Photometric facial analysis of the Igbo Nigerian adult male

Ukoha Ukoha Ukoha, Onochie Okwudili Udemezue, Chidi Kingsley Oranusi, Azuoma Lasbrey Asomugha, Uchechukwu Dimkpa[1], Lynda Chinenye Nzeukwu[2]

Departments of Anatomy, and [1]Physiology, Nnamdi Azikiwe University, Nnewi Campus, [2]Anatomy, Anambra State University, Uli, Anambra State, Nigeria

ABSTRACT

Background: A carefully performed facial analysis can serve as a strong foundation for successful facial reconstructive and plastic surgeries, rhinoplasty or orthodontics. **Aim:** The purpose of this study is to determine the facial features and qualities of the Igbo Nigerian adult male using photometry. **Materials and Methods:** One hundred and twenty subjects aged between 18 and 28 years were studied at the Anambra State University, Uli, Nigeria. The frontal and right lateral view photographs of their faces were taken and traced out on tracing papers. On these, two vertical distances, nasion to subnasal and subnasale to menton, and four angles, nasofrontal (NF), nasofacial, nasomental (NM) and mentocervical, were measured. **Results:** The result showed that the Igbo Nigerian adult male had a middle face that was shorter than the lower one (41.76% vs.58.24%), a moderate glabella (NF=133.97°), a projected nose (NM=38.68°) and a less prominent chin (NM=125.87°). **Conclusion:** This study is very important in medical practice as it can be used to compare the pre- and post-operative results of plastic surgery and other related surgeries of the face.

Key words: Adult male, facial analysis, Igbo Nigerian, photometric

Address for correspondence:
Dr. Ukoha Ukoha Ukoha,
Department of Anatomy, Nnamdi
Azikiwe University, Nnewi,
Anambra State, Nigeria.
E-mail: drukohaukoha@yahoo.com

INTRODUCTION

The morphology of the human face varies with individuals and even more with races and ethnic group.[1] The identification of aesthetic facial qualities began with ancient civilizations such as Egyptians and Greeks, who captured their ideals of facial beauty in artform.[2] Some of the classical Greek canons of facial proportions, with modifications, are still embraced today as the basic foundation of aesthetic facial analysis.

Variations in facial parameters (facial anthropometry) have been studied extensively for different ethnic groups and races. For instance, Oyinbo *et al*.,[3] carried out normal outer and inner central measurements for the Ijaws of Southern Nigeria and compared the result with that obtained for Igbos of South Eastern Nigerian. They found out that there were significant differences between the two ethnic groups at *P*<0.05.

These observed variations may be favourable or unfavourable, depending on the individual's aesthetic preferences, as well as that of the society in which he lives. In a society focused on youth and beauty, individuals with less visible disfigurements have higher self-esteem[4] and can more effectively socialize with peers and members of the opposite sex.[5] Perhaps this has also informed the increased attention given to aesthetic facial analysis.

Besides the use of direct measurements for the determination of facial proportions, photometry, which rather involves the use of photographs, has also been employed as seen in the case of Powell and Humphries,[6] who introduced the use of the aesthetic facial triangle. Extensive literature in this area is already available for North Americans and Europeans.[6] Similar studies have also been published for Asians, especially in recent times. In our environment, there is paucity of data on the facial analysis using photometry. Therefore, this present study is aimed at filling this observed gap.

MATERIALS AND METHODS

One hundred and twenty subjects aged between 18 and 28 years participated in this study. Included in the study were subjects whose parents and grandparents were all of Igbo ethnic origin. The subjects were all randomly chosen

male students. Those with facial deformities and congenital facial abnormalities were excluded from the study.

The study involved taking facial photograph of subjects. Consent was obtained from the subjects before photographs were taken. Photographs of the front and lateral views of the subjects were taken from a distance of 1.0-1.5 m with 28 focus free manual camera (Prestige 280s). Each subject was asked to relax against a plain white background, with both hands hanging beside the trunk. The subjects' position was clearly marked on the floor, and a meter rule placed by the subject to enable measurement at life size 150 cm in front of the subject. The subjects were asked to look straight into the camera with their lips relaxed so that both the front and side view profiles were taken in the natural head position. Clear view of the forehead, neck, and ear were ensured with the lips relaxed.

The photographs obtained were colour printed, and their facial areas were traced out using tracing paper. On the trace outs of the frontal views, the following soft-tissue points (land marks) were introduced as shown in Figure 1; the nasion (N), subnasale (Sn) and menton (Mn). Using the same trace-outs, two vertical distances were measured and converted to the percentage ratio.

N: The deepest point on the bridge of the nose overlying the centre of the suture between the nasal and frontal bones.

Subnasale: The point at which the base of the nose merges with the nasal cutaneous tip.

Menton: The lowest point of the soft-tissue skin in the sagittal plane overlying the bony menton.

The vertical distances shown in Figure 1, include a vertical line drawn from Nto menton, and it is divided into two parts:

Nasion to subnasale (N-Sn)/middle face.
Subnasale to menton (Sn-Mn)/lower face.

On the other hand, using the trace-outs of the right lateral views, the following landmarks and angles were noted and measured respectively. Below are the landmarks:

Glabella (G):   The smooth rounded surface of the frontal bone in the middle of the forehead, between the two eyebrows [Figure 2].

Pogonion (P):   The most prominent point on the soft-tissue chin in the mid sagittal plane overlying the bony progonion [Figure 2].

Cervical (C):   The point where the neck meets with the soft tissue. The angles:

Nasofrontal Angle (NFA): Angle formed at the point where a line drawn tangent to the glabella through the Nintersects with a line drawn

tangent to the nasal dorsum [Figure 3].
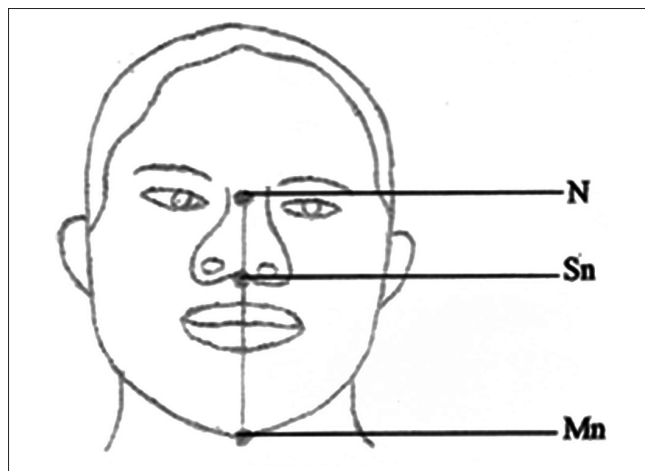
Nasomental Angle (NMA): Angle formed at the point of

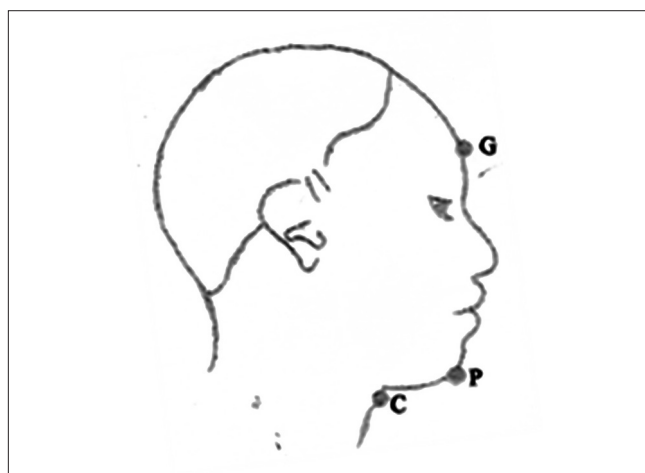**Figure 1:** Landmarks on the frontal facial view

Figure 2: Landmarks on the right lateral view

Figure 3: Nasofrontal angle

intersection of the line drawn through the nasal dorsum and that drawn from the nasal tip to the pogonion [Figure 4].

Mentocervical angle (MCA): Angle formed at the meeting point of a vertical line drawn from the glabella to the pogonion and that drawn from the cervical through the soft-tissue menton.

Data analysis

Computation and analysis of data from the measurements were done by Microsoft Excel 2007, version 10 using some simplified mathematical relations to show the measures of dispersion. These included; the mean, variance and standard deviation.

RESULTS

The study was carried out on 120 subjects comprising adult males aged between 18 and 28 years. The results of this study are presented in the tables below.

Table 1 shows the results of the vertical distance (N-Sn) and (Sn-Mn) of the Igbo Nigerian adult male in millimeters (mm). Analysis of the frontal view photographs showed that the distance from N-Sn varied from 10 mm

to 17 mm with a mean value of 13.2 mm while that from subnasale to menton varied from 14 mm to 22 mm with a mean value of 18.4 mm.

Table 2 shows vertical distance (N-Sn) and (Sn-Mn) of the Igbo Nigerian Adult male in percentage ratio (%). Percentage ratio of these distance (lengths) N-Sn and subnasale to menton (Sn-Mn) to N-Mn varied from 37.9% to 48.3% with a mean value of 41.8% for N-Sn and 51.7% to 62.1% with a mean value of 58.2%.

Table 3 shows the values of the angles of Aesthetic triangle i.e., Nasofrontal (NF) Nasofacial (NFc) [Figure 5], nasomental (NM) and mentocervical (MC) angles of the Igbo Nigerian male in Degrees (°).

Analysis of the right lateral view photograph of the subjects showed variations in the angles of Aesthetic triangle, which include; NF, NFc, NM and Mentocervical (MC) angles [Figure 6]. NFA was observed to be the largest angle with a mean value of 134° and the values ranging from 118° to 150°. This is followed by the NMA with a mean value of
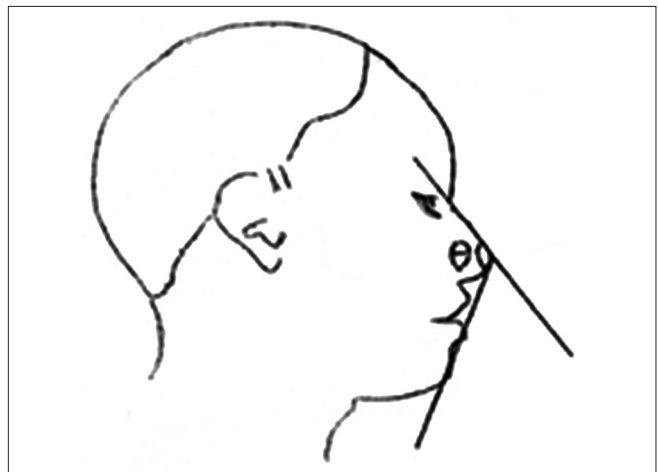
Table 1: The results of the vertical distance, nasion to subnasale and subnasale to menton of the Igbo Nigerian adult male in millimeters

Length (mm)	Minimum	Maximum	Mean	SD	Variation
N-Sn	10	17	13.2	1.67	2.79
Sn-Mn	14	22	18.4	2.06	4.23

N-Sn – Nasion to subnasale; Sn-Mn – Subnasale to menton

Table 2: Vertical distancenasion to subnasale and subnasale to menton of the Igbo Nigerian adult male in percentage ratio (%)

Length (mm)	Minimum	Maximum	Mean	SD	Variation
N-Sn	37.9	48.3	41.8	1.34	1.80
Sn-Mn	51.7	62.1	58.2	1.25	1.57

N-Sn – Nasion to subnasale; Sn-Mn – Subnasale to menton

Table 3: Angles of Aesthetic triangle, i.e., Nasofrontal, Nasofacial, Nasomental and Mentocervical angles of the Igbo Nigerian male in degrees (%)

Angles (°)	Minimum (°)	Maximum (°)	Mean (°)	SD	Variation
Nasofrontal	118	150	134	8.97	80.39
Nasofacial	28	50	39	5.79	33.56
Nasomental	115	140	126	6.11	37.34
Mentocervical	90	110	92	5.44	29.59

NF – Nasofrontal; NFc – Nasofacial; NM – Nasomental; MC – Mentocervical

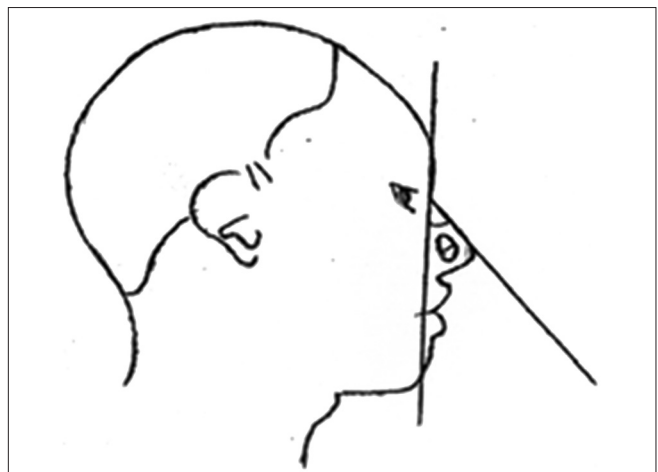**Figure 4:** Nasomental angle

Figure 5: Nasofacial angle

126° and the values ranging from 115° to 140°. Next to NMA is the MCA whose values range from 90° to 110° and has a mean value of 99°. The smallest angle is the NFc with a mean value of 39° ranging from 28° to 50%.

Table 4 shows the comparison of mean values of vertical distances between adult Nigerians and Himanchali adults and North American adult males. The N-Sn shows lower values for adult Nigerian males while the Sn-Mn is higher in adult Nigerian males than for the other two races.

Table 5 shows the comparison of mean values of angles of Aesthetic triangle of the Igbo Nigerian adult male and those of the Himachali Indian, North American, Urhobo Nigerian and Itsekiri Nigerian adult males the results reveal that the Himachali Indian has the highest NF and MCAs with respective values as 134° and 100°, Urhobo Nigerian has the highest NFc angle at 40°, while the Itsekiri Nigerian has the highest NMA at 129°.

DISCUSSION

Photometric facial analysis has been documented by various authors.[6-9] Photometric analysis offers some advantages in terms of human profile analysis. In contrast to cephalometric analysis, angular measurements are not affected by photographic reduction.[10] The use of photometric analysis makes the employment of expensive and sophisticated instruments unnecessary.

Leonardo da vinci divided the face into thirds namely; from the frontal hair line to the root of the nose; from the nasal root to nasal base; and from the nasal base to the bottom of the chin, menton, but only the lower two-thirds were considered in this study, because the frontal hair line, which is a landmark for the first-third was absent in some of the subjects and this

is consistent with the finding and method of Powell and Humphries (1984).[6]

In this study, it was discovered that the middle face (N-Sn) was shorter than the lower face (Sn-Mn) i.e., 41.76% vs. 59.95%, which is similar to the report by Jain *et al*., 2004 and Powell and Humphries, 1984 on the Himachali Indians and North Americans respectively.[6,7]

Our studied population, however, has a shorter middle face compared to the other two. Anibor and Okumagba[9] in their study stated that the aesthetic angles of the Igbos are different from those of the Urhobos, Itsekiris, Himachalians and North Americans.

The present study shows that the NFc angle of Igbo males were similar to that of the Urhobos and Itsekiri and different from those of the Himachali Indians and North Americans [Table 5]. The NFA was also similar to those of Himachali, Indians, Urhobos and Itsekiri but were strikingly different from those of North Americans. Thus, the population under study was found to have a less prominent glabella than the North Americans.

Jain *et al*.,[7] stated that the NFc angle shows the degree of nose projection from the skin of the face in an individual. Since the NFc angle of the Igbo Nigerian adult male is 38.68° [Table 6], it shows that he has a projected nose bigger than that of the Himachali and North American, but smaller compared to those of the Urhobo and Itsekiri of Nigeria. The NMA from the present study was found

Table 4: Comparison of mean values of vertical distance of the Igbo Nigerianadult male and those of the Himachali Indian and North American adult males in percentage ratio (%)

Length (%)	Igbonigerian (present study)	Himachali Indian[7]	North American[6]
N-Sn	41.8	44.6	47.0
Sn-Mn	58.2	55.4	53.0

N-Sn – Nasion to subnasale; Sn-Mn – Subnasale to menton
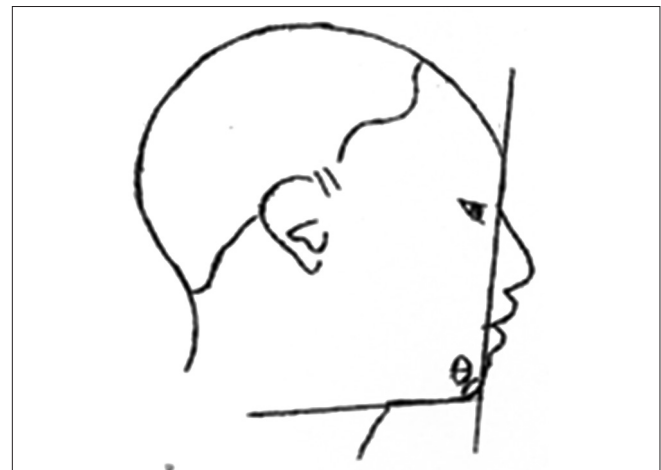
Figure 6: Mentocervical angle

Table 5: Comparison of mean values of angles of aesthetic triangle of the Igbo Nigerian adult male and those of the Himachali Indian, North American, Urhobo Nigerian and Itsekiri Nigerian adult males

Angles (°)	Igbo Nigerian (present study)	Himachali Indian[7]	North American[6]	Urhobo Nigeria[8]	Itsekiri Nigeria[9]
Nasofrontal	134	134	123	132	132
Nasofacial	39	33	35	40	39
Nasomental	126	128	126	127	129
Mentocervical	99	100	88	85	85

Table 6: Comparison of values of the angles of aesthetic triangle of the Igbo Nigerian male and those of the Himachali Indian and North American males in degrees (%)

Angles (°)	Igbo Nigerian (present study)	Himachali Indian[7]	North American[6]
Nasofrontal	134	134	123
Nasofacial	39	33	35
Nasomental	126	128	126
Mentocervical	99	100	88

to be the least among the different populations [Table 5]. This result suggests that the Igbo Nigerian population had the least prominent chin. Ethnic and racial differences in the facial structure is a well accepted fact. This study has, therefore, shown that aesthetic angles using photometric analysis may be used as a means of racial and ethnic identification.

CONCLUSION

The results of this photographic documentation as used here is the most convenient and helpful method for facial analysis. It will be particularly useful in plastic surgery to compare the pre-and post-operative results, orthodontic, anatomical modeling and for identification purposes.

REFERENCES

1. Cochran CS. Ethnic rhinoplasty. Oper Tech Otolaryngol 2007;18:293-6.
2. Peck H, Peck SA. Concept of facial aesthetics. Angle Orthod 1970;40:284-317.
3. Oyimbo AC, Fawehinmi HB, Dare WN, Berezi AM. Normal outer and inner canthal measurements of the Ijaws of Southern Nigeria. European J Sci Res 2008;22:163-7.
4. Lerner RM, Karabenick SA. Physical attractiveness: Body attitudes and self concept in late adolescen. J Youth Adolesc1974;23:307.
5. Berscheid E, Gangestadt S. The social psychological implications of facial physical attractiveness. Clin Plast Surg 1982;9:289-96.
6. Powell N, Humphries B. Properties of the aesthetic face. New York: Thieme – Stratton; 1984. p. 51-5.
7. Jain SK, Anand C, Ghosh SK. Photometric facial analysis – A baseline study. J Anat Soc India 2004;53:11-3.
8. Anibor E, Okumagba MT. Photometric facial analysis of the Urhobo ethnic group of Nigeria. Arch of Appl Sci Res 2010;2:28-32.
9. Anibor E, Okumagba MT, Avwioro OG. Photometric facial analysis of the Itsekiri ethnic group of Nigeria. Arch Appl Sci Res 2010;2:219-22.
10. Malkoc S, DemirA, Uysal T, Canbuldu N. Angular photogrammetric analysis of the soft tissue facial profile of Turkish adults. European J Orthod 2008;26:1-6.