

# A Morphometric Analysis of the Inter-Alar Width Among Isoko Ethnic Group of Nigeria

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## Abstract

**Introduction:** Anthropometry has been used in forensic science for the purpose of understanding human physical variation, in paleoanthropology and in diverse attempts to link physical, ethnic and psychological traits. The relationship between interalar width and mouth width can also provide insights into overall facial morphology as these measurements contribute to the golden ratio of the face.

**Objective:** The aim of this study was to measure and compare the interalar width of males and females among the Isoko ethnic group of Delta State, Nigeria.

**Materials and Methods:** This study was carried out in Ozoro, Delta State, Nigeria. The study is a cross-sectional study. The study population consisted of young adults who are of Isoko origin in Delta State, and their ages range between 18 – 27, from which a sample of 60 males and 60 females were drawn. Materials used for this study include a digital vernier caliper and a data sheet.

**Results:** Result showed that males had higher mean $\pm$ SD values of  $42.67\pm 3.79$  compared to that of the females having  $37.80\pm 2.43$ . Comparing age group with female nose width shows that there is no statistical significant difference between male nose width and age as the p-value (sig. 2-tailed) was 0.317 which is greater than 0.05. **Conclusion:** The findings of this study reveal notable sexual dimorphism in nasal width among the Isoko ethnic group, with males exhibiting significantly higher nasal widths compared to females.

**Keywords:** Interalar, Isoko, Anthropometry, Ethnic Group.

## INTRODUCTION

Anthropometry has been used in forensic science for the purpose of understanding human physical variation, in paleoanthropology and in diverse attempts to link physical, ethnic and psychological traits. Nowadays, it plays an esteemed role in industrial design, fashion design, ergonomics and architecture; where geometrical data about the distribution of body dimensions in the population are used to improve product dimensions. Features differentiating various ethnic groups were discovered when anthropometric methods were introduced into clinical practice; to quantify changes in the craniofacial framework. To successfully treat congenital or post-traumatic facial disfigurements in members of these groups, surgeons require access to craniofacial databases based

on accurate anthropometric measurements. Normative data of facial measurements are indispensable to precisely determine the degree of deviation from normal.<sup>1,2,3,4</sup> A morphometric study on interalar width (the distance between the outer edges of the nostrils) is essential in fields such as forensic anthropology, maxillofacial surgery, and orthodontics, where facial proportions play essential role in identification and aesthetic assessments.

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These measurements provide key data for understanding facial symmetry and ethnic or sex-related morphological differences. In particular, interalar width is closely related to nasal morphology which varies significantly across populations and is influenced by genetic, environmental and developmental factors. Studies show that the interalar width tends to differ by sex, with males generally having a broader nasal base than females.<sup>5</sup> This difference has implications for facial reconstruction in forensic contexts and in tailoring surgical procedures to improve nasal aesthetics or function.<sup>6</sup>

The relationship between interalar width and mouth width can also provide insights into overall facial morphology as these measurements contribute to the golden ratio of the face. Deviations from average proportions may indicate syndromic conditions or guide orthodontic and maxillofacial treatments aimed at restoring facial symmetry.<sup>7</sup> These dimensions are thus instrumental in designing prosthetics such as maxillofacial prosthetics and in creating more accurate anatomical models for clinical use. Interalar width, which describes the horizontal distance between the outermost points of the nostrils, is influenced by both genetic and environmental factors and serves as a critical metric in studies of facial morphology. In forensic anthropology, interalar width can aid in identifying an individual's ancestry and sex as studies indicate significant population-specific and sex-specific variations.<sup>8</sup> For example, research has demonstrated that African populations generally exhibit a broader interalar width compared to Asian and European populations, an adaptation likely related to climatic and evolutionary factors.<sup>9</sup> In reconstructive and aesthetic surgery, accurate interalar measurements are essential for achieving harmonious facial features particularly in rhinoplasty. For example, the ideal interalar width is often recommended to be roughly equal to the width of the mouth in a balanced face, contributing to aesthetic symmetry.<sup>10</sup> Disproportionate interalar width can lead to facial asymmetry, which can affect perceived attractiveness and requires surgical correction. This has led to the establishment of norms based on demographic data, allowing surgeons to tailor their procedures to specific ethnic and facial characteristics.<sup>11</sup> The relationship between interalar width and mouth width provides valuable insights in several fields. For instance, morphometric analysis of these features can support forensic identification by providing standards for facial reconstruction, especially in skeletal remains where soft tissue dimensions must be inferred.<sup>12</sup> A consistent correlation has been found between wider interalar width and wider mouth width particularly in males across various populations, highlighting patterns

that can be used to estimate unknown facial dimensions in forensic cases.<sup>13</sup>

In orthodontics, interalar and mouth width measurements are essential for assessing facial growth patterns and planning treatments that achieve ideal facial proportions. Variations in these measurements among individuals with malocclusions have been documented, showing that abnormalities in interalar or mouth width can affect overall dental and skeletal harmony.<sup>14</sup> Such morphometric data enable personalized orthodontic interventions that enhance not only dental alignment but also facial aesthetics. Ethnic differences in interalar and mouth width are widely documented. A study by Martins et al.<sup>15</sup> on a Brazilian population found that the mean interalar width was 35 mm in males and 32 mm in females, while the mouth width averaged 50 mm in males and 48 mm in females. These measurements tend to be larger in African-descendant populations and smaller in East Asian populations, which has practical implications for forensic reconstructions and medical treatments that seek to align with natural facial characteristics.<sup>15</sup> These population-specific norms are increasingly important in globalized clinical settings, where surgeons and forensic experts work with individuals from diverse backgrounds. Incorporating ethnicity-specific morphometric data into clinical and forensic practices allows for more accurate reconstructions and aesthetically pleasing results.<sup>16</sup>

## THEORETICAL REVIEW

**Nose:** The nose is a vital structure in the respiratory and olfactory systems playing an essential role in breathing, filtering air and detecting smells.<sup>17</sup> Structurally, the nose consists of external and internal components. The external nose includes the nostrils, which lead to the nasal cavity where air is warmed, filtered, and humidified before reaching the lungs.<sup>18</sup> Additionally, the nasal cavity contains olfactory receptors, which are specialized cells that allow humans to detect a wide range of odors, contributing to the sense of smell.<sup>19</sup> The nose also acts as the body's first line of defense against pathogens and environmental pollutants. The mucous membrane lining the nasal cavity traps particles, while cilia which are tiny hair-like structures, help move mucus and trapped particles out of the airway.<sup>20</sup> This filtering mechanism is essential in protecting the respiratory tract from harmful substances.<sup>17</sup> The aim of this study was to measure and compare the interalar width of males and females among the Isoko ethnic group of Delta State, Nigeria.

## MATERIALS AND METHODS

Materials that were used for this study include a digital vernier caliper and a data sheet. This study was carried out

in Ozoro, Delta State, Nigeria. The study is a cross-sectional study. The study population consists of young adults who are of Isoko origin in Delta State between the ages of 18-27. The sample size consists of 60 males and 60 females. Simple random sampling technique was used. Subjects inclusion criteria are that participants must be of Isoko origin, parents and grandparents (maternal and paternal) must be of Isoko origin, no facial surgery done. no facial deformity and must be of the age bracket (18-27)

### ETHICAL APPROVAL

For this study, ethical approval was obtained from the Research and Ethics Committee of Anatomy and Cell

### RESULTS

Results are presented as in the tables below:

**Table 1.** Descriptive statistics of male and female nose width

| Gender | N  | Max   | Min   | Mean  | Std  |
|--------|----|-------|-------|-------|------|
| Male   | 60 | 50.00 | 38.00 | 42.67 | 3.79 |
| Female | 60 | 43.00 | 33.00 | 37.80 | 2.43 |

Table 1 above shows the descriptive statistics of male and female nose width. From the statistics, males had higher mean $\pm$ SD values of 42.67 $\pm$ 3.79 compared to that of the

Biology, Faculty of Basic Medical Sciences, Delta State University, Abraka. This research also involved a verbal informed consent from all subjects stating the aim of the study and only those who agreed participate.

In this study, the direct method described by Anas and Sale <sup>21</sup> was used. In this method, a person sits on a chair in a relaxed condition with his or her head placed in anatomical position (directed interiorly) to measure his or her parameters. A digital type of sliding vernier caliper was used for measurements of which the values were recorded on a data sheet. Data collected were analysed using Statistical package for Social Sciences (SPSS).

females having 37.80 $\pm$ 2.43 which indicates that male tends to have a higher nose width compared to female nose width.

**Table 2.** Test of significance between male and female

| Gender | N  | Mean  | Std  | Mean Difference | T_cal | T_crit | p-value |
|--------|----|-------|------|-----------------|-------|--------|---------|
| Male   | 60 | 42.67 | 3.79 | 4.87            | 5.92  | 1.96   | 0.001   |
| Female | 60 | 37.80 | 2.43 |                 |       |        |         |

From Table 2, a test of significance was performed, and result shows that there is a statistically significant

difference between the male and female nose widths at p<0.05.

**Table 3.** Comparison of age group among the males

| Age Group   | N  | Mean  | Std  | Mean Difference | T_cal | T_crit | p-value |
|-------------|----|-------|------|-----------------|-------|--------|---------|
| 18-22 years | 39 | 42.17 | 3.34 | -2.11           | 3.63  | 1.96   | 0.081   |
| 23-27 years | 21 | 44.29 | 4.96 |                 |       |        |         |

Table 3 above is to test comparing age group with male nose width shows that there is no statistically significant difference between male nose width and age as the

p-value (sig. 2-tailed) is 0.081 which is greater than 0.05. This implies there is no relationship between nose width of males and age.

**Table 4.** comparison of age group among the females

| Age Group   | N  | Mean  | Std  | Mean Difference | T_cal | T_crit | p-value |
|-------------|----|-------|------|-----------------|-------|--------|---------|
| 18-22 years | 36 | 37.74 | 2.56 | -0.26           | 1.04  | 2.201  | 0.317   |
| 23-27 years | 24 | 38.00 | 2.08 |                 |       |        |         |

From Table 4 above comparing age group with female nose width shows that there is no statistically significant difference between male nose width and age as the p-value (sig. 2-tailed) is 0.317 which is greater than 0.05. This implies there is no relationship between nose width of females and age.

### DISCUSSION

A morphometric study on interalar width (the distance between the outer edges of the nostrils) is essential in fields such as forensic anthropology, maxillofacial surgery, and orthodontics, where facial proportions play

essential role in identification and aesthetic assessments. These measurements provide key data for understanding facial symmetry and ethnic or sex-related morphological differences. In particular, interalar width is closely related to nasal morphology which varies significantly across populations and is influenced by genetic, environmental and developmental factors. Studies show that the interalar width tends to differ by sex, with males generally having a broader nasal base than females.<sup>5</sup>

It was observed from the descriptive statistics of male and female nose width that the mean value of males was higher than females. This finding is in agreement with a previous study by Anibor et al.<sup>22</sup> who reported that males had mean nasal width, height and index than females of which the mean nasal index of the Isoko males was significantly higher than that of the females ( $P < 0.5$ ).

Another study by Akpa et al.<sup>23</sup> also agrees to the findings which stated that males had having a higher mean length than females; the width and length were found to be higher in males than in females also the ages of the subjects in the male and female categories showed non-significant ranges  $p > 0.05$ . Another study by Gholamreza et al.<sup>24</sup> also agrees with the findings which stated that Iranian men have a higher mean value than the women and also there was a significant different ( $P \leq 0.05$ ). Another study by Okoro et al.<sup>25</sup> agrees with the findings which stated that the mean nasal width was higher for males than females and the difference was statistically significant ( $p < 0.05$ ).

## CONCLUSION

The findings of this study reveal notable sexual dimorphism in nasal width among the Isoko ethnic group, with males exhibiting significantly higher nasal widths compared to females. This difference may be attributed to genetic, environmental and hormonal influences that shape craniofacial features. Understanding such ethnic-specific morphometric characteristics is valuable not only for anthropological and forensic applications but also for clinical practices such as reconstructive surgery and prosthetic design. The data obtained provides a reference baseline for future comparative studies among other Nigerian and African populations.

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