

Anthropometric Studies of Inner Canthal Distance, Outer Canthal Distance and Canthal Index of Adult Ibibios

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Abstract: Outer canthal distance, Inner canthal distance and canthal index are important component of craniofacial anthropometry. Craniofacial anthropometry is vital in making a precise and systematic measurement of the human skull. Eight hundred (800) adults comprising 400 males and 400 females were used for this study. The subjects were measured for inner and outer canthal distances using a non-stretchable plastic ruler and the canthal index was obtained as the ratio of inner canthal distance and the outer canthal distance multiplying the resultant fraction by 100. The results showed that Ibibio males and females had inner canthal distances of 3.52 and 3.36 cm, respectively, outer canthal distances of 11.15cm for male Ibibios and 10.73 cm for the females. Mean canthal index for both males and females was 31.64 and 31.47, respectively. The canthal index of Ibibio males is higher than that of females ($p < 0.05$) using Z-test. This study will be useful in anthropology and medicine most especially in craniofacial surgery.

Key words: Canthal index, ibibios, inner canthal distance, Nigeria, outer canthal distance

INTRODUCTION

Anthropometry is concerned with measurement of physical sizes and shapes of human body (Basciftci *et al.*, 2004). Craniofacial anthropometry is an integral part of craniofacial surgery and syndromology (Farkas *et al.*, 1992). It is a technique used in both physical and clinical anthropology comprising precise and systematic measurements of the human skull (Mahfouz, 1988). Craniofacial anthropometry also includes measurement of the inner (medial) and outer (lateral) canthal distances and canthal index. It is important for the study of human growth and variations in different races and also for clinical diagnosis and treatment Poswillo (1963). It has been reported by Kasai *et al.* (1993) that people with different genetic background subjected to significantly different environmental influences have different craniofacial morphology.

Oladipo *et al.* (2008) reported that the canthal index of male Ijaws and Igbos were 37.04 and 35.15, respectively and female Ijaws and Igbos were 33.11 and 32.59, respectively. Similarly studies were carried out by Cem *et al.* (2001) in Turkey. He reported the inner canthal distance, outer canthal distance and canthal index of 28.33 mm, 81.74 mm and 34.66, respectively for Turkish males while those of females were 28.14, 81.17 and 34.6 mm, respectively.

Although, Nigeria is the most populous country in Africa, she has few reports on craniofacial anthropometry

Oladipo *et al.* (2008) including those of Urhobo and Itsekiri ethnic group Oladipo *et al.* (2009). Thus the aim of this study is to find out the outer and inner canthal distances and the canthal index among the Ibibio ethnic group of Akwa Ibom state which could be of importance in Clinical practices, Forensic Anthropology, Genetics and paleoanthropological studies.

MATERIALS AND METHODS

This research was carried out on Ibibio ethnic group in Akwa Ibom state. Eight hundred adults (18-80 years) were selected randomly from Uyo in Akwa Ibom state and Port Harcourt in Rivers state. The study was carried out between June and December, 2009. The eight hundred (800) subjects were made up of four hundred (400) males and four hundred (400) females by both parents and grand parents. Subjects with craniofacial defects were not used. The method used for assessing the canthal index was Cem *et al.* (2001) method. A non stretchable plastic ruler with 0.5cm interval was used for the measurement. The subject was made to seat comfortably in a chair with his/her head at the same level as the examiner's head. The subject's face was well illuminated. The inner canthal distance (distance between medial angles of the two eyes) was then determined by having the subject look straight at the examiner while the ruler was held tightly against the bridge of the nose of the subject. The inner canthal distance was measured as the distance from the medial

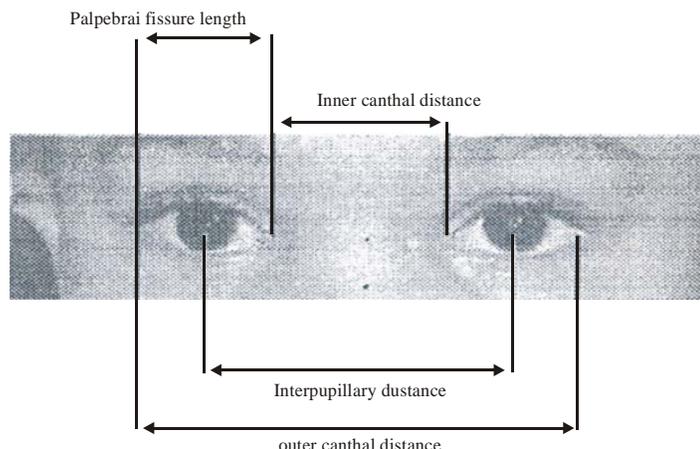


Fig. 1: Measurement of inner and outer canthal distances

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

Age group	Inner canthal distance		Outer canthal distance		Canthal index	
	Males	Females	Males	Females	Males	Females
18 – 22	3.51	3.39	10.94	10.80	32.15	31.40
23 – 27	3.55	3.39	11.30	10.70	31.51	31.62
28 – 32	3.59	3.34	11.35	10.60	31.66	33.42
33 – 37	3.55	3.31	11.30	10.70	31.49	30.96
38 – 42	3.50	3.35	10.98	10.50	31.96	32.09
43 – 47	3.51	3.31	11.20	10.80	31.35	30.70
48 – 52	3.53	3.33	11.04	10.70	31.99	31.02
53 – 57	3.57	3.33	11.34	10.60	31.47	31.45
58 & above	3.43	3.37	11.06	11.30	31.07	32.75

Table 2: Result showing the total mean, Standard deviation, Z-test of inner and outer canthal distances (cm) and canthal indices of both sexes

Variables	Males	Females	Z-critical	Z-calculated	Inference
Inner canthal distance	3.52±0.27	3.36 ±0.30	1.96	7.9	Significant
Outer canthal distance	11.15±0.51	10.73±0.63	1.96	10.37	Significant
Canthal Index	31.64±2.57	31.47±4.62	1.96	0.64	Insignificant

Table 3: Comparison of canthal indices of Ibibios with other populations

Investigator/year	Population	Male mean	C.I	Female mean	C.I
Singh and Banerjeel (1983)	India	37.23		37.82	
Cem <i>et al.</i> (2001)	Turkish	34.67		34.66	
Juberg <i>et al.</i> (1975)	African-American	38.38		38.50	
Erika <i>et al.</i> (2005)	Latvian	27.38		26.44	
Oladipo <i>et al.</i> (2008)	Ijaw	37.04		33.11	
Oladipo <i>et al.</i> (2008)	Igbo	35.14		32.59	
Oladipo <i>et al.</i> (2009)	Urhobo	24.38		29.38	
Oladipo <i>et al.</i> (2009)	Itsekiri	26.03		27.70	
Present study	Ibibio	31.64		31.47	

angle of the left eye to the medial angle of the right eye as shown in Fig. 1. The subjects were instructed to look upwards for outer canthal distances (distances between lateral angles of the two eyes), thus maximizing the contrast between the sclera and skin measured between the medial and lateral palpebral fissures respectively. The outer canthal distance was measured as the distance from the lateral angles of the left eye to the lateral angle of the right eye as shown in Fig. 1. Canthal index was then calculated as inner canthal distance/outer canthal distance X 100. Statistical analysis was made with Z-test at significant level of 0.05.

RESULTS

The results of this study are presented on Table 1-3. Observation showed that the values of outer and inner canthal distances of males were significantly higher than those of females-Table 2 ($p < 0.05$). The mean inner canthal distances for Ibibio males and females were 3.52 and 3.36 cm, respectively while the mean outer canthal distances for Ibibio males and females were 11.15 and 10.73 cm respectively (Table 2). Thus these parameters were sexually dimorphic in Ibibios. The mean canthal indices among Ibibio males and females were found

to be 31.64 and 31.47, respectively. However no difference was observed in canthal index between the sexes ($p>0.05$). Table 3 consists of comparative data of canthal indices (CI) of Nigerian Ijaws, Igbos, Urhobos, Itsekiri, Ibibios and other races with Nigerian Igbos and Ijaws showing higher values than the Ibibios while the values reported for the Itsekiris and Urhobos were lower than those of Ibibios. Other populations also such as Indians, Turks and African Americans equally showed higher values while Latvians showed lower values than Ibibios.

DISCUSSION

Craniofacial anthropometry is important in the evaluation of facial trauma, facial defect, congenital and post traumatic deformities, easy identification of certain congenital malformation, and diagnosis of hypo/hypertelorism. The normal values of inner and outer distances and canthal index are important for successful reconstruction of the canthal 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.

The study has shown that the canthal parameters (inner and outer canthal distances) of males are larger than those of females and it has also shown that the values of canthal indices obtained for Ibibios are clearly different from other populations of the world. The result from the study was in agreement with those of Cem *et al.* (2001) on Turks, Oladipo *et al.* (2008) on Ijaws and Igbos and Erika *et al.* (2005) on Latvians but at variance with those of Singh and Banerjee (1983) on Indians, Juberg *et al.* (1975) on African American and Oladipo *et al.* (2009) on Urhobos and Itsekiris who reported larger values of canthal indices in females than males.

CONCLUSION

Canthal index among the Ijaws and Igbos are larger than that of Ibibios. In conclusion, genetics and environmental factors are responsible for the variation in canthal indices and other craniofacial indices between and within populations. The result of this study will be very

useful in forensic medicine, surgery ophthalmology and anthropology and will also serve as a future framework for estimating the canthal index of Nigerians.

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REFERENCES

- Basciftci, F.A., T. Uysal and A. Buyukerdmen, 2004. Craniofacial structure of Anatolian Turkish adults with normal occlusions and well balanced face. *Am. J. Orthod. Dentofacial Orthop.*, 125(3): 366-372.
- Cem, E., Y. Cengiz, E. Hamdi, D. Selim and D. Yasar, 2001. Normative values of craniofacial measurements in idiopathic benign microcephalic children. *Cleft-palate Craniofacial J.*, 38(3): 260-263.
- Erika, N., T. Uldis and K. Dzintra, 2005. Craniofacial anthropometry in a group of healthy Latvian residents. *Acta Medica Lituanica.*, 12(1): 47-53.
- Farkas, L.G., J.C. Posnick, T.M. Hreczko and G.E. Pron, 1992. Growth patterns in orbital region. *Cleft Palate Craniofac. J.*, 29: 315-318.
- Juberg, R. C., F. G. Sholte and W. J. Touchstone, 1975. Normal values for intercanthal distance of 5-11 old American Blacks. *Pediatrics*, 55: 431-436.
- Kasai, K., L.C. Richards and T. Brown, 1993. Comparative study of craniofacial morphology in Japanese and Australian aboriginal populations. *Hum. Biol.*, 65(5): 821-834.
- Mahfouz, K.J., 1988. Craniofacial anthropometry of a group of resident of New Delhi in India, 33: 243-247.
- Oladipo, G.S., E.J. Olotu and I.U. Gwurineama, 2008. Anthropometric comparison of canthal indices between the Ijaw and Igbo tribes. *Sci. Afr.*, 7(1): 141-144.
- Poswillo, D., 1963. Casual mechanism for craniofacial deformity. *J. Trop. Pediatr.*, 44: 973-977.
- Singh, J.R. and S. Banerjee, 1983. Normal values of interpupillary, inner and outer canthal distances in an Indian population. *Hum. Hered.*, 33(5): 326-328.