

Comparison Of Anthropometric Measurements Of Male And Female External Ear Of Medical Students Of Rajasthan

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Abstract:

Background: Human ears are unique to each person because the external ear is also a distinguishing characteristic, similar to other personal identifiers and is therefore utilized in multiple scientific fields such as forensic science, anthropology, and biology. The ear lobule is the last part of the auricle to develop. **Aim:** The primary aim of the study was to compare anthropometric measurements of both external ears between male and female subjects of medical students of Udaipur, Rajasthan. **Material and methods:** The study was conducted among 220 students (110 Male and 110 Female) with age range from 17 to 25 years in the Department of Anatomy, Pacific Institute of Medical Science, Udaipur, Rajasthan, India. **Results:** Total ear length, ear length above tragus and ear width were significantly higher in male than female in this study. Ear length below tragus was found nonsignificant. **Conclusion:** All measurements except ear length below tragus, were higher in male as compared to the female subjects.

Keywords: External ear, Anthropometry, Vernier Caliper, Total ear length, Ear width, Ear length above tragus, Ear length above tragus.

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Introduction:

Anthropometry is the measuring of body segments in both live and deceased individuals using specialized tools. The outer ears consist of the auricle, also known as the pinna, and the external acoustic canal¹.

The auricle extends from the facial side and has an irregular concavity along with various protrusions and indentations on its outer surface. The structure extends inward from the auricle to the tympanic membrane. The distinctive shape of the pinna is attributed to yellow elastic cartilage, whereas the lobule, the lower section of the pinna, consists solely of fibro-fatty tissue enveloped by a skin fold². Auricle shape and size vary depending on sex, age, and ethnicity³. Malformations of the external ear as a consequence of inherited disorders or traumas (after trauma), infection or removal of tumor, etc⁴, require surgical intervention or prosthetic replacement⁵. Consequently, plastic surgeons necessitate comprehensive knowledge regarding its intricate anatomy and standard measurements to accurately create and ascertain the placement and alignment of the auricular framework⁶. During legal investigations, especially in crimes (resulting in fatality) or discovery of unidentified human remains, the jurisprudence requires to give an opinion regarding personal identification of the deceased⁷. As the morphological characteristics and

measurements of external ear vary with ethnicity, age and sex⁸, ear biometrics can be utilized as an aid for personal identification of the living or deceased in absence of valid fingerprints⁹.

The main objective of this research was to examine the different morphometric parameters such as total ear length, ear length above the tragus, ear length below the tragus, and ear width of both the left and right ears of medical students in the Udaipur area. These metrics were later contrasted between male and female participants.

Aim and Objectives:

The primary aim of the study was to compare anthropometric measurements of both external ears between male and female subjects of medical students of Udaipur, Rajasthan under following objectives:

- 1) To measure both ear parameters of male and female subjects.
- 2) To compare the anthropometric measurements of both external ears between male and female subjects.

Material and methods:

This study was carried out among 220 students (110 Male and 110 Female with age range from 17 to 25 years) of Udaipur, Rajasthan.

The purpose of the study was explained to the involved volunteers and written consent was obtained from each

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individual prior to initiating the research. The general information and the basic demographic profile of the participants were obtained by using a proforma.

Inclusion criteria:

- Subjects with age from 17 to 25 years
 - Subjects who were willing to participate
- Exclusion criteria:

- Subjects with external ear deformities
- Developmental defect of pinna

The parameters measured for the study as shown in figure 1 were:

- TEL of external ear measured from the topmost part of the pinna to the lower point of lobule (A-B)⁹ (shown in figure 2).
- ELAT of external ear measured from the superior most point of pinna to the tragus (A-C)⁹.

- ELBT of external ear measures from the intertragic incisura to lower most point of lobule(D-B)⁹.

- EW of left ear measured from the root to the maximum convexity of the helix (E-F)⁹ (shown in figure 3).

The measurements were acquired using a digital vernier caliper by a sole investigator. The information was inputted into the MS-Excel software. The statistical evaluation of the mean and standard deviation for several ear parameters was conducted utilizing SPSS (Statistical Product and Service Solution) software version 20.0. An independent t-test was utilized to assess the disparities between males and females. A p-value below 0.05 was deemed statistically significant.

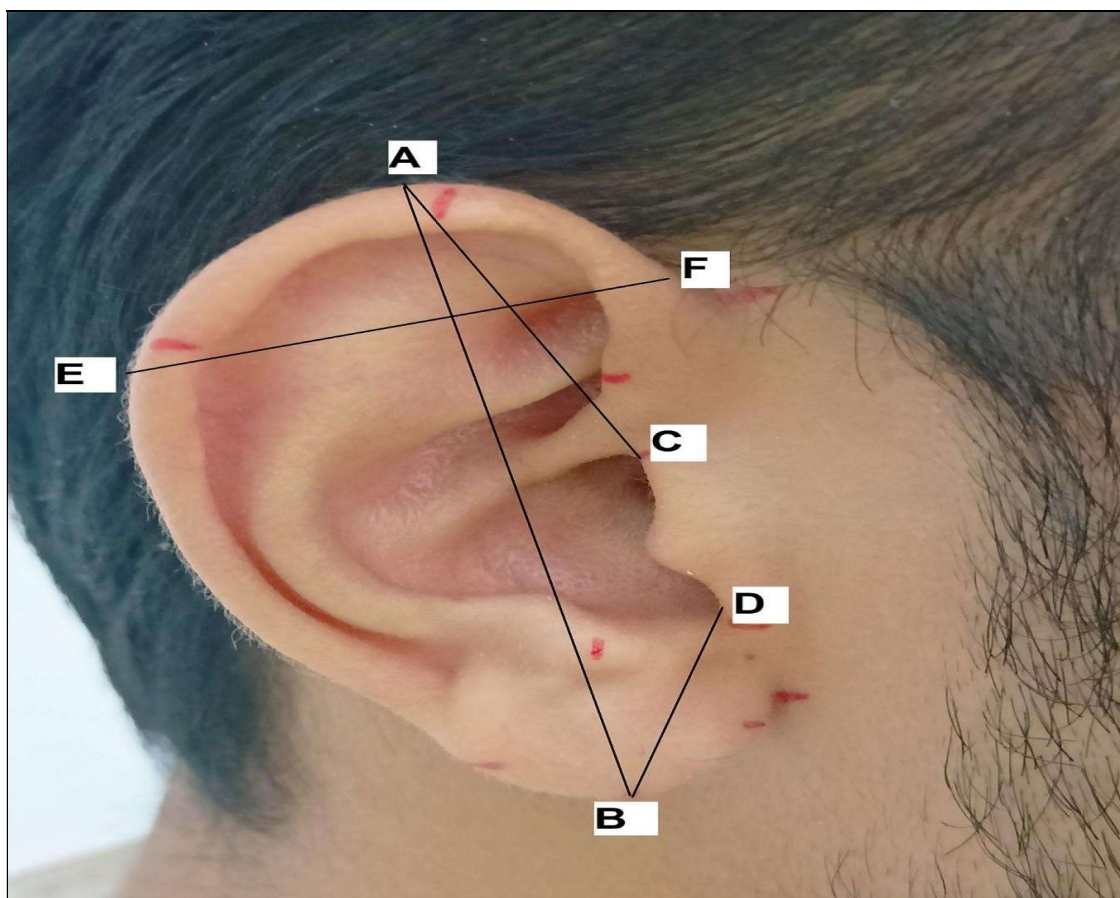


Figure 1: External ear showing total ear length (A-B), ear length above tragus(A-C), ear length below tragus(D-B) and ear width (E-F).



Figure 2: Showing measurements of total ear length



Figure 3: Showing measurements of ear width

Results and Discussion:

Comparison of both ear parameters between male and female subjects:

Total ear length, ear length of above tragus, ear length below tragus and ear width comparison between male and female subjects were shown in table 1 and table 2.

❖ Total ear length:

Table 1 and table 2 showed the comparison of the mean of right TEL were 61.92 mm & 58.28 mm, SD were 3.81 mm & 3.09 mm and left TEL were 62.41 mm &

58.25 mm, SD were 3.84 mm & 3.09 mm in male and female subjects respectively.

Present study showed TEL of both ears were significantly higher in male than female with p value <0.0001. Similar findings were observed from studies by Japatti S. R. et al (2018)¹⁰, Rani D. et al (2021)¹¹

❖ Ear length above tragus:

Table 1 and table 2 showed the comparison of the mean of both ears ELAT between male and female, which were 20.17 mm & 19.06 mm, SD; 2.43 mm &

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2.51 mm for right ear and 20.68 mm & 19.63 mm, SD; 2.28 mm & 2.44 mm respectively.

In present study, right ELAT was higher in male than female statistically significant with $p = 0.001$. Similar findings were observed from studies by Japatti S. R. et al (2018)¹⁰ and Rani D. et al (2021)¹¹.

❖ Ear length below tragus:

Table 1 showed the comparison of the mean of right ELBT between male and female were 17.52 mm & 17.21 mm and SD were 2.40 mm & 2.18 mm. On applying t-test, no significant difference was observed. As per shown in table 1 and 2, the mean of right ELBT between male and female were 17.52 mm & 17.21 mm, SD were 2.40 mm & 2.18 mm and the mean left ELBT between male and female subjects were 17.54 mm & 17.16 mm and SD were 2.26 mm & 2.11 mm respectively.

There was no significant difference observed when compared between male and female subjects. Similar findings were observed from a study by Japatti S. R. et al (2018)¹⁰.

❖ Ear width:

Table 1 showed the comparison of the mean of right EW were 31.90 mm & 29.96 mm, SD were 2.78 mm & 1.85 mm and the mean of left EW were 31.60 mm & 29.58 mm, SD were 2.51 mm & 1.73 mm between male and female subjects respectively. It was significantly higher in male than female with p value

<0.0001 . Similar findings were observed from the studies by Japatti S. R. et al (2018)¹⁰, Rani D. et al (2021)¹¹. In contrast, a study by Laxman K. et al (2019)¹² showed contrast findings with present study, demonstrating right ear width statistically non-significant.

Summary:

In present study 4 variable TEL, ELAT, ELBT and EW were measured.

➤ Comparison of ear parameters between male and female subjects:

- Right TEL was observed significantly higher in male than female. Left TEL was found highly significant more in male than female when compared.
- Right ELAT was significantly higher in male than female. Left ELAT was observed significantly high in male than female on applying t-test.
- No significant difference was observed between male and female subjects in case of right ELBT. No significant difference was observed when compared left ELBT between male and female subjects.
- Right EW was significantly higher in male than female. Left EW was also observed high in male than female subjects.

Table 1: Comparison of mean values of right ear parameters between male and female subjects.

Parameter (mm)	Male (Mean $\pm$ SD)	Female (Mean $\pm$ SD)	t value	p value
Right total ear length	61.92 $\pm$ 3.81	58.28 $\pm$ 3.09	7.78	<0.0001
Right ear length above tragus	20.17 $\pm$ 2.43	19.06 $\pm$ 2.51	3.33	0.001
Right ear length below tragus	17.52 $\pm$ 2.40	17.21 $\pm$ 2.18	1.002	0.32
Right ear width	31.90 $\pm$ 2.78	29.96 $\pm$ 1.85	6.08	<0.0001

Table 2: Comparison of mean values of left ear parameters between male and female subjects.

Parameter (mm)	Male (Mean $\pm$ SD)	Female (Mean $\pm$ SD)	t value	p value
Left total ear length	62.41 $\pm$ 3.84	58.25 $\pm$ 3.09	8.85	<0.0001
Left ear length above tragus	20.68 $\pm$ 2.28	19.63 $\pm$ 2.44	3.29	0.001
Left ear length below tragus	17.54 $\pm$ 2.26	17.16 $\pm$ 2.11	1.25	0.21
Left ear width	31.60 $\pm$ 2.51	29.58 $\pm$ 1.73	6.95	<0.0001

Conclusion:

All three ear parameters except ear length below tragus were higher in male than female.

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