

PHOTOMETRIC ANALYSIS OF THE FACIAL ANGLE OF THE IBOS IN NIGERIA

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ABSTRACT

Aim: This study was carried out to provide data on and compare the mean facial angle between male and female Ibo subjects.

Methods: The study design was the cross-sectional descriptive type that involved 100 Ibo subjects aged between 18 and 30 years. The multi-stage sampling technique was used in this study. Simple random sampling was employed to select the research subjects. There was also stratified sampling such that equal number of the male and female subjects were selected. The subjects had the right-side photographs of their faces taken with a digital lens camera. Computer assisted analysis of the facial photographs was done. The following soft tissue points were introduced on the photographic images: the trignon (Tr), nasion (N) and pogonion (P).

Results: Significant differences were found between Ibo males and females in measurements of the facial angle ($P < 0.05$). The mean facial angles of Ibo male and female subjects were 83.1 and 81.1 degrees respectively.

Conclusion: A data base on the facial angle in Ibo people has been established. This database is recommended for use when formulating a treatment plan for this ethnic group.

Key words: Facial angle, Photometric, Ibo, Identification

INTRODUCTION

Physical appearance is an important characteristic of the face. It has long been established that self-esteem is strongly influenced by facial appearance (Hershon and Giddon, 1980). The perception of an attractive face is largely subjective, with ethnicity, age, gender, culture, and personality influencing average facial traits (Mandall et al., 2000; Sahin and Gazileri, 2001). Interestingly, facial features are usually studied in profile. Various methods have been used to evaluate facial characteristics, such as anthropometry (Farkas, 1981), photogrammetry (Gavan et al., 1952; Neger, 1959), computer imaging (Guess and Solzer,

1989), and cephalometry (Garner, 1974; Roos, 1977). A uniform standard of facial aesthetic is not appropriate for application to diverse racial and ethnic groups (Wuerpel, 1936). Hence, researches on craniofacial study of different ethnic groups are on going to establish ethnic specific anthropometric data (Krishan and Kumar, 2007). Measurements of the human head by imaging, traditionally from x-ray films have established standard values for skeletal, dental and soft tissue structures for different ethnic groups (Broadbent, 1931; Brodi, 1949) as well as in forensic medicine (Krishan, 2007). Cephalometric norms for Iranians (Hijighadimi et al., 1981), Saudis (Shalhoub et

al., 1987), Jordanians (Hamdan and Rock, 2001), Egyptians (Loutfy et al., 1970; Bishara et al., 1990) and Cameroonians (William, 1983) have been established. Ajayi investigated cephalometric norms of Nigerian children from the Igbo ethnic group (Ajayi, 2005). The facial angle assesses the forehead-to-jaw relationship and has a long history of been employed to make judgments of inferiority and superiority of certain human races (Oghenemavwe et al., 2010). Aristotle utilized it to determine a person's intelligence and to rank humans from inferior to superior. It was first adopted in modern times to compare human races by Petrus Camper (1722–1789), and it became widely popular until disproved in the early 20th century (Haller, 1971). Petrus Camper is known for his theory of the 'facial angle'. He discovered that modern humans had facial angles between 70° and 90°, with African angles closer to 70°. The facial angle is an angle formed by drawing two lines: one horizontally from the nostril to the ear; and the other perpendicularly from the advancing part of the upper jawbone to the most prominent part of the forehead. Greco-Roman people display an angle of 100°-95°, Europeans of 90°, 'Orientals' of 80°, Black people of 70° and the orangutan of 58°. Camper agreed with Buffon in drawing a sharp line between human and animals (Thomson, 2003). The facial angle was used to measure human "degeneracy". Talbot saw that a chimpanzee has a facial angle of 40° to 50° because the jaw occupies two-thirds of the skull and the brain only one third. Africans had angles of close to 70° compared to 75° to 80° for Caucasians (Talbot, 1898). The facial angle was also one of the main initiators of racial craniology, which emerged during the nineteenth century to justify racism (Camper, 1792). Presently, photometric studies are being done to determine aesthetic facial angles in humans. This is preferable as it eliminates the exposure to radiation experienced in cephalographic studies. Soft tissue profile standards using photogrammetry have been reported for North American population (Powell and Humphreys, 1984), Spanish (Fernández-Riveiro et al., 2003), Himachalis of India (Jain et al., 2004), Brazillian Caucasians (Reis et al., 2006), Croatians (Anic-Milosevic et al., 2008) and Turkish (Kale-Varl et al., 2008; Senem et al., 2009). Photometric analysis of soft tissue facial profile of Adult Urhobos has been done (Oghenemavwe et al., 2010). Photogrammetric

analysis of soft tissue profile of the face of Igbos in Nigeria has also been done (Oghenemavwe et al., 2011). A research considered photometric analysis of the facial angle of the Urhobos in Nigeria (Anibor et al., 2013). One study dived into a computer-assisted photometric analysis of the facial angle of the Itsekiris in Nigeria (Anibor and Okobia, 2013). Studies on aesthetic facial angles of Africans are not as common as those from other parts of the world. Researches on soft tissue facial profile amongst Nigerians are limited. Literature search did not reveal any research on the photometric analysis of the facial angle of the Ibos. The Ibos are an ethnic group of Nigeria's Niger Delta area, Delta State. The study of facial beauty and harmony has been a pivot to the practice of orthodontics, right from its early infancy to date. Determining the facial profile and facial balance is a continuous learning process for an orthodontist (Jan, 2004). This research is also important in the field of facial surgery. This study will no doubt provide a comprehensive data for use in anthropology and forensic medicine. The purpose of this study is to document a baseline data of the facial angle amongst the Ibos in Nigeria using photometric analysis.

MATERIALS AND METHODS

The study design was the cross-sectional descriptive type that involved 100 Ibo subjects aged between 18 and 30 years. The multi-stage sampling technique was used in this study. Simple random sampling was employed to select the research subjects. There was also stratified sampling such that equal number of the male and female subjects were selected. Subjects were of Ibo ethnic origin by both parents and grandparents. 50 were males while 50 were females. The subjects were made to sit in a relaxed and upright position with head in the natural head position while taking photographs. The right-side photographs of their faces were taken using a digital lens camera. The photographs were transferred into a computer by a universal serial bus (USB) cord. Computer assisted analysis of the facial photographs was done. The following soft tissue points were introduced on the photographic images: the tragion (Tr), nasion (N) and pogonion (P). The tragion is the most superior point on the tragus. The nasion lies at the root of the nose in the midline. The pogonion is the

most anterior point of the chin. Iconographic protractor screen software took the measurements of the facial angle. The facial angle was measured in a plane developed by drawing a line from the trignon anteriorly to bisect a line from the nasion to pogonion. The angle created by the intersection of these two

lines is the facial angle as described by Peck and Peck (1970). The data obtained was analyzed using Statistical Package for Social Sciences (SPSS) version 16 and t test was used to search for significant gender differences. The subjects had Dental Class I occlusion and normal overjet–overbite relationships.

RESULTS

Table 1: Facial angle in Ibo males and females

	MALE				FEMALE			
	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation
Facial angle	75.0	91.1	83.1	4.1	70.0	90.0	81.1	5.2

The Ibo males have higher facial angles than the females. The mean facial angles of Ibo male and female subjects are 83.1 and 81.1 degrees respectively.

Table 2: Gender and facial angle among the Ibos

	T test	P value
Facial angle and gender	0.0461	P < 0.05

The results of the t - test used to search for significant differences in the facial angle between male and female Ibo subjects. A significant difference was found between Ibo males and females in the facial angle (P < 0.05).

Table 3: Age and facial angle among the Ibos

	T test	P value
Age and the facial angle	0.442	P < 0.05

The facial angle increased significantly with age (P < 0.05).

DISCUSSION

This publication is an output from a research on the facial angle among the Itsekiris in Nigeria using photometric analysis. Several angles have been employed to evaluate facial aesthetics (Anic-Milosevic et al., 2008). The H-angle elucidates the prominence of upper lip in relation to the overall soft tissue profile (Holdaway, 1983). Merrifield (1966) utilized the Z-angle measurement and profile line to provide a description of the relationship of the lower face. Legan and Burstone (1980) took interest in the angle of convexity which is formed by soft tissue glabella, subnasale, and soft tissue pogonion. The Powell analysis, which is made up of the nasofrontal, nasofacial, nasomental, and mentocervical angles, provides

an insight into an ideal facial profile (Powell and Humphreys, 1984). Stoner utilized soft tissue analysis of the facial profile on photographic records (Stoner, 1955). Arnett and Bergman defined frontal and lateral analysis from the photographic records taken in the natural head position (Arnett and Bergman, 1993a; 1993b). Peck and Peck (1970) described an orientation plane formed by a line from the trignon that bisects a line from the nasion to the pogonion . The facial, maxillofacial, and nasomaxillary angles developed from these lines relate the upper lip to the chin and nasal tip and the nasion to the chin. In the present study, the mean facial angles of Ibo male and female subjects are 83.1 and 81.1 degrees respectively. This concurs with the

facial angles of the Urhobos in Nigeria which are 82.6 and 82.5 degrees for the males and females respectively (Anibor et al., 2013). This study concurs with the assertion that facial proportions, angles, and contours vary with sex (Larrabee, 2004). In Caucasians, the mean facial angle as described by Peck and Peck is 102.5° (Peck and Peck, 1970). The documented significant gender difference seen in previous studies was demonstrated in our sampled population. Sexual dimorphism was seen in an angular photogrammetric analysis of the soft tissue facial profile of Anatolian Turkish Adults (Kale-Varl, 2008). Analysis of the soft tissue facial profile of a Croatian (Caucasian) sample by means of angular measurements revealed distinct gender differences (Anicy-Milosevicy et al., 2008). A cephalometric study done on Mexicans displayed significant gender differences (Lara - Carrillo et al., 2009). When comparing the cephalometric data of Iowan and North Mexicans a significant gender difference was seen among the Northern Mexicans (Samir and Arturo, 1985). No significant gender difference was observed in the Igbos in Eastern Nigeria (Ajayi, 2005). The mean facial angles of the Ibo male is 83.1 degrees, which is not in agreement with the findings of Fernández-Riveiro et al., (2003) of 168 ± 5 degrees and Arnett and Bergman of 169.4 ± 3.2 degrees, who used natural head position. A Croatian (Caucasian) sample revealed a facial angle (Glabella – Subnasale – Pogonion) of 168.8 ± 4.96 degrees for males. A study presented measurement for total facial angle or facial convexity including the nose (Nasion – Pronasale – Pogonion) for males as 130.5 ± 3.7 degrees and females as 130.2 ± 3.5 degrees, indicating no significant gender difference (Anicy-Milosevicy et al., 2008). For Fernández-Riveiro et al. (2003), higher values were seen for males (140 ± 5.0 degrees) than females (139 ± 4.5 degrees) and they measured from glabella, not from nasion. This study does not concur with their research as there was no significant gender difference in their research though the males had higher values. Yuen and Hiranaka encountered gender dimorphism though almost equal values were displayed (males = 135 ± 4 degrees; females 135 ± 3 degrees) (Yuen and Hiranaka, 1989). The mean facial angle of Ibo female subjects is 81.1 degrees which does not concur with Arnett and Bergman (1993a; 1993b) who observed 169.3 ± 3.4 degrees. The

present study does not concur with Arnett and Bergman's as they did not display significant gender differences. A Croatian (Caucasian) sample displayed a facial angle (Glabella – Subnasale – Pogonion) of 169.07 ± 4.72 degrees for females (Anicy-Milosevicy et al., 2008). That research unlike the present one displayed no significant gender differences. In Turkey, the soft tissue facial angle of both sexes was found to display statistically significant differences. There the facial angle for females and males were 87.41 ± 4.10 and 86.49 ± 4.82 degrees respectively (Aynur and Umit, 2001). Significant differences were found between males and females in measurements of soft tissue facial angle in a sample of Jordanian adolescents (Hamdan, 2010). The different studies discussed above present different values for the facial angles. This may be due to different racial origins, head orientations, measurement methodologies and ages.

CONCLUSION

The mean facial angles of Ibo male and female subjects are 83.1 and 81.1 degrees respectively. There is sexual dimorphism ($P < 0.05$). A data base on the facial angle in Ibo people has been established. This database is recommended for use when formulating a treatment plan for this ethnic group.

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