

Short communication

The interpupillary distance and the inner and outer intercanthal distances

Usman YM^{1*} and Shugaba AI¹

¹Department of Human Anatomy, Faculty of Medical Sciences, University of Jos, Jos, Nigeria

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Anthropometric studies are integral part of craniofacial surgery and syndromology. Interpupillary distance has been defined as the distance between the centres of the pupil. Intercanthal distance is defined as the distance between the medial and /or lateral canthi of the palpebral fissures bilaterally. Inner canthal dimensions in young adult Ijaw males and females were 42 ± 5 mm and 39 ± 3 mm respectively and outer canthal dimensions were 111 ± 14 mm for males, and 120 ± 7 mm for females respectively. Canthal indices in the Ibibios are clearly different from other populations. The study among the Igbos revealed that ageing affects the rate of growth of the intercanthal distances. For the healthy urban Turkish subjects, there was significant increase in near and distant IPD measurements with age until 19 years in male subjects. In the Sudanese population, ICD was found to be greater in males than in females. No statistically significant difference exists in the inner canthal and interpupillary distances between both Egyptian boys and girls for the same mean age. In Saudi Arabian adults, mean ICD was 31.92mm. It has been demonstrated that genetics, environmental factors, gender and age results in variations of the considered parameters.

Key words: interpupillary distance, inner intercanthal distance, outer intercanthal distance.

INTRODUCTION

Anthropometric studies are integral part of craniofacial surgery and syndromology. Therefore, normal values for frontooccipital circumference, inner canthal distance, outer canthal distance, near interpupillary distance and far interpupillary distance are integral measurements in the evaluation of telecanthus, ocular hypotelorism or hypertelorism. Congenital and posttraumatic deformities can also be treated with the knowledge of normal values for this region to produce the best aesthetic and functional result. The keystone for successful reconstruction of the medial canthal area is adequate positioning of the medial canthal complex to maintain proper inner canthal distance. For these reasons, standards based on ethnic or racial data are desirable because these standards reflect the potentially different patterns of craniofacial growth resulting from racial, ethnic and sexual differences (Evereklioglu, 2002).

Interpupillary distance (IPD) has been defined by various authors as the distance between the centres of the pupils (Osuobeni, 1991). Near Interpupillary Distance (NIPD) is the IPD during near vision while Far Interpupillary Distance is the IPD during far vision.

Intercanthal distance (ICD) is defined as the distance between the medial and /or lateral canthi of the palpebral fissures bilaterally.

The inner intercanthal distance (IICD) is the distance between the medial canthi while the outer intercanthal distance (OICD) is the distance between the lateral canthi of the palpebral fissures bilaterally (Umwani et al., 2011), see figure 1.

LITERATURE REVIEW

The study of ocular dimensions in adult Ijaws of Nigeria shows that male mean values are significantly larger than those of females (Oladipo, 2010). 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

*Corresponding author **Email:** cckpz373@yahoo.com.
Tel: 08064817431

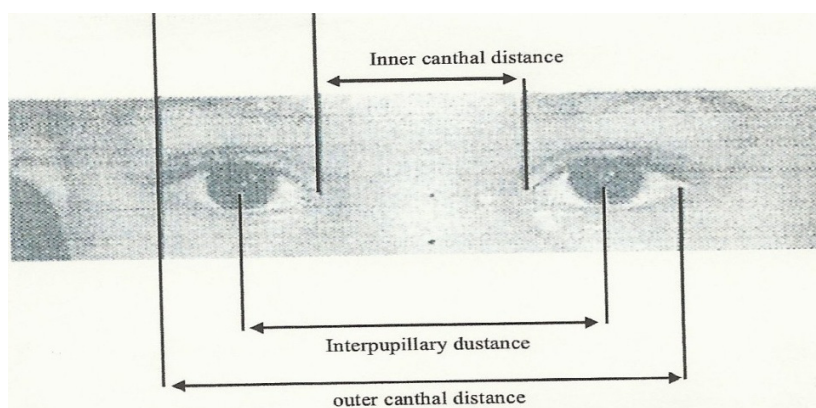


Figure 1. The interpupillary distance and the inner and outer intercanthal distances

for females respectively. The mean inner and outer canthal dimensions of male and female Ijaws was significantly different from those of male Igbos. Conversely, ICD of female Ijaws varies significantly from those of female Igbos. However, the difference in mean ICD of male and female Ijaws appears to be more than that of the Igbos. Furthermore, the difference observed in the mean outer canthal value was significant between Ijaw males and females. Those between Ijaw males and Igbo males and between Ijaw females and Igbo females were nonetheless insignificant. 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 females (Charles, 2008).

In the study among the Igbos of South – Eastern Nigeria, it was revealed that ageing affects the rate of growth of the intercanthal distances. For subjects between 7-9 and 13-15 year old age groups, the inner canthal distance lengthened by 6.2 mm in males and in females 9.5mm. For ages between 16-18 and 20-24 year old age group, the inter canthal distance gradually lengthened further by 0.6mm in males while in females it gradually shortened by 1.0mm while in the outer canthal distance value the male value shortened by 0.3mm while female value further lengthened slightly by 1.3mm. For ages between 25-27 and 31-40 year old, the inner canthal distance gradually shortened by 0.7 mm in females while in males the value did not change while in the outer canthal distance value the male value shortened by 3.8 mm while female value remain the same (Esomonu, 2012).

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 world. The result from the study was in agreement with those on Turks, Ijaws, Igbos and Latvians but at variance with those on Indians, Urhobos and

Itsekiris who reported larger values of canthal indices in females than males (Oladipo, 2011).

The mean interpupillary distance of the subjects selected from the department of Prosthodontics, Lahore Medical and Dental College, Lahore was shown to be 65.26 ± 5.41 mm by (Hussain, 2012) with a range of 81.29mm to 44.41mm. Other studies however showed a mean value of 59.16mm after measuring 100 subjects of United States army, 63.51mm for 109 edentulous patients with a range of 38.00 to 73.00mm. Hussain also revealed an increased interpupillary distance values for male than female and these gender based variations similar to Hussain's study were also reported in other studies (Hussain, 2012).

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 that of the Indians and White populations (Etezzad – Razavi, 2008).

In the study of Saudi Arabian adults, Al-Wazzan (2001) showed that the mean ICD of 31.92mm was similar to that reported by Etezzad – Razavi (2008) 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 studies (Al-Wazzan et al., 2001).

For the healthy urban Turkish subjects, there was significant increase in near and distant IPD measurements with age until 19 years in male subjects. On the other hand, this increase for both distances was observed until 14 years of age in females. This represents the earlier maturation of females than males. Furthermore, age related increase in IPD was small but continuous until mid – thirties in this study. It was also observed that IPD in males was significantly greater than

females starting from childhood. The average total growth increments for near and distant IPD for 7 and 35 year old males were 8.66 and 9.31mm respectively. In females, these increments were on the average 7.61 and 7.96 mm respectively. The overall Turkish male subjects had average 1.21 and 2.01 mm near and distant IPD greater than those for females respectively. The difference was statistically significant. Across all subjects, the average difference between distant and near IPD was 2.98 mm for males and 2.80 mm for females. The overall distant IPD obtained in this study was 60.75 ± 4.03 mm for males and 59.45 ± 3.51 mm for females (Evereklioglu et al., 1999).

There was no statistically significant difference in the inner canthal and interpupillary distances between both Egyptian boys and girls for the same mean age. Outer canthal distances also showed no significant differences between boys and girls except that at 13 years there were increased distances among girls. The mean inner and outer canthal distances obtained in Egyptian children were similar to that of Turkish children. The interpupillary distances showed similarity with female children but male children showed different measurements. In spite of that, African Americans have wider inner canthal distances than Egyptian children who have smaller outer canthal distances (Abdel-Azeem, 2010).

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 (2001) of 31.92 mm. No significant difference was found in the mean ICD when compared to gender or age (El – Sheikh et al., 2010).

The overall FIPD obtained in a Turkish population was 60.75 ± 4.03 mm for men and boys and 59.45 ± 3.51 mm for girls and women. In the 7 – 11 yr age group, the average IPD was greater in the Turkish population (54.5 to 59 mm) than reported averages for Chinese (52mm), Black (53.1 to 57.5 mm) and Caucasian children (52 to 56 mm). The Turkish values are very similar to those reported for Hong Kong (54 to 59 mm) and British children (55 to 60 mm). In the 7 – 15 year old girls, Turkish FIPD and NIPD values were 58.03 ± 3.31 and 55.31 ± 3.29 mm respectively, quit similar with values of Arabian children which are 57.55 ± 3.29 and 55.32 ± 3.29 mm respectively (Evereklioglu et al., 2002).

CONCLUSION

This review in a minute way has demonstrated that genetics, environmental factors, sex and age are responsible for the variation in the considered parameters. Therefore when making clinical determination of ocular hypo – or hypertelorism in some craniofacial malformations and various syndromes, it should not be enough to rely on impression on physical features on the face only but to consider standards

already established for each race, ethnic group, sex and age of the patient.

The review also intends to familiarize the science community with the reviewed subject matter and the paucity of data in same, so as to stimulate interest for further research. It is therefore recommended that more studies be carried out among the numerous other ethnic groups and races so that national and international standards can be documented.

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