ANTHROPOMETRIC STUDY OF THE 2ND TO 4TH DIGIT RATIO OF THE IGBO NIGERIANS: A RADIOGRAPHIC APPROACH

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ABSTRACT

This study was carried out to investigate sexual dimorphism in the second to fourth digit ratio (2D:4D) of Igbos in Nigeria from radiograph or x-ray films. One hundred (100) radiographs of Igbos were used for this study. These comprised 60 males (60%) and 40 females (40%). Digital venier caliper was used to measure the length of the second digit (2D) and the fourth digit (4D) from the base of the proximal phalanx to the tip of the distal phalanx. The digit ratio 2D:4D was then calculated for each sample. ANOVA was used to compare digit ratio between males and females. The result obtained from the study revealed that males demonstrated lower digit ratio (0.90±0.05) compared to the females (0.92 ±0.04). The difference observed between males and females of the Igbo tribe, when subjected to statistical analysis showed statistical significant difference (F=13.05 and P=0.034). This data therefore represents the original values for the digit ratio of the Igbos, and may be useful in forensic, archaeological and medico-legal cases.

KEYWORDS: Anthropometry, 2D:4D, Radiograghs, Igbo-Nigerians

INTRODUCTION

The study of differences in physical characteristics among human beings is known as physical anthropology. Digit ratio which is an anthropometric study and commonly known as 2D:4D is the ratio of the index finger (2D) and the ring finger (4D) (Manning et al, 2000). Other ratios have previously been studied. For instance, the second to fifth digit ratio, arm to trunk length ratio, Waist- hip- ratio, Hip- chest- ratio etc. Digit ratio has been extensively reviewed, yet the need to continue is still very imperative. Digit ratio exhibits sexual dimorphism with females having higher ratio than do males, as reported by Phelps, 1952, Manning et al, 1998, Manning et al, 2002,Oladipo et al, 2006 and 2009, Gwunireama et al, 2010. Manning et al, 2002 reported that for males, the index finger is generally about 96% of the length of the ring finger, which gives an average digit ratio of 0.96 whereas females have a digit ratio of approximately 1.0 This sexual dimorphism in 2D:4D is largely influenced by prenatal secretion of testosterone and estrogen. Testosterone negatively correlates with digit ratio (2D:4D) while estrogen correlates positively with digit ratio (Manning et al, 2003). Digit ratio has been linked with fertility and human behavior (Manning et al, 2002), aggression and assertiveness (Wilson, 1983 and Allison et al, 2004), personality factor, hand skill and medical condition such as CAH (Windy 2002). It has however been reported to be an inherited trait with no geographical influence (Gwunireama and Ihemelandu, 2010). Ethnic variations have also been reported by Oladipo et al, 2009 when they compared the digit ratios of the major ethnic groups in Nigeria.

Luxen et al, 2005, established that the levels of estrogen that a person has can be seen in the relative length of their index (second) and ring (fourth) fingers and that pupils with longer ring fingers excelled in numeracy while those with shorter ring fingers tend to be more adept at literacy. Scientists believe the trends can be explained by the levels of testosterone and estrogen that children are exposed to in the womb. The sex hormones are thought to govern brain development as well as finger length (Brosnan, 2005)

The focus of this present study is to document values of the digit ratio of the Igbos using the radiological approach.

MATERIAL AND METHODS

A total of one hundred (100) radiograghs of Igbo origins obtained from the achive of the radiology department of the Federal medical center, Owerri, Imo state University Teaching Hospital, Orlu and Abia state University Teaching Hospital, Aba, all in Nigeria in 2011 were used for this study. These comprised of 60 males (60%) and 40 females (40%). Digital venier caliper was used to measure the lengths of the second digit (2D) and the fourth digit (4D) from the base of the proximal phalanx to the tip of the distal phalanx according to Manning et al, 2003. The digit ratio (2D:4D) was then calculated each sample. Descriptive statistics and ANOVA was used to analyze the data obtained.

RESULTS

The results from this study is summarized in table 1 below

Table 1: Shows the length of the second digit (2D), fourth digit (4D) and the digit ratio (2D:4D).Mean ± SD

	Male		Female		F-ratio	P-value
Parameter(CM)	Right	Left	Right	Left		
2D	7.97±0.54	7.96±0.56	7.86±0.64	7.91±0.56		
4D	8.84±0.62	8.972±0.48	7.88±0.54	7.99±0.52		
2D:4D	0.90±0.05	0.90±0.05	0.92±0.03	0.92±0.04	13.05	0.034
Sample size	60	60	40	40		

The results showed that males had lower ratios (0.90±0.05) on both hands as compared to females (0.92 ±0.03) as indicated in table 1 above. This difference however was statistically significant (F=13.05, P=0.034).

The result therefore demonstrated sexual dimorphism and may be attributed to the prenatal secretions of testosterone and oestrogen.

DISCUSSION

The finding from this study suggests that 2D:4D is sexually dimorphic among Igbos when radiographs are used for assessment of the digit ratio, which agrees with the work of Robertson *et al.,* 2007, Oladipo *et al.,* 2006 and Oladipo et al, 2009, Gwunireama, et al 2010, Gwunireama and Ihemelandu, 2010.Digit ratio of the Igbos have previously been reported to show sexual dimorphism with males 0.96 and females 1.00. This has put a clear distinction between the present study with males 0.90 and females 0.92.

The sexual difference that occurred may be associated with testosterone concentration as suggested by Manning *et al*., 1998.This study when compared with many previous findings of digit ratio from direct measurement reveals that digit ratio from radiographs are lower than the values gotten from direct measurement as revealed by (Manning *et al*, 2000; Oladipo *et al.,* 2006; Paul *et al,* 2006; Vehmas *et al,* 2006; Robertson *et al.,* 2007). The difference may be as a result of the fat-pads and soft tissues at the tip of the finger and base of the fingers (Vehmas *et al.,* 2006).

The method of this study has revealed that osteoarthritis in finger joints, which is common in middle aged persons, that leads to shortening of the fingers due to joint space narrowing, may be easily detected from radiograph, rather than from physical observation when measuring directly from the hand, which thus biases finger length measurements as revealed by Vehmas *et al.,* 2006).

The values obtained from this study represent the original values for the Igbos and will be very useful in forensic archeological anthropology in the case of indentifying skeletal models.

CONCLUSION

Beyond claims about digit ratio, using a precise radiographic phenotype of Igbos in Nigeria, this study has shown that digit ratio can be gotten from radiographs and it showed strong sexual dimorphism.

This data therefore represents the original values for the digit ratio of Igbos, and may be useful in forensic, archaeological and medico-legal cases.

Further studies should be conducted on digit ratio using radiograph, since true bony lengths may be measured and wrinkles in soft tissues or differences in nail characteristics do not disturb the measurements.

Also radiographic dimension may be less vulnerable to differences in hand positioning.

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