

Anthropometric study of nasal index in Hausa ethnic population of northwestern Nigeria

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Objective Anthropometric study is very important in differentiating a true race from the local mingling of races. The nasal index has a great value in anthropological studies, because it is one of the anthropometric indices acknowledged in nasal surgery as well as management. Anthropometric studies are very important area for craniofacial surgery and syndromology. This study aimed to provide baseline data of nasal index of northern Nigerian people and to classify their nose type and the comparison of the data with other studies.

Methods The nasal width and height were measured from 200 participants of Hausa ethnic group of northwestern Nigeria, nasal index (NI) was calculated and analyzed statistically.

Results There was a significant difference in the nasal width ($P = 0.0001$), height ($P = 0.0001$) and NI ($P = 0.0001$) of sex groups, with nasal shapes: 120 mesorrhine (60%), 75 leptorrhine (37.5%) and 5 platyrrhine (2.55%). It shows Hausa people have a mesorrhine nose.

Conclusion The nasal index of males is higher than females; this study presents the data for Hausa people in this area, which will be of clinical, surgical interest in Rhinology. We recommend a further study to compare the nasal index of Hausa and other ethnic group living in northwestern Nigeria.

Keywords anthropometry, mesorrhine, nasal index, rhinoplastic

Introduction

Anthropometric studies are scientific methods and techniques for displaying different measurement and observation on the human being as well as skeleton. Anthropometric studies are very important area for craniofacial surgery and syndromology.¹ Variation is the great phenomena existing among human being, and it is related to different factors such as mutation and natural selection. Different researches show the advantage of anthropometric measurement as a tool for studying the variation in human population and very important in forensic science for crime investigation.² In the 20th century, the relevance of anthropometry to the study of different races was substituted by different sophisticated methods for determining racial variations. Nowadays, anthropometry has got recognition in medical sciences particularly forensic medicine.²

Nasal anthropometry is a study that deals with the measurements of the proportion, size as well as shape of nose of the human being.³ The study of nasal anthropology is very important in forensics as well as physical anthropology as one of the techniques used in the determination of different races, ethnicity as well as gender of an individual.⁴ Some studies documented that bioenvironmental, geographical as well as biological factors, ethnicity, sex and age have influence in body dimensions especially in the head and neck region.⁵⁻⁷ In anthropology and forensic medicine, the knowledge of nasal index (NI) is relevant in distinguishing the race, ethnicity and sex of individuals whose identity is not known.^{2,8} NI is also useful in the analysis and classification of fossil remains as well as the study of living population.⁹

In clinical practice, NI 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.¹⁰ NI measurement in healthy individuals is also useful for dysmorphologists in the early diagnosis of some dysmorphic syndromes like cleft lip and palate which are associated with nose disorders.⁴

The NI is determined as the percentage of the width in relation to the height of the nose. While on skeleton, the height is measured from the nasion (where the internasal suture touches the frontal bone) to a level just at the bottom of the nasal spine. The width on the skull is the maximum distance on the nasal sinuses. On living human, the height is from nasion to the subnasal (where the nasal septum touches the upper lip). The nasal width on living human is the highest distance between the two nasal wings or two alae in anatomical position. Usually, the NI on living human and the NI on skeleton never correspond to each other.¹¹

A nose is referred to leptorrhine if the NI is 69.9% or less (long and narrow nose), mesorrhine nose if the NI is between 70% and 84.9% (medium) and platyrrhine nose if the NI is above 85% (broad nose).^{8,12} The platyrrhine nose generally has a very prominent ala lobule with a complete and well-rounded nasal tip. The mesorrhine nose has a small prominent lobule with more clear nasal tip and the leptorrhine nose has very small prominent ala lobule with well-defined nasal tip.¹³

Majority of Caucasians have the leptorrhine type of nose characterized as long and narrow. The Indo-Aryan is like European people with fine nose.¹⁴ Jingpo people of China have mesorrhine nose.¹⁵ Indo-African¹⁴ as well as Afro-American¹⁶ possessed platyrrhine nose. Risley described that the NI of African descent has platyrrhine nose. Sarka¹¹ also revealed that the nose of Australian aborigines varies from that of Negro by more intensely depressed root.

Facial anthropometry is one of the most important aspects used in reconstructive surgery, forensic investigation as well as genetic counseling.^{10,17,18} The external nose is a part of the human nose that protrudes anteriorly from the face.¹⁹ The shape of the external nose is inconsistent,²⁰ and is related to ethmoid bone as well as septum, which is made up of cartilage and separate nostrils apart.

The aim of the study was to provide baseline data of certain nasal anthropometric measurements for male and female of northern Nigerian people and to classify their nose type and the comparison of the data with other studies, so that it would be further useful as an essential tool to the researchers, clinicians, rhinoplastic and facial reconstructive surgeons and forensic experts related to this field. The results from this study will also add to the pool of the anthropological data that may be used as a reference by other health practitioners' especially in Nigeria and worldwide.

Materials and Methods

On the basis of nasal height and breadth index, Martin and Sallar²¹ categorized noses (Table 1). This study is a cross-sectional study, conducted in northwestern part of Nigeria on 200 volunteered participants (100 males, 100 females) adult individuals. The age range of the participant was 16–60 years. The volunteered participants of this study had no history of trauma, no physical deformities, no surgery of face or nose, and no history of cleft lip or palate. Nasal width and nasal height were measured using spreading venire caliper (manual) following standard method described by Martin and Saller.²¹ Nasal width was measured as a straight distance from right ala to left ala. Nasal height was measured as the distance from the nasion to the subnasale. The NI was calculated as follows:

$$NI = \text{nasal width/nasal height} \times 100.^{22}$$

Statistical Analysis

The data obtained were analyzed statistically. Basic descriptive statistics and independent sample *t*-test were carried out by computerized statistical analysis software—Statistical Package

Table 1. Nasal categories based on Martin and Sallar⁽²¹⁾ method

Categories	Size of nose	Nasal index	
		On living head	On skull
Hyperleptorrhine	Long narrow nose	40–54.9	—
Leptorrhine	Moderately narrow nose	Less than 70	Less than 47
Mesorrhine	Moderate or medium size	70–84.9	47–50.9
Platyrrhine	Moderately wide nose	85–99.9	51–57.9
Hyperplatyrrhine	Very wide nose	100 or more	58 or more

Table 2. Statistical analysis of nasal parameters

	Mean	SD*	Minimum	Maximum
Nasal width (cm)	3.91	0.42	3.01	5.37
Nasal height (cm)	5.45	0.47	4.2	6.65
Nasal index	71.99	7.17	54	91

Table 3. Descriptive statistical analysis of nasal index of males and females

	Mean	SD*	Minimum	Maximum	P-value
Nasal width (cm) in male	4.13	0.38	3.15	5.37	0.0001
Nasal width (cm) in female	3.69	0.34	3.01	4.91	
Nasal height (cm) in male	5.59	0.38	4.61	6.55	0.0001
Nasal height (cm) in female	5.31	0.51	4.2	6.65	
Nasal index in male	74.08	6.92	56	89	0.0001
Nasal index in female	69.9	6.83	54	91	

*Standard deviation.

Table 4. Frequency (percentage) of nose shapes of males and females

	Male frequency (%)	Female frequency (%)	Total frequency (%)
Leptorrhine	25 (25)	50 (50)	75 (37.5)
Mesorrhine	71 (71)	49 (49)	120 (60)
Platyrrhine	4 (4)	1 (1)	5 (2.55)

for Social Sciences (SPSS-22) and Microsoft Excel Windows 2007. The *P*-value of less than 0.05 was considered statistically significant.

Results

The results consisting of the statistical analysis with respect to the measurement of nasal variables such as nasal width, nasal heights as well as NI of males and females are shown in Tables 2–4. In this study, 100 males (50%) and 100 females (50%) were evaluated for the NI. The descriptive analysis of data was shown in Table 1. There was a significant difference in the nasal width ($P = 0.0001$), height ($P = 0.0001$) and NI ($P = 0.0001$) of sex groups as shown in Table 3. The nasal shapes were described according to the NI and its distribution in this study was as follows: 120 mesorrhine (60%), 75 leptorrhine (37.5%) and 5 platyrrhine (2.55%) types. The distribution of nasal shapes in the sex groups was demonstrated in Table 4. The most nasal shape frequency was related to mesorrhine type in male group and equally leptorrhine and mesorrhine in female group.

Discussion

Nose is very important in racial origin.²³ The NI plays a vital role in anthropology and is one among the clinical anthropometric

parameters to be considered in nasal surgical and medical management.^{24,25} NI is associated to regional and climatic variations.²⁶ Many studies have shown the racial and ethnic differences in NI between different populations.²⁷ Majority of Caucasians are leptorrhine with long and narrow nose and NI of 69.9 or less. The Indo-Aryan is as well similar to the European with fine nose.¹⁴ The Jingpo people of China are mesorrhine.¹⁵ Indo-African¹⁴ as well as Afro-American people have platyrrhine nose type.¹⁶

From the results of this study, the statistical analysis of nasal parameters shown in Table 1, shows the mean, standard deviation, minimum and maximum range of nasal parameters, nasal width, nasal height and NI. Comparing the current study with the study conducted by Jovanovic on the nasal parameters of Serbian population (Caucasians) with mean NI of 66.78,²⁸ it can be concluded that the Hausa people living in northwestern part of Nigeria had a higher mean (NI = 71.99). This shows that there are differences in the nasal parameters among different ethnic groups and races.

There were differences between the nasal parameters of both men and women. This result did not corroborate with a study carried out by Eliakim-Ikechukwu on nasal indices and bi-alar angle between two ethnic groups Igbo and Yoruba in Nigeria, in which he found out that no significant difference in the nasal parameters between the two ethnic groups.³ However, this present study is in conformity with the study carried out by Eliakim-Ikechukwu on nasal parameters of Ibibio and Yakurr ethnic groups in south-southern part of Nigeria as there was significant difference in the nasal parameters of the two ethnic groups.²⁹ Also, a study conducted by Anas and Saleh revealed that anthropometric comparison of nasal indices among Hausa and Yoruba ethnic groups living in Kano State, northern part of Nigeria there was significant difference in nasal indices among the two ethnic groups.³⁰ This result corroborates with the present study. Some previous studies revealed that the mean, median, minimal and maximal width, height and the NI in males are higher than the females and there was significant difference.^{31,32} These are in line with the current study. NI of the Hausa ethnic group living in northwestern Nigeria, males were identified with mesorrhine type of nose, while females with leptorrhine and mesorrhine type of nose, this is not in conformity with the previous studies carried out by Rislely³³ in which he revealed that African people has a platyrrhine type of nose. Another study conducted by Oladipo reported platyrrhine nose type in Igbo, Yoruba and Ijaw ethnic groups of southern part of Nigeria.⁷ Esomonu⁴ reported a platyrrhine type of nose among Bekwaras ethnic group in Cross River state Nigeria. Nevertheless, a few studies have revealed mesorrhine type of nose in some ethnic groups in Nigeria. Research conducted by Oladipo identified a mesorrhine nose type for Andoni ethnic group of Rivers State in Nigeria,³⁴ mesorrhine type in Ikwerre males,³⁵ Ibibio females and Yakurr males of south-southern part of Nigeria,²⁹ it was also reported that mesorrhine type in Hausa people living in northern part of

Nigeria.³⁰ Variations in NI occur among different ethnic groups; variation can be as a result of warmer climate with higher temperature in northern part of Nigeria³⁶ compared to southern part of Nigeria.³⁷

The classification of nose into different categories is a function of NI, in anthropology as it is applied in differentiating racial and ethnic variations.^{8,38} The NI as well shows sexual dimorphism³⁹ that is why it is very important in forensic science particularly in gender differentiation.¹⁵ The shape of nose of the African people, when compared to other races counterparts, are said to be affected by the climatic and environmental conditions.⁴⁰ The broader nose of the African populations might be due to natural selection that affects their warm moist environmental condition.⁴¹ The current study reported the NI of Hausa ethnic group living in northwestern Nigeria males 71% and females 50%. The male NI was higher than the female NI. This is in conformity with research conducted by Oladipo et al.,¹⁷ who reported the males from Igbo, Ijaw as well as Yoruba ethnic groups in southern part of Nigeria have higher NI than their female counterpart. Also, another report by Oladipo et al.,³⁴ revealed that there is a sexual dimorphism in the NI of Itsekiris and Urhobos of Nigeria, in which males reported to have higher NI compared to females.³⁴

Results from the present study reported that Hausa ethnic group was found to be mesorrhine similar to oriental nose.^{42,43} Moreover, Negros have been reported as platyrrhine, which is not in conformity with the result obtained from this study and some previous studies amongst Negros.⁴² This shows that not all Negros are platyrrhine it might be due to interethnic genetic differences have more effect than climatic differences.

Conclusion

This present study determined the nasal index of males and females of Hausa ethnic group of northwestern Nigeria. The result from this study shows Hausa people have a mesorrhine type of nose. The nasal index of males is significantly higher than females, which confirmed the existence of sexual difference in nasal parameters possibly due to genetic, hormonal, nutrition and other related factors. There is no specific data for the nasal index of Hausa people in northwestern Nigeria; this study presents for the first time the nasal parameters for Hausa people in this area, thus providing a useful baseline and an anthropometric data that will be of clinical and surgical interest in Rhinology in this part of the world. We recommend a further study to compare the nasal index of Hausa and other ethnic group living in northwestern Nigeria.

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