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RESEARCH ARTICLE

EVALUATION OF CANTHAL DIMENSIONS AMONG ADULTS OF EJAGHAM ETHNIC GROUP IN CROSS RIVER STATE, NIGERIA

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ABSTRACT

Evaluation of Canthal dimensions can be employed in identification of the sex, age and ethnicity. It is also a vital part of craniofacial anthropometry. This study was aimed at obtaining normal values of canthal dimensions in adults of the Ejagham ethnic group in Cross River State of South-South Nigeria. A total of Five hundred subjects (250 males and 250 females) aged 18-45 years were recruited for this study. The subjects were measured for innercanthal distance (ICD) and outercanthal distance (OCD) with a nonstretchable plastic ruler and canthal index (CI) was obtained as the ratio of inner canthal distance and the outer canthal distance multiplied by 100. The results we obtained showed that Ejagham males and females had outer canthal distances of 11.42 cm and 11.23 cm, respectively, whereas inner canthal distances were 3.40cm for Ejagham males and 3.20 cm for the Ejagham females. More so, Mean canthal index for both males and females was 29.80 and 28.55, respectively. The data shows that all the canthal dimensions as well as the canthal index of Ejagham males were higher than that of Ejagham females ($p < 0.05$) using t-Test. This study will be useful in bioanthropology, forensic medicine and in craniofacial surgery.

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INTRODUCTION

The knowledge of craniofacial anthropometry is employed in physical anthropology and in forensic science as one of the vital instrument used in identification of different ethnic groups and the sexes of individuals. Furthermore, craniofacial anthropometry is an integral part of craniofacial surgery and syndromology (Farkas *et al.*, 1992). Craniofacial anthropometry is also when it comes to the study of human growth and variations in different ethnic groups and also for clinical diagnosis and treatment (Poswillo *et al.*, 1963). Craniofacial anthropometry has therefore become an important tool used in genetic counselling, reconstructive surgeries, and forensic medicine (Oladipo *et al.* 2008). More so, Kasai *et al.*, (1993) reports that people with different genetic background subjected to significantly different environmental influences have different craniofacial morphology. Various researchers have worked on canthal anthropometry of Nigerians. A study which involved anthropometric assessment of canthal parameters was carried out on Urhobo and Itsekiri ethnic groups of Nigeria was carried out by Oladipo *et al.*, (2009). Urhobo males and females had inner canthal distances of 3.40 cm and 3.00 cm, respectively while Itsekiri males and females recorded inner canthal distances of 3.50 cm and 3.30 cm respectively.

Other studies carried out on some Nigerian ethnic group revealed higher values of inner canthal distance (Esomonu *et al.*, 2011). This study revealed that the inner canthal distance for adult Igbo males and females were 3.81 cm and 3.74 cm, respectively. In a related study but on Yoruba ethnic group Anas and Esomonu (2009) reported that the inner canthal distance of the Yoruba ethnic group was 3.68 cm and 3.67 cm for males and females respectively but no significant difference between males and females. Similarly, Cem *et al.*, (2001) reported inner canthal distance, outercanthal distance and canthal index of 28.33 mm, 81.74 mm and 34.66, respectively for Turkish males and 28.14 mm, 81.17 mm and 34.6, respectively for Turkish females. Cross River State is a coastal state in South-South Nigeria, named after the Cross River, which passes through the state. The State has different ethnic groups with the major ones being Efik, Ejagham and Bekwarra, and all three are mainly located in the three senatorial districts namely Southern, Central and Northern, respectively. The Ejagham ethnic group is one of the major Ethnic groups in Cross River State of Nigeria. An extensive literature survey revealed that there were no published studies on canthal dimensions among the Ejagham people of Cross River State. Thus the aim of this work was to obtain normal values of canthal dimensions and also the canthal index of adults of the Ejagham ethnic group of Cross River State, Nigeria.

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MATERIALS AND METHODS

This research was carried out on the Ejagham ethnic group in Cross River State. A total number of five hundred (500) subjects were recruited for this research (250 males and 250 females) and were randomly selected from obubra and Ikom local government areas. The study was carried out between April and October, 2014. The five hundred (500) subjects were made up of males and females who were residing in the study area and whose parents and grandparents were of Ejaghamancestry. Subjects that presented with craniofacial defects were excluded from the study. The inner canthal distance was measured as the distance between the medial canthi of the eyes (Figure 1). The inner canthal was measured using a non-stretchable, transparent, plastic, centimeter ruler. The measurement was done by having the subject look straight at me while the centimeter ruler was held tightly against the bridge of the nose (Cem *et al.*, 2001). The outer canthal distance was measured as the distance between the lateral canthi of the eyes (Figure 2). The outer canthal distance was measured using a non-stretchable, transparent, plastic, centimeter ruler. The subject was made to sit comfortably on a chair looking straight with the face well exposed to source of day light and the subject was asked to look straight at me while the centimeter rule was held tightly against the bridge of the nose (Cem *et al.*, 2001). The Canthal index was then calculated as inner canthal distance/outer canthal distance X 100.

Statistical Analysis

Statistical Package For Social Sciences (SPSS) Version 17.0 (Chicago, SPSS, Inc.) was used for the statistical analysis. Results were expressed as Mean \pm Standard error of mean. Comparisons were made of the canthal dimensions studied between males and females using the Student's *t*-test. The differences were considered significant at 95% confidence level (that is, when $P < 0.05$).

Ethical Consideration

The objectives of the research was explained to each subject and written informed consent was obtained from each of them before commencement of measurement. In line with Helsinki Declaration of 1975, as revised in 2000, ethical approval was obtained from the Ethics/Research Committee of the Faculty of Basic Medical Sciences, Cross River University of Technology, CRUTECH Okuku Campus, Yala, Nigeria.

RESULTS

The results obtained in the present study are presented on Table 1 and 2. In Table 1, the subjects were divided into nine age groups: 18-20, 21-23, 24-26, 27-29, 30-32, 33-35, 36-38, 39-41 and 42-45 years. The table shows the mean for outer canthal distance (OCD), inner canthal distance (ICD) and canthal of Ejagham males and females divided across these nine groups. Table 2 shows the general result presented as Mean \pm standard error of mean. The mean outer canthal distances for Ejagham males and females were 11.42 cm and 11.23 cm, respectively while the mean inner canthal distances for Ejagham males and females were 3.40 and 3.20 cm respectively. The mean canthal indices between Ejagham males and females were 29.80 and 28.55, respectively. *t*-Test

carried out to see the difference between the canthal parameters measured and calculated in Ejagham male and female revealed that outer canthal distance, inner canthal distance and canthal index of males were significantly ($p < 0.05$) higher than those of females (Table 2).

Table 1. Mean values for inner and outer canthal distances (cm) and canthal index of adult male and female Efiks

Age group	Inner canthal		Outer canthal		Canthal index	
	Male	Female	Male	Female	Male	Female
18-20	3.36	3.27	11.41	11.20	29.43	29.20
21-23	3.53	3.21	11.36	11.24	31.17	28.58
24-26	3.37	3.24	11.35	11.53	29.74	28.19
27-29	3.30	3.19	11.37	11.18	29.08	28.57
30-32	3.35	3.10	11.40	11.24	29.38	27.63
33-35	3.32	3.23	11.44	11.18	29.04	28.90
36-38	3.46	3.18	11.45	11.26	30.18	28.22
39-41	3.42	3.24	11.67	11.17	29.35	29.04
42-45	3.49	3.19	11.36	11.17	30.72	28.58

Table 2. Total mean, standard error of mean, t-Test of inner and outer canthal distances (cm) and canthal indices of both sexes

Parameter	Male	Female	t	Df	Sig. (2 tail)
Outer canthal distance	11.42 \pm 0.03	11.23 \pm 0.02	5.211	498	.000**
Innecanthal distance	3.40 \pm 0.02	3.20 \pm 0.01	8.736	498	.000**
Canthal index	29.80 \pm 0.15	28.55 \pm 0.15	5.866	498	.000**

**Statistically significant ($p < 0.05$)

Table 3. Comparison of canthal indices of Ejagham with other populations of the world

Researcher/Year	Population	Male mean CI	Female mean CI
Juberget <i>et al.</i> (1975)	African-American	38.38	38.50
Singh and Banerjee (1983)	India	37.23	37.82
Cemet <i>et al.</i> (2001)	Turkish	34.67	34.66
Erika <i>et al.</i> (2005)	Latvian	27.38	26.44
Oladipoet <i>et al.</i> (2008)	Ijaw	37.04	33.11
Oladipoet <i>et al.</i> (2008)	Igbo	35.14	32.59
Oladipoet <i>et al.</i> (2009)	Urhobo	24.38	29.38
Oladipoet <i>et al.</i> (2009)	Itsekiri	26.03	27.70
Oladipoet <i>et al.</i> (2011)	Ibibio	31.64	31.47
Present Study	Ejagham	29.80	28.55

DISCUSSION

Numerous anthropological findings have described craniofacial parameters as a signature indicating the sex, age and ethnicity of an individual (Singh and Banerjee, 1983). The morphological differences in anatomy of Canthal parameters between genders cannot be over emphasized especially in genetic counselling, facial reconstructive surgeries, and forensic medicine (Erika *et al.*, 2005). Craniofacial anthropometry is significant in the assessment of facial defect, facial trauma, congenital and post traumatic deformities, and diagnosis of hypo/hypertelorism and easy identification of certain congenital malformations. The normal values of inner and outer distances and canthal index are important for successful reconstruction of the canthal area. It becomes imperative to have the data of these parameters since these standards reflects the possibly different patterns of craniofacial growth as a result of ethnic, racial, sexual and dietary differences (Cem *et al.*, 2001). The values obtained for inner canthal distance (ICD) from Ejagham Ethnic population of Nigeria is 3.40 cm for males while females recorded 3.20 cm which suggest the existence of sexual dimorphism in this canthal dimension which is in agreement with previous a study by Oladipo *et al.*,

(2009) where Urhobo males had higher inner canthal distances than their female counterparts. Similar results were obtained for Itsekiri ethnic group according to Oladipo *et al* (2009) where the male subjects recorded higher inner canthal distances than female subjects which also conforms to results of the current study. The present study also revealed that outer canthal distance was sexually dimorphic with the male subjects having significantly ($p < 0.05$) higher outer canthal distance than females. This result agrees with the other findings Esomonu *et al.*, (2011) on the outer canthal distance (OCD) of the Igbos where the igbo males had higher outer canthal dimensions than their female counterparts. In another study carried out by Anas and Esomonu (2009) on the Yoruba ethnic group, the male subjects also had higher values of outer canthal distance than the female subjects which is in agreement with the findings of the present study. The results of the present study suggest the existence of sexual dimorphism in canthal indices of Ejaghams. The study has also shown that the normal values of canthal indices obtained for the Ejaghams are clearly different from other populations of the world. The result from the current study was in agreement with some studies (Oladipo *et al.*, 2008; Cem *et al.*, 2001; Erika *et al.*, 2005 and Oladipo *et al.*, 2011) on Ijaws and Igbos of Nigeria, Turks, Latvians and Ibibios of Nigeria, respectively who reported that the males had significantly higher canthal indices than the female but differ from other studies (Oladipo *et al.*, 2009; Singh and Banerjee, 1983 and Juberg *et al.*, 1975) on Urhobos and Itsekiris of Nigeria, on Indians and on African Americans respectively where higher values of canthal indices in females than males were reported. Sexual dimorphism observed in the canthal dimensions can be attributed to genetic and environmental factors, as well as differences seen across age and ethnic background (Oyinbo *et al.*, 2008).

Conclusion

The present study has provided normative data in Ejagham ethnic group of Nigerian which has previously not been investigated. This study has shown that the male Ejagham has higher values of inner canthal distance, outer canthal distance, and canthal index than the female. The evidence strongly suggests that environmental factors, genetics and even ethnicity account for the variation in canthal indices and other craniofacial indices between and within populations. The data therefore has utility in bioanthropology, craniofacial evaluation, surgery and forensic investigations involving the present population.

Conflict of interest: The authors declare that they have no conflict of interest

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