Angular Photometric Facial Analysis of the Adult Kalabari Females

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ABSTRACT

Angular photometric analysis deals with the measurement of the soft tissues of the face using angular parameters. The morphology of the human face varies from person to person and more in populations and ethnic groups. The aim of this study is to determine the facial features and qualities of the adult Kalabari females using some facial angles from standardized facial profile photographs. Standardized profile photographic records were obtained from 84 adult Kalabari females in both frontal and lateral views in a natural head position (NHP) and analyzed using pro image analyzer. The average angular measurements for Nasofrontal, Nasolabial, Nasofacial, Nasomental and Mentocervical angles include; $138.68^0 \pm 0.73^0$, $87.44^0 \pm 1.47^0$, $29.31^0 \pm 0.35^0$, $133.61^0 \pm 4.65^0$, $96.59^0 \pm 8.55^0$ respectively. These angles denotes that the adult Kalabari females possess a less prominent glabella, more prominent chin, slightly protruded lips and a flat and short nose which is the platyrrhine type of nose possessed by most black Africans. This data can serve potentially as a good foundation for successful facial reconstruction, in orthodontics and plastic surgeries.

Key words: Angular, Photometric Facial Analysis, Adult Kalabari, Females

INTRODUCTION

Photometric facial analysis is used to describe a detailed examination of the craniofacial trait of an individual using the standard anatomical landmarks. The identification of aesthetic facial qualities began with ancient civilizations such as Egyptians and Greeks who captured their ideals of beauty in art form [1]. Facial traits are major features in physical appearance which is related to social acceptance, psychological wellbeing and self-esteem of an individual [2]. In the nineteenth century, the facial angle was used as one of the main initiators of racial craniology to justify racism [3]. It is suggested that since the craniofacial traits of individuals of a particular population or ethnic group vary geographically and genetically, a single standard of anthropometric variable is not appropriate to apply to diverse racial and ethnic groups [4].

Craniofacial anthropometry also refers to the manual taking of measurements with the use of vernier caliper, protractor and measuring tape [5]. Cephalometric radiography makes use of radiation that is x-ray. Anthropometric landmarks can be used to determine facial dimensions from radiographs [6]. The advantage of this method is that the soft tissue thickness can be easily evaluated; however it exposes the subject to radiation. In addition, angular measurements are affected by enlargement in cephalometry [7, 8]. 2D photogrammetry method is commonly used due to advances in technology. It may be digital or analog. The equipment in this method are mobile and cheap, it also does not need high level of expertise to use. The problem of this method is difficulty in measuring curved surfaces [9]. The 3D photogrammetry method is capable of accurately reproducing surface geometry of the face however it requires a high level of expertise and it is also expensive.

Using the photogrammetry method, soft tissue profile standards have been reported from researches conducted for the North America populations, Spanish and Croatians [10, 11, 12]. Photometric facial analysis of the adult Urhobos, the Khana adults and Igbos in Nigeria has also been reported [13, 14, 15]. Statistical significant sexual dimorphism have been found in four craniofacial angles (Nasofrontal angle, Nasomental angle, Nasofacial angle and Angle of facial convexity) except the Nasolabial angle in a research carried out to determine the angular photometric analysis of the Igalas in Nigeria [3].

This study is aimed at determining the facial features and qualities of the adult Kalabari females using photometric analysis.

MATERIALS AND METHODS

A total number of eighty four (84) Adult females within the age of 18 to 45 years whose parents and

grandparents are from the Kalabari ethnicity were selected for this study. The study was carried out within the Buguma and Abonnema localities of Rivers state, Nigeria. The photographic set-up consists of a tripod stand supporting a good resolution camera (Sony Cyber-shot DSC - W630). Adjustment of the tripod height allows a horizontal position of the optical axis of the lens during recording. In a standing position, the subjects in turns were asked to relax with both hands hanging beside their trunk and a graph sheet behind them. The subjects looked into a mirror which was placed 120cm in front of them on the opposite side with their lips relaxed so that the views can be taken in the natural head position (NHP). The frontal and lateral view photographs of the face of the subjects were taken from a distance of 120cm. The photographs were transferred to a laptop prior to analysis. The angles were measured and an average of their angles were taken and tabulated. These are: Nasofrontal angle (NF), Nasomental angle (NM), Nasofacial angle (NFa), Nasolabial angle (NL) and Mentocervical angle (MCe).

Statistical Analysis: Images were analyzed using the IMG pro image analyzer. The data obtained was processed using Z- test and tabulated.

Figure 1: Image showing Nasofrontal angle

Figure 2: Image showing labial angle

Figure 3: Image showing Nasofacial

Figure 4: Image showing Nasomental angle

Figure 5: Image showing Mentocervical angle

RESULTS

The results of this study are represented in the tables below. Table 1. Showing the mean and standard error of mean of the facial angles of the sampled population. The mean $\pm$ standard error of mean of the Nasofrontal angle is $138.68^0 \pm 0.73^0$, Nasolabial angle is $87.44^0 \pm 1.47^0$, Nasofacial angle is $29.31^0 \pm 0.35^0$, Nasomental angle is $133.61^0 \pm 4.65^0$ and Mentocervical angle is $96.59^0 \pm 8.55^0$.

Table 2 shows the comparison of this research study parameters with other population.

Table 1: Descriptive statistics and the mean values of the measured parameters

Parameters	N	Mean + SE
Nasofrontal Angle	84	$138.68 \pm 0.73^\circ$
Nasofacial angle	84	$29.31 \pm 0.35^\circ$
Nasomental angle	84	$133.61^0 \pm 4.65^0$
Nasolabial angle	84	$87.44^0 \pm 1.47^0$
Mentocervical angle	84	$96.59^0 \pm 8.55^0$

Table 2: Comparative data of angular measurements with other populations

Author/Date	Population	Age	NF(^{0})	NFa(^{0})	NM(^{0})	NL(^{0})	MCe(^{0})
Present study	Kalabari	18-45	138.68 ± 0.73	29.31 ± 0.35	133.61 ± 4.65	87.44 ± 1.47	96.59 ± 8.55
Anic-Milosevic *et al.* (2008)	Croatian,	23-28	139.11			109.39	
Reddy *et al.,* (2011)	North India	18-25	144.33 ± 1.75	33.69 ± 1.37	127.11 ± 1.81	101.50 ± 4.39	
Oghenemavwe *et al.*(2010)	Urhobo	18-35	127.85 ± 8.50	35.60 ± 7.46	126.55 ± 6.93		90.88 ± 3.58
Oghenemavwe *et al.* (2011)	Igbos in Port Harcourt	18-35	134.29 ± 9.18	38.0 ± 5.22	117.25 ± 8.24		90.37 ± 1.28
Osunwoke and Onyeriodo (2014)	Khana	18-45	137.36 ± 6.37	32.09 ± 3.61	130.97 ± 5.68	91.73 ± 14.85	93.76 ± 9.59
Ferdousi *et al.* (2013)	Bangladeshi Garo	25-45	137.97 ± 4.80		132.79 ± 5.10		
Ezeuko and Eboigbe (2015)	Bini	18-30	133.80 ± 0.40	34.30 ± 0.20	128.10 ± 0.30	75.90 ± 0.70	

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DISCUSSION

Extensive evaluation of angular relationship are essential in soft tissue profiling as not all facial traits directly follow the underlying dentoskeletal profile [16]. The present study has shown that the mean value for nasofrontal angle was much similar to the values in studies by Ferdousi *et al.* [17] on the Bangladeshi Garo population, [18] Anibor and Okumagba on the Urhobo ethnic group – $137.70^0 \pm 7.6^0$ [18], Wamalwa *et al.* on Kenyans – $137.97^0 \pm 5.21^0$ [19], Osunwoke & Omin on the Okrikas [20] and Devi *et al.,* on Bengali population – 139.568^0 [21]. A lower value of the mean nasofrontal angle was observed in the study on the Bini ethnicity [22]. The mean values for the current study were however lower than the values in studies by Reddy *et al.*, on North Indian population [23], Fernandez- Riveiro *et al.,* on the European Caucasian population – $141.98 \pm 6.06^°$ [11], Anic – Milosevic *et al.*, on Croatians – $139.11 \pm 6.35^°$ [12], Malkoc *et al.*, on Turkish population – $148.61 \pm 6.66^°$ [24] and Ajami *et al.*, on Iranian population – $148.78 \pm 5.88^°$ [25] which could be attributed to racial and geographical difference in these populations. In these studies mentioned above, the mean values for nasofrontal angle are higher in females than males. This is attributed to the fact females have less prominent glabella [26].

The mean value of the Nasofacial angle found in the adult Kalabari females was similar to the values given by Anic – Milosevic *et al.*, but lower than the values given by Ferdousi *et al.*, Reddy *et al.*, Osunwoke and Onyeriodo, Oghenemavwe *et al.*, Ezeuko and Eboigbe, Kale Varlk – $31.4 \pm 3.4^°$ and Ukoha *et al.*, $38.65 \pm 4.89^°$ [3,12,13,14,15,20,23,27]. According to Wamalwa *et al.*, a high Nasofacial angle suggests a greater projection of the nose [19]. Therefore, the adult Kalabari females have a lesser nose projection than the aforementioned populations. The mean value of the Nasomental angle for the adult Kalabari females suggests a broad and flat nose (which is of the platyrrhine type of nose) and is similar to the study given by Ferdousi *et al.*, in the Bangladeshi Garo population ($132.79 \pm 5.10º$) [17]. However, values of the mean Nasomental angle of studies given by Reddy *et al.*, for North Indian, Anic-Milosevic *et al.,*for Croatian/Caucasian , Ukoha *et al.*, for Igalas – $127.41 \pm 5.61^°$ and Osunwoke and Onyeriodo for Khanas were lower than that of the mean value obtained for Nasomental angle of the present study [3,12,14,23]. As stated by Ukoha *et al.*, a wider Nasomental angle suggests a more prominent chin, therefore the value of the mean of the present study suggests a more prominent chin. [3]

The mean value of the Nasolabial angle found in the adult Kalabari females were lower than studies in the Bangladeshi Garo population, Bangladeshi population; $91.44 \pm 6.924^°$, Khana people of Rivers state, Nigeria, North Indian population and Turkish population ($102.94 \pm 10.43^°$) [17,14,23,24,21]. However, the mean values of the Nasolabial angle obtained for the Bini people and the Igala ethnicity ($79.29 \pm 11.40^°$ were lower than the

mean value of the Nasolabial angle of the present study. [3,22]

The average value of the Mentocervical angle of this present study was higher compared to average value of the Mentocervical angle of studies given by Oghenemavwe *et al.,* for the Igbos in Port Harcourt, Nigeria and by Osunwoke and Onyeriodo for the Khana people in Rivers state, Nigeria [14,15]. The acute angle ($< 90^0$) noted in the Nasolabial and Nasofacial angles of the adult female Kalabari shows that they possess a downwardly oriented nose which is slightly flat and short and also a slightly protruded lips. The obtuse angle ($> 90^0 < 180^0$) noted in the Nasofrontal angle indicates a less prominent glabella and the Nasomental angle indicates a short and prominent chin. According to anthropometric classification, it can be deduced that the Kalabari females possess a broad and flat nose which the platyrrhine type of nose as possessed by most black Africans.

CONCLUSION

The uniqueness of the facial features and qualities of the adult Kalabari females is due to the influence of genetics and other factors. As clearly stated by Richmond *et al.,* the facial phenotype populations across have been influenced by factors such as migration, mate-choice survival, climate and even genetics [29]. The derived angular parameters can be considered as normal values for the Kalabari female population. The data obtained can serve as reference for further studies. It can be very important in medical practice as it can be used to compare pre & post-operative results of plastic surgery and other related surgery of the face.

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