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INNER AND OUTER INTERCANTHAL DISTANCES IN A NIGERIAN POPULATION

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Abstract

Objective: *This study investigated the inner and outer intercanthal distances in a Nigeria population.*

Materials and Methods: *The cross sectional study was carried on 384 adults (males and females) between the ages of 18-35years. This study was carried in Abraka, Delta State, Nigeria. A pair of digital venier calipers was used to carry out anthropometric measurement of the inner and outer intercanthal distances measured between the medial and lateral ends of the palpebral fissures respectively.The canthal index (CI) was calculated as [ICD x 100]/OCD. Simple descriptive and inferential statistics were calculated from the data obtained. Gender and age differences were scrutinized using the students' t-test and correlation respectively. P value <0.05 was accepted as significant difference.*

Results: *The mean canthal dimensions for the Nigerian population was inner-canthal distance (38.65±1.49mm), outer-canthal distance (76.25±4.03mm), and canthal index (50.85±3.50). According to gender, inner-canthal distance was 39.15±1.44mm and 38.15±1.38mm, outer-canthal distance was 76.59±4.13mm and 75.89±3.91mm, and canthal index was 51.26±3.46 and 50.41±3.52 for male and female respectively. There was a significant difference (p<0.05) in the inner-canthal distance and canthal index between male and female. There was insignificant correlation between: age and inner-canthal distance (r= 0.082, p= 0.108), age and outer-canthal distance (r= -0.024, p= 0.641), and age and canthal index (r= 0.064, p=0.213).*

Conclusion: *Sexual dimorphism occurred as the inner canthal distance and canthal index were significantly higher in males compared to females in the Nigerian population.*

Keywords: *Intercanthal, medial, lateral, distance*

INTRODUCTION

The pattern of the inner and outer intercanthal distances varies with no universal normative values.The inner intercanthal distance (IICD) is the distance between the medial angles of the horizontal palpebral fissures of both eyes, while the outer intercanthal distance (OICD) is the distance between the lateral angles of the horizontal palpebral fissures of both eyes.

The measures of medial (inner) and lateral (outer) canthal distances as well as canthal index are referred to as craniofacial anthropometry. This assessment is critical for the study of human development, variance among races, and clinical diagnosis (Yadav *et al*., 2019). Numerous investigations have revealed that the canthal index, as well as the inner and outer intercanthal distances are affected by a wide range of clinical, congenital, and trauma-related disorders (Zhang *et al*., 2000; Evereliogl*u et al*., 2000). These diseases, including hypertelorism, post traumatic telecanthus, naso-orbitoethmoidal injuries, and cleft palate, can either increase or reduce the inner and outer intercanthal distances.

The clinical importance of the intercanthal dimensions is in the evaluation of many craniofacial malformations and syndromes and the management of posttraumatic telecanthus. Increased intercanthal distance is considered to be one of the somatometric traits by which craniofacial anomalies can be diagnosed. The intercanthal distances are essential in ophthalmology for a variety of reasons. These dimensions may change in craniofacial disorders and may be beneficial in the treatment of post-traumatic cranial and orbitofacial abnormalities. Furthermore, craniofacial anthropometry values are beneficial in the construction of spectacle frames and lenses (Oladipo *et al*., 2010).

The outcome of this research will be important to ophthalmologists for craniofacial assessment, surgery and identification of craniofacial syndromes. Furthermore, the outcome of this study will provide a databank for craniofacial surgeons and related specialties in the evaluation of deformities, post-traumatic telecanthus and hypertelorism among the Nigerian population. This inquest determined the inner and outer intercanthal distances in a Nigerian population.

MATERIALS AND METHODS

This cross-sectional study was carried out on different Nigerian ethnic groups in Abraka Delta State, Nigeria. The study populace include males and females between the age of 18-35 years. Foreigners or individuals with history of inter-racial marriage were not included in this study.

The sample size is three hundred and eighty four (384). Sample size calculation (Cochran, 1997) is thus:

$$n= Z^2 p (1-q)/d^2$$

where n= sample size, Z= confidence level, p= approximate proportion of the event in the population, d= margin of error.

Assuming the maximum variability which is equal to 50% (p=0.5) and taking 95% confidence level with 5% margin of error, the calculation for required sample size is as follows:

$$n= 1.96^2 \text{ X } 0.50 (1-0.50)/ 0.05^2$$

Thus sample size= 384.

A pair of digital venier calipers was used to carry out anthropometric measurement of the inner and outer intercanthal distances. The inner canthal distance was measured as the distance between the medial angles of the horizontal palpebral fissures of both eyes, while the outer canthal distance was measured as distance between the lateral angles of the horizontal palpebral fissures of both eyes. The measurements were done by having each subject look straight at the researcher, while the digital venier caliper was held tightly against the bridge of the nose. All measurements were carried out in millimeters (mm).

The data generated from this study was analyzed via SPSS (Statistical Package for the Social Sciences) with simple descriptive statistics presented in frequency, charts and tables as Mean±SD (standard deviation). Furthermore inferential statistics came into play as the results were also compared between both genders using the students' t-test (independent samples, unpaired, assuming equal variance). The differences were considered statistically significant at 95% confidence level, i.e., when probability is less than 0.05 ($P<0.05$). The relationship between age and canthal distances was defined by the use of correlation.

RESULTS

The total sample size of 384 individuals comprised of 197 (51.3%) males and 187 (49.7%) females (figure 1). The participants were between the ages of 18-35years. Age distribution from this study showed that 98(25.5%) were within 18-22yrs, 138(35.9%) were within 23-27yrs, 118(30.7%) were within 28-32yrs, and 30(7.8%) were within 33-35years of age (figure 2). The mean age recorded for this study was 26years.

Table 1 shows the descriptive statistics of canthal distances and canthal index for the different age groups. The 18-22years age bracket portrayed the minimum inner canthal distance as well as canthal index. The 28-32years age set displayed the least outer canthal distance.

Table 2 shows comparison of canthal distances between males and females in this study. Gender variations in inner canthal distance and canthal index were significant (p= 0.00 and p= 0.01 respectively).

Table 3 shows the relationship between age and canthal distances and divulged a weak positive relationship (r= 0.082) between age (26.03±4.50years) and inner canthal distance (38.65±1.49mm), and this difference was not significant (p>0.05). Also there was a weak negative relationship (r=-0.024) between age (26.03±4.50years) and outer canthal distance (76.25±4.03mm), and this was not significant (p>0.05). Finally, there was a weak positive relationship (r=0.064) between age (26.03±4.50years) and canthal index (50.85±3.50), and this was also not significant (p>0.05).

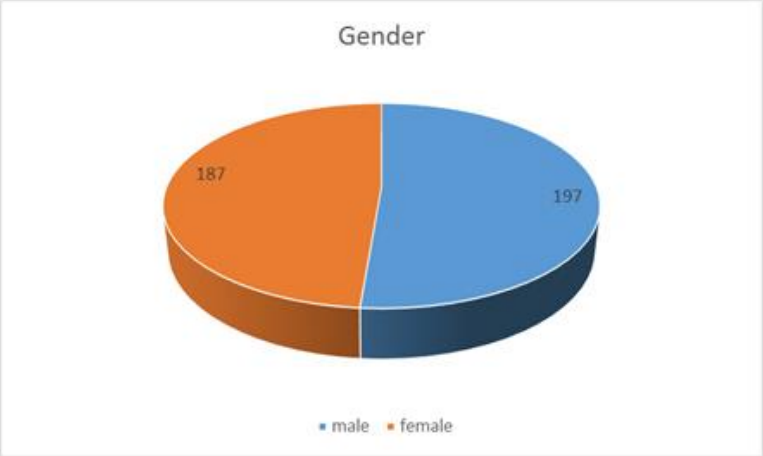

Figure 1: Gender distribution of the study sample

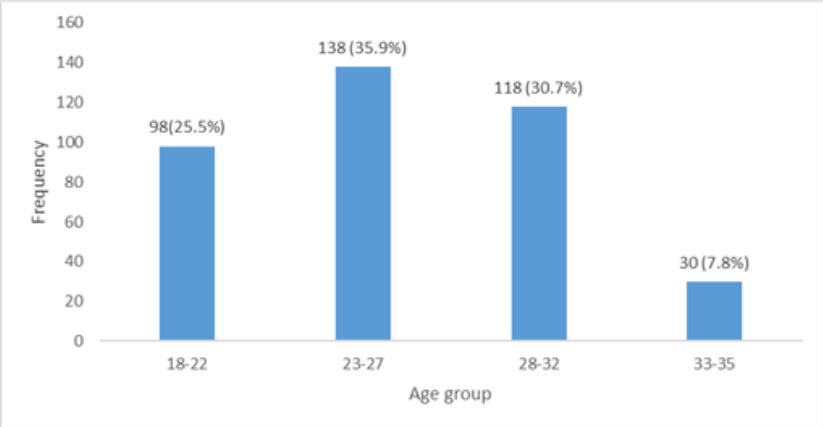

Figure 2: Age distribution of participants

Table 1: Descriptive statistics of canthal distances according to age-group

Age group (years)	N	Canthal distances	Minimum	Maximum	Mean	Standard deviation
18-22	98	Inner canthal (mm)	34.67	42.32	38.43	1.46
		Outer canthal (mm)	67.47	81.64	76.71	3.57
		Canthal index	43.38	58.64	50.22	3.18
23-27	138	Inner canthal (mm)	34.62	42.61	38.83	1.53
		Outer canthal (mm)	67.46	81.67	76.14	4.08
		Canthal index	44.28	62.13	51.15	3.52
28-32	118	Inner canthal (mm)	34.61	42.51	38.64	1.57
		Outer canthal (mm)	67.47	81.64	76.10	4.28
		Canthal index	43.43	61.03	50.95	3.72
33-35	30	Inner canthal (mm)	37.01	40.99	38.59	1.01
		Outer canthal (mm)	67.46	81.21	75.83	4.32
		Canthal index	46.42	58.36	51.06	3.44

Table 2: Comparison of canthal dstances across gender with independent sample t-test

Parameter	Male	Female	t	Df	P value
Inner canthal distance (mm)	39.15±1.44	38.15±1.38	6.934	382	0.00*
Outer canthal distance (mm)	76.59±4.13	75.89±3.91	1.698	382	0.09
Canthal index	51.26±3.46	50.41±3.52	2.384	382	0.01*

Table 3: Relationship between age and canthal dimensions in a correlation table

Pairs	N	Mean	Standard deviation	R	P value
Age &	384	26.03	4.50	0.082	0.108
Inner canthal distance		38.65	1.49		
Age &	384	26.03	4.50	-0.024	0.641
Outer canthal distance		76.25	4.03		
Age &	384	26.03	4.50	0.064	0.213
Canthal index		50.85	3.50		

DISCUSSION

The major parameters that influence the anthropometric difference in the inner and outer canthal distances are age, gender, and ethnic background. This present study observed that the inner canthal distance was significantly ($p<0.05$) higher in males than in females. This is in line with previous studies (Egwu *et al*., 2008; Oladipo *et al*., 2010; El-Sheikh *et al*., 2010; Ipigansi *et al*., 2017; Oria *et al*., 2018; Hayat *et al*., 2019; Yadak *et al*., 2019). Also, it was observed that there was no significant difference ($p\geq0.05$) in the outer canthal distance between males and females. This observation agrees with previous reports (Osunwoke *et al*., 2010; Jaja *et al*., 2011).

However, the observation in this present study with reference to gender was contrary to previous reports (Abdel-Azeem *et al*., 2010; Oladipo *et al*., 2010; Usman and Shugaba, 2015; Oria *et al*., 2018; Hayat *et al*., 2019; Yadak *et al*., 2019) on both outer and inner canthal distances. This may be due to differences in craniofacial morphology in various regions and different methodologies employed in carrying out the studies.

The canthal Index as observed in this present study was significantly higher ($p<0.05$) in males (51.26±3.46) than in females (50.41±3.52). This observation is in agreement with previous reports (Oladipo *et al*., 2010; Jaja *et al*., 2011; Oria *et al*., 2018; Hayat *et al*., 2019; Yadak *et al*., 2019). However this observation was contrary to a previous one by Egwu *et al*., (2008), who reported insignificant gender difference in the canthal index among the South-East population of Nigeria.

Futhermore, this present study observed that no significant ($p>0.05$) correlations exist between age and inner canthal distance ($r=0.082$), age and outer canthal distance ($r= -0.024$), as well as age and canthal index ($r=0.064$). This is in agreement with the observations of Hayat *et al.*, (2019).

CONCLUSION

The mean inner canthal distance of the Nigerian population is 38.65mm, outer canthal distance is 76.25mm, and canthal index is 50.85. Gender variations in inner canthal distance and canthal index were significant

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