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A Study of the Inner and Outer Intercanthal Distances Among the Bura Ethnic Group of North Eastern Nigeria

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ABSTRACT

This study is aimed at establishing standards for the inner and outer intercanthal distances, documenting the anthropometric variation with advancing age and determining the extent of sexual dimorphism of these parameters among the Bura ethnic group of North Eastern Nigeria. This was a cross sectional study involving 300 volunteers consisting of 150 males and 150 females aged 7 to 40 years. Measurement of the intercanthal distances was performed with a sterilized Vernier calliper after Ethical clearance and Informed Consent had been obtained. The data was entered and analysed in statistical software (SPSS version 17). The comparative tests were conducted using the independent student's -t-test at significant level of 0.05. The mean Inner and outer Intercanthal distances for the studied population was 34 ± 2.4 mm and 100 ± 4.1 mm respectively. There is a strong correlation between advancing age and the mean values of inner and outer intercanthal distances in all age groups and among both sexes. There is also demonstration of significant sexual dimorphism among inner and outer intercanthal distances. In conclusion these findings would be of benefit in the diagnosis of craniofacial syndromes associated with hyper/hypotelorism, management of posttraumatic cranial and orbitofacial deformities, in the manufacture of spectacle frames and lenses and as a guide for dentists in selecting denture teeth.

Keywords: Anthropometry, Inner Intercanthal Distance, Outer Intercanthal Distance, Bura Ethnic Group, North Eastern Nigeria

INTRODUCTION

Intercanthal distance (ICD) is defined as the distance between the medial (nasal) and / or lateral (temporal) angles (canthi) of the palpebral fissures bilaterally. The inner Intercanthal distance (IICD) is the distance between the medial (nasal) canthi of the palpebral fissures bilaterally while the outer Intercanthal distance (OICD) is the distance between the lateral (temporal) canthi of the palpebral fissures¹. These parameters may be altered in craniofacial syndromes associated with hyper/hypotelorism, may be useful in the management of posttraumatic cranial and orbitofacial deformities and are important in the manufacture of spectacle frames and lenses².

Inner and outer canthal dimensions are important measurements in the evaluation of several systemic syndromes and craniofacial abnormalities and in surgical treatments of post-traumatic telecanthus³. Deformities of the face are often congenital but may result from trauma, burns, neoplasm or any pathology involving the facial skeleton⁴.

Studies have shown that the average values of canthal dimensions are race, age and gender sensitive. It is also

known that canthal distances vary with age in a given individual and tend to become constant in the mid to late twenties⁵. The study of ocular dimensions in adult Ijaws of Nigeria shows that male mean values are significantly larger than those of females⁶.

The inner canthal dimensions in young adult Ijaw males and females were 42 ± 5 mm and 39 ± 3 mm respectively, their outer canthal dimensions were 111 ± 14 mm for males and 120 ± 7 mm for females respectively. It does appear that ICD dimensions of Ijaw males and Igbo females were identical. Moreover, there is a significant difference between Igbo males and Ijaw females⁷.

In the study among the Igbos of South – Eastern Nigeria, it was revealed that ageing affects the rate of growth of the Intercanthal distances⁸. The canthal parameters (inner and outer canthal distances) of males are larger than those of females and it has been shown that the values of canthal indices obtained for the Ibibios are clearly different from other populations of the world⁹.

In studies on white subjects and a mixed European

population, IICD has been reported from 25.5 to 38.5mm and from 32 to 34 mm respectively with a mean IICD of 31 ± 2.7 mm and no difference between genders. It has also been reported that the mean OICD in the 12.5 – 20 year age group was 90.5mm in males and 89.8mm in females with no statistically significant difference. These values fall between those of the Indians and White populations².

In the study of Saudi Arabian adults, Al Wazzan showed that the mean ICD of 31.92mm was similar to that reported by Etezad – Razavi of 31 ± 2.7 mm. No significant difference was found between the mean ICD measurements in relation to sex which is in accordance with other studies¹⁰.

In the study of the Sudanese population, measurements of ICD were found to be greater in males than in females. The mean ICD of 32.8 mm was greater in this study when compared with the findings of Al Wazzan of 31.92 mm. No significant difference was found in the mean ICD when compared to gender or age¹¹.

This study is therefore aimed at establishing standards for the inner and outer intercanthal distances, documenting the anthropometric variation with advancing age and determining the extent of sexual dimorphism of these parameters among the Bura ethnic group of North Eastern Nigeria

MATERIALS AND METHODS

This was a cross sectional study design conducted among the Bura Ethnic group of North – Eastern region of Nigeria. Three hundred (300) volunteers consisting of 150 males and 150 females aged 7 to 40 years were recruited for this study. Only subjects who met the criteria of age ranging from 7 – 40, with normal craniofacial configuration, having no strabismus and whose parents and grandparents are from Bura land were selected. The subjects from Bura land were determined from presentation of their birth certificates. Measurement of the ICD was performed with a sterilized Vernier calliper after Ethical clearance and informed consent had been obtained. The sterilized calliper was placed against the forehead and lowered toward the eyes (Fig. 1). The arms of the callipers were adjusted so that they were in gentle contact with the medial angles of the palpebral fissures of the eyes (inner intercanthal distance) and then in contact with the lateral angles of the palpebral fissures of the eyes (outer intercanthal distance). Utmost care was taken not to compress the soft tissues.

The data was entered and analysed in statistical software (SPSS version 17). The comparative tests were conducted using the independent student's -t-test at significant level of 0.05 to demonstrate any statistical significance between the measured parameters¹².



Figure 1: Measurement of intercanthal distance
(Source: EL-Sheikh et al., 2010)

RESULTS

The results of this study are presented in tables 1 to 5. Subjects were divided into three age groups; 7 – 15 years, 16 – 25 years and 26 – 40 years to determine the anthropometric variation of the measured parameters with advancing age. The mean values of the investigated parameters were compared statistically using the independent student t test. The mean values in the text are represented as mean value $\pm$ standard

deviation.

The mean Inner Interanthal distance for the studied population was 34 ± 2.4 mm while the mean Outer Interanthal Distance was 100 ± 4.1 mm as shown in table 1. The mean inner intercanthal distance for males and females are 34.1 ± 2.2 mm and 32.9 ± 2.4 mm respectively with the male population having a mean outer intercanthal distance of 100.8 ± 4.0 mm and the

female population having a mean value of 98.9 ± 3.9 mm (table 2). The mean values for the various age groups for IICD are 31.0 ± 1.5 mm, 33.9 ± 1.4 mm and 35.7 ± 1.3 mm and for OICD are 95.0 ± 1.5 mm; 100.5 ± 1.7 mm and 104.1 ± 1.5 mm respectively (table 3).

There is a strong correlation between advancing age and the mean values of IICD and OICD in all age groups and among both sexes signifying anthropometric variation with age (table 4). There is demonstration of significant sexual dimorphism among IICD and OICD (table 5).

Table 1: Overall Mean Inner and Outer Intercanthal Distances

	N	Minimum (mm)	Maximum (mm)	Mean (mm)	Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error
IICD	300	28.0	38.0	34.0	.14
OICD	300	92.0	107.0	100.0	.23

IICD: inner intercanthal distance, OICD: outer intercanthal distance

Table 2: Mean Inner and Outer Intercanthal Distances With Respect to Sex

	SEX	N	Mean (mm)	Std. Deviation	Std. Error Mean
IICD	Male	150	34.1	2.2	.18
	Female	150	32.9	2.4	.20
OICD	Male	150	100.8	4.0	.33
	Female	150	98.9	3.9	.32

IICD: inner intercanthal distance, OICD: outer intercanthal distance

Table 3: Mean Inner and Outer Intercanthal Distance with Respect to Age

	N	Minimum (mm)	Maximum (mm)	Mean (mm)	Std. Deviation
Age (years)	Statistic	Statistic	Statistic	Statistic	Std. Error
IICD	7 to 15	100	28.0	36.0	.15
	16 to 25	100	30.0	36.0	.14
	26 to 40	100	33.0	38.0	.13
OICD	7 to 15	100	92.0	99.0	.15
	16 to 25	100	96.0	103.0	.17
	26 to 40	100	100.0	107.0	.15

IICD: inner intercanthal distance, OICD: outer intercanthal distance

Table 4: Anthropometric Variation of Inner and Outer Intercanthal Distances with Age

	Age	IICDM	OICDM	IICDF	OICDF
Age	Pearson Correlation	1	.711**	.863**	.819**
	Sig. (2-tailed)		.000	.000	.000
	N	150	150	150	150

IICDM: inner intercanthal distance in males, OICDM: outer intercanthal distance in males,
IICDF: inner intercanthal distance in females, OICDF: outer intercanthal distance in females

Table 5: Sexual Dimorphism of Inner and Outer Intercanthal Distances

		Levene's Test for Equality of Variances		t-test for Equality of Means						95% Confidence Interval of the Difference
		F	Sig.	T	Df	Sig. (2 tailed)	Mean Difference	Std. Error Difference	Lower	Upper
IICD	Equal variances assumed	3.065	.081	4.277	298.0	.000	.115	.027	.062	.168
	Equal variances not assumed			4.277	295.7	.000	.115	.027	.062	.168
OICD	Equal variances assumed	.123	.726	4.071	298.0	.000	.186	.046	.096	.276
	Equal variances not assumed			4.071	297.8	.000	.186	.046	.096	.276

IICD: inner intercanthal distance, OICD: outer intercanthal distance

DISCUSSION

Ocular dimensions are important in the diagnosis and treatment of congenital orbital or craniofacial anomalies and posttraumatic deformities as well as in proper mounting of spectacle lenses to eliminate unwanted prismatic effect⁶. Normal values of Interanthal Distances are important for the successful reconstruction of the canthal area. Thus it is important to have local data of these parameters since this standard reflect the potentially different pattern of craniofacial growth resulting from racial, ethnic, sexual and age differences⁶.

The overall mean IICD and OICD obtained in this study (Table 1) and with respect to males and females (Table 2) were lower than those reported by Oladipo⁶ for the Ijaws who had IICD of 42±5mm and 39±3mm and OICD of 111±14mm and 120±7mm for males and females respectively. The European population as reported by Etezzad – Razavi² had slightly lower IICD (31±2.7mm) and OICD (90.5mm for males and 89.8mm for females) than those found for the Buras in this study.

This study shows a strong correlation between advancing age and the mean values of IICD and OICD in all age groups and among both sexes signifying anthropometric variation with age of all parameters (Tables 3 and 4). There is however no significant difference in the mean ICD among the Sudanese population when compared to age¹¹.

It has been demonstrated in this study that there is significant sexual dimorphism among the mean values of IICD and OICD (Table 5). Indeed several other studies have also demonstrated significant sexual dimorphism in IICD and OICD^{2,6,7,9,13,14}.

CONCLUSION

This study in a minute way has established standards for the inner and outer intercanthal distances in the Buras, demonstrated the anthropometric variation of the studied parameters with age and showed that there is significant sexual dimorphism with higher mean values in males. These findings would be of benefit in the diagnosis of craniofacial syndromes associated with hyper/hypotelorism, management of posttraumatic cranial and orbitofacial deformities, in the manufacture of spectacle frames and lenses and as a guide for dentists in selecting denture teeth.

RECOMMENDATION

It is recommended that more studies should be carried out among the various other ethnic groups in Nigeria and indeed in other parts of the world so as to have standard national and international data on these studied anthropometrical parameters.

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