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# Anthropometric Study of Canthal Distances and Mouth Width Among Adults of Kalabari

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## ABSTRACT

**Purpose**: The face is considered to be the most crucial aspect to define the beauty of a particular individual. Therefore, the facial anatomy of different ethnic groups must be well understood for forensic studies, research, and also for surgery purposes. The purpose of this study is to establish normal values of canthal distances and mouth width parameters in adult Kalabaris in Rivers State, Nigeria, to determine sexual dimorphism and also to correlate them with age.

**Methodology**: The study was conducted using a total of 315 participants, consisting of 163 females and 152 males, selected randomly from the various Kalabari communities, between the ages of 19 and 50. Participants were measured using a digital Vernier caliper.

**Findings**: The data were collected and analysed using SPSS, and results were expressed in mean ± standard deviation. The mean values of inner canthal distance in adult males and females were 36.64 ± 1.81mm and 34.78 ± 3.25mm respectively. Mean values for outer canthal distance were 99.30 ± 3.63mm for males and 97.91 ± 4.45mm for females. The mean values for mouth width in males was 55.69 ± 5.58mm, whereas in females it was 53.92 ± 3.23mm.

**Unique Contribution to Theory, Policy and Practice:** There is sexual dimorphism in the parameters measured, and it also showed significant positive relation with age, $p < 0.05$. Comparison with other population showed the mean values for the parameters in the adult kalabari population differ from them. Data obtained in this study would provide basis for application in forensics, maxillofacial surgery and clinical practice in Rivers State, Nigeria We recommend that the result of this study be used as a baseline data for future works and similar studies be done on other ethnic groups

**Keywords**; *Facial Anatomy, Sexual Dimorphism, Forensic, Age, Kalabari.*

## INTRODUCTION

The systematic measuring of the physical properties of the human body, especially dimensional descriptors of body size and shape, is referred to as anthropometry. (Aslam et al., 2017). It referred to a method of measuring the living human body to determine its proportions at different ages, or of physically distinguishing human races to determine their evolutionary status relative to one another. (Vangara et al., 2017). It has been used for identification, for the goals of understanding human physical variation, in paleoanthropology, and in numerous attempts to correlate physical with racial and psychological qualities since its inception in physical anthropology. (History of Anthropometry). The human body's size and dimensions have been influenced by a variety of elements including ecology, botany, nutrition, age, race, nutrition, and sex. The study of the face and skull is known as cranial anthropometry. It's crucial for the study of human growth and variance between races and for clinical diagnosis, treatment, and surgical repair of any head defect. It's a physical anthropology approach that involves taking exact and systematic measurements of the bones in the human head. (Gupta et al., 2019).

The study of these anthropometric parameters at various ages yields a variety of criteria that can be applied in clinical practice, forensics, general medical practice, as well as social and environmental practices. Mouth width, binocular width, minimum frontal breadth, supraorbital breadth, total cranial length, total craniofacial height, cranial base width, and maximum cranial breadth are among the parameters. These measurements will be used in studies of human growth and population variation, forensic research, and a guide for clinical treatment and surgical repair of any anomaly associated with the head region. (Anibor et al., 2011).

Facial anthropometry is a branch of anthropometry that has grown in importance in recent years in many countries for health assessment. It is useful in determining an individual's age, gender, and race, as used in anthropology, archaeology, anatomy, and forensics (Kulkarni et al., 2021). The external physical appearance of any individual or race is very important in their identification.

As a result, it is necessary to have local data for these parameters because these standards reflect potentially different patterns of craniofacial growth due to age, race, gender, and dietary differences. (Oladipo et al., 2011).

The purpose of this study is to assess normal values of canthal distances and mouth width, which are important for reconstructing the canthal area and mouth area, respectively.

## MATERIAL AND METHODS

### Research Design

This research work has quantitative descriptive design, comprising of 315 subjects selected randomly from the Kalabari population between the ages of 19-50 years. The Kalabari people,

which are one of the minor tribes in Nigeria that are indigenous to the South-South of Nigeria in Rivers State.

**SAMPLE SIZE AND TECHNIQUE**

The simple random sampling method was used for the selection of subjects, and a total of 391 participants were selected randomly from Buguma, Tombia, and Ilelema, Abalama, Ido.

The sample size was determined using Yamanes formula and is as follows:

n = N/1 + Ne2

Where N = Total Population size

e = Tolerable error margin (normally assumed to be 5%)

**The following participants were included in the research:**

a. Both parents must be Kalabari.
b. Subjects should be residents of the Kalabari region.
c. Subjects within the age range of 19 – 50 years

**The following participants were excluded from the research:**

a. People with any congenital anomaly involving the face
b. People with any significant traumatic defect or deformity involving the face
c. Non Kalabari
d. Subjects below the age of 19 and above the age of 50.

**IDENTIFICATION OF LANDMARKS**.

**CANTHAL DISTANCE**: This is the angle formed by the upper and lower eyelids meeting at either corner of the eyes. It is measured as inner canthal distance and outer canthal distance. (Gray's Anatomy, p1855-1856)

**OUTER CANTHAL DISTANCE (OCD)**: The outer canthal distance (OCD) is measured from the lateral junction of the eye's upper and lower eyelids. It is also known as the lateral aspect of the eyelid angle. (Preedy 2012)

**INNER CANTAL DISTANCE (ICD)**: The inner canthal distance, also known as the medial canthal distance, is the distance between the medial angles of the left and right eyes. It is 6mm away from the eyeball and forms a short angle towards the nose (Preedy 2012).

**CANTHAL INDEX**: This is the inner canthal distance divided by the outer canthal distance, multiplied by 100.

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**MOUTH WIDTH**: This is the distance between the lateral angles of the mouth. (Preedy 2012)

**CRANIOFACIAL LANDMARKS USED FOR DATA COLLECTION:**

**Endocanthus (en)**: Inner corner of the eye fissure where the eyelids meet.

**Exocanthus (ex):** Outer corner of the eye fissure where the eyelids meet.

**Cheilion (ch):** The point located at each lateral commissure, i.e. the angle of the mouth.

**Cheilon points**: The distance between the angles of the mouth, cheilion points (ch-ch).

**Intercanthal distance:** This is the distance between the two endocanthi of both eyes (en-en)

**Outer Canthal distance**: This is the distance between the two exocanthus of both eyes (ex-ex).

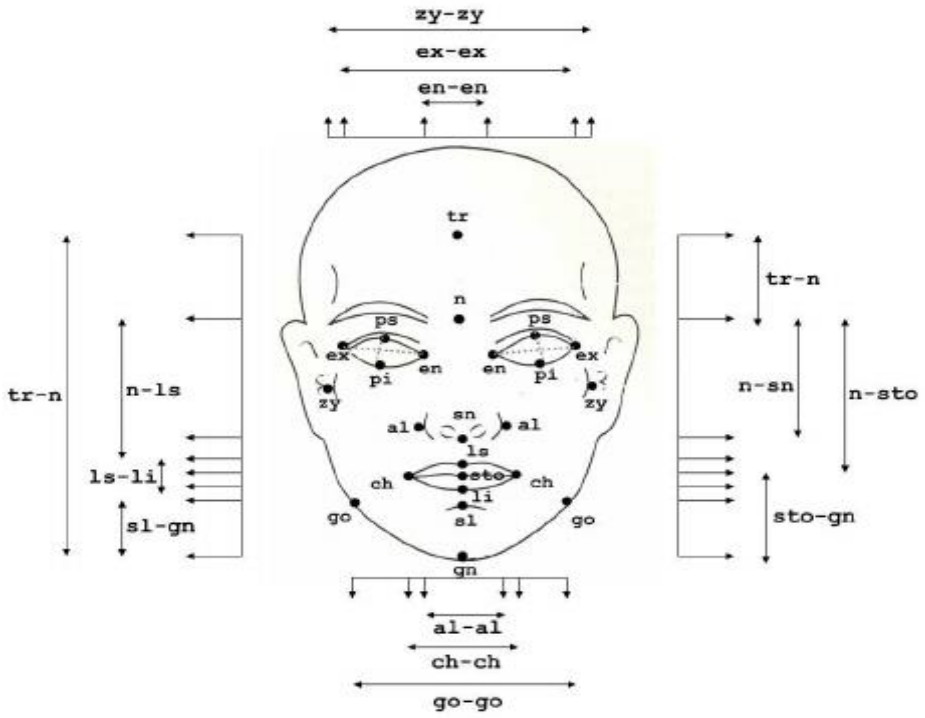


Figure 1: Face anthropometry with detected facial landmarks.

( Source: Ramanathan et al 2006).

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Figure 2: Measurement of canthal Figure 2: Measurement of canthal distance

Figure 3: Measurement of mouth width.

The participants were made to relax in a sitting position, with the head in the correct anatomical position. A digital Vernier calliper was used to measure the inner and outer canthal distances. For inner canthal distance, the Vernier calliper was placed on both endo canthus of the eyes. For outer canthal distance, the digital Vernier calliper was placed on both exo canthus of the eyes.

To measure the Mouth width, each subject was asked to look straight in front and adopt a relaxed nature of facial expression to prevent distortion of the lip. A Vernier calliper was used to measure the width of the Mouth by placing the digital Vernier calliper on the lip of the Mouth at the widest points of the Mouth (on both cheilons).

**NUMERICAL DATA ANALYSIS:**

Data obtained were recorded in a form. The data was then subjected to statistical analysis using Statistical Package for Social Science (SPSS) software program, and results obtained were presented as mean ± S.D.

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**Table 1 Descriptive statistic of the group A (16 – 25 years) Males and Females**

| | | Females, N = 60 | | | | Males, N = 66 | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S/N** | **VARIABLES** | **MEAN ± SD** | **SEM** | **MIN** | **MAX** | **MEAN ± SD** | **SEM** | **MIN** | **MAX** |
| **1** | **AGE** | 21.40 ± 2.34 | 0.30 | 19.00 | 25.00 | 21.00 ±1.57 | 0.19 | 19.00 | 25.00 |
| **2** | **ICD** | 35.13 ± 2.59 | 0.33 | 29.88 | 41.63 | 35.57 ± 2.21 | 0.27 | 30.34 | 40.34 |
| **3** | **OCD** | 96.31 ± 4.15 | 0.54 | 83.58 | 109.54 | 98.11 ± 3.44 | 0.42 | 89.68 | 105.47 |
| **4** | **CIDX** | 36.47 ± 2.06 | 0.53 | 31.08 | 40.50 | 36.28 ±2.32 | 0.51 | 32.02 | 41.25 |
| **5** | **MW** | 53.02 ± 4.12 | 0.27 | 45.19 | 61.05 | 56.32 ± 4.10 | 0.28 | 47.04 | 68.69 |

N = number of samples, SD = standard deviation, SEM=Standard error of mean, MIN = Minimum, MAX = Maximum,

Table 1 shows the descriptive values for ages 16-25, and their mean values for inner canthal distance were 35.13 ± 2.59 for females and 35.57 ± 2.21 for males, mean values for outer canthal distance were 96.31 ± 4.15 for females, and 98.11 ± 3.44 for males, and the mean values for mouth width is 53.02 ± 4.12 for females, and 56.32 ± 4.10 for males respectively.

**Table 2**: **Descriptive statistics of the group B (26 – 35 years) Males and Females**

| | | Females, N = 54 | | | | Males, N = 19 | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S/N** | **VARIABLES** | **MEAN ± SD** | **SEM** | **MIN** | **MAX** | **MEAN ± SD** | **SEM** | **MIN** | **MAX** |
| **1** | **AGE** | 31.00 ± 3.17 | 0.43 | 26.00 | 35.00 | 29.63 ± 3.04 | 0.70 | 26.00 | 35.00 |
| **2** | **ICD** | 35.75 ± 2.93 | 0.40 | 29.33 | 42.26 | 37. 12 ± 3.32 | 0.76 | 30.23 | 44.69 |
| **3** | **OCD** | 98.51 ± 4.33 | 0.59 | 88.21 | 104.66 | 101.05 ± 4.75 | 1.09 | 91.94 | 108.95 |
| **4** | **CIDX** | 36.27 ± 2.31 | 0.52 | 31.84 | 41.05 | 36.69 ± 2.14 | 1.07 | 32.55 | 41.03 |
| **5** | **MW** | 56.02 ± 3.84 | 0.32 | 49.92 | 65.33 | 56.95 ± 4.66 | 0.49 | 48.04 | 63.49 |

N = number of samples, SD = standard deviation, SEM= Standard error of mean, MIN=Minimum, MAX= Maximum

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Table 2 shows the descriptive values for ages 26-35. The mean values for inner canthal distance are 35.75 ± 2.93 for females and 37.12 ± 3.32 for males. Mean values for outer canthal distance were 98.51 ± 4.33 and 101.05 ± 4.75 for females and males, and the mean values for mouth width is 53.02 ± 4.12 for females, and 56.32 ± 4.10 for males.

**Table3 : Descriptive statistics of the group C (36 – 45 years) Males and Females**

| | | Females, N = 27 | | | | Males, N = 49 | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S/N** | **VARIABLES** | **MEAN ± SD** | **SEM** | **MIN** | **MAX** | **MEAN ± SD** | **SEM** | **MIN** | **MAX** |
| **1** | **AGE** | 40.26 ± 3.23 | 0.62 | 36.00 | 45.00 | 41.71 ± 2.73 | 0.39 | 36.00 | 45.00 |
| **2** | **ICD** | 34.03 ± 2.23 | 0.43 | 29.03 | 39.54 | 36.21 ± 2.70 | 0.39 | 31.21 | 41.40 |
| **3** | **OCD** | 98.01 ± 5.74 | 1.10 | 88.86 | 108.86 | 100. 04 ± 5.90 | 0.84 | 89.83 | 112.53 |
| **4** | **CIDX** | 34.78 ± 2.31 | 0.81 | 30.86 | 38.99 | 36.25 ± 2.57 | 0.64 | 32.12 | 40.78 |
| **5** | **MW** | 55.95 ± 4.23 | 0.44 | 48.79 | 63.47 | 57.12 ± 4.45 | 0.38 | 51.09 | 40.78 |

N = number of samples, SD = standard deviation, SEM= Standard error of mean, MIN= Minimum, MAX=Maximum

Table 3 shows the descriptive values for ages 36-45. Their mean values for inner canthal distance are 34.03 ± 2.23 for females, 36.21 ± 2.70 for males. For outer canthal distance, the mean values are 98.01 ± 5.74 for females and 100. 04 ± 5.90 for males. Mean values for mouth width are 55.95 ± 4.23 and 57.12 ± 4.45 for females and males respectively.

**Table 4: Descriptive statistics of the group D (46 years and above) Males and Females**

| | | Females, N = 22 | | | | Males, N = 18 | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S/N** | **VARIABLES** | **MEAN ± SD** | **SEM** | **MIN** | **MAX** | **MEAN ± SD** | **SEM** | **MIN** | **MAX** |
| 1 | AGE | 47.55 ± 1.53 | 0.33 | 46.00 | 50.00 | 48.56 ± 1.29 | 0.31 | 47.00 | 50.00 |
| 2 | ICD | 34.78 ± 3.25 | 0.69 | 25.09 | 41.04 | 36.64 ± 1.81 | 0.43 | 34.15 | 40.12 |
| 3 | OCD | 97.91 ± 4.45 | 0.95 | 89.58 | 104.32 | 99.30 ± 3.63 | 0.86 | 94.83 | 107.41 |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 4 | CIDX | 35.53 ± 3.01 | 0.69 | 27.49 | 39.93 | 36.92 ± 1.99 | 1.31 | 33.87 | 41.36 |
| 5 | MW | 53.92 ± 3.23 | 0.64 | 48.92 | 59.33 | 55.69 ± 5.58 | 0.47 | 47.21 | 65.59 |

N = number of samples, SD = standard deviation, SEM = Standard error of mean, MIN=

Table 4. shows the descriptive values for ages 46 and above. Their mean values for inner canthal distance are 34.78 ± 3.25 for females, 36.64 ± 1.81 for males. For outer canthal distance, the mean values are 97.91 ± 4.45 for females and 99.30 ± 3.63 for males. Mean values for mouth width are 53.92 ± 3.23 and 55.69 ± 5.58 for females and males respectively.

**Table 5 Descriptive statistics of all Males and Females' parameters**

| | | All Females, N = 163 | | | | All Males, N = 152 | | | |
|---|---|---|---|---|---|---|---|---|---|
| **S/N** | **VARIABLES** | **MEAN ± SD** | **SEM** | **MIN** | **MAX** | **MEAN ± SD** | **SEM** | **MIN** | **MAX** |
| 1 | AGE | 31.23 ± 9.63 | 0.76 | 19.00 | 50.00 | 32.02 ±11.03 | 0.89 | 19.00 | 50.00 |
| 2 | ICD | 35.11 ± 2.79 | 0.22 | 25.09 | 42.26 | 36.09 ± 2.53 | 0.21 | 30.23 | 44.69 |
| 3 | OCD | 97.54 ± 4.60 | 0.36 | 83.58 | 109.54 | 99.24 ± 4.64 | 0.38 | 89.68 | 112.53 |
| 4 | CIDX | 36.00 ± 2.39 | 0.32 | 27.49 | 41.05 | 36.39 ± 2.34 | 0.36 | 32.02 | 41.36 |
| 5 | MW | 54.62 ± 4.15 | 0.19 | 45.19 | 65.33 | 56.58 ± 4.46 | 0.19 | 47.04 | 68.69 |

N = number of samples, SD = standard deviation, SEM=Standard error of mean, MIN= Minimum, MAX= Maximum

Table 5 shows the descriptive statistics of all the parameters irrespective of the age groupings. It showed the mean values for inner canthal distance as 35.11 ± 2.79 for females and 36.09 ± 2.53 for males. The mean values for the outer canthal distance are 97.54 ± 4.60 for females and 99.24 ± 4.64 for males. Mean values for mouth width are 54.62 ± 4.15 and 56.58 ± 4.46 for females and males respectively.

**Table 6: Descriptive statistics of all parameters irrespective of sex**

| | | All, N = 315 | | | |
|---|---|---|---|---|---|
| **S/N** | **VARIABLES** | **MEAN ± SD** | **SEM** | **MINIMUM** | **MAXIMUM** |

| | | | | | |
|---|---|---|---|---|---|
| **1** | AGE | 31.61 ± 10.32 | 0.58 | 19.00 | 50.00 |
| **2** | ICD | 35.58 ± 2.71 | 0.15 | 25.09 | 44.69 |
| **3** | OCD | 98.36 ± 4.69 | 0.26 | 83.58 | 112.53 |
| **4** | CIDX | 36.19 ± 2.37 | 0.25 | 27.49 | 41.36 |
| **5** | MW | 55.57 ± 4.40 | 0.13 | 45.19 | 68.69 |

N = number of samples, SD = standard deviation, SEM=Standard error of mean

Table 6 shows the descriptive statistics of all parameters irrespective of sex and age. The results showed mean values for inner canthal distance to be 35.58 ± 2.71mm, the mean values for outer canthal distance was 98.36 ± 4.69mm, and mean values for mouth width was recorded to be 55.57 ± 4.40mm

**Table 7 Paired t – test of all parameters for males and females**

| | | **Females N = 163** | | | **Males N = 152** | | | |
|---|---|---|---|---|---|---|---|---|
| **S/N** | **VARIABLES** | **MEAN ± SD** | **t-value** | **p-value** | **MEAN ± SD** | **t-value** | **p-value** | **Remark** |
| 1 | AGE – ICD | 0.81 ± 10.34 | -4.78 | 0.00 | 0.89 ± 10.98 | -4.58 | 0.00 | Significant |
| 2 | AGE – OCD | 0.82 ± 10.24 | -64.72 | 0.00 | 0.92 ± 1.29 | -73.43 | 0.00 | Significant |
| 3 | AGE – MW | 0.76 ± 9.65 | -30.93 | 0.00 | 0.95 ± 11.72 | -25.83 | 0.00 | Significant |

Significant; $p<0.05$ N = number of samples, SD = standard deviation

Table 7 shows the paired t-test to check for significant relationship between age and all the parameters for both males and females. The test showed a statistically significant relationship between age and all the parameters for both males and females.

**Table 8 Results of significance test between males and females Kalabari indigenes**

| **Parameters** | **Comparison** | **Z-critical** | **Z-calculated** | **Level of Significance** | **Decision** |
|---|---|---|---|---|---|
| Canthal Distance (ICD) | Male VS Female | 1.96 | 3.3 | P<0.05 | Significant |

| | | | | | |
|---|---|---|---|---|---|
| Outer Canthal Distance (OCD) | Male VS Female | 1.96 | 3.28 | P<0.05 | Significant |
| Mouth Width (MW) | Male VS Female | 1.96 | 4.05 | P<0.05 | Significant |
| Canthal Index (CI) | Male VS Female | 1.96 | 2.3 | P<0.05 | Significant |

Significant; p<0.05

Table 8 shows results for z test checking for significant differences between males and females in all the parameters to analyse sexual dimorphism. The mean values for all the parameters are shown to be higher in males than in females in all age groups. The differences between the sexes are shown to be statistically significant in all the ages. The inner canthal and outer canthal distances of the males were significantly wider than those of the females in all the age groups. The width of the mouth was significantly wider in the males than the females at all ages.

**Table 9: Comparison of canthal distances and mouth width of male Kalabaris with other populations (Results expressed in mm)**

| Study/Year | Population | ICD | OCD | CI | MW |
|---|---|---|---|---|---|
| T. R Ogoun et al., 2021 | Ekowe | 35.5±0.58 | 139.1±0.84 | 25.59 ± 4.54 | - |
| K. Radha et al., 2021 | South India | 26.4±0.51 | 103.5±0.81 | 25.71 ± 4.91 | - |
| Yadav et al.,2020 | Nepali | 34.48±3.35 | 96.54±4.77 | 35.79 ± 3.76 | - |
| Ubulu et al., 2021 | Delta | - | - | - | 58.91±7.26 |
| Gupta et al., 2019 | Haryana | - | - | - | 51.57±4.63 |

| | | | | | |
|---|---|---|---|---|---|
| Adamu et al., 2016 | Hausa | - | - | - | 50.4±4.15 |
| Emelike et al., 2012 | Igbo | - | - | - | 53.7 ± 0.52 |
| Oladipo et al., 2009 | Urhobo | 34.0±0.14 | 131.0±0.28 | 24.38 | - |
| Oladipo et al., 2009 | Itsekiri | 35.0±0.16 | 129.0±0.42 | 26.03 | - |
| Oyinbo et al., 2008 | Ijaw | 42.5±0.5 | 110.1±1.38 | - | - |
| Jaja et al., 2011 | Kalabari | 18.5±0.30 | 103.9±0.56 | 17.8 | - |
| Present study | Kalabari | 36.09±2.53 | 99.24±4.64 | 36.39 ± 2.34 | 56.58 ± 4.46 |

**Table 4.10: Comparison of canthal distances and mouth width of female Kalabaris with other populations (Results are expressed in mm)**

| Study/Year | Population | ICD | OCD | CI | MW |
|---|---|---|---|---|---|
| T. R Ogoun et al., 2021 | Ekowe | 34.3±0.52 | 136.2±0.76 | 25.30 ± 4.03 | - |
| K. Radha et al., 2021 | South India | 25.1±0.46 | 101.9±1.02 | 24.83 ± 7.83 | - |
| Yadav et al., 2020 | Nepali | 31.84±2.22 | 94.30±3.42 | 33.77 ±2.42 | - |
| Ubulu et al., 2021 | Delta | - | - | - | 47.42±6.10 |
| Gupta et al., 2019 | Haryana | - | - | - | 47.08±3.21 |
| Adamu et al., 2016 | Hausa | - | - | - | 47.3±3.15 |
| Emelike et al., 2012 | Igbo | - | - | - | 51.4 ± 0.39 |
| | Urhobo | 30.0±0.39 | 121.0±0.21 | 29.38 | - |

| | | | | | |
|---|---|---|---|---|---|
| Oladipo et al. 2009 Oladipo et al., 2009 | Itsekiri | 33.0±0.12 | 114.0±0.55 | 27.70 | - |
| Oyinbo et al., 2008 | Ijaw | 39.1±0.32 | 104.0±0.98 | - | - |
| Jaja et al., 2011 | Kalabari | 20.7±0.29 | 104.0±0.98 | 20.08 | - |
| Present study | Kalabari | 35.11±2.79 | 97.54 ± 4.60 | 36.00±2.39 | 54.62 ± 4.15 |

Comparison of canthal parameters and mouth width across different populations has shown differences in the values of these parameters that could be due to ethnic, racial, environmental, nutritional and age-related differences in the population. The comparison also shows that, generally, values for these parameters in the males tend to be greater than in the females. Relatively greater mean values for Inner canthal, Outer canthal distances and Mouth width has been reported in males as compared to females in studies carried out among subjects of different populations. The mean outer canthal distances reported in various population shows to be greater than the mean values reported in the present study.

## DISCUSSION

Craniofacial anthropometry plays an important role in assessing the ethnicity and gender of an individual as intra- and interpopulation variations are affected by ecological, biological, geographical, racial, gender, and age factors. (Mostafa A et al. 2014)

## INNER CANTHAL DISTANCE

The mean inner canthal distance for males and females were 35.57±2.21mm and 35.13±2.59mm respectively, for ages 16 to 25 as shown in Table 1. This result is similar to the values reported by Agrawal et al., 2013, for ages 14 to 25, with mean values of ICD for males as 31.82mm, and 31.72mm for females. The mean values reported in the present study are higher than the values reported for the students, age 16-18 in Kalabari by Jaja et al., 2011, where inner canthal distance was 1.85±0.30cm for males and 2.07±0.29cm for females. Mean ICD values for males and females within the age group of 26 to 35 reported as 37.12±3.32mm for males and 35.75±2.93mm for females as in Table 2 This result was similar to values reported by T. R Ogoun et al., 2021, on Ekowe indigenes of Bayelsa State with mean values of ICD as 3.55±0.58cm for males and 3.43±0.52cm for females.

Mean inner canthal distance values reported for ages 36 to 45 were 36.21±2.70mm for males and 34.03±2.23mm for females, shown in Table 3 and 4 respectively. For ages 45 and above, the mean

values were reported to be 36.64±1.81mm for males and 34.78±3.25mm for females. The mean values reported in the present study are similar to that of adult Ibibios, as reported by Oladipo et al., 2011, with ICD as 3.52cm for males and 3.36cm for females. The result in the present study showed to be slightly lower than values gotten for adult Igbos between the ages of 38 and 42, as 39.97±0.68mm for males and 39.02±1.60mm for females as reported by Emelike et al.,2012

The mean of the overall inner canthal distance as in Table 5, of males in the population of this present study was 36.09 ± 2.53mm and the females had a lower value of 35.11 ± 2.79mm. The inner canthal distance of another ethnic group, Ikwerre of South-South Nigeria had values closer to the present study since their males had inner canthal distance of 33.9mm and the females had 33.8mm (Oladipo et al., 2013). In Urhobo population, (Oladipo et al., 2009), the inner canthal distance was reported to be 3.40±0.14cm for males and 3.00±0.39cm for females. Itsekiri population, (Oladipo et al., 2009), the mean inner canthal distance was reported to be 3.50±0.16cm for males and 3.30±0.12 for females.

In the present study, the males had significantly wider inner canthal distances than the females. ($P < 0.05$) as reported in Table 8, and this agrees with results reported for previous studies seen in other populations like Gabriel et al., 2013, Jaja et al., 2011, Oladipo 2017, Oladipo et al., 2011, Oria Radamene et al., 2018

In the present study, age 26-35 had the highest mean values for inner canthal distance. The mean ICD at age 16-25 were less than at age 26-35. The mean values for ICD at ages 36-45 had the least mean values, while ages 46 and above had slightly higher values than 36-45. The values increased from 16-35, reduced at 36 to 45, and had another slight increase from 46 and above.

**OUTER CANTHAL DISTANCE**

Mean outer canthal distance for males and females within the ages of 16-25 in this study were reported as 98.11±3.44mm for males and 96.31±4.15mm for females as shown in Table 1. is similar to the values in a study by Agrawal et al., 2013, between the ages of 14-25, with mean OCD of males as 95.69mm and 94.15mm for females. Another study by Jaja et al., 2011, reported mean values of OCD as 10.39±0.56 for males, and 10.40±0.98cm for females which were higher than the values reported for the present study.

Mean OCD values for ages 26 to 35 were reported as 101.05±4.75mm and 98.51±4.33mm for males and females respectively, as seen in Table 2. These values were similar to Osunwoke et al., 2010, whose mean values for ages 28 to 32 were 103.13±1.42mm for males and 100.70±1.30mm for females, and G.S Oladipo 2017, whose values were reported to be 9.26±0.73cm and 9.15±0.68cm for males and females respectively.

The mean values for ages 36-40, and also for ages 40 and above as seen in Tables 3 and 4 are 100.04±5.90mm for males, 98.01mm for females and 99.30±3.63mm for males, 97.91±4.45mm

for females respectively. Yadav et al., 2020, reported OCD as 96.54±4.77mm for males and 94.30±3.42mm for females, which were slightly less than the results for the present study. The values were less than values reported by Oladipo et al., 2011 for Ibibio adults as 11.15cm and 10.73cm for females. T.R Ogoun et al., 2021, Oria Radamene et al., 2018, had higher mean outer canthal distance values as 13.91±0.84cm and 13.62±0.76cm for males and females in Ekowe indigenes of Bayelsa State, and 11.42cm for males and 11.23cm for females in Ejagham indigenes in Cross River State.

The overall mean outer canthal distance was 99.24 ± 4.64mm for males and 97.91 ± 4.45mm for females for the present study as in Table 5. The mean values for outer canthal distance of another ethnic group, and Urhobo and Itsekiri (Oladipo et al., 2009) with OCD as 13.10±0.28 for males and 12.10±0.21 for females in Urhobo population, and Itsekiri being 12.90±0.42 for males 11.40±0.55 for females respectively. The disparity in values could be due to differences in age group of the population of this study, geographical difference, ethnicity, nutritional, and also environmental factors.

The mean values for outer canthal distance in the present study is reported to be less than the mean values for outer canthal distance of Ekowe, Ejagham, Itsekiri and Urhobo indigenes.

In the present study, the males in this population had significantly wider outer canthal distances than the females ($P < 0.05$).

Mean outer canthal distance for the present study had an increase from ages 16-35. The value decreased from ages 36 to 45, and finally had a slight increase from 40 and above.

**MOUTH WIDTH**

In the present study, between the ages of 16 to 50 years, the mouth width of males and females ranged from 55.69±5.58mm to 57.12±4.45 for males and from 53.02±4.12mm to 56.02±3.84mm for females, reported in Tables 1 and 4 respectively. The males had a wider mouth with a mean width of 56.58 ± 4.46mm while the females had 54.62 ± 4.15mm overally, as reported in Table 5. The results of this study are similar to that of Emelike et al., (2012) who reported 53.7mm for males and 51.4mm for the females of the young adult Igbos living in Borno State of Nigeria. Delta State adults had a mean mouth width of 58.91±7.26mm for males and 47.42±6.10mm for females. The values for males are similar to the present study, but the values for females are less than those in the present study. (Ubulu et al., 2021). Mouth width values for Arabians were reported to be slightly less than the values for the present study, Dharap et al., 2013, with mean values as 52.85mm for males and 48.63mm for females. Gupta et al., 2019, reported mean values for mouth width as 51.57±4.63mm for males and 47.08±3.21mm for females, less than the present study.

It was shown to be significantly wider in males as was observed in young adult Arabians (Dharap et al., 2013), and also in people from Delta State Nigeria (Anibor et al., 2011).

In the present study, mean values for mouth width increased form ages 16-35, and was reported to decrease from age 36 and above.

## CONCLUSION

The normal values of inner and outer distances and canthal index and mouth width are important for successful reconstruction of the canthal and mouth area. Thus, it is necessary to have a local data of this parameters since these standards reflect the potentially different patterns of craniofacial growth resulting from racial, ethnic, sexual and dietary differences.

This study has shown that the parameters measured (inner and outer canthal distances, and mouth width) of males are larger than those of females and it has also shown that the values gotten for the adult kalabari population are different from other populations of the world. The parameters exhibit sexual dimorphism, and have a significant relationship with age. Test for sexual dimorphism showed that there was significant difference between the values for males and females for all measured parameters. This work has generated normative values of canthal distances and mouth width parameters in adult Kalabaris in Rivers State, Nigeria. The study would be of help to anthropometrist, oral and maxillofacial surgeons, plastic surgeons and forensic scientist. Therefore, data obtained in this study would presumably provide basis for application in forensics, maxillofacial surgery and clinical practice in Rivers State, Nigeria

## RECOMMENDATION

We recommend that the result of this study be used as a baseline data for future works and similar studies be done on other ethnic groups.

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