

Full Length Research Paper

ANTHROPOMETRIC VARIATIONS OF THE CANTHAL DISTANCES AND INDICES OF CHILDREN FROM YORUBA AND IGBO ETHNIC GROUPS IN KANO, NIGERIA; USING 2D IMAGES.

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Abstract: Canthal measurements are important tools to craniofacial anthropologists, clinical geneticists and reconstructive surgeons and vary within and between individuals. The aim of this study is to determine the differences of the canthal measurements within and between children of two ethnic groups in Nigeria. The study samples were Yoruba and Igbo children between the ages of 5-16 year residing in Kano metropolis in Kano state of Nigeria. Inner canthal distance (ICD) and outer canthal distances (OCD) were measured in mm, using Facial landmark detection software from Bayero University Kano, version 1.0.0.0 program for Windows operating system. Canthal index (CI) was calculated using the standard formula. The data obtained were subjected to statistical analysis; and independent sample *t*-test. P value of <0.05 was considered statistically significant. Sexual dimorphism was observed in OCD within Yoruba ethnic group with males having significantly higher mean value, while Igbo males had higher insignificant mean value in OCD than Igbo females. The mean ICD were insignificantly higher in males than in females in both ethnic groups. In comparison of OCD and ICD between Yoruba and Igbo males and females, the Yoruba males and females had higher mean value than the Igbo males and females with no statistical significance. Yoruba females had higher insignificant CI value more than Yoruba males while Igbo males had higher insignificant higher CI value than Igbo females. The mean CI difference between Yoruba and Igbo children were statistically significant. Thus Canthal dimensions exhibit sexual dimorphism within and between ethnic group and may therefore be of use to esthetic surgeons.

Key words: Canthal Distance, Canthal Index, Igbo, Yoruba, Kano.

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INTRODUCTION

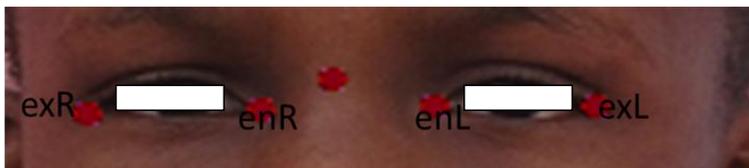
Human physical variability has been of great interest for scientists for a very long time. Study of intra and inter-population variations in different morphological characters have long been an interest to anthropologists. The dimensions of the human body are affected by ecological, biological, geographical, racial, gender and age factors (Golalipour *et al.*, 2003). Anthropological studies have been conducted on age, gender and racial groups in certain geographical zones. Obtaining measurements of the soft tissues of the face is important in terms of achieving aesthetic criteria (Ozdemir *et al.*, 2007), but accurate measurements are required in the estimation of several systemic syndromes and craniofacial abnormalities and also in surgical treatments of post-traumatic telocanthus (Farkas *et al.*, 2005). Normal canthal values can serve as a guide for the diagnosis of pathology and interventions for craniofacial abnormalities. Aesthetic results from clinical treatments thus depend on the anatomic structures present. In the recent time, physical measurements and assessment of growth and development of children from different ethnic groups within a Country are gaining prominence as a highly desirable tool in determining the health status of children in communities (Tanner, 1981). In Nigeria, few studies concerning canthal measurements exist for example, Oladipo *et al.* (2008) compared the canthal indices of Ijaw and Igbo tribes of Nigeria, while Saheeb *et al.* (2004) conducted a study on normal values for medial and lateral canthal distances in 3 to 18-year-old Nigerians, comprising of 468 males and 408 females. The values for Nigerians were compared with those of Caucasians, the mean value for medial canthal distance was slightly higher in Nigerian males compared to their Caucasian counterparts and the difference was significant ($p < 0.05$). The aim of this study is to determine the differences of the canthal measurements within and between children of two ethnic groups in Nigeria.

MATERIALS AND METHODS

The population of this study was Yoruba and Igbo children between the ages of 5-16 year residing in Kano metropolis in Kano state of Nigeria. The study was carried out at Ruler's Academy Nursery Primary and Secondary school, Golden Crown International schools, Topkids Academy, Baptist Academy and Floral International schools Kano State. A total of four hundred and two (402) children comprising of two hundred (200) Igbo (97 males and 103 females) and two hundred and two (202) Yoruba (108 males and 94 females) were used. Consent was obtained from guardians after the procedure has been explained to them. Ethical approval was obtained from Kano State Ministry of health. The photographic set up consisted of a tripod stand (Manfrototripod, model FB 10) that held a 24 mm wide-angle lens camera (Sony, model DSC-W380 made in India) and a primary flash light. The tripod stand controlled the stability and adjust the height of the camera according to the subject's height, with a zooming power of 3.6 (de Carvalho *et al.*, 2013) The camera was used always at a distance of 120 cm from the subject and each of the subjects was asked to sit at rest on a chair facing the camera with the head in the anatomical position and the lips in repose (de Carvalho *et al.*, 2013). An identification number tag was placed lateral to the head of the subject so as to merge each subject with his questionnaire. The subject's forehead, neck, and ears were clearly visible during the recording. Photographs were analyzed using Facial landmark detection software from BUK, version 1.0.0.0 program for Windows operating system. The program was customized with the landmarks used in this study. The required landmarks on the face were adjusted manually, after which the software automatically

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measured all the possible dimensions. Measured dimensions by the software were scaled to life size using a correcting factor. Intra and inter-investigator reliabilities correlation coefficient was considered good at 0.7 and above (Shrout & Fleiss, 1979). Children aged between 5-16yrs with facial surgery, facial trauma, parents or grandparents from different ethnic group or place of birth not Kano were excluded. Parameters measured included the Outer Canthal Distance (OCD) -the distance between the lateral canthus of the left eye(exL) and the lateral canthus of the right eye(exR); Inner Canthal Distance (ICD) -the distance between the medial canthus of the left eye(enL) and the medial canthus of the right eye(enR); and Canthal Index (CI)-the ratio of the inner canthal distance to the outer canthal distance multiplied by 100. Independent Sample *t*-test was used in assessing sexual dimorphism and comparative analysis between ethnic groups. A P value less than 0.05 was considered significant. All statistics were done using SPSS for windows (Version 21.0).



Exocanthion right = exR, endocanthion right = enR,
endocanthion left = enL exocanthion left = exL

Plate 1:.0 Landmarks Used

RESULT

The mean OCD and ICD were higher in males than in females in both ethnic groups. In Table 1, the mean values of 100.31 ± 9.51 mm and 97.86 ± 7.94 mm were observed as the mean OCD in Yoruba males and females with statistically significant sexual difference, while 100.10 ± 9.83 and 97.70 ± 9.28 was observed as the mean OCD in Igbo males and females respectively but statistically insignificant difference. The mean ICD in Yoruba males and females was 36.48 ± 3.97 and 35.83 ± 3.78 respectively, while Igbo males and females had 35.64 ± 4.85 and 34.67 ± 4.55 respectively all without any significant sexual dimorphism. Table 2 compared OCD and ICD between Yoruba and Igbo males and females, the Yoruba males and females had higher mean value than the Igbo males and females with no significant ethnic difference. Table 3 shows the mean CI of Yoruba males and females which were $36.38 \pm 2.29\%$ and $36.62 \pm 2.58\%$ with the females having significantly higher mean value than males, while that of Igbo males and females were $35.54 \pm 2.58\%$ and $35.43 \pm 2.67\%$ respectively with insignificantly higher mean value in males than in females. Table 4 indicates the mean CI difference between Yoruba and Igbo males and between Yoruba and Igbo females which showed statistically significant ethnic difference.

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Table 1.0: Independent Sample *T*-test for Sexual Dimorphism in Outer and Inner Canthal distance in Yoruba and Igbo Ethnic groups

Ethnicity	Variables	Sex	N	Mean	Std	T	p-value
Yoruba	OCD	Males	108	100.31	9.51	1.98	0.0495
		Females	94	97.86	7.94		
	ICD	Males	108	36.48	3.97	1.19	0.2349
		Females	94	35.83	3.78		
Igbo	OCD	Males	97	100.10	9.83	1.77	0.0782
		Females	103	97.70	9.28		
	ICD	Males	97	35.64	4.85	1.46	0.1455
		Females	103	34.67	4.55		

Table 2: Independent Sample *T*-test for Comparison of Outer and Inner Canthal distance in Yoruba and Igbo Ethnic groups

Sex	Variables	Ethnicity	N	Mean	Std	t	P-Value
Males	OCD	Yoruba	108	100.31	9.51	0.16	0.8731
		Igbo	97	100.10	9.83		
Females	ICD	Yoruba	108	36.48	3.97	1.37	0.1735
		Igbo	97	35.64	4.85		
	OCD	Yoruba	94	97.86	7.94	0.12	0.9028
		Igbo	103	97.70	9.28		
ICD	Yoruba	94	35.83	3.78	1.94	0.0538	
	Igbo	103	34.67	4.55			

Table 3: Independent Sample *T*-test for Sexual Dimorphism in Canthal Index in Yoruba and Igbo Ethnic groups.

Sex	Sex	N	Mean	Std	t	P-value
Yoruba	Males	108	36.38	2.29	-0.72	0.4750
	Females	94	36.62	2.58		
Igbo	Males	97	35.54	2.58	0.29	0.7710
	Females	103	35.43	2.67		

Table 4: Independent Sample *T*-test for Comparison of Canthal Index between Yoruba and Igbo ethnic groups

Sex	Ethnicity	N	Mean	Std	t	P-value
Males	Yoruba	108	36.38	2.29	2.45	0.0150
	Igbo	97	35.54	2.58		
Females	Yoruba	94	36.62	2.58	3.17	0.0020
	Igbo	103	35.43	2.67		

DISCUSSION

The OCD and ICD values observed in this study were higher than the values obtained by Oladipo *et al.*, (2013) in Ikwere school children which may be due to environmental, or genetic differences between the two study groups. The higher mean values obtained in males in OCD and ICD than females are in line with previous studies in Ijaw (Oyinbo *et al.*, 2008), Urhobo and Itsekiri (Oladipo *et al.*, 2009) proving that males have higher average values in physical characteristic than females, but disagree with the work of Blessing *et al.*, (2011) who reported

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higher mean values in females than males which may be attributed to environmental or age differences between their study and present study. Also, the fact that the mean values in males were significantly larger than those of females ($p < 0.05$), is in agreement with that of Cem *et al.* (2001), Oladipo *et al.* (2010), and Kasai *et al.*, (1993), which reported larger values for ocular dimension in males than in females. The insignificant difference found between males and females of both ethnic groups is in agreement with the work of Umar *et al.*, (2005) which observed insignificant difference between the Plateau population and the Hausa ethnic groups in ICD, because the two ethnic groups were also sharing same environment. It means therefore, environment has no influence on the intercanthal distances of ethnic groups living on the environment.

The insignificant sexual difference observed in CI of both ethnic groups in this study is not in keeping with the report of Oladipo *et al.*, (2008) in Igbo and Ijaw people in the southern part of Nigeria, but this variation in the findings of our study and their own study may most likely be attributed to the age differences and possibly environment between the two study groups.

The significant difference observed between Yoruba males and Igbo males, Yoruba females and Igbo females in CI in the current study is in line with what Oladipo *et al.*, (2009) reported where they reported Canthal index of Urhobo females to be significantly higher than of Itsekiri females, while canthal index in Itsekiri males was significantly higher than that of Urhobo males indicating that canthal index varies among ethnic groups, even though they live in the same environment.

CONCLUSION

The canthal index of the study ethnic groups was significantly different indicating differences in genetic contents and different origin. The study also found sexual dimorphism only in OCD of Yoruba ethnic groups. The findings of this study therefore provide data on canthal distances and indices of Yoruba and Igbo children in Kano metropolis, which may be of help to forensic scientists, plastic surgeons, researchers, anatomist and general public and may also serve as a future framework for estimating the canthal distances and index of Nigeria children.

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CONFLICT OF INTERST

The authors declare that there is no conflict of interest with regards to this study.

REFERENCES

- Blessing N.R Jaja, Hakeem B Fawehinmi and Joy T. Jack (2011). Craniofacial Anthropometry in a Young Nigerian Population: the Canthal Distances *Int. J. Morphol.* 29(3):914-917.
- Cem E., Cengiz Y., Hamdi E., Selim D., Yasar D., (2001): Normative values of craniofacial measurements in idiopathic benign microcephalic children. The cleft palate. *Craniofacial Journals.* 38(3):260-263.
- de Carvalho Rossa Gomes, L., Horta, K. O. C., Gandini Jr., L. G., Goncalves, M., and Goncalves, J. R. (2013). Photographic assessment of cephalometric measurements. *The Angle Orthodontist*, 83(6), 1049-1058.
- Farkas, L.G., Katic, M.J., Forrest, C.R., Alt K.W., and Erasmus, I.(2005) International anthropometric study of facial morphology in various ethnic groups/races. *Journal of Craniofacial Surgery* 16:615-646
- Golalipour, M.J., Haidari, K., Jahanshahi, M. and Farahani, R.M. (2003). The shape of head and face of new born in south east of Caspian Sea (Iran-Gorgan). *Journal of Anatomical Science India*, 52; 28-31.
- Kasai, K., Richards L.C., Brown, T., (1993): Comparative study of Craniofacial Morphology in Japanese and Australian Aboriginal Populations. *Human Biol.* 65: 821-834
- Oladipo G.S., Chinagorom E., Iruoghene G.O., (2010): Craniofacial dimension of Ijaw children of Nigeria. *Biomedicine International.* 1(2):25-29.
- Oladipo G.S., Fawehinmi H.B. and Okoh P. (2009). Canthal indices of Urhobo and Itsekiri ethnic groups. *Australian journal of basic and applied science* 3(4):3093-3096.
- Oladipo Gabriel S., Yorkum Leyira K. and Okoh Peter D. (2013). Measurements of Head Circumference, Intercanthal Distances, Canthal Index and Circumference Interorbital Index of Ikwerre School Children in Nigeria, *Journal of Natural Sciences Research* (4), 2013:16-20.
- Oladipo G.S, Olotu J. E, Guinireamal.U(2008) Anthropometric comparison of Canthal Indices between the Ijaw and Igbo tribe in Nigeria. *Scientia Africana*:7(1):141-144.

- Oyimbo, A.C., Fawehinmi, H.B., Dare, W.N., and Berez,i A.M.(2008) Normal outer and inner canthal measurements of the Ijaws of Southern Nigeria. *European J Sci Res.*;22:163–167
- Ozdemir MB, Ilgaz A, Dilek A, Ayten H, Esat A(2007). Describing normal variations of head and face by using standard measurement and craniofacial variability index (cvi) in seven-year-old normal children. *J Craniofac Surg*; 18: 470–474.
- Saheeb B.D,Umweni A.A, ObuekweO.N,Flolaranmi.N(2004).Normal values of medial and lateral canthal distances in 3to 8 year old Nigerians. *West Afr J Med.*23(2):156-161.
- Shrout P.E, Fleiss J.L. (1979). Intra class correlations: uses in assessing rater reliability. *Psychol Bull.*, 86(2):420-8.
- Tanner, J. M., 1981. *A History of the Study of Human Growth.*Cambridge University Press.286-298.
- Umar, M.B.I, Singh, S.P., and Shugaba A.I.(2005). Orbital measurement among the ethnic groups of plateau state, Nigeria. *Highland medical research journal* 3(2):45-50