7mm in a research conducted in Korea<sup>9</sup>. These results are not in line with what was obtained in this study since the values were higher. (5.21±1.65mm for right and 5.40±1.89mm for left mean width in males and in females 4.97±0.18mm for right and 5.00±0.20mm for left). The result of a study conducted on 400 north Indian skulls revealed the presence of bilateral foramina in 18.25% and 44.25% having bilateral notches while 12.55% had a notch on one side and a foramen on the contra-lateral side<sup>10</sup>. In the present study, bilateral foramen was also seen in 30.56% of the male skulls and 33.33% in the female skulls. 50% of the male skulls had bilateral notch while 58.33% of female skulls had bilateral notch. Multiple foramina have also been revealed to occur in 7.84% of skulls on the right side and 17.64% of skulls on the left side in Nepal<sup>6</sup>. There were no multiple foramina or notches observed on the skulls. It was observed that there were more notches than foramina in both the male and female skulls studied. Complete absence of notch or foramen may deprive the supraorbital nerves and vessels the protection given by these and make them more vulnerable to injuries at sharp supraorbital margins.

In conclusion, the results of the present study will serve as a guide to surgeons carrying out craniofacial surgery to avoid injury to the neurovascular bundles of the face and also assist anthropologists and forensic scientists in the localization and characterization of these foramina and notches.

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