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A COMPUTER-ASSISTED PHOTOMETRIC ANALYSIS OF THE FACIAL ANGLE OF THE ITSEKIRIS IN NIGERIA

Anibor Ese, Okobiah Richard

Department of Human Anatomy and Cell Biology, Faculty of Basic Medical Science, College of Health Sciences, Delta State University, Abraka, Nigeria.

Correspondence
Anibor Ese
Email: eseovo2000@yahoo.com

ABSTRACT

Aim: To determine and compare the mean facial angle between male and female Itsekiris.

Methods: This is a cross sectional study that involved 100 Itsekiris aged between 18 and 30 years. The multi-stage sampling technique was used in this study. The three local government areas in Itsekiri land were covered. Simple random sampling was employed to select the research subjects. There was also stratified sampling such that equal number of 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 tragion (Tr), nasion (N) and pogonion (P).

Results: The mean facial angles of Itsekiri male and female subjects are 83.8 and 82.9 degrees respectively. There is no sexual dimorphism ($P > 0.05$).

Conclusion: The facial angle portrays ethnic and racial differences. This research establishes a data base on the facial angle in Itsekiri people. This data base is vital for use when formulating a treatment plan for this ethnic group.

Key words: Facial angle, Photometric, Ethnic, Racial

INTRODUCTION

Facial traits are major features in physical appearance, which is related to social acceptance, psychological well being and self esteem of an individual (Hershon and Giddon, 1980; Sahin and Gazileri, 2001). The face, comprising of pairs of eyes and ears, nostrils and the mouth is the anterior aspect of the head from the forehead to the chin and from one ear to the other (Moore and Dalley, 2006). Facial beauty analysis can be characterized as a combination of symmetry, proportions and harmonious relationship among the structures (Pasinato et al., 2008). Parameters used in facial aesthetics are currently based on Powell and Humpherys (1984). They formulated suitable relationships between the face and the nose and defined facial angles (Pasinato et al., 2008). 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 et al., 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 close 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 statues display an angle of 100°-95°, Europeans of 90°, 'Orientals' of 80°, Black people of 70° and the Orangutan of 58°, but out of all human races, Africans were most removed from the classical sense of ideal beauty. Camper agreed with Buffon in drawing a sharp line between human and animals (although he was misinterpreted by Diderot, who claimed that he was a supporter of the Great Chain of Being theory (Thomson, 2003). The facial angle was used to measure human "degeneracy". Talbot noted 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 because the brain was encroaching and the jaw receding (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 been 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) , Brazilllian Caucasians (Reis et al., 2006), Croatians (Anic-Milosevic et al., 2008) and Turkish (Kale-Varl, 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 faces 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 photometric analysis of the facial angle of the Ibos in Nigeria (Anibor and Okobiah, 2014). 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 among Nigerians are limited. Literature search did not reveal any research on the photometric analysis of the facial angle of the Itsekiris of Nigeria. The Itsekiris are an ethnic group of Nigeria's Niger Delta area, Delta State (Ikime, 1968). The significance of this study concerns clinicians such as Oral and Maxillofacial Surgeons. Orthodontists will also appreciate this research. The findings will equally be relevant in forensic and anthropological sciences. The purpose of this study is to document a baseline data of the facial angle among the Itsekiris in Nigeria using photometric analysis.

MATERIALS AND METHODS

This is a cross sectional study that involved 100 Itsekiris aged between 18 and 30 years. Subjects were of Itsekiri ethnic origin by both parents and grandparents. 50 were males while 50 were females. The multi-stage sampling technique was used in this study. The three local government areas in Itsekiri land were covered. These are the Warri South, Warri North and Warri South

West local government areas. In two local governments, simple random sampling was employed to select 33 research subjects each. Thirty four subjects were randomly selected in the third local government. In each local government there was also stratified sampling such that equal number of the male and female subjects were selected. 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 tragion 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 (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 were told the nature and objectives of the study and only those who gave consent were included in the study. Also prior to the commencement of the study, permission was obtained from the Research and Ethics Committee of the College of Health Sciences in the Delta State University, Nigeria. The subjects had Dental Class I occlusion and normal overjet–overbite relationships. Those with history of orthodontic or oral surgical treatment were excluded from the study.

RESULTS

Table 1: Facial angle in Itsekiri subjects

	MALE				FEMALE			
	Minimum	Maximum	Mean	Standard deviation	Minimum	Maximum	Mean	Standard deviation
Facial angle	70.0	99.0	83.8	4.7	70.0	92.0	82.9	3.5

It can be seen that the Itsekiri males have higher facial angles than the females.

Table 2: Gender and facial angle among the Itsekiris

	T test	P value
Facial angle and gender	0.2637	P > 0.05

Table 2 shows the result of the t test used to search for significant differences in the facial angle between male and female Itsekiris. There was no significant alteration in the facial angle between the male and female gender ($P > 0.05$).

Table 3: Age and facial angle among the Itsekiris

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

Table 3 reveals that the facial angle increased significantly ($P < 0.05$) with age.

DISCUSSION

This research considered the facial angle among the Itsekiris in Nigeria using photometric analysis. Several angles have been employed to evaluate facial aesthetics (Anicy-Milosevicy et al., 2011). The H-angle elucidates the prominence of upper lip in relation to the overall soft tissue profile (Holdaway, 1983). Merrifield utilized the Z-angle measurement and profile line to provide a description of the relationship of the lower face (Merrifield, 1966). Legan and Burstone took interest in the angle of convexity formed by soft tissue glabella, subnasale, and soft tissue pogonion (Legan and Burstone, 1980). 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 tragion 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 Itsekiri male and female subjects are 83.8 and, 82.9 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 et al., 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 not 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 cephalometirc 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). In the present investigation the value of the facial angle in males is 83.8 degrees, which is not in agreement with the findings of Fernández-Riveiro et al., (2003) of 168 ± 5 degrees and Arnett and Bergman (1993a; 1993b) 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. That 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 Fernandez-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 concurs with their research as there was no significant gender difference 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). In the present study, the facial angle for females is 82.9 degrees, which does not concur with the 169.3 ± 3.4 degrees seen by Arnett and Bergman (1993a; 1993b). The present study concurs with Arnett and Bergman's in that both do 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 like 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 (P <

0.05) (Hamdan, 2010). The different studies discussed above present different values for the facial angles. Reasons for this are not farfetched and may be due to racial origin, head orientation, measurement methodology and age.

CONCLUSION

The mean facial angles of Itsekiri male and female subjects are 83.8 and 82.9 degrees respectively. There is no sexual dimorphism (P > 0.05). From the present study one can appreciate that the facial angle portrays ethnic and racial differences. This research establishes a data base on the facial angle in Itsekiri people. This data base is vital for use when formulating a treatment plan for this ethnic group.

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