

ANTHROPOMETRIC CHARACTERIZATION OF NASAL PARAMETERS IN ADULTS OYEMEKUN ETHNIC GROUP IN AKURE SOUTHWEST NIGERIA

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ABSTRACT

Background: This study was conducted to provide baseline data of the nasal ergonomics for male and female and to identify the differences in Nasal parameters of male and female oyemekun ethnic group in Akure southwest Nigeria.

Materials and Methods: The sample comprised of one hundred and twenty five (125) males and one hundred twenty (125) females of oyemekun descendant. The ages of the subjects ranged from 18-65years. Nasal Length (NL), Nasal Height (NH), Nasal Width (NW), Nasal Depth (ND) was obtained with the aid of a sliding caliper and nasal indices were calculated as the ratio of nasal width and nasal height multiplied by 100. The data were subjected to statistical analysis using descriptive statistics and t-test.

Results: Males had mean nasal Length, Height, Width, Depth and index of 2.93cm, 3.10cm, 3.07cm, 0.26cm, and 98.92 respectively, while those of females were 1.97cm, 2.44cm, 2.27, 0.21 and 92.94 respectively. The mean nasal index of the oyemekun males was significantly higher than that of the females ($P < 0.05$). The oyemekun ethnic group has a mean nasal index of 96.91. The result of this study shows that the mean nasal index of the oyemekun ethnic group falls within the platyrrhine (broad nose) type.

Conclusion: This study thus shows that age and gender based data in this study may be useful in Forensic and anthropological research, as well as cosmetic and reconstructive surgery.

KEY WORDS: Anthropometric, Nasal Parameters, Adults Oyemekun, Akure.

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INTRODUCTION

Variation is an important phenomena occurring in humans, and it has been attributed to a number of factors such as physical morphology,

ecological, geographical, racial, age and gender factors [1]. Many studies have emphasized the importance of anthropometric measurements as a means of studying variation

in human populations as well as an important tool in forensic science for crime detection [2]. Measurement of human individuals for the purpose of understanding human physical variation has been a long time practice. Today this practice is called anthropometry. Anthropometry is therefore defined as a series of systematized measuring techniques that expresses quantitatively the dimensions of the human body and skeleton [3]. In ancient times, anthropometry was used in criminology to identify criminals by measuring parts of their body. During the early 20th century, one of its primary uses became the attempted differentiation between differences in the races of man [4]. Anthropometry stems from the measurement of the whole human body to individual body parts e.g. face, nose, limb and orbit.

Nasal anthropometry is the study concerned with the measurements of the proportion, size and shape of the human nose [5]. It is considered as one of the best clues to racial origin [6]. The knowledge of nasal anthropometry is useful in forensic medicine and physical anthropology, as one of the tools used in identification of different races, ethnicity and gender of an individual [7]. The nose is the uppermost part of the respiratory tract and the organ for smell. Its shape including the nasal bridge, slope of the tip, septum and nares differs from race to race, tribe to tribe and from one environmental region of the world to the other [8]. It can be divided into two parts, external and internal parts; the external nose is the part that protrudes forward from the face [9]. The shape of the nose is determined by certain variables which are race, tribes and environmental climatic conditions [8]. Narrower noses are said to be favored in cold and dry climates while broader nose in warmer and moister ones [10].

Furthermore, the three major categories of nose on the basis of nasal index are leptorrhine (Long and narrow nose) with a nasal index of 69.90 or less, mesorrhine (medium) with a nasal index between 70 and 84.90 and platyrrhine (broad nose) with a nasal index of 85 and above [11,12]. Within and outside Nigeria, several studies have been carried out and documented on nasal indices [13-18] but little or nothing has been documented on Nasal

parameters of oyemekun ethnic group in Akure southwest Nigeria.

The nasal index (NI), expressed as the percentage ratio of breadth and height of the nose, is one of the most commonly used anthropometric parameters in classifying human races [19,20]. In anthropology and forensic medicine Nasal proportions, together with other physical characteristics, such as skin color and hair texture are used to identify the different 'races' [21]. Not only the race but also sex of an individual or group whose identity is unknown, might be determined using the nasal index [15]. Nasal index is also useful in the analysis and classification of fossil remains as well as the study of living population [22]. Also In clinical practice, nasal index is useful in rhinoplastic surgery (plastic surgery of the nose) as nasal analysis is the first step a rhinoplastic surgeon takes to change the size or shape of the nose for a desired aesthetic effect. Also, nasal analysis of a particular ethnic group can help the rhinoplastic surgeon change the shape of nose of a patient without compromising the patient's desire to maintain his cosmetic status [23]. Nasal index measurement in healthy individuals is also useful for dysmorphologists in the early diagnosis of some dysmorphic syndromes like cleft lip and cleft palate which are associated with nose disorders [7]. This study was conducted to provide baseline data of the nasal ergonomics for male and female and also to identify the differences in Nasal parameters in both sexes among oyemekun ethnic group in Akure southwest Nigeria.

MATERIALS AND METHODS

Selection Criteria: This study was conducted, and simple random samples of 250 subjects, with 125 males and 125 females from 18 years and above were selected. This age group was selected, as age negligibly affects the nasal parameters in subjects above 18 years of age; because at this age most nasal structures are fully formed. The subjects were selected from oyemekun ethnic group in Akure southwest Nigeria.

Exclusion criteria: The subjects comprised of individuals with normal craniofacial configuration. Subjects with trauma of the nose and

congenital abnormalities were excluded.

List of Tools Used in Data Collection:

A digital sliding vernier caliper by Esal, China; SPSS 21.0, Microsoft Excel 2007, scientific calculator, data sheet, a questionnaire which consisted of sex, age, tribe and tribe of parents of the subject, pen, and notebook.

Measurement procedure: Two hundred and fifty subjects of oyemekun ethnic group in Akure southwest Nigeria with age ranging from 18 to 65 years were involved in this study. The sample was made up of 125 males and 125 females.

The readings were taken in millimeters, converted to centimeters and the data were recorded on the data sheet. Subjects were told to sit upright in a relaxed mood with head in an anatomical position while taking measurements. The sliding vernier caliper after been adjusted to an accurate point was used in measurement of Nasal Length (NL) – measured from nasion to pronasale, Nasal Height (NH) – measured from nasion to subnasale, Nasal Width (NW) – maximum width at right angle to the nasal height from ala to ala, Nasal Depth (ND) – from pronasale to subnasale. The readings were read from the digital screen of the caliper and then recorded. The nasal index was calculated as the ratio of nasal breadth to the nasal height multiplied by 100. Nasal Index = (Nasal Width (NW)/Nasal height (NH) multiplied by hundred. [24]

The landmarks measured were:

Nasion - the point on the root of the nose where the mid-sagittal plane cuts the nasofrontal suture.

Subnasale - the point at which the nasal septum merges with the upper cutaneous lip in the mid-sagittal plane.

Pronasale - the point at the tip of nose.

Alare - the point at the most prominent side wall of the nose.

Readings were taken twice and the average was recorded to reduce the error of measurements. It was ensured that the caliper was placed properly and accurate readings were taken. It was also ensured that each subject did not smile or change facial expressions while taking measurements in order to get accurate values. The data obtained were subjected to statistical analysis

using descriptive statistics and t-test.

Statistical Analysis: Data were analyzed using SPSS Windows Version 21.0 (SPSS Inc, IBM, UK) and Microsoft Excel 2010. Descriptive statistics of mean, standard error of mean and standard deviation. Two-sided P values were calculated using the Paired sample T test for observed variables. P values < 0.05 were considered statistically significant.

RESULTS

The results consisting of the statistical analysis with respect to the nasal parameters (nasal length nasal height, nasal width and nasal index) of each ethnic group are shown in Tab. 1.

Nasal parameter: As shown in [Table 1] In age group (18-25) the mean values of NL and ND for females significantly different from the males, $P < 0.05$ while that of NH and NB are not significantly different $P > 0.05$. Nasal indexes (NI) on living head between 85 and 99.9 is Platyrhine and those from 100 and above are hyperplatyrhine therefore for female between ages 18-25 they are found to be Platyrhine (94.58) and male to be hyperplatyrhine (100). Age group (26– 33) NL and NB for females significantly dissimilar from the males, because their P-values are < 0.05 while that of NH and ND are not significantly different from each other $P > 0.05$, nasal index (NI) for female between this age group are found to be Platyrhine (94.56) and male to be hyperplatyrhine (109.56). Age group (34–41) the values obtained from NL, NH and NB for females significantly different from the males, because their P-values are < 0.05 while that of ND is not significantly different from each other because their P-values are > 0.05 , nasal index (NI) for female and male between ages 34 – 41 are found to be both Platyrhine (91.2) and (97.58) respectively. Age group (42- 49) NL, NH and NB for females significantly different from the males $P < 0.05$ while that of ND is not significantly different $P > 0.05$. nasal index (NI) of female and male between ages 42 – 49 are both Platyrhine (89.92) and (97.07) respectively. Age group (50- 57) NL, NH and NB for females significantly dissimilar from the males $P < 0.05$ while mean value of ND for female is not significantly different from male $P > 0.05$. Nasal index (NI) for female and male

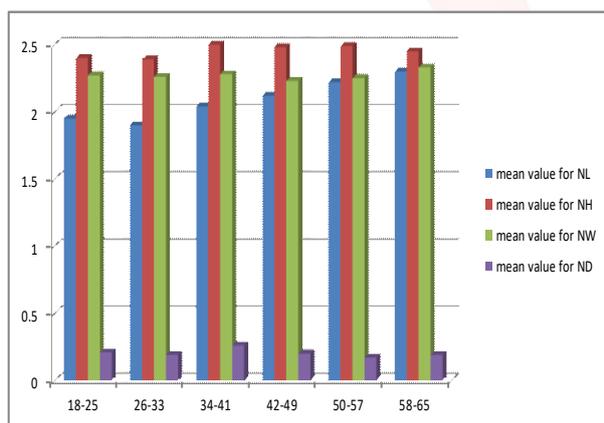
between this age group are also found to be both Platyrrhine (90.36) and (99.69) respectively. Age group (58- 65) NL, NH and NB measured for females significantly different from the males $P < 0.05$, while that of ND is not significantly different from each other because $P > 0.05$. Nasal index for female and male between ages 58 – 65 are found to be both Platyrrhine (95.1) and (98.07) respectively

Nasal index: Nasal index of adult female and male in this region is 92.94 and 98.92 respectively. they are said to be platyrrhine because nasal indexes on living head between 85 and 99.9 is Platyrrhine and those from 100 and above are hyperplatyrrhine [Table.6]. The nasal index for the sampled population in all age group is 96.91 therefore, they are found to be platyrrhine because their nasal index falls between the above said value i.e. between 85 and 99.9.

Mean values of all measured nasal parameters (NL, NH, NW AND ND) IN 125 FEMALE for each age group

Figure 1. Shows the changes in the measured nasal parameters with age. It was observed that there was an increase in the nasal height with age and at about the age 50 years the increment in the nasal height reduced, this could be attributed to weakness in nasal muscles and cartilages that comes with aging.

Fig. 1: Mean values of all measured nasal parameters (NL, NH, NW AND ND) in 125 female for each age group.

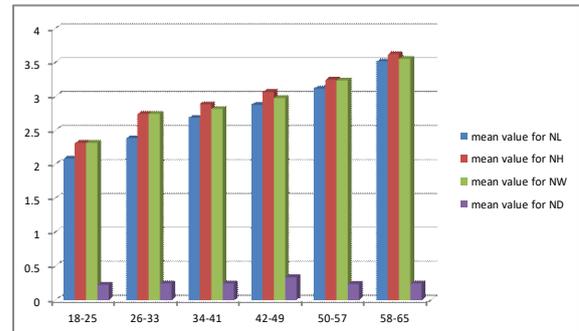


Mean values of all measured nasal parameters (NL, NH, NW AND ND) IN 125 MALE for each age group

Figure 2. Shows the relationship between all nasal parameters with age. There was steady increase in the values of all nasal parameters throughout life with exception of ND that

reached its peak value at age 42-49 years and started falling afterwards. This could be attributed to weakness in nasal muscles and cartilages that comes with aging.

Fig. 2: Mean values of all measured nasal parameters (NL, NH, NW AND ND) in 125 male for each age group.



Index against age group for both sexes (n=250)

Figure 3. shows the difference noticed in Nasal Index at various age groups for both female and male, the male nasal index bar reached its peak value at about age 26years though it showed considerable difference from that of the female from 18years. This might indicate the fact that there is an increase in oxygen demand in male due to an increase in activity, which requires an increase in the size of the nose.

Fig. 3: Nasal index against age group for both sexes (n=250).

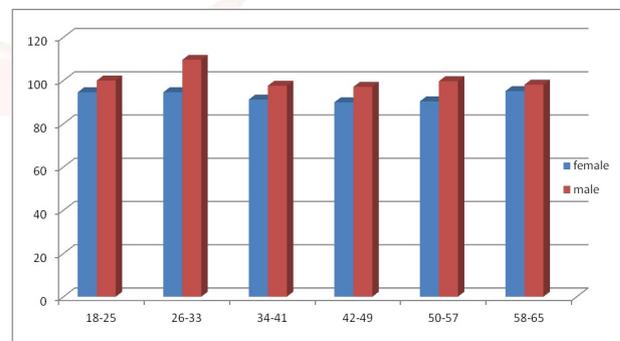


Table 1: Group Statistics for all the results obtained from the age group 58-65years (In Cm).

Gender	Age groups	NL	NH	NW	ND	NI
Female	18- 25	1.67 ± 0.12*	2.4 ± 0.13	2.27 ± 0.11	0.21 ± 0.054*	94.58
Male		2.09 ± 0.57	2.32 ± 0.31	2.32 ± 0.18	0.23 ± 0.11	100
Female	26- 33	1.9 ± 0.07*	2.39 ± 0.16	2.26 ± 0.09*	0.19 ± 0.05	94.56
Male		2.39 ± 0.13	2.51 ± 0.16	2.75 ± 0.18	0.25 ± 0.1	109.56
Female	34- 41	2.04 ± 0.03*	2.5 ± 0.22*	2.28 ± 0.13*	0.26 ± 0.39	91.2
Male		2.69 ± 0.17	2.89 ± 0.27	2.82 ± 0.37	0.25 ± 0.13	97.58
Female	42- 49	2.12 ± 0.04*	2.48 ± 0.15*	2.23 ± 0.13*	0.2 ± 0.56	89.92
Male		2.88 ± 0.12	3.07 ± 0.16	2.98 ± 0.3	0.34 ± 0.58	97.02
Female	50- 57	2.22 ± 0.36*	2.49 ± 0.14*	2.25 ± 0.14*	0.17 ± 0.58	90.36
Male		3.12 ± 0.67	3.25 ± 0.12	3.24 ± 0.22	0.24 ± 0.55	99.69
Female	58- 65	2.3 ± 0.06*	2.45 ± 0.11*	2.33 ± 0.13*	0.19 ± 0.41	95.1
Male		3.52 ± 0.17	3.63 ± 0.16	3.56 ± 0.23	0.25 ± 0.11	98.02

Values are expressed as mean ± SD for n= 250; * $p < 0.05$ female significantly dissimilar from male

Table 2: Descriptive Statistics of the results obtained for female in all the age groups.
n= 125

Statistics	Range	Minimum	Maximum	Mean	Standard Error	Standard Deviation
Nasal Length (cm)	0.97	1.42	2.39	1.99	0.02	0.21
Nasal height (cm)	0.92	2.05	2.97	2.44	0.02	0.17
Nasal Width(cm)	0.53	2.01	2.54	2.27	0.01	0.12
Nasal Depth (cm)	2.2	0.09	2.29	0.21	0.02	0.2

Table 3: Descriptive Statistics of the results obtained for male in all the age groups.
n= 125

Statistics	Range	Minimum	Maximum	Mean	Standard Error	Standard Deviation
Nasal Length (cm)	1.88	2.03	3.91	2.93	0.05	0.52
Nasal Height (cm)	1.82	2.15	3.97	3.1	0.04	0.5
Nasal Width(cm)	1.9	2.09	3.99	3.07	0.04	0.49
Nasal Depth (cm)	0.42	0.1	0.52	0.26	0.01	0.11

Table 4: Descriptive statistics of the results obtained for both female and male in all the age groups.
n=250

Statistics	Range	Minimum	Maximum	Mean	Standard Error	Standard Deviation
Nasal Length (cm)	2.49	1.42	3.91	2.46	0.04	0.62
Nasal Height (cm)	1.92	2.05	3.97	2.77	0.03	0.49
Nasal Width(cm)	1.98	2.01	3.99	2.67	0.03	0.54
Nasal Depth (cm)	2.2	0.09	2.29	0.23	0.01	0.16

Table 5: Nasal index of female, male and sampled population in all age group.

Gender	Female	Male	Female and Male
NI	92.94	98.92	96.91

Table 7: A comparison of average nasal indices according to gender and ethnicity.

Authors	Year	Ethnicity	Female NI	Male NI
Aung S C [19]	2000	Chinese	81	79
Porter and Olson [13]	2003	African American females	79.7	----
Farkas L G [25]	2005	Caucasian	64.2	65.5
Uzun A [26]	2006	Turkish males	----	59.4
Oladipo et al. [27]	2007	Nigeria –Igbos	90.8	95.9
Oladipo G S [2]	2008	Nigerian – Yoruba	83.66	89.85
Oladipo G S [15]	2009	Nigeria –Adonis	83.77	79.83
Heidari Z [28]	2009	Iran-Sistan	69.7	---
Eboh & John [18]	2011	Nigeria- Ukwuani	98.08	97.47
Ese et al [29]	2011	Nigeria – Isoko	89.51	92.35
Staka G [30]	2012	Kosovo- Albanian	63.87	67.07
Gangrade and Babel [31]	2012	India-Southern Rajasthan	79.73	83
Esomonu U G [7]	2013	Nigeria-Cross River State	91.7	99.77
Jovanović J [20]	2014	Serbia	66.01	67.56
Koirala S [32]	2014	Nepal Mongoloid	75.9	74.6
Hegazy A A [33]	2014	Egypt- East Delta	64.56	71.46
Oluwayinka [34]	2015	Nigeria – Igala	93.48	97.21
Oluwayinka [34]	2015	Nigeria – Ebirra	92.99	96.93
Oluwayinka [34]	2015	Nigeria – Okun	93.64	97.23
Current study	2018	Nigeria– Oyemekun- Akure	92.94	98.92

DISCUSSION

Anthropometry is the measurement of living subjects [35]. The use of anthropometry to establish nasal dimensions has been reported by many authors. Anthropometric parameters of

Table 6: Classifications of nose types based on nasal index.

On the basis of nasal height and width index, divided noses into the following categories:

Categories Size of Nose		Nasal index	
		On Living Head	On Skull
Hyperleptorrhine	Long Narrow Nose	40 to 54.9
Leptorrhine	Moderately Narrow Nose	< 70	< 47
Mesorrhine	Moderately or Medium Size	70 to 84.9	47 to 50.9
Platyrrhine	Moderately Wide Nose	85 to 99.9	51 to 57.9
Hyperplatyrrine	Very Wide Nose	100 or more	58 Or more

(Martin R et al, 1957)

the nose vary with age, sex, and ethnic background [36]. Knowledge of these parameters is essential for surgeons undertaking esthetic (beauty) repair and reconstruction of noses [37]. The present study established normal values of nasal index and nasal parameters in a sample of oyemekun adult population. Generally, there was a gradual increased in the means of all investigated measurement with the age (Tables 1 and Fig.1 – 3). The current findings agree with the report [38] that the external nose continues to modify and enlarge beyond the attainment of skeletal maturity. This is manifested by the noticed increase in the nasal dimensions in the 26 – 33years age groups than that of the 18 – 25years age groups (Table 1). The older age group (34 – 41years and above) showed a slight decrease in means of nasal length in

comparison to the previous one (26– 33years and below) (Table 1). On the other hand, the nasal width continued to slightly increase with age this is in accordance as reported by Zankl *et al.*, [39] in their study using growth curves that the nose continues to grow throughout life, supporting the frequent (subjective) observation that old people often have large noses. Also Genecov *et al.*, [40] concluded that the growth and subsequent nasal projection continued in both males and females after skeletal growth had subsided. The variations in the actual nasal dimensions occurring after skeletal maturity might be explained by the reports stating that modifications of the microscopic structure of facial soft tissues, with alterations of cartilages, muscles, skin elasticity and resilience affect the nasal dimensions, especially those more determined by muscles and cartilages, such as nasal width [38].

The importance of nasal index in anthropological studies has been recognized for a long time. Based on both bony and cartilaginous landmarks, this index differs from most other anthropological indices [41].

In the present study, nasal index in males was significantly higher than those of females in adults of age groups above 18 years, thus was sexually dimorphic amongst the oyemekun ethnic group. Hall [42] detected a strong correlation between nasal dimensions and oxygen consumption. She stated that natural selection has fine-tuned the size of the fleshy nose to support the amount of air that needs to be processed. Males, who consume relatively more oxygen during their hard activities, would be expected to have relatively broader noses than females of the same population [19,43]. In the first age group (18 – 25years) studied, it was above 85, classified as platyrrhine – broad nose in both males and females (Tab.1). Similar finding was reported for all other age groups. Boys and men had larger noses than girls and women, appearing from the age above 18years; findings in general accord with the previous report by Sforza *et al.*, [38]. However, the sexual dimorphism in nasal dimensions appears to begin at different ages (at the second age group; the age 26years and above). This obviously occurred as a result of the increase in the NW noticed at this age

level. Mean of NW at this age was 2.75 ± 0.18 cm in males and 2.26 ± 0.09 cm in females, with P value <0.05 (significant) (Tab.1). The present finding supports the previous study of Fransiscus and Long [4] in their rejection of the argument stating that nasal width contributes little to the world-wide variation in the human nasal index. In the first months of life, the NI is similar in boys and girls [44]. There are four main nasal types; leptorrhine, mesorrhine, platyrrhine and hyperplatyrrhine typically associated with Caucasian, Asian and African races respectively. This type of classification is still used in the demographic section of many clinical trials [21]. Referring to this method of classification; it was found that most of oyemekun ethnic group subjects were considered to have the type of platyrrhine “big, large or wide” nose in both males and females NI measurements.

Nasal growth and subsequent changes in nasal index continue till the age 20 year, it is suggested to do the anthropometric comparison of nasal indices with other ethnic and racial population after that age. This suggestion may be also supported by previous cross-sectional anthropometric studies stating that modifications went on with reduced speed after the 20 years of age [39,45]. The mean nasal index in the investigated adults above age 18years in this study was 96.91; in females and males was 92.94 and 98.92, respectively. In our study (Table 5), the nasal index of the oyemekun ethnic groups place them under the platyrrhine nose type. This is in accordance with previous study by Risley [13] that places the nose type of Africans into platyrrhine type. Oladipo *et al.*, [27] also reported a platyrrhine nose type in an analysis of the nasal indices of Igbo, Ijaw and Yoruba ethnic groups in southern Nigeria. In another study by Bekwaras in Cross River State, Nigeria; Esomonu *et al.*, [7] reported a platyrrhine nose type. Report of Oluwayinka *et al.*, [34] showed that the nasal index of the Igala, Epira and Okun ethnic groups place them under the platyrrhine nose type. However, a few studies have recorded mesorrhine nose type among some ethnic groups in Nigeria. Oladipo *et al.*, [15] reported a mesorrhine nose type for Andoni ethnic group of Rivers State in Nigeria, also Ikwerre males fell under the mesorrhine nose type [16], Ibibio

females and Yakurr males of South- South Nigeria [5] and Hausas of Northern Nigeria [24]. Staka *et al.*, [30] reported a leptorrhine nose type for the Kosovo Albanian population of which the mean nasal index was 65.46 ± 6.32 irrespective of sex. This shows that a racial variation exists in nasal index of various populations. The reason for the platyrrhinity of the oyemekun ethnic groups of Ondo State can be linked to report by Hall and Hall [10] that broader noses (Platyrrhine) are favoured in warm climates whereas narrower noses are favoured in cold climates. This distribution is identified as a consequence of natural selection [10]. Our findings were therefore in line with this report as the oyemekun people are within the warmer climates of Nigeria.

CONCLUSION

This study showed the existence of sexual dimorphism in all the nasal indices, oyemekun ethnic groups fall under the platyrrhine nose type (broad nose) which is the typical African nose type. This study was done in accordance with standard anthropometric method, therefore result is recommended to forensic experts, plastic surgeons and anthropologists.

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Conflicts of Interests: None

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