

Anthropometric study of adult human external ear

Swati Lalasaheb Patil^{1*}, Avinash D Shewale², Rohini Rajesh Karmbelkar³

¹Assistant professor, ³Professor and HOD, Department of Anatomy, Prakash Institute of Medical Sciences and Research College, Islampur, Maharashtra, INDIA.

²Associate professor, Department of Anatomy, Yogita Dental College, Khed, Chiplun, Maharashtra, INDIA.

Email: drswatipatil1612@gmail.com

Abstract

Aims and Objectives: To study and compare the normal anthropometric measurements of external ear in males and females of 18-21yrs on either sides. **Material and Methods:** This study was carried out on 100 medical students of PIMS and R, Islampur, out of which 50 males and 50 females. Subjects with congenital ear anomalies and previous ear surgeries were excluded from the study. Digital vernier caliper was used to take the ear measurements. Parameters were total ear length, ear width. The data was analyzed by using SPSS version 16.0. **Observation and Results:** All the parameters were larger in males as compared to females and also significantly larger on right side than the left one which was statistically significant. **Conclusion:** Normal measurements of bilateral external ear of males and females obtained in the study may be helpful in plastic reconstructive surgeries in congenital ear anomalies by plastic surgeons and also for making hearing aids.

Key Words: Anthropometry, morphometry, vernier caliper, hearing aids.

*Address for Correspondence:

Dr. Swati Lalasaheb Patil, Assistant professor, Department of Anatomy, Prakash Institute of Medical Sciences and Research College, Islampur, Maharashtra, INDIA.

Email: drswatipatil1612@gmail.com

Received Date: 21/04/2018 Revised Date: 15/05/2018 Accepted Date: 12/06/2018

DOI: <https://doi.org/10.26611/1001631>

Access this article online

Quick Response Code:



Website:

www.medpulse.in

Accessed Date:
18 June 2018

INTRODUCTION

The human external ear composed of pinna, external acoustic meatus and external acoustic canal. The external ear which is also known as pinna is formed by three primary components; the helix-antihelix complex, the conchal complex, and the lobule¹. The ear pinna is yellow elastic cartilage which gives it the characteristic shape. Ear lobule is simply fold of skin containing fibro fatty tissue. Ear pinna develops in 4th and 6th weeks of gestation². According to many studies conducted on morphometry of external ear; the size, shape and the orientation of each external ear is unique as fingerprint but it can be generalised. Males have larger ears as

compared to females. In females ears increases with age from birth to 99 yrs of age but in case of males development of ears stop around 50-70 yrs of age³. The current study provides information of dimensions of total ear length and ear width of both sides in males and females of age group 18-21yrs. which is one of the parameter of morphometry of external ear. These ear dimensions may be helpful in constructive and periauricular surgeries of external ear, designing ear prosthesis.

MATERIALS AND METHODS

Present study was carried out in department of Anatomy, on 100 students (50 males and 50 females) between 18-21 yrs of age. These all are students of I and II MBBS of Prakash Institute of Medical Sciences and Research Centre, Islampur, Sangli. Students with congenital deformity, tumour, trauma, or previous surgery to pinna were excluded. Informed oral consent was taken. Bilateral auricles were measured with the help of standard vernier caliper which can measure 0.1mm. Parameters measured were total ear length (TEL), ear width (EW), lobular height (LH), lobular width (LW). All the parameters were measured with subject in the sitting position with head in Frankfort horizontal plane. TEL was calculated by

measuring highest point of pinna (A) to the lowest point of pinna (B). EW was anterior and posterior points on pinna. The LH was measured from midpoint of the base of intertragic notch to the lowest point of lobule. LW was considered as the transverse distance of ear lobule passing through centre of length of lobule. Data was analyzed by

using SPSS version 16.0. Comparisons of the measurements according to sex were done by using an independent samples t test. Comparison of measurements of right and left ears were performed by using paired samples t-test.

OBSERVATIONS AND RESULTS

Table 1:

Comparison of male right vs female right ear								
Variables	Ear length		Ear width		Lobular height		Lobular width	
	M	F	M	F	M	F	M	F
Mean	59.98	57.71	28.74	25.62	18.21	18.11	22.30	19.30
S.D.	3.51	2.96	2.16	2.46	2.72	2.32	2.70	1.88
t value	3.4959		6.72060		1.7360		4.3007	
p value	0.00834		0.00004		0.4257		0.0013	

Table 2:

Comparison of male left vs female left ear								
Variables	Ear length		Ear width		Lobular height		Lobular width	
	M	F	M	F	M	F	M	F
Mean	58.30	57.30	28.73	25.70	18.01	17.47	22.11	19.72
S.D.	3.81	3.04	2.32	2.40	2.71	2.22	2.49	2.31
t value	1.4584		6.5599		1.0771		4.95526	
p value	0.8543		0.00003		0.34458		0.00603	

Table 3:

Comparison of male right vs left ear								
Variables	Ear length		Ear width		Lobular height		Lobular width	
	R	L	R	L	R	L	R	L
Mean	59.98	58.30	28.74	28.73	18.02	18.01	22.30	2.11
S.D.	3.51	3.82	2.16	2.32	2.71	2.71	2.70	2.49
t value	2.28316		2.2476		1.2356		1.5525	
p value	0.05433		0.08095		0.27219		0.5792	

Table 4:

Comparison of female right vs left ear								
Variables	Ear length		Ear width		Lobular height		Lobular width	
	R	L	R	L	R	L	R	L
Mean	57.71	57.30	25.62	25.70	18.11	17.47	19.30	19.72
S.D.	2.96	3.04	2.46	2.40	2.32	2.22	1.88	2.31
t value	1.00681		1.00581		1.3984		1.00724	
p value	0.32445		0.15820		0.30793		0.15138	

Results: The measurements and comparison of results of all the individuals who participated in the study according to genders are tabulated in table no 1 and table no 2. The data shows significant differences mainly in total ear length and ear width of male and female right ear and left ear. The dimensions of the external ear of males and females which depicts higher values in males as compared to females. The Table no 3 and table no 4 shows comparison of male right and left ear, female right and left ear respectively which also shows differences in

dimensions of external ear with right sided higher values in both males and females.

DISCUSSION

According to Ito I *et al* (2001), in case of male the external ear acquires its mature height at 13yrs and in females at the age of 12 yr⁴. The differences in the dimensions of external ear were determined by several authors, with higher values in males as compared to females^{5,6} Another study carried out on Turkish and Japanese populations done by Bozkir *et al* (2006)

observed that total ear length and width were longer in males of the Turkish population⁷. Ekanem *et al* (2010) stated that all the values of pinna are higher in males as compared to females⁶. Similar finding of sexual dimorphism are seen in the present study. Same was also observed by author Nidhi Sharma² Pradhuman Verma *et al* (2016) in his study observed that all external ear biometric measurement comparison of both ears in two subpopulations of India i.e. North East (NE) and North West (NW), all values were noted more in NW subjects in both genders⁸. For accuracy in plastic reconstruction surgeries and forensic purposes, also for designing ear phones for various companies the accurate knowledge of facial and external ear parameters were very much essential². The external ear dimensions were important variables in evaluation of congenital anomalies like cleft lip/palate, Down's syndrome, chromosomal abnormalities like aneuploidy, also in existence of abnormality of urinary tract³. The study carried out by Sidra Shireen *et al* significantly observed right and left external ear differences with higher values in right side along with sexual dimorphism in the dimensions with higher values in males³. Sexual dimorphism in the dimensions of external ear may be due to release of more growth hormone in males than females⁸. The same findings in the dimensions of external ear were also observed by Doepa *et al* (2013) in their study on Uttrakhand region¹. Present study showed that all auricular dimensions are higher in males as compared to females, also significant differences are observed in right and left sides.

CONCLUSION

The present study provides the mean values of external ear dimensions of right and left ears of students of PIMS and R, Islampur. These values may provide significant information required for supportive evidence in forensic field, diagnosis of congenital malformations of ear. So this information can be used in plastic reconstruction surgeries, designing hearing aids, head phones.

REFERENCES

1. D. D. Anthropometric measurements of external ear of medical students in Uttrakhand region Anatomical society of India. 2013; 62:79-83.
2. Sharma N. Anthropometric measurement and cross-sectional surveying of ear pinna characteristics in Northern India. Journal of Experimental and clinical anatomy. 2016; 15:102-6.
3. Sidra Shireen VPK. Anthropometric measurements of human external ear. Journal of Evolution of Medical and Dental Sciences. 2015; 4(59):10333-8.
4. Ito I IM, Sueno K, Sugiura M, Suzuki S, Kida A. Anthropometric study on normal human auricle in Japan. Nippon Jibiinkoka Gakkai Kalho. 2001; 104(2):165-74.
5. Brucker MJ PJ, Sullivan PK. A morphometric study of the external ear: age and sex related differences. Plast Reconstruct Surg. 2003; 112:647-52.
6. Ekanem A. U. GSH, Musa T.S., Dare N.D. Anthropometric study of the pinna among adults Ngerians resident in Maiduguri metropolis. J Med Sci. 2010;10(6):176-80.
7. Bozkir MG KP, Yavuz M, Dere F. Morphometry of external ear in our adult population Aesth Plast Surg. 2006;30:81-5.
8. Pradhuman Verma HKS, Kanika Gupta Verma, Sharry Goyal, Madhu Sudan, Amit Ladgotra. Morphological variations and biometrics of ear: An aid to personal identification. J Clin Diagn Res. 2016; 10(5):138-42.

Source of Support: None Declared
Conflict of Interest: None Declared