



ORIGINAL RESEARCH PAPER

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ANTHROPOMETRIC STUDY ON HUMAN EXTERNAL EAR

KEY WORDS: External Ear, Anthropometric, Morphometry, Vernier Caliper.

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ABSTRACT

Aim and Objectives : Aim of study was to determine normal anthropometric measurements and their comparison on either sex or either side.
Material and Method: The study was conducted on 150 medical students of Kanti Devi Medical College Hospital & Research Center Mathura. The study consisted of 75 males and 75 females aged on 17 to 24 years. Congenital ear anomalies or previous ear surgeries were excluded from study. Vernier calipers were used for measuring bilateral size of external ear. Parameters consisted of total ear height and width and lobular height and lobular width.
Observation And Results : All parameters were significantly more on right side in both males and females. On measurements significantly higher in males than in females.
Conclusions : Findings were suggested of implications in the cosmetic surgeries ear malformation corrections ear phone and ear aids designing.

INTRODUCTION

The external acoustic meatus develops from the dorsal end of the first pharyngeal (hyomandibular) cleft. The development of the auricle is initiated by the appearance of six tissue elevations, the auricular hillocks. External ear consists of the auricle, or pinna, and the external acoustic meatus¹. The human ear is divided into external, middle and internal parts. Pinna and external acoustic meatus form the external ear. The external ear is composed of three primary components: the helix-ant helical complex, the conchal complex, and the lobe². The shape, size and orientation of each external ear is unique as fingerprint but it is plausible to make some conclusion; males have larger ears than their female's counterpart³. The mean values of different age groups such as 4-5 (34.16mm), 15-17 (35.74mm), 18-30 (34.51mm) and 31-40 (35.72mm) for auricular width and 4-5 (50.30mm), 15-17 (60.26), 18-30 (56.11) and 31-40 (58.43) for auricular length were documented.⁴

RESULTS

Bilateral sizes of auricles were measured.

- A). Total ear height (THE)
- B). Ear width (EW)
- C). Lobular height (LH)
- D) The lobular width (LW)

Table: 1. Comparison of male & female right ear. (All parameters in cm)

Variables	Gender	Mean	SD	p-Value
Ear Height (EH)	Male	64.1	6.1	0.404
	Female	63.4	3.9	
Ear Width (EW)	Male	29.4	2.8	0.0007
	Female	27.9	2.5	
Lobular Height (LH)	Male	20.1	3	0.0002
	Female	18.5	2.1	
Lobular Width (LW)	Male	19.6	2.5	≤0.0001
	Female	17.7	1.6	

Table: 2. Comparison of male & female left ear. (All parameters in cm)

Variables	Gender	Mean	SD	p-Value
Ear Height (EH)	Male	61.9	4.4	0.493
	Female	61.4	4.5	
Ear Width (EW)	Male	28.7	4.9	0.044
	Female	27.4	2.6	
Lobular Height(LH)	Male	19.1	3.1	0.002
	Female	17.7	2.4	
Lobular Width(LW)	Male	18.5	1.8	≤0.0001
	Female	15.7	1.8	

Table: 3. Comparison of male right ear & left ear. (All parameters in cm)

Variables	Gender	Mean	SD	p-Value
Ear Height (EH)	Right	64.2	6.1	0.0009
	Left	61.9	4.4	
Ear Width (EW)	Right	29.4	2.8	0.285
	Left	28.7	4.9	
Lobular Height (LH)	Right	20.1	3	0.047
	Left	19.1	3.1	
Lobular Width (LW)	Right	19.6	2.5	0.002
	Left	18.5	1.8	

Table: 4. Comparison of female right ear & left ear. (All parameters in cm)

Variables	Gender	Mean	SD	p-Value
Ear Height (EH)	Right	63.4	3.4	0.003
	Left	61.4	4.5	
Ear Width (EW)	Right	27.9	2.5	0.232
	Left	27.4	2.6	
Lobular Height (LH)	Right	18.5	2.1	0.031
	Left	17.7	2.4	
Lobular Width (LW)	Right	17.7	1.6	≤0.0001
	Left	15.7	1.8	

DISCUSSION

The auricle reaches its mature height at 13 years in male and at 12 years in females⁵. Anthropometric studies had been carried out on the external ear of children with different conditions such as cleft lip/palate⁶, Down's syndrome⁷, chromosomal abnormalities, like aneuploidy⁸. The diagnostic values of abnormality of external ear to establish the existence of an abnormality of the urinary tract, as a result of coincidence in the period of embryogenesis has been reported⁹. An acquired deformity that develops with aging may include elongation or Ptoisis of the ear lobe. This condition has been attributed to the loss of elastic fibres and gravitational forces¹⁰. Earrings add additional weight on the ears, and they therefore affect ear lobe¹¹. Existence of sexual dimorphism in external ear dimensions were documented¹². It was shown that sexual dimorphism exists in auricular linear dimensions between males and females with higher values in males¹³. This is similar to the findings of Bozkir et al. (2006) who observed significant difference in ear height between Turkish and Japanese populations. In the same study, it was also shown that the total auricular height and width were longer in males within the Turkish population. It was therefore concluded that all auricular dimensions were significantly larger in males than in females. It was therefore concluded that all auricular dimensions were significantly larger in males than in females. The differences in males and females may be linked to the statement that auricle expansion starts earlier in males than females, which continues up to the older age¹⁴. The variations in gender may also be influenced by genetic factors which vary with sex.

In this study shows sexual dimorphism in the auricular dimensions on both sides, significant differences were observed in right and left sides respectively.

CONCLUSION

In this study provides the mean values of different morphometric measurements of right and left ears in the students of Kanti Devi Medical College Hospital & Research Center Mathura. As a result, the present study has established the existence of sexual dimorphism in external ear dimensions and also the differences between the auricular indices of both sides. The result shows that there is significant correlation between the ear variables. Therefore, the use of ear dimensions in morphometry for characterization of the differences in sex was highlighted in the present study. An alternative method adopted in the study for measurement of linear ear dimensions was proved to have potential in ear morphometry. Knowledge about the normal auricular dimensions is important in the diagnosis of congenital malformations, syndromes and acquired deformities thus the study has implications in the cosmetic surgeries, correction of malformations, designing of head phones, ear phones and hearing aids.

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