

# Craniofacial morphometric study of adult Ogoni people of Nigeria

## Abstract

Craniofacial anthropometry requires series of direct standard anthropometric measurement of the bones of the human skull. The study was aimed at establishing baseline data of the craniofacial parameters which are head circumference, intercanthal distances, canthal index and circumference interorbital index of the adult Ogonis of Nigeria. A total of three hundred and eighty two (382) subjects were selected randomly from Kibagha in Gokana local government area, Bori in Khana local government area, Nonwa in Tai local government area and Alesa in Eleme local government area all in Ogoni. Three hundred and eighty two (382) subjects which include one hundred and eighty nine (189) and one hundred and ninety three (193) for males and females respectively with a non-stretchable plastic ruler with 0.5cm interval was used for the measurement and the data. The results showed among others, the mean age value as 30.81±10.13 for male and 32.64±10.91 for female, head circumference (male 56.41±1.52cm, female 57.05±2.02cm), intercanthal distance (male 3.56±0.30cm, female 3.47±0.26), outer canthal distance (male 12.53±0.49cm, female 12.39±0.55cm), canthal index (male 28.41±1.79cm, female 28.15±1.83cm) and circumference inter-orbital index (male 6.31±0.44cm, female 6.09±0.40cm). It showed statistical significant difference between the male and female among the parameters measured indicating sexual dimorphism. Discriminate function analysis of Wilkis' Lambda test also confirms accurateness and predictability of the statistical significant difference of male and female measured variables. The knowledge from the study can provide information for craniofacial assessment for important clinical questions in research especially during surgery on the cranium development forensic investigation in personal identification in the population and society at large.

**Keywords:** head circumference, inner canthal distance, outer canthal distance, canthal index, circumference interorbital index

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## Introduction

Craniofacial morphometric study is a constituent of both cranial and facial parameters such as fronto-occipital circumference, intercanthal distance, canthal index and circumference interorbital index and over the years they have showed consistent important landmark for anatomist and surgeons. In the view of<sup>1</sup> craniofacial anthropometry is a technique used in both physical and clinical anthropology comprising precise and systematic measurements of the bones of the human skull. The usefulness of head circumference, intercanthal distances, canthal index and circumference interorbital index to clinicians in description diagnosis and surgical treatment of abnormal skeletal and facial patterns and manufacturing of spectacle frames and lenses cannot be overemphasized<sup>2</sup> and their also reported the male mean canthal indices of Ijaw and Igbo tribes of Nigeria to be 37.04 and 32.59 respectively and female Ijaw as 33.11 and female Igbo as 32.51.

The mean result of the comparative study carried out by Oladipo et al.,<sup>3</sup> revealed male Ijaws 37.04 and Igbo 35.15. Face is appearance and description of an attractive of personality, culture, age, ethnic background as well as personal preferences.<sup>4</sup> Scholars in Nigeria have documented the baseline data of studied anthropometric parameters in Ethnic groups of Nigeria, however, none could be attributed to Ogoni ethnic group, thus, the study aimed at establishing baseline data of the craniofacial parameters which are head circumference, intercanthal distances, canthal index and circumference interorbital

index of the adult Ogonis of Nigeria and documenting standard values with available data from other ethnic groups and other populations of the world for any ethnic or racial differences which would be very useful in anthropological studies, craniofacial surgery, diagnosis of craniofacial anomalies and forensic medicine.

## Materials and methods

This study was carried out on Ogoni Ethnic group of Rivers State. A total of three hundred and eighty two (382) subjects were selected randomly from Kibagha in Gokana local government area, Bori in Khana local government area, Nonwa in Tai local government area and Alesa in Eleme local government area all in Ogoni. Three hundred and eighty two (382) subjects which include one hundred and eighty nine (189) and one hundred and ninety three (193) for males and females respectively. Subjects with any craniofacial deformity were not selected. The method adopted for assessing the Canthal Index was<sup>5</sup> while the circumference inter – orbital index was.<sup>6</sup> A non-stretchable plastic ruler with 0.5cm interval was used for the measurement and the data were subjected to analysis using SPSS version 20.0.

## Result

Table 1 Summarize descriptive statistics of age, head circumference (HC), intercanthal distance (ICD), outer canthal distance (OCD), canthal index (CI) and circumference inter-orbital index (CI-I) in both male and female of Ogonis. The mean results revealed as follows: age (male 30.81±10.13cm, female 32.64±10.91cm), head circumference

(male 56.41±1.52cm, female 57.05±2.02cm), intercanthal distance (male 28.41±1.79cm, female 28.15±1.83cm) and circumference inter-orbital (male 3.56±0.30cm, female 3.47±0.26), outer canthal distance (male 12.53±0.49cm, female 12.39±0.55cm), canthal index (male 6.31±0.44cm, female 6.09±0.40cm).

**Table 1** Summary of the descriptive statistics of age, HC, head circumference; ICD, intercanthal distance; OCD, outer canthal distance; CI, canthal index; and circumference inter-orbital index (CI-I) in male and female of Ogonis

Variables	Sample Size		Minimum value		Maximum value		Mean ± SD	
	Male	Female	Male	Female	Male	Female	Male	Female
Age (years)	189	193	18	18	70	62	30.81±10.13	32.64±10.91
HC (cm)	189	193	52.1	52.2	59.5	62.5	56.41±1.52	57.05±2.02
ICD (cm)	189	193	2.9	2.9	4.5	4.2	3.56±0.30	3.47±0.26
OCD (cm)	189	193	11.4	10.8	14.2	14.5	12.53±0.49	12.39±0.55
CI	189	193	24.59	24	33.6	38.8	28.41±1.79	28.15±1.83
CI-I	189	193	5.3	5.1	7.73	7.16	6.31±0.44	6.09±0.40

Table 2 showed the results of paired sample Test (z-test) of parameters or variables in male and female Ogonis at confidence interval of 95% (P=0.05).from the results, it is evidence that the craniofacial parameters of male and female of Ogonis were significance different and showed sexual dimorphic incraniofacial parameters in both male and female Ogoni at alpha significant level of 0.05. Tables 3A & 3B showed comparative data of canthal indices

and circumference inter-orbital index in of Nigerian ethnic and sub-ethnic groups and other foreign populations. In Table 4, discriminate function analysis of Wilkis’ Lambda test was used for predictability into group membership of male and female craniofacial parameters. It further revealed that all the predictors add certain predictive power to the discriminate functions showed significant difference at P<0.001

**Table 2** Results of paired sample Test (z-test) of craniofacial parameters in male and female Ogonis at confidence interval of 95% (P=0.05)

Variables	P-values	Degree of freedom	z-values (t-calculated)	Inference
Age	0.069	188	1.83	Significant (2-tailed)
HC	0	188	3.678	Significant (2-tailed)
ICD	0.003	188	2.99	Significant (2-tailed)
OCD	0.008	188	2.674	Significant (2-tailed)
CI	0.183	188	1.337	Significant (2-tailed)
CI-I	0	188	4.906	Significant (2-tailed)

**Table 3A** A comparison of Canthal Index in male and female Ogonis and other Nigerian Populations previously studied

**Table 3B** A comparison of circumference inter-orbital index in male and female Ogonis and other Nigerian Populations previously studied

Authors/years	Population	Male	Female
Oladipo et al. <sup>7</sup>	Bayelsa	30.01±1.33	30.01±1.07
Nzeakor et al. <sup>8</sup>	Ika North and South	30.93±3.30	30.73±2.87
Dennis et al. <sup>9</sup>	Urhobo	37.12±2.78	36.84±2.60
Oladipo et al. <sup>10</sup>	Ibiobio	31.64±2.57	31.47±4.62
Oladipo et al. <sup>11</sup>	Igbo	35.15	32.59
Egwu et al. <sup>12</sup>	Igbo	37.10±2.93	36.41±2.69
Oladipo et al. <sup>3</sup>	Urhobo	24.38±1.96	29.38±1.37
	Itsekiri	26.03±1.46	27.7±1.35
Present study	Ogonis	28.41±1.79	28.15±1.83

Authors/years	Population	Male	Female
Dennis et al. <sup>9</sup>	Urhobo	7.15±0.74	7.12±0.68
Chukwujekwuet al. <sup>13</sup>	Igbos	10.62±0.61	10.49±0.74
Aniboret al. <sup>14</sup>	Isoko	6.62±0.38	6.58±0.10
Oladipo et al. <sup>3</sup>	Ijaw	7.80±2.20	8.10±0.60
	Igbos	6.20±0.50	6.50±0.20
Oladipo et al. <sup>15</sup>	Southern Nigeria	6.03±6.53	6.50±0.36
Present study	Ogonis	6.31±0.44	6.09±0.40

**Table 4** Discriminate function analysis of Wilkis' Lambda test for predictability into group membership

Wilks' Lambda					
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.	Remarks
Canthal Index	0.984	5.997	1	0.014	Significant
C.I.I	0.933	26.171	1	0	Significant

## Discussion

Craniofacial anthropometry requires series of direct standard anthropometric measurement of the bones of the human skull. The present study provided a baseline information of craniofacial anthropometry of male and female of Ogonis with respect to their mean values of head circumference, intercanthal distances, outer canthal distance, canthal index and circumference interorbital index. The presence of sexual dimorphism in this study agreed with other studies that compared craniofacial characteristics of male and female and also showed significant difference in the craniofacial parameters of male and female Ogonis at the significant level of  $P=0.05$ .

From the result of the present study, the canthal index of the female mean is similar with work done by Oladipo et al.,<sup>3</sup> on female Itsekiri who reported the mean value as  $27.7\pm 1.35$ , however, it is not in agreement with the research work done by Oladipo et al.,<sup>3</sup> on male Urhobo and Itsekiri who documented their values as  $24.38\pm 1.96$  and  $26.03\pm 1.46$  respectively. It also differed with the work done by Oladipo et al.,<sup>7</sup> who have the mean values of Bayelsans as  $30.01\pm 1.33$  for male and  $30.01\pm 1.07$  for female. In line with this, Nzeakoret al.,<sup>8</sup> documented the mean values of Ika North and South male ( $30.93\pm 3.30$ ) and female ( $30.73\pm 2.87$ ). This research did not concur with the work done by Dennis et al.,<sup>9</sup> on the male and female Urhobo population as their values were (male  $37.12\pm 2.78$  and female  $36.84\pm 2.60$ ).<sup>10,11</sup> Igbo population also presented the highest value in canthal index ( $37.10\pm 2.93$  for male and  $36.41\pm 2.69$  for female).<sup>12-14</sup>

The result of circumference interorbital index showed similar with the work carried out by Oladipo et al.,<sup>3</sup> on Igbos who documented their mean values as (male  $6.20\pm 0.50$  and female  $6.50\pm 0.20$ ). Another research study done by Oladipo et al.,<sup>15</sup> on the Southern Nigeria with the male and female values of  $6.30\pm 6.53$  and  $6.50\pm 0.36$  respectively also agreed with the present study. The present study also agreed with the research investigation done by Anibor on the male and female Isoko population which has the mean values of male as  $6.62\pm 0.38$  and female as  $6.58\pm 0.10$ . Conversely, the present disagreed with the done by Dennis et al.,<sup>9</sup> on the Urhobo population as (male  $7.15\pm 0.74$  and female  $7.12\pm 0.68$ ) and Chukwujekwu et al.,<sup>13</sup> on Igbo population which has their values of male and female as  $10.62\pm 0.62$  and  $10.49\pm 0.74$  respectively. Research work done by Oladipo et al.,<sup>3</sup> on Ijaws also did not agree with the present study.

Discriminate function analysis of Wilkis' Lambda test was used for predictability into group membership of male and female craniofacial parameters. It revealed that all the predictors add certain predictive power to the discriminate functions showed significant difference at  $P<0.001$ , which confirms accurateness and predictability of the statistical significant difference of male and female measured variables.

## Conclusion

The present study has established baseline information for male

and female craniofacial parameters of Ogonis which may serve as useful source for preliminary identification purposes especially in settings that encourage forensic investigation. The variation in this study could be accrued to genetics and environmental factors within and between populations. The findings of this study, therefore has the ability for provision of craniofacial assessment, helps to provide important clinical questions in research especially during surgery on the cranium development, it would also provide forensic investigation in personal identification in the population and society at large.

## Acknowledgements

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## Conflict of interest

The author declares no conflict of interest.

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