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Photometric Analysis of Soft Tissue Facial Profile of Adult Urhobos

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Abstract: This study determined facial soft tissue norm for Urhobos adults by means of vertical and angular measurements usually used for aesthetic treatment goals. In addition gender differences were tested. Standardized photographic record of 120 (60 male, 6o females) Urhobos young adults between 18 and 35 years were taken in the natural head position using a digital camera. The measurements of the vertical and angular parameters were done with the aid of a ruler and protractor. The Urhobos males had a mean percent ratio of 42.27±3.71 for middle face and 57.73±3.63 lowers face. The mean values of nasofrontal angle was 117.75±9.07º, 40.77±6.29º for nasofacial angle, 121.95±7.93º for nasomental angle and 93.33±3.27 for mentocervical angle. The females had a mean percent ratio of 43.51±3.66 for middle face height and 56.49±3.69 for lower face height. The nasofrontal angle was 127.859.50º, nasofacial angle 35.607.46º, nasomental angle 126.55±6.93º and mentocervical angle 90.88±3.58º. There was sexual dimorphism in all measured parameters except the lower face. This study shows that as in other populations, vertical and angular variable that defines the soft tissue profile are sexually dimorphic. In addition, the middle face of Urhobos is lower that that of the Himachalis and North Americans.

Key words: Lower face, mentocervical, nasofacial, nasofrontal, nasomental, Urhobos

INTRODUCTION

The Urhobo ethnic group is one of the minority groups in the Niger Delta area of Nigeria. They are found in the Southern coastal states of Delta, Edo and Bayelsa, where their predominant occupation is farming, trading and fishing. Soft tissues refer to tissues that connect, support or surround other structures and organs the body not being bones. Soft tissues of the face together with the underlying skeleton define the facial trait of an individual. Facial traits are major feature in physical appearance, which is well related to social acceptance, psychological well being and self esteem of an individual (Hershon and Giddon, 1980; Sahin and Gazileri, 2001). Therefore defects (malformation, scaring, or other alterations resulting from pathology or trauma) of the face have marked consequences beyond physical defects. Thus one of the primary goals of all medical specialties concerned with the treatment of the face is to attained and preserved optimal facial attractiveness. The understanding of soft tissues and their normal ranges enables treatment plan to be formulated for a given individual.

It well established that a single of facial aesthetics is not appropriate for application to diverse race and ethnic groups (Wuerpel, 1936; Moyers, 1988; Profit, 1999), as facial traits are largely influenced by factors such as race, ethnic group, age, sex, culture etc (Mandall *et al*., 2000). In addition, morphological features of different races and ethnic groups are not randomly distributed but appear in geographic cluster thus there is a need for facial study on different ethnic groups to establish specific anthropometric data for population with different ethnic backgrounds (Krishan and Kumar, 2007).

Soft tissue profile standards using photogrammetry have been reported for North American population (Powell and Humphries, 1984), Spanish (Fernandez-Riveiro *et al*., 2003), Himachalis of Indians (Jain *et al*., 2004), Brazilllian Caucasians (Reis *et al*., 2006), Croatians (Anic-Milosevic *et al*., 2008) and Turkish (Kale-Varlk, 2008; Senem *et al*., 2009). Norms of soft tissue facial profile of African tribes from various geographical region and ethnicity are not as readily available as those from other parts of the world. However morphometric studies of facial dimensions of Nigerians have been reported. Didia and Dappa (2005) measured the facial, nasal maxillary and oro-facial heights of Nigerians and established an average facial height of 12.28 and 11.77 cm; 4.50 and 4.48 cm; 2.44 and 2.03 for maxillary height; 4.49 and 4.023 cm for mandibular heights; and 6.90 and 6.32 cm for oro-facial height for males and females respectively. In the anthropometric study of Igbos by Akpa *et al*. (2003) the average nasal height were 6.31 cm for males and 6.04cm for females. In a separate study of the facial and nasal length of adult Igbos by Olotu *et al*.

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(2009), the average facial length for males was 12.22 cm ±2.11 while that for females was 11.19±0.84cm; the nasal height for males was 4.87±0.84cm and 4.40 cm ±76 for females. The studies showed significant gender differences with higher values for males. Studies on craniofacial parameters in Nigerians have been conducted. Oladipo *et al.* (2008) studied the craniofacial dimension among adult Ijaws and reported that males had mean facial height, nasal height, maxilairy height, mandibular height and orofacial height of 11.87, 4.71, 2.49, 4.60 and 7.12 cm, respectively; in the same vein, the mean values for the females were 10.71, 4.43, 2.39, 4.28 and 6.50 cm. Significant gender difference was also established.

Studies on soft tissue facial profile amongst Nigerians are limited: there are no reports of angular measurement of soft tissue facial profile amongst adult Nigerians. In view of the paucity of this information, the present study was carried to quantify mean parameters that define soft tissue facial profile of young adults of Urhobo origin of South-Southern Nigeria. Angular and vertical measurements where defined in standardized photographic techniques to analyzed the profile.

MATERIALS AND METHODS

The population of this study were adult males and females Urhobos between the ages of 18 and 35 years residing in Warri, Ughelli and Sapele towns in the Niger-Delta area of Nigeria. The study was done in the Frienship Centre of these towns between July and December 2009. Consent was obtained from individuals after the procedure has been explained to them. Urhobos of dual ethnic origins were excluded. In addition individuals who have undergone any maxillofacial or orthodontic treatment were also excluded. A sample 120 individuals consisting of 60 males and 60 females were randomly obtained. The criteria of selection included a pleasing and balanced profile as judged by two authors. A brief questionnaire that included names, age, origin of parent and grand parent, and previous orthodontic or maxillofacial treatment was completed by the subjects.

The photographic set up consists of a tripod (Seagull A300) supporting a digital camera (Samsung S850). Adjustment of the tripod height allows the optical axis of the lens to be maintained in a horizontal position during the recording. This was adapted to it object height in a standing position. Each subject was asked to relax with both hands hanging beside the trunk. The subject was position on a line marked on the floor and placed beside the subject was a meter rule that allows measurement at life size. 120 cm in front of the subject on the opposite was a mirror. The subject have to look into their eyes in the mirror with their lips relax so that both the front and side view profile were taken in the natural head position before every recording. The operator ensures that the

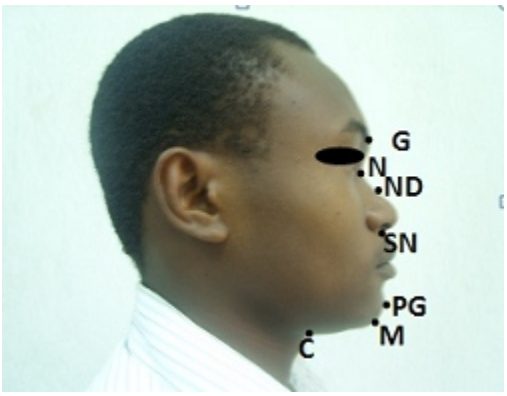

Fig. 1: Soft tissue landmarks used in this investigation: glabella (G), nasion (N), nasal dorsum (ND), pronasale (PRN), subnasale, pogonion (PG), menton (M),

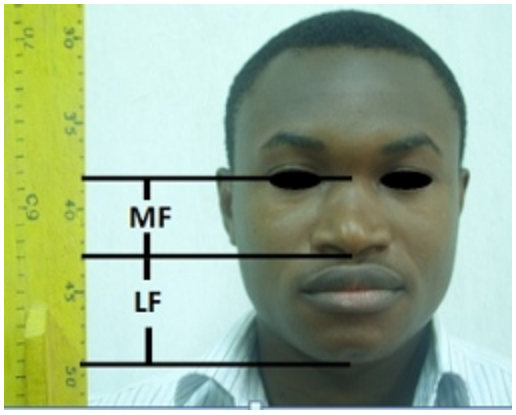

Fig. 2: Vertcal measurements: middle face height (ML), lower face height (LF)

subjects forehead, neck and ear were clearly visible and their lip in repose. Using the meter rule on the side as a guide all photographic record was scaled to life size and eight landmarks (Fig. 1) were used to obtained the following parameters (Fig. 3-6).

Middle face: This is the distance between the nasion (N) and subnasale (SN) expressed in percent ratio by dividing it with the distance from nasion (N) to menton (M) and multiplying by 100 (i.e N-SN/N-M X100).

Lower Face: This is the distance between the subnasale (SB) and menton (M) expressed in percent ratio by dividing it with the distance from nasion (N) to menton (M) and multiplying by 100 (i.e., SN-M/N-M X100).

Nasofrontal angle: It is formed by drawing a line tangent to the glabella (G) through the nasion (N) that will intersect a line drawn tangent to nasal dorsum (ND).

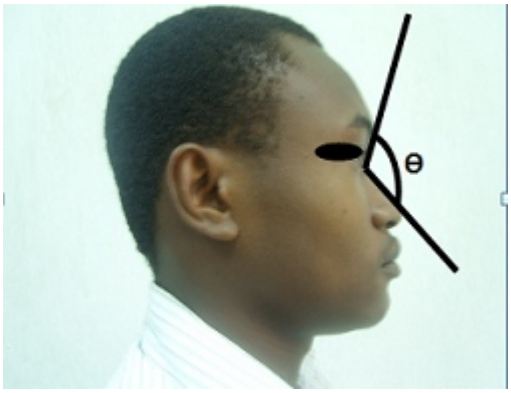

Fig. 3: Nasofrontal angle

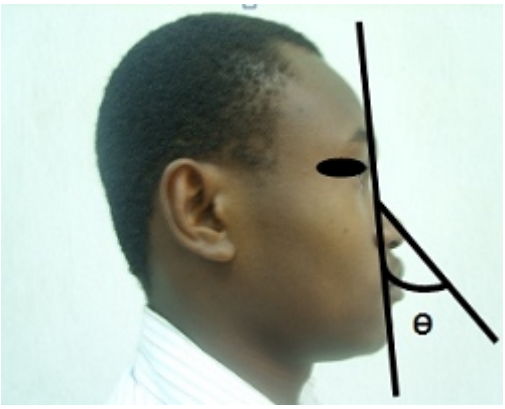

Fig. 4: Nasofacial angle

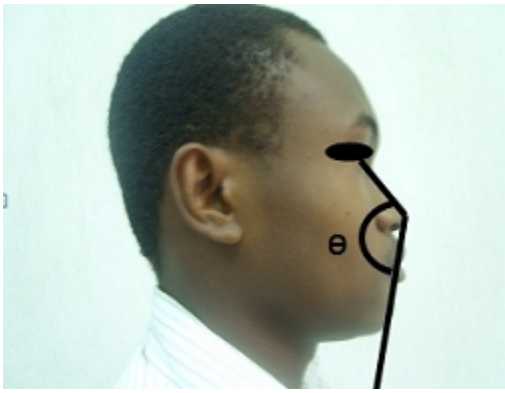

Fig. 5: Nasomental angle

Nasofacial angle: It is formed by drawing a vertical line tangent to the forehead at the glabella (G) and tangent to the chin at pogonion (PG) so that a line drawn along the nasal dorsum (ND) intersects it.

Nasomental angle: It is formed by a line drawn through the nasal dorsum (ND) intersecting a line drawn from the nasal tip to soft tissue chin pogonion (PG).

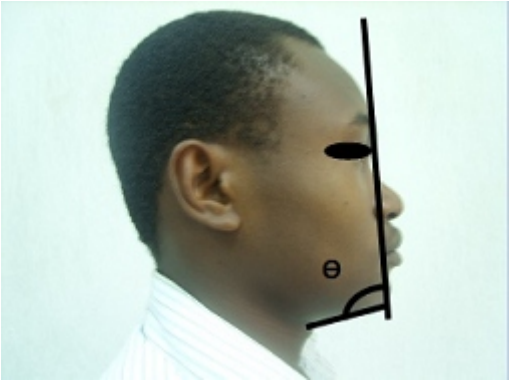

Fig. 6: mentocervical angle

Mentocervical angle: A vertical line tangent to the forehead passing through the glabella (G) and pogonion (PG) and second line intersecting tangent to the chin of the menton (M).

RESULTS

The mean measured values for males and females are shown in Table 1. All parameters showed statistically significant ($p<0.05$) sexual dimorphism, except the lower face. The nasofrontal and nasomental angles were wider in the females. The greatest variability was found for the nasofrontal angle, which had the highest standard deviation and error of mean. Table 2 is comparative data on vertical and angular measurements in different populations.

DISCUSSION

We have investigated vertical and angular variables that define the soft tissue profile in Urhobos ethnic group of Nigeria using standardized photogrammetry record taken in the natural head position. Photography has been used as an excellent and convenient anthropometry tool for facial analysis and to compare pre and post operative outcome in facial plastic surgery (Larrabee, 1967; Andrews and Schoenrock, 1998).

In the present study all measured parameters showed statistical gender difference except in the lower face height. The lower face is bigger than the middle face and these well correlate with studies on the Himachalis of Indian and North American caucasian populations. Mean values of 44.63% for middle face and 55.37% for lower face were reported for the Himachalis (Jain *et al*., 2004) and 43 and 57% for middle and lower face respectively for North American population. One study showed a lower face of 53% for very attractive females and 54% for attractive (Frakas and Kolar, 1987). The mean percent ratio obtained in this study and those of Powell and

Table 1: Mean values for vertical and angular measurement in males and females

	Sex	N	Mean	SD	SEM
middle face	Male	60	42.27	3.71	0.47*
	Female	60	43.51	3.66	0.47*
Lower face	Male	60	57.73	3.63	0.46
	Female	60	56.49	3.69	0.48
NasoFrontal	Male	60	117.75	9.07	1.17*
	Female	60	127.85	9.50	1.22*
NasoFacial	Male	60	40.77	6.29	0.81*
	Female	60	35.60	7.46	0.96*
NasoMental	Male	60	121.95	7.93	1.02*
	Female	60	126.55	6.93	0.89*
MentoCervical	Male	60	93.33	3.27	0.42*
	Female	60	90.88	3.58	0.46*

Table 2: Comparative data on vertical and angular measurement in different population

Author/Date	Population	MF (%)	LF (%)	NFR (°)	NFA (°)	NM (°)	MC (°)
Present study 2010	Urhobos	42.27±3.17(M)	57.73±57(M)	121.75±9.07(M)	40.77±6.29(M)	121.95±7.93(M)	93.33±3.27(M)
		43.51±3.67	56.49±3.69(F)	127.85±8.50(F)	35.60±7.46(F)	126.55±6.93(F)	90.88±3.58(F)
Sandra *et al.* (2008)	Croatians			139.11(F)			
				136.38(M)			
Jain *et al.* (2004)	Himachalis	44.63	55.37	134.00	33.26	128	99.88
Epker (1992)	Caucasians			130			
Powell and Humphries (1984)	North American caucasians	47	53	122.5	35	126	87.5
Frakas (1981)	Caucasians		53-56				

Data are mean ±SD, ML: Middle Face, LF: Lower Face, NFR: Nasofrontal Angle, NFA: Nasofacial Angle, NM: Nasomental Angle, MC: Menctoervical Angle

Humphries (1984) for the lower face contradict the assertion by Frakas, (1981) that the normal range for lower face is 53 to 56%. The middle and lower face are extremely important in surgical orthodontic diagnosis and treatment planning. The important consideration is the proportionate measurement as opposed to absolute measurement (Bergman, 1999). Decrease in the lower face is found in vertical maxillary deficiency and deep bite mandibular retrusion.

Extensive evaluation of angular relationship are essential in soft tissue profiling as not all facial traits directly follow the underlying dentoskeletal profile (Subtenly, 1959). The angles measured in this study were the Powell and Humphries (1984) aesthetic triangle. The nasofrontal angle showed statistically significant sexual dimorphism ($p<0.05$) in our study with mean values of 117.75º±9.07 for males, 127.35º±9.50 for females. These values are low compared to those of Caucasian studies. Anic-Milosevic *et al.* (2008) reported a mean value of 136.38º±6.7 for males and 139.10º ±6.35 for females of Croatian origin. Powell and Humphries (1984) reported a mean value of 122.5º for North Americans caucasians. It was 138º±7 for males and 142º±6 for females of Galician origin (Fernandez-Riveiro *et al.*, 2003) and 130º in a study by Epker (1992) of Caucasians samples. The reason for the low value in this study may be attributed to prominent glabella. Sexual dimorphism observed in this study agrees with the findings of Anic-Milosevic *et al.* (2008) and Fernandez-Riveiro (2003). It however contradicts that of Epker (1992).

The relationship of the nose with the facial plane is a facial parameter of aesthetic importance. An average of 35º and 33.26º has been reported for North American Caucasians and Himachali population respectively. This is low when compared to the samples in this study. Higher nasofacial angle suggest that the projection of the nose in the Urhobos is more than those of the Himachalis and North American population.

Bigger lower face correlate well with high nasomental angle as seen in this study. The higher mean value of 126.55º ±6.93 for females against 121.95º ±7.93 for males shows significant gender difference ($p<0.05$). Studies by Powell and Humphries (1984) and Jain *et al.* (2004) established an average value of 126º and 128º for Himachalis and North American populations, respectively.

The mentocervical angle is higher in males when compared to females in the present study. The mean for the Urhobos is higher than that of North America population and lesser than that of the Himachalis. Less prominent glabella results in higher mentocervical and nasofrontal angles. Bergman, (1999) pointed out that this critical in anteroposterior facial dysplasia and that an obtuse should warn against procedures that reduce the prominence of the chin in surgical cases. In surgical cases subject with obtuse angle should not have a mandibular set back (Worms *et al.*, 1980; Legan and Burstone, 1980).

CONCLUSION

In conclusion, racial and ethnic differences in the facial structure is a well accepted fact. The correct concept for aesthetics for a Brazilian Negroid facial trait is different for that for a Nigerian Negroid. Hence it is imperative that effort should be made to establish general norms for different races and ethnic groups with consideration for certain individual characteristic features. This study has shown as in most other population that the

vertical and angular variables that tissue profile are sexually dimorphic amongst the Urhobos of Nigeria.

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