ORIGINAL ARTICLE

DETERMINATION OF SEXUAL DIMORPHISM USING NASAL AND FACIAL INDICES AMONG THE HAUSA ETHNIC IN NIGERIA

*Umar M I[1,6], Rano M A[3], Jamil D U [2], Atiku I A[1], Gudaji A[4] and Sadik R U[5]

[1]Department of Human Anatomy, Faculty of Basic Medical Sciences, Federal University Dutse, Jigawa, Nigeria
[2]Department of Human Physiology, Faculty of Basic Medical Sciences, Federal University Dutse, Jigawa, Nigeria
[3]Department of Human Anatomy, Faculty of Basic Medical Sciences, Yusuf Maitama Sule University, Kano
[4]Department of Anatomy, Faculty of Basic Medical Sciences, Bayero University Kano, Nigeria
[5]Department of Anatomy, Federal University Dutsin-Ma, Katsina state
[6]Department of Human Anatomy, Faculty of Biomedical Sciences, Kampala International University, Bushenyi, Uganda

ABSTRACT

The purpose of this study was to identify sexual dimorphism among Hausa ethnic group students at a chosen higher educational institution in Kano using nasal and facial indices. 150 students between the ages of 18 and 30 were involved in the study—75 males and 75 females. The voluntarily recruited study subjects had no history of physical malformations, facial or nasal surgery, cleft lip or palate. Digital Vernier calliper, scientific calculator, weighing machine and sterilisation consumables were used for the study. The individual subjects were instructed to sit calmly, straighten out, and look forward. The nasal and facial index (NI) was measured and recorded during the facial anthropometry. According to the study, the mean age of the study sample for males' students was 25.1 ± 3.60 years and for female students it was 23.4±3.10 years. Males and females differed significantly in terms of NI ($P<0.001$), height ($P<0.05$), and nasal width ($P<0.001$). Based on the Nasal Index and its distribution, the nasal shapes of the Hausa ethnic group were described as mesorrhine (66%), leptorrhine (29.3%), and platyrrhine (4.7%). It was also found that Nasal Index in males is higher than that of the females. This study demonstrates existence of sexual dimorphism in nasal and facial indices among Hausa ethnic group in Kano State, Nigeria

Keywords: Dimorphism, Nasal index, facial index, morphology

*Corresponding Author
M.I. Umar; Department of Human Anatomy, Faculty of Biomedical Sciences, Kampala International UniversityWestern Campus; +256703952828, majenikoko@gmail.com; michael.kunle@kiu.ac.ug

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INTRODUCTION

Anthropometry is the measurement of the human body, especially on basis of comparison. In order to comprehend the physical variances among humans, it has been used to identify individuals, ethnic groups, or races [1, 2, 3, 4]. Many attempts have been made in palaeoanthropology to link racial and psychological characteristics to physical anthropology. Specifically, dimensional descriptors of body size and shape are measured systematically as part of anthropology [4]. Anthropometry is used in a wide range of medical and manufacturing processes, including reconstructive surgery and the identification of people for forensic investigations. Anthropometry, particularly in the measurement of the face and head, is crucial in the design sector for the production of caps, helmets, and goggles [5, 6].

As statistical information tool about distribution of body dimensions in a population, anthropometry is utilised to optimise products, which is now a key component of industrial apparel design, ergonomics and architecture. Frequent updating of anthropometric data collections is necessary due to changes in life style, diet and ethnic makeup of people, which affect how body dimensions are distributed. Multitude of complicated biological, genetic and environmental factors, contribute a significant variation in human height across population. Numerous variances in anthropometric research, suggest existences of disparities that could be due to various: genetics, sex, physical activity, nutrition, ethnic groups, and ageing [7].

The study of nasal anthropometry focuses on dimensions of human nose proportion, size and form. The external nose has a wide range of shapes depending on individual, ethnic group and race. Environmental, biological, regional, ethnic, gender, and age variables all have an impact on human body's dimensions [8, 9]. Anthropometrical research on age, gender, and racial groupings in particular geographic zones have been carried out based on the aforementioned characteristics which affect human body dimension [8, 9]. Various races, including those in Africa, Europe, Asia, Australia and the Pacific Indo-Africans, hold various anthropometric viewpoints. Every race has unique characteristics and these vary greatly when considering various anthropometric factors [10]. Oladipo et al. conducted research in African races and found three categories for physiological classification [11, 12]. These include; Afro-Caucasians, Africans, and Afro-Indians. The study's participants were divided into three groups, with the majority belonging to the Afro Caucasians (52%), Africans (24%) and Afro-Indians (22%) racial classifications [12, 13].

Due to natural selection during evolution of humans, smaller noses are favoured in cold and dry areas, whereas broader noses are in warmer and moister areas [14]. Recently, the number of cosmetic surgeries done has virtually double especially in the US. 92 % of women underwent cosmetic procedures in 2014, up from 88 % in 2001. With nose reshaping (rhinoplasty) been one of the top five plastic surgery procedures in the US, according to the American Society of Plastic Surgeons [15, 16, 17].

The use of cosmetic operations has increased across racial and ethnic lines. The rise in this procedure was also observed among Caucasian Americans as well as African-Americans, Asian Americans, and Hispanic Americans [18]. The need for cosmetic surgery has increased in Asia, and nations like China and India have emerged as the region's largest cosmetic surgery markets [19]. Anatomists, anthropologists, plastic surgeons, and artists have always found the human race to be an attractive subject. Additionally, forensic identification and reconstructive surgery both depend on being able to identify a person's race [20]. For morphometric investigations, the study of normal and abnormal growth, and the detection of inherited and

acquired defects, accurate facial analysis, such as facial height, width and index is crucial. Given that, the europrosopic facial type encourages nasal breathing, facial index may play a significant role in increasing susceptibility to obstructive sleep apnoea [21]. More research is necessary because it is obvious that there is a research gap in the areas of facial height, facial width and facial index. Therefore, the purpose of this study was to identify sexual dimorphism among Hausa ethnic group students, at a chosen higher educational institution in Kano using nasal and facial indices.

METHODS

Materials

Questionnaire, digital vernier caliper, calculator, cotton wool and methylated spirit were used during the study.

Study Location

The research was carried out in Faculty of Basic Medical Science of Yusuf Maitama Sule University, Kano amongst male and female Hausa Ethnic Group.

Study Population

The subjects of the study were 150 students in total (75 males and 75 females) with the age range of 18 to 30 years. The volunteered participants of this study from Hausa ethnic group, had no history of trauma, mental health issues, no physical deformities, no surgery of face or nose, and no history of cleft lip or palate.

Study Design

An informed verbal consent was obtained from the respondent, which comprised of students willing to participate in the survey. Random statistical method was used to select the 150 subjects from Basic Medical Science of Yusuf Maitama Sule University Kano whom are all from Hausa ethnic group.

Questionnaire was distributed to the subjects requesting their bio-data, socio-demographic and anthropometric values. The bio-data includes: age, sex and ethnic groups. The socio-demographic variables include: fathers ethnic group, mothers 'ethnic group, paternal grandfathers ethnic group, paternal grandmothers ethnic group, maternal grandfathers ethnic group, maternal grandmothers ethnic group. The anthropometric values collected were: Nasal/facial widths and nasal/facial height as well as the body height and weight to determine the Body Mass Index of each respondent. The Nasal, facial Index and Body Mass Index was also calculated.

Ethical approval was sought from the ethical committee of faculty of basic medical sciences of Yusuf Maitama Sule University, Kano. Participants were asked to sign the information consent form prior to the commencement of data collection after the have been well informed about the study.

Data Collection

The participants were instructed to sit calmly, straighten out, and look forwards. A digital slide caliper was used to measure the morphological facial height on a scale ranging from nasion (n) to gnation (g). The straight distance between the right and left zygion was used to determine face breadth (zy-zy). Nasal height and width were measured using a sliding Vernier caliper. Nasal height was determined by placing the upper, fixed divider arm of the Vernier caliper on the superior nasal region, followed by the lower, movable divider arm on the sub nasal region. The reading was then recorded on the Vernier scale. Nasal width was measured as a straight distance from right alar to left alar. The nasal and facial index (NI) was determined using the formulas below:

NI=Nasal width /nasal height multiplied by 100, while Facial height / width multiplied by 100 is the facial index (FI).

Nasal Index

Nasal index is an ethnic sensitive anthropometric index which is used to classify race and sex of an individual [22]. See Table 1 for nasal index categorization based on Martin and Sallar method.

Facial Index

Facial index is an ethnic sensitive anthropometric index which is used to classify race and sex of an individual [23]. See Table 2 for facial index categorization based on Martin and Sallar method.

Statistical Analysis

The collected data were statistically examined. Statistical Package for Social Sciences (SPSS-22) and Micro soft Excel Windows 2007 were used to perform independent sample t-tests and basic descriptive statistic soft data collected. Statistical significance was considered at P-value of 0.05 or less.

RESULTS

One hundred and fifty participants were sought forth is study of the Hausa ethnic groups. Half of the individuals (75) from the research population were males, and the other half (75) were females. The sample's demographic age ranged from18 to 30 years. The average age of the study sample was 24.3 ± 3.5 years, and the average ages for the male and female sub groups were 25.1 ± 3.6 years and 23.4 ± 3.1 years, respectively.

The average Nasal width, height and index of the study population was 3.91 ± 0.42 cm, 5.45 ± 0.47 cm and 71.99 ± 7.17 respectively (Table 3). The average Nasal width, height and index for the male (4.13 ± 0.38 cm, 5.59 ± 0.38 cm and 74.08 ± 6.92) were significantly (P =0.0001, 0.0240 and 0.0001) higher than that of the female (3.69 ± 0.34 cm, 5.31 ± 0.51 cm and 69.90 ± 6.83), respectively (Table 4). Male have higher percentage of occurrence of mesorrhine and platyrrhine nose shapes, than the female, while female has higher percentage of leptorrhine nose shapes than male individuals (Table 5).

The average facial width, height and index of the study population was 9.51 ± 0.56 cm, 8.85 ± 1.21 cm and 93.86 ± 3.82 respectively (Table 6). The average facial width and height for the male 9.97 ± 0.33 cm and 9.24 ± 1.01 cm) were significantly (P =0.0015 and 0.0031) higher than that of female (9.04 ± 1.01 cm and 8.46 ± 0.84 cm), respectively, while facial index for the female (94.69 ± 5.83) was significantly (P = 0.0001) higher than the of male individuals (93.02 ± 4.92) (Table 7). Female have higher percentage of occurrence of mesoprosopic and leptoprosopic face shapes, than the male. While male has higher percentage of hyperleptoprosopic face shapes than the females (Table 8).

Mesorrhine (66%) nasal shape percentage occurrences were highest in both male and female in the present study population, while platyrrhine (5%) was the lowest (Figure 1 and 2). While Leptoprosopic (85%) face shape percentage occurrences was highest in both male and female in the present study population, while hyperleptoprosopic (5%) was the lowest (Figure 3 and 4).

DISCUSSION

The nasal index in this study significantly differs between the two gender groups, with men having a greater nasal index than women. These are all consistent with the recent research by Zolbin et al. [24]. Males were found to have mesorrhine-shaped noses in the current study of the Hausa ethnic group at Yusuf Maitaima Sule University in Kano State, while females had both leptorrhine and mesorrhine-shaped noses. This is consistent with earlier research by Oladipo et al. [13] that found mesorrhine-shaped noses in Ikwerre males, as well as Ibibio female [25].

There have also been reports of mesorrhine type in Hausa people residing in northern Nigeria [26]. The sexual dimorphism of the face index for the entire participant is statistically different in the current investigation. However, there was a statistically significant difference between male and female Hausa face indices, with males having a mean facial index higher than female shaving. The current results are not consistent with a study conducted by Shetti et al. [27] about the facial index of Indian and Malaysian students, which came to the conclusion that there was no significant difference in facial index between Indian males and girls [27].

In contrast to a study by Kurnia et al. [21]. that found Chinese men have a higher mean face index than Chinese women,

Hausa females had a higher mean facial index than males. In these research, the leptoproscopic face type was most common in the male than female groups with percentages of (89.3) and (81.3) respectively. The result of this study revealed that amesorrhine-type nose and leptoprosopic face are characteristics of the Hausa ethnic group at Yusuf Maitama Sule University. Men have much greater nasal indices than females do, and females have significantly higher face indices than males. The observed differences in nasal and facial indexes of male and female in the current study, suggest that there are sexual differences in these parameters. This could be influenced by genetic, hormonal, and dietary variables.

CONCLUSION

This study demonstrates existence of sexual dimorphism in nasal and facial indices among Hausa ethnic group in Kano State, Nigeria, with men having greater nasal indices than females while females have significantly higher face indices than males.

RECOMMENDATION

Further studies should be conduction with larger population as report from this study can gives a valuable baseline and anthropometric data on nasal and face characteristics for Hausa people in this region for the first time.

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Table 1. Nasal categories based on Martin and Sallar method

Categories	Size of nose	Nasal index
Hyper leptorrhine	Long narrow nose	40–54.9
Leptorrhine	Moderately narrow nose	Less than70
Mesorrhine	Moderate or medium size	70–84.9
Platyrrhine	Moderately wide nose	85–99.9
Hyper platyrrhine	Very wide nose	100 or more

The above table describe the 5 major categories nose shapes and their indexes

Table 2. Facial categories based on Martins and Sallar method

S/N	Faces Shape	Range of Facial Index
1	Hyper europrosopic (very broad face)	<79.9
2	Europrosopic (broad face)	80-84.9
3	Mesoprosopic (round face)	85-89.9
4	Leptoprosopic (long face)	90-94.9
5	Hyperleptoprosopic (very long face)	>95

The above table describe the 5 major categories face shapes and their indexes

Table 3. Statistical analysis of nasal parameters

VARIABLES	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	55	91

The above table shows the result of nasal height, width and index of the 150 subjects who participated in the study

Table 4. Descriptive statistical analysis of nasal index of males and females

VARIABLES	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	0.0240
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	55	91	

The above table shows the sexual dimorphism in descriptive statistics of nasal height, width and index of the 150 subjects who participated in the study

Table 5. Frequency (percentage) of nose shapes of males and females

VARIABLES	Male	Female	Total
Leptorrhine (Moderately narrow nose)	10	19	29
Mesorrhine (Moderate or mediums ize)	46	20	66
Platyrrhine (Moderately wide nose)	04	01	05

The above table shows the sexual dimorphism in percentage (%) of nose shape of the 150 subjects who participated in the study

Table 6. Statistical analysis of facial parameters

VARIABLES	Mean	SD*	Minimum	Maximum
Facial width(cm)	9.51	0.56	8.64	14.73
Facial height(cm)	8.85	1.21	7.71	13.92
Facial index	93.86	3.82	87.41	97.60

The above table shows the result of facial height, width and index of the 150 subjects who participated in the study

Table 7. Descriptive statistical analysis of facial index of males and females

VARIABLES	Mean	SD*	Minimum	Maximum	*P*-value
Facial width(cm)in male	9.97	0.33	8.82	14.73	0.0015

Facial width(cm)in female	9.04	0.41	8.64	14.02	
Facial height(cm)in male	9.24	1.01	7.95	13.60	0.0031
Facial height(cm)in female	8.46	0.84	7.71	13.92	
Facial index in male	93.02	4.92	87.41	95.27	0.0001
Facial index in female	94.69	5.83	88.36	97.60	

The above table shows the sexual dimorphism in descriptive statistics of facial height, width and index of the 150 subjects who participated in the study

Table 8. Frequency(percentage)of face shapes of males and females

VARIABLES	Male (75)	Female (75)	Total (150)
Mesoprosopic (round face)	6(8)	9(12)	15(10)
Leptoprosopic (long face)	67(89.3)	61(81.3)	128(85.3)
Hyperleptoprosopic (very long face)	2(2.7)	5(6.7)	7(4.7)

The above table shows the sexual dimorphism in percentage (%) of face shapes of the 150 subjects who participated in the study

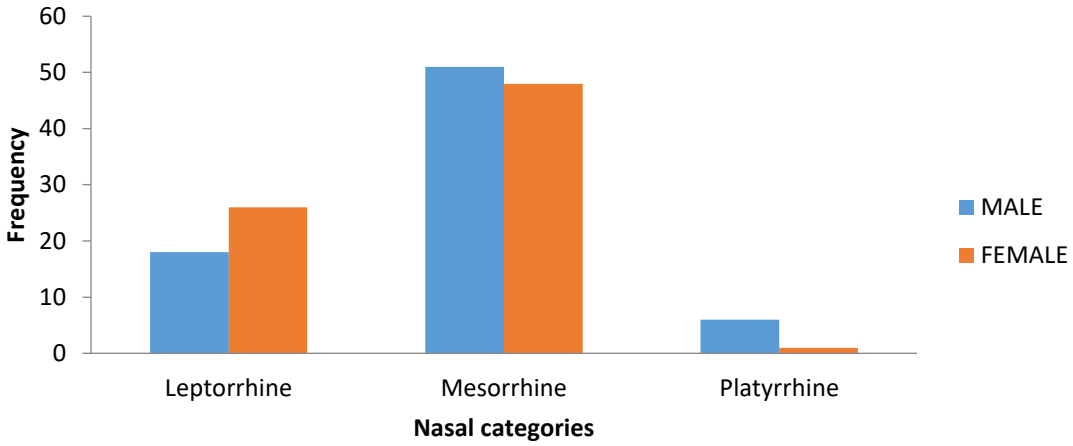

Figure 1. Nasal index in respect to gender (*P<0.05, N = 150; n= 75)

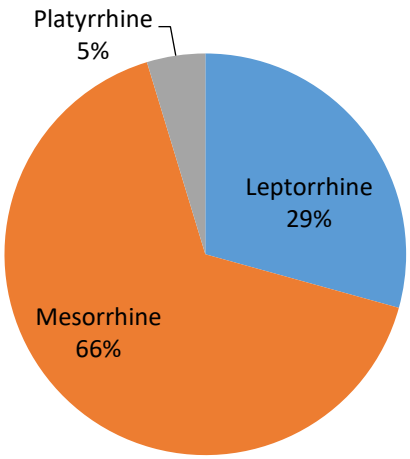

Figure 2. Percentage of nasal categories in the study (*P<0.05, N = 150; n= 75)

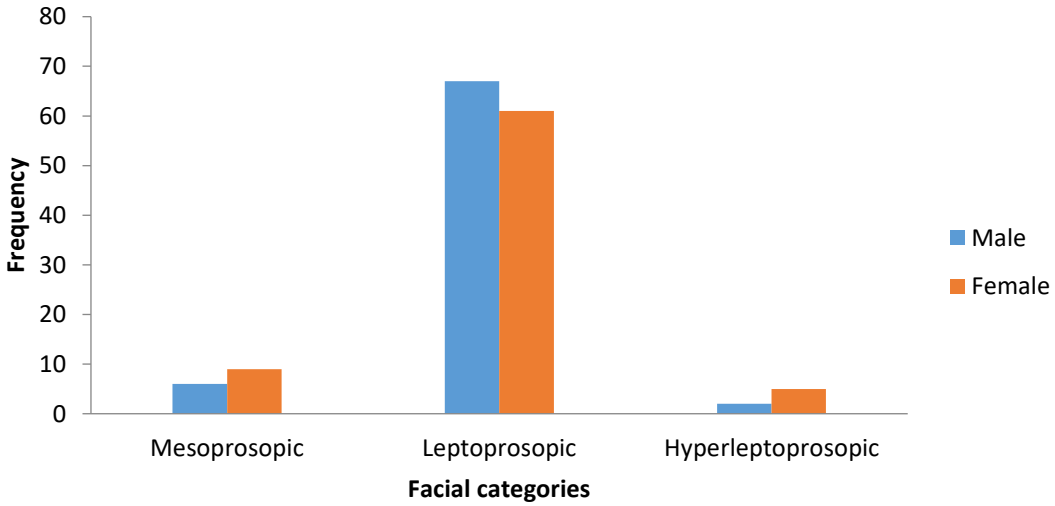

Figure 3. Facial index in respect to gender (*P<0.05, N = 150; n= 75)

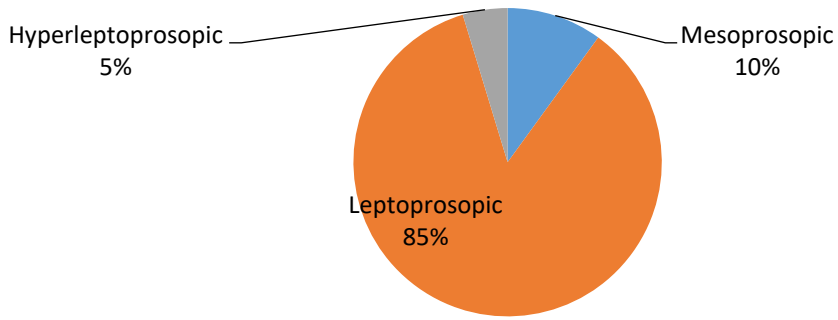

Figure 4. Percentage of facial categories in the study area (*P<0.05, N = 150; n= 75)