Original Research Article

Assessment of Earlobe Patterns and Ear Shapes in the Hausa Ethnic Group of Nigeria: Implications for Forensic and Clinical Applications.

Abstract

Background: The external earconsists of the pinna and external auditory meatus, whichvary in different shapes, sizes, and structures among individuals. The earlobe is a soft tissue region near the base of the external ear. Both men and women have attached and detachable earlobes. The study sought to evaluate the external ear morphology and earlobe attachment pattern of the Hausa ethnic group in Nigeria.

Method: The study included 300 individuals (150 males and 150 females) with mean age and standard deviation of ?.... Multi-stage random sampling was employed. The data was analyzed using version 23 of the statistical package for social sciences. Chi-square was used as an inferential statistic and a probability less than 0.05 ($p<0.05$) was considered statistically significant.

Result: The study shows that 61.3% of males and 54.3% of females were observed to have an attached lobe. It shows no significant relationship between the sexes. The most prominent ear shape among the population was triangular in females while in males was oval.

Conclusion: This study shows that the most dominant pattern of earlobes was attached earlobes. It also indicated that the most common morphological shapes among the population were oval and triangular shapes in males and females respectively. This study will be useful in the implications of sectors like plastic surgery, hearing aid design, and forensic science, where a precise understanding of ear morphology aids in identification processes.

Keyword: Anthropometric; Ear shape; Earlobe; Hausa; Forensic

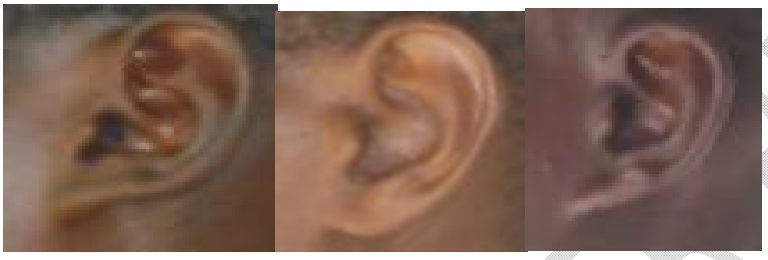
1. INTRODUCTION

Anthropometry is the scientific study of measurement and proportion of the human body dimension. It is crucial in understanding human diversity, genetics, and evolution [1]. The external ear consists of the pinna and external auditory meatus, a unique part of human anatomy that varies greatly in shape (oval, round, triangular, and rectangular), size, and structure across individuals and populations [2]. This structure contributes to the unique appearance of the ear, especially in the concha and lobe areas. It has been observed that there is a significant variation in the geometry and shape of the ear among individuals. The earlobe is the soft tissue area at the bottom of the outer ear. Despite lacking cartilage, the earlobe has nerve endings and blood vessels [3]. Earlobe attachment differs in every individual; it is either directly attached to the lateral side of the head or detached, hanging freely to the lateral side of the face.

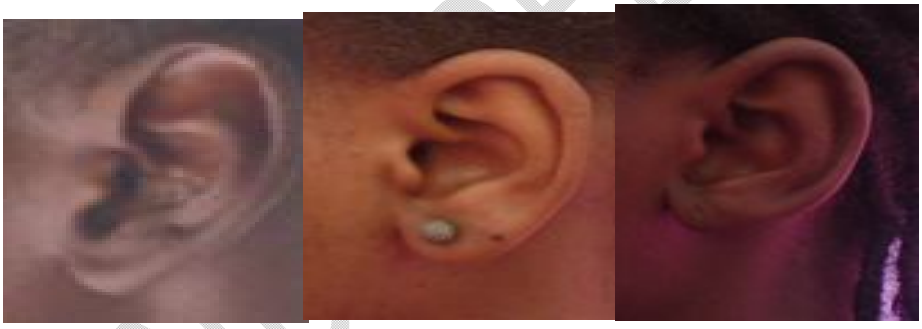
However, because ear shape and earlobe attachment patterns are influenced by both environmental and genetic factors, they are particularly intriguing [4]. Variations in these qualities can serve as distinguishing features in population-specific research. This study has practical implications in sectors like plastic surgery, hearing aid design, and, most significantly, forensic science, where a precise understanding of ear morphology aids in identification processes.

Studies on earlobe patterns across diverse populations in Nigeria have reported that the attached earlobe is more common than the free or unattached earlobe among the Ika ethnic group in Delta State [5]. Asiwe et al., [6] verified that the unattached pattern of earlobe attachment is predominant in males and the attached is more predominant in females. Francis and Okoseimiema [7], stated that free (detached) earlobes were more common than the attached ones among the Kalabari people. Paul et al., [8] of the Idoma population revealed that attached earlobes are more observed than detached ones. Oyubu et al. [9] also reported the most predominant earlobe among the Nigerians in southern regions was the attached earlobe. Among the Adult Malaysian Population at Shah Alam, Attalla et al., [10] reported in terms of the shape of ear distribution, the shapes oval, round, rectangular and triangular are nearlyequally distributed among young adults in Shah Alam.

The Hausa ethnic group, one of the largest in Nigeria and West Africa, is an important population for studying anthropometric features such as ear morphology. The Hausa people, known for their rich cultural legacy and distinct genetic background, provide an unparalleled chance to study the variation and distribution of external ear features. However, while several anthropometric studies have been conducted on various global populations, precise data on ear morphology within the Hausa ethnic group is limited. Therefore, this study sought to evaluate the external ear morphology and earlobe attachment pattern of the Hausa ethnic group in Nigeria.

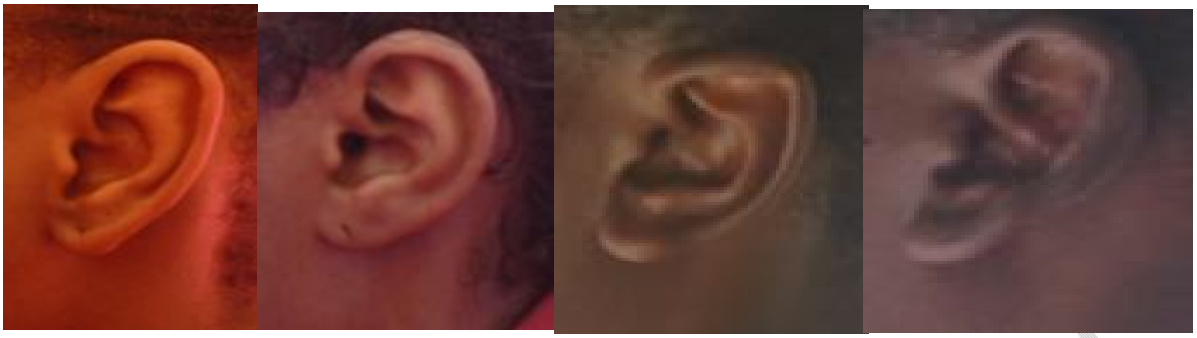


Attached earlobe pattern



Detached earlobe pattern

Fig. 1; Pattern of Earlobe



Oval shape **Round shape** **Triangular shape** **Rectangular shape**

Fig. 2; Morphological Shapes of Ear

2. 0 MATERIALS AND METHODS

2.1 Study Design

The study used a cross-sectional descriptive study designand only respondents within the age rangeof 18-37 years old (mean and standard deviation of ….) made up the study population (150 males and 150 females) were allowed to participate in this study. The respondents were drawn from Kano, Kaduna, Kebbi, and Kastina states,Kano city was used as the study area and a multi-stage random sampling technique was adopted in the study to ensure that all respondents had an equal chance of being selected.

2.2 Study Criteria

Inclusion Criteria

Only subjects whose parents and grandparents are fromthe Hausa ethnic group of Nigeria. Those who fall between the age range of 18-37 yearsand also those who did not have surgeryperformed on the ear were selected in this study.Also having no abnormalities that would have affected the ear morphology was one of the inclusion criteria.

Exclusion Criteria

Subjects whose parents and grandparents are not from the Hausa ethnic group of Nigeria and those who underwent surgeryor had abnormalities that would have affected their ear morphology were all omitted from the study.

Above options are inclusion criteria.It isnecessary to be corrected.

2.3 Method of Data Collection

A descriptive questionnaire was designed and distributed to each respondent to collect information on socio-demographic characteristics (age, sex, and ethnic group). A personal interview was conducted to validate that the responder satisfied the inclusive criterion. The questionnaire was then retrieved and documented.

2.4 Method of Data Analysis

The data obtained from the study were subjected to statistical analysis using the International Business Machine of Statistical Package for Social Sciences (IBM SPSS version 23) and Chi-square was used as an inferential statistic. A probability less than 0.05 ($p<0.05$) was considered statistically significant.

3. RESULTS

The present study comprised three hundred subjects (150 males and 150 females) of the Hausa ethnic group of Nigeria, whose mean age was 18-37 years old.

(This is not mean age. This is age range)

Table 1 shows the association of earlobe attachment among the sexes where 61.3% of males were observed to have an attached lobe and only 54% had an attached lobe. 46.8% and 54.3% of females were observed to have an attached lobe and detached lobe respectively, and no gender difference was observed.The distribution of ear shape among the genders shows oval (31.3%), round (16%), triangular (30%) and rectangular (22.7%) all observed in males. In females, oval (20.7%), round (30.7%), triangular (35.3%) and rectangular (13.3%) were observed, it also shows there was a significant difference between two gender about the ear shape (p-

value=0.002). This shows that ears are not the same in shape in both genders of the Hausa population (Table 2).

Table 1; Association of Earlobe Attachment among the Sex of Hausa Ethnic Group of Nigeria

Sex	Attached lobe	Detached lobe	X^2	df	p-value	Inference
Male	92 (61.2%)	58 (38.7%)	1.652	1	0.24	NS
Female	81 (54%)	69 (46%)				

X^2= Chi-square, df =degree of freedom, NS= Not significant, Values are: number (percentage)

Table 2; Distribution of Ear Shape among the Genders

Ear Shape	Male	Female	X^2	df	p-value	Inference
Oval	47 (31.3%)	31 (20.7%)	14.479	3	0.002	S
Round	24 (16%)	46 (30.7%)				
Triangular	45 (30%)	53 (35.3%)				
Rectangular	34 (22.7%)	20 (13.3%)				

X^2= Chi-square, df =degree of freedom, S= significant, Values are: number (percentage)

4. DISCUSSION

The present study evaluates the association of earlobe patterns among genders in the Hausa ethnic group of Nigeria and results presented that the majority of the male(61.3%) and female (54.3%) had attached earlobe patterns. This association also showed no gender difference. The

findings of this study were in line with Gaya and Yahaya, [11] who reported that attached earlobe is more predominant in both genders among Nigerian students of Bayero University Kano. However, the findings of this study were inconsistent with Ese et al., [5] whose study was among the Ika ethnic group in Delta State, Nigeria, which showed that females have a free earlobeand males have more attached earlobe and the findings of Oyubu et al. [9], that attached earlobe patterns was predominant in male, among Adult Nigerians residing in the Southern region and this aligned with the present study that attached earlobe are more noted in males. However, they also report that earlobe patterns showed no gender differences and this concurs with the present study. Moreover, the present study differsfromAsiwe et al., [6]a study among the Igbo ethnic group of Nigeria where the males had unattached patterns of the earlobe and the females had attached earlobe patterns and Munir et al. [12] study among the Quetta, Pakistan population that the most common earlobe attachment pattern found in males was free and females were attached and this research agreed with present study in terms of females having attached earlobe.

The study further revealed that the attached earlobe was the most common among the Hausa ethnic group of Nigeria, and our result concurs with Gaya and Yahaya, [11] reported that attached earlobe is more noted in Nigerian students of Bayero University Kano and Krishan et al., [13] observed that attached earlobe was common in the population of Indian. On the contrary, Fakorede et al., [14] and Kapile et al., [15] observed that detached (free) earlobes were more predominant and this disagreed with the present study.

In the present study, the most common ear shape observed was oval among the males (31%) and triangular among the females (35.3%) and it also shows there was a significant difference between males and females about the ear, p-value>0.05. Genetically, ear shape and size are influenced by hereditary traits, which may differ slightly between males and females due to evolutionary adaptations or genetic variations [16]. Hormonal differences, particularly during puberty, can affect cartilage development and elasticity, leading to subtle variations in ear structure [17]. For example, testosterone has been linked to thicker and more prominent cartilage, which might explain slightly larger or more angular ears in males. Environmental factors such as lifestyle, ageing, and exposure to elements like sun or wind can also shape ear morphology over time The sexual alteration shown in this study was in line with other research across many populations, which found that Fakorede et al., [14] whose study was on ear

morphology and morphometry as potential forensic tools for identification of the Hausa, Igbo and Yoruba populations of Nigeria, indicated that triangular shape is more frequent in Hausa females. In contrast, round ear shape is more common in males, which opposes the present study regardingmale ear shape. However, the Malay females and males were found round shape and triangular respectively by Attalla et al., [10], which disagreed with the present study.

Although, in this present study, the most predominant ear shape among the Hausa ethnic group in Nigeria was triangular, followed by an oval, round and the least common is rectangular and this contradicts the study by Krishan et al., [13] among Northern Indian where the most predominant ear shape was oval on both genders. According to Osunwoke et al., [18] inan anthropometric study on the anatomical variation of the external ear amongst Port Harcourt students, Nigeria, it was observed that an oval shape is the most predominant ear shape among the students and this differs from the present study. Morphological variation and biometrics of the ear, an aid to personal identification carried out in north-west and north-east of India by Verna et al., [19], discovered that an oval shape was commonly noted among the population and this research also disagreed with the present study. The round-shaped ear was more predominant in the morphological features of the ear in sex classification by Sezgin and Ersoy [20]. The oval and round-shaped ears were reported in 37.3%; 35.92% of males and 23.92%; 38.41% of females, respectively reported by Rani et al., [21].Distribution of external ears in Sriganaganagar District, Rajasthan, India, oval shape ear was more observed by Kaur et al., [22]. Determination of external ear indices by digital photometry among the adult population by More et al., [23] observed that oval-shaped ears were common in both sexes.The present study has shown some similarities and differences in external ear shape and earlobe attachmentpatterns among the Hausa ethnic group of Nigeria. The differences could be attributed to genetic, race, and environmental factors.

5. CONCLUSION

In conclusion, this study shows that both genders have attached earlobes and no significant relationship between the sexes. It also indicated that the most common ear shapesamong the populationwere oval and triangular in male and female respectively. However, this study will be useful in the implications of sectors like plastic surgery, hearing aid design, and forensic science, where a precise understanding of ear morphology aids identification processes.

CONSENT

A written consent was distributed to all the subjects explaining the nature of the research and only those who consented were allowed to participate in the study. The consents were retrieved and preserved by the authors.

ETHICAL CONSIDERATION

The study was approved by the research and ethics committee of the University of Port Harcourt, Port Harcourt Nigeria (UPHCEREMAD/REC/MM/91/046).

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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