Original Research Article

Anthropometric Analysis of External Ear Shape and Earlobe Attachment Patterns in the Hausa Ethnic Group of Nigeria

Abstract

Background: The external ear, also known as the pinna or auricle, varies in shape, size, and structure among individuals. The earlobe is a soft tissue region near the base of the outer 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) aged 18 to 37 years. 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 inferential statistic and probability less than 0.05 ($p<0.05$) was considered statistically significant.

Result: The study shows that 61.3% of males and 54% of females were observed to have an attached lobe. It indicated no gender difference. The most prominent ear shape among the population is triangular.

Conclusion: This study will be useful in the implications of sectors like plastic surgery, hearing aid design, andforensic science, where a precise understanding of ear morphology aids in identification processes.

Key Note: Anthropometric; External Ear Shape; Earlobe; Hausa

Comment [k1]: The external ear consist of pinna and external auditory meatus
Please correct this sentence.

Comment [k2]: It is better to use one term, outer ear or external ear.

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Comment [k4]: Thisexplanation show the importance of conducting research and do not show the conclusion. This part should be corrected.

Comment [k5]: Keyword

1. INTRODUCTION

Anthropometry is the scientific study of measurement and proportion of the human body dimension. It plays a crucial role in understanding human diversity, genetics, and evolution [1]. The external ear, also known as the auricle or pinna, is a unique part of human anatomy that varies greatlyin shape (oval, round, triangular, and rectangular), size, and structure across

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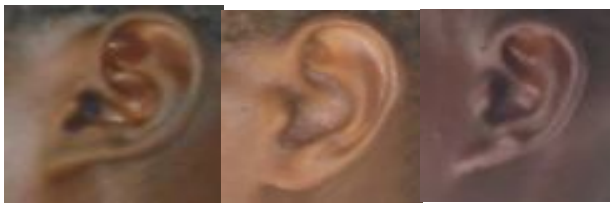
individuals and populations [2]. This structure helps togive our unique ear appearance, especially in the concha and lobe areas.It has been observed thatthere is a significant variation in the geometry and shape of the ear among individuals. The earlobe is the soft tissue area at the bottom of the outer ear. Despite lacking cartilage, the earlobe has nerve endings and blood vessels [3]. Earlobe attachment differs differently 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 MalaysianPopulation 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.

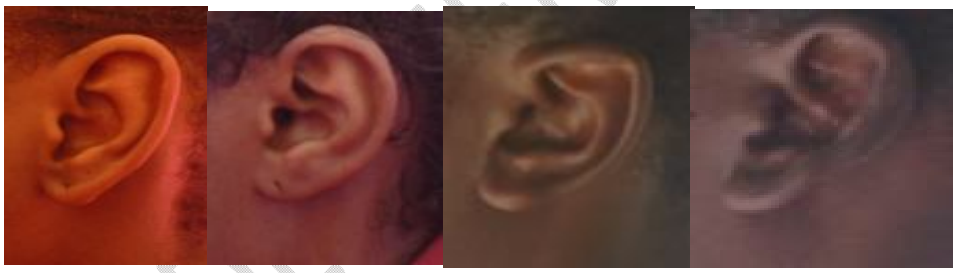
The Hausa ethnic group, one of the largest in Nigeria and West Africa, is an important population for studying anthropometric features such as ear morphology. The Hausa people, known for their rich cultural legacy and distinct genetic background, provide an unparalleled chance to study the variation 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.



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 approved a cross-sectional descriptive study designand only respondents within the age interval of 18-37 years 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 and the sample size was calculated using theTaro Yamane formula.

Comment [k7]: This study is a cross-sectional descriptive-analytical study. Because the effect of gender is also investigated.

2.2 Study Criteria

Inclusion Criteria

Only participants whose parents and grandparents are fromthe Hausa ethnic group of Nigeriaand those who did not have surgery performed on the ear were selected in this study.

Comment [k8]: This section requires revision. It is essential that details such as the age of the study participants, the absence of abnormalities, and other relevant characteristics are accurately provided in this section.

Exclusion Criteria

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

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2.3 Method of Data Collection

A descriptive questionnaire was designed and distributed to each respondent to collect information on socio-demographic characteristics, ear shape and earlobe attachment patterns. A personal interview was conducted to validate that the responder satisfied the inclusive criterion. The questionnaire was then retrieved and documented.

Comment [k10]: Evaluation of research variables requires detailed observation by trained specialist. The use of a questionnaire is not valid enough to investigate the research topic.
Has a detailed examination by an expert in the field of anatomical features been done?
Have other arrangements been made for a detailed investigation?

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 26) 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 age range was 18-37 years old. Table 1 shows the association of

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earlobe attachment among the sex where 61.3% of males were observed to have an attached lobe and only 54% had a attached lobe. In comparison to females, 46.8% of females were observed to have an attached lobe, only 54.3% had a detached lobe and no gender difference was observed. Distribution of ear shape among the genders shows oval (31.3%), round (16%), triangular (30%) and rectangular (22.7%) were all observed in males, while in females, oval (20.7%), round (30.7%), triangular (35.3%) and rectangular (13.3%) were observed, it also shows there was significant difference between the ear shape and gender, p-value>0.05 (0.002). This shows that ears are not the same in shape in the both gender of Hausa population (Table 2).

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

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This table is not illustrative
It is necessary that the analytical comparisons are given separately or shown in a better way

Variables	Attached lobe	Detached lobe	X^2	df	p-value	Inference
Male count	92	58	1.652	1	0.24	NS
% within sex	61.3%	38.7%				
% within earlobe	53.2%	45.7%				
Female count	81	69				
% within sex	54.0%	46.0%				
% within earlobe	46.8%	54.3%				
Total count	173	127				
% within sex	57.7%	42.3%				
% with earlobe	100.0%	100.0%				

X^2= Chi-square, df =degree of freedom, NS= Not significant

Table 2; Distribution of Ear Shape among the Genders

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Variables	Oval	Round	Triangular	Rectangular	X^2	df	p-value	Inference
Male count	47	24	45	34	14.479	3	0.002	S
% within sex	31.3%	16.0%	30.0%	22.7%				
% within ear shape	60.3%	34.3%	45.9%	63.0%				

Female count	31	46	53	20
% within sex	20.7%	30.7%	35.3%	13.3%
% within ear shape	39.7%	65.7%	54.1%	37.0%
Total count	78	70	98	54
% within sex	26.0%	23.3%	32.7%	18.0%
% with ear shape	100.0%	100.0%	100.0%	100.0%

X^2= Chi-square, df =degree of freedom, NS= Not significant

4. DISCUSSION

The present study evaluates the association of earlobe patterns among gendersinthe Hausa ethnic group of Nigeria and results presented that the majority of the (61.3%)males show attached patterns of earlobe while 54% of the females had attached earlobe patterns, this shows that both genders have attached earlobes. This association also showed no gender difference. The findings of this study were in line with Gaya and Yahaya, [14]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 studywas among the Ika ethnic group in Delta State, Nigeria, which showed thatthe female has a free earlobeand male has more attached earlobe and thefindings ofOyubu et al. [9], that attached earlobe patterns was predominant in male, among Adult Nigerians residing in the Southern region and this agreed 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 agreed with the present study. Moreover, the present study disagreed with Asiwe 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. [11] 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 agreed with Gaya and Yahaya, [14] reported that attached earlobe is more noted in Nigerian students of Bayero University Kano and Krishan et al., [12] observed that attached earlobe was commonin the population of Indian. On the contrary,

Comment [k14]: Reference numbers should be corrected
Reference number 14 is mentioned before number 11.

Fakorede et al., [13] 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 significant difference between the ear shape and gender, p-value>0.05 (0.002). This can be attributed to genetic and hormonaland environmental factors. The sexual alteration shown in this study was in line with other research across many populations, which found that Fakorede et al., [13] 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 while round ear shape is more common in males and this disagreed with the present study in term of male's ear shape. However, among the Malay females and maleswere found round shape and triangular respectively by Attalla et al., [10] and it 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 oval, round and the least common is rectangular and this contradict with the study by Krishan et al., [12] among Northern Indian where the most predominant ear shape was oval on both genders. According to Osunwoke et al., [16] on anthropometric study on the anatomical variation of the external earamongst Port Harcourt students, Nigeria, it was observed that oval shape is most predominant ear shape among the student and this disagreed with the present study. Morphological variation and biometrics of the ear, anaid to personal identification carried out north-west and north-east of India by Verna et al., [], they discovered that oval shape was commonly noted among the population and this research also disagreed with the present study. 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.

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5. CONCLUSION

In conclusion, this study shows that both genders have attached earlobe and it shows no gender differences. It also indicated that the most common ear shape among the population is triangular. However, this study will be useful in the implications of sectors like plastic surgery, hearing aid

design, andforensic science, where a precise understanding of ear morphology aids in 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.

REFERENCE

1. Umar M. An Introduction to Anthropometry. InGarment Sizing and Pattern Making 2024 Oct 17 (pp. 1-19). Singapore: Springer Nature Singapore.
2. Osunwoke EA, Vidona WB, Atulegwu GC. Anthropometric study on the anatomical variation of the external ear amongst Port Harcourt students, Nigeria. Int J Anat Var. 2018 Dec;11(4):143-6.
3. Deep A, Mortazavi MM, Adeeb N. Ear. Bergman's Comprehensive Encyclopedia of Human Anatomic Variation. 2016 Jul 5:1167-81.
4. Purkait R. Application of external ear in personal identification: a somatoscopic study in families. Ann Forensic Res Anal. 2015;2(1):1015.
5. Ese A, Emmanuel ON, Charity I, Enoh O. Pattern of earlobe attachment among the Ika ethnic group in Delta State, Nigeria. GSC Advanced Research and Reviews. 2021;7(3):054-7.
6. Asiwe N, Irozulike FC, Filima PL, Wedeh MS, Yirate BN. Pattern of earlobe attachment among igbo ethnic group of Nigeria. Asian Journal of Advanced Research and Reports. 2023 Nov 4;17(11):344-9.
7. Francis GI, Okoseimiema SC. Distribution of Earlobe Attachment among Kalabari People of Southern Nigeria. Sch J App Med Sci. 2022 Nov;11:1884-6.

8. Paul JN, Ochai J, Dimkpa GC, Ogba AA, Ohanenye CA. Pattern of Earlobes Attachment among the Idoma People of Benue State, Nigeria. Sch J App Med Sci. 2022 Dec;12:2419-23.
9. Oyubu EA, Oyakhire MO, Amasiatu VC. MORPHOMETRIC EVALUATION OF THE EXTERNAL EAR IN RELATION TO ATTACHMENT PATTERN: A STUDY OF ADULT NIGERIANS RESIDENT IN THE SOUTHERN REGION. European Journal of Biomedical. 2019;6(6):65-72.
10. Attalla SM, Kumar KA, Hussain N. Study of the Ear Shape and the Lobule Attachment among the Adult Malaysian Population at Shah Alam. European Journal of Molecular & Clinical Medicine. 2020;7(3):5417-25.
11. Munir S, Sadeeqa A, Nergis B, Tariq N, Sajjad N. Assessment of morphogenetic inherited traits; earlobe attachment, bent little finger and hitchhiker's thumb in Quetta, Pakistan. world Journal of Zoology. 2015;10(4):252-5.
12. Krishan K, Kanchan T, Thakur S. A study of morphological variations of the human ear for its applications in personal identification. Egyptian Journal of Forensic Sciences. 2019 Dec;9(1):1-1.
13. Fakorede ST, Adekoya KO, Fasakin TP, Odufisan JO, Oboh B. Ear morphology and morphometry as potential forensic tools for identification of the Hausa, Igbo and Yoruba populations of Nigeria. Bulletin of the National Research Centre. 2021 Dec;45:1-9.
14. Gaya AA, Yahaya AI. Sub-Saharan human morphological variations in the external ear (pinna): a potential tool for human identification. EC Clin Exp Anat. 2019;2:175-84.
15. Kapil V, Bhawana J, Vikas K. Morphological variation of ear for individual identification in forensic cases: a study of an Indian population. Res J Forensic Sci. 2014 Jan;2(1):1-8.
16. Osunwoke EA, Vidona WB, Atulegwu GC. Anthropometric study on the anatomical variation of the external ear amongst Port Harcourt students, Nigeria. Int J Anat Var. 2018 Dec;11(4):143-6.