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Research Paper

A Study of Morphometric variations of the Human Ear Lobule in North Indian Population

RajKumar[1], Shubhangi Maheshwari[2], Pradeep Kumar[3],Hem Singh[4], M. Haque[5], Preeti Kumari[6]

[1] *Demonstrator, Department of Anatomy, Autonomous State Medical College Society, Hardoi, Uttar Pradesh, India.*
[1] *Demonstrator, Department of Anatomy,Gian Sagar Medical College and Hospital, Patiala, Punjab*
[3]*Demonstrator, Department of Anatomy, Autonomous State Medical College, Fatehpur, Uttar Pradesh, India.*
[4]*Senior Resident, Department of Anatomy,* Maulana Azad Medical College, Delhi,India
[5]*Prof.& Head, Department of Anatomy,*Integral Institute of Medical Sciences *and* Research, Lucknow, *India*
[6]*Senior Demonstrator, Department of Biochemistry, University College of Medical Sciences (UCMS), Dilshad garden, Delhi, India*
Corresponding Author: Raj Kumar
Department of Anatomy, Autonomous State Medical College Society, Hardoi, Uttar Pradesh, India

ABSTRACT:*The external ear is a defining feature of the face. It helps make one have the "normal" look with an aesthetically fine appearance. A prominent ear is the commonest congenital deformity of the external ear. External ear consists of auricle or pinna and external acoustic meatus. It collects sound waves and conducts them on the external acoustic meatus inward to the tympanum. The present study is attempted provide anthropometric data on normal adult male and female ear lobule from population of Uttar Pradesh. Aim: To study the anthropometric measurements of ear lobule in population of Uttar Pradesh. Materials and Methods: This study was conducted on 420 adults (210 males and 210 females) who were randomly selected from the population of Uttar Pradesh, using a vernier calipers. The parameters measured were, ear lobule length and width of both sexes. Results and discussion: In our study, there was highly significant difference between the two sides Conclusion: Knowledge of normal ear dimensions is important in the diagnosis of congenital malformations and acquired deformities, and in planning of treatment. The data presented in this study would help the clinician to produce an anatomically correct ear during its reconstruction.*

KEY WORDS*: Anthropometry, Ear length, Ear breadth, Lobule length, Lobule breadth, Vernier calipers.*

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I. INTRODUCTION

The external ear is a defining feature of the face. It helps make one have the "normal" look with an aesthetically fine appearance. A prominent ear is the commonest congenital deformity of the external ear [1,2]. External ear consists of auricle or pinna and external acoustic meatus. The auricle projects to a variable and individual degree from the side of the head. It collects sound waves and conducts them on the external acoustic meatus inward to the tympanum. The lateral surface of the auricle is on an irregular basis concave and faces slightly forwards.

Its prominentcurved rim, or helix, usually bears postero-superiorly a small auricular tubercle, a structure that is pronounced round the sixth month of intrauterine life, when the auricle closely resembles that of some adult monkeys. There aretwo fissures within the auricular cartilage, one behind the crushelicis and another within thetragus. The ligaments of the auricle kindtwo sets; (a) the extrinsic, connecting it to temporal boneand (b) therefore the intrinsic, interconnecting numerouscomponents of its cartilage. There aretwoextrinsicligaments; - (a) anterior and (a) posterior, (a) the anterior extending from the tragusand (b) therefore the spine of the helix to the root of the zygomatic process of the temporal bone.The chief intrinsic ligaments are: - (a) a powerful fibrous band passes from the tragus to the helix, thereby completing the meatus anteriorly and forming a part of the boundary of the concha; and (b) another band passes between the antihelix and also the tail of the helix [3].

II. Materials And Methods

The study was conducted in department of Anatomy, IIMSR, Lucknow. This study was conducted on 420 adults (210 males and 210 females) who were randomly selected from the population of Uttar Pradesh. Approval of Institutional Research Committee and Institutional Ethical committee was obtained prior to commencement of the study. Informed consent was obtained from each volunteer before taking the measurements.

Inclusion criteria –

- Interested volunteers were included in the study.
- Healthy adult individuals
- Subjects belonging to Uttar Pradesh

Exclusion criteria -

- Subjects with ear inflammation, injury, surgery, and others ear related diseases.
- Congenital ear malformation
- Subject under 18 years of age.

All the landmark defined by De Carlo et al (1998)[4]weretaken –

1. Otobasioninferius
2. Outer maximum breadth of lobule
3. Subaurale
4. Tragal notch

Measurements: -

- The subject was made to sit in a chair or lab stoolwith head in Frankfurt`s plane.
- After determining the landmarks with skin marker measurement were taken with the help of digital caliper capable of measuring to the nearest 0.1 mm.

Fig. 1 Measurement of lobule length

Fig. 2 Measurement of lobule breadth

- **Lobule length –**fromTragal notch to Subaurale.
- **Lobule breadth** – from the OtobasionInferius to the outermost maximum transverse width of the ear lobule.

Methodology

• The data was stastistically analysed using student t-test with p- value <0.0001 taken as highly significant, p- value is 0.05 significant, and greater than p- value 0.05 is not significant.

III. RESULT AND DISCUSSION

The measurements and comparison of results for right and left ears are shown in table 1.

Table 1. Comparison of left and right auricular parameters -

s.no.	Parameters	Sides	min-max(mm)	mean±SD(mm)	p-value
1.	Lobule length	L	11.21-22.74	17.25±2.32	0.354
		R	11.44-23.5	17.10±2.23	
2.	Lobule breadth	L	11.54-26.67	20.74±3.27	<0.0001
		R	11.25-26.65	20.08±3.19	

The mean lobule length on the left side was 17.25±2.32 with maximum length of 22.74 mm and minimum length being 11.21 mm whereas the minimum length on the right side was 11.44 mm and maximum length was 23.5 mm with mean value of 17.10±2.23 mm. There was no significant difference between the two sides (Table 1).

The mean lobule breadth on the left side was 20.74±3.27 mm with maximum length of 26.67 mm and minimum length being 11.54 mm whereas the minimum length on the right side was 11.25 mm and maximum length was 26.65 mm with mean value of 20.08±3.19 mm. There was highly significant difference between the two sides (Table 1).

The mean lobule length on the left side was 16.74±2.29 with maximum length of 22.74 mm and minimum length being 12.11 mm whereas the minimum length on the right side was 12.12 mm and maximum length was 23.5 mm with mean value of 16.65±2.17 mm. There was no significant difference between the two sides.

The mean lobule breadth on the left side was 19.76±3.71 mm with maximum length of 26.13 mm and minimum length being 11.54 mm whereas the minimum length on the right side was 11.25 mm and maximum length was 24.58 mm with mean value of 19.08±3.51 mm. There was no significant difference between the two sides.

The mean lobule length on the left side was 17.76±2.25 with maximum length of 22.5 mm and minimum length being 11.21 mm whereas the minimum length on the right side was 11.44 mm and maximum length was 23.00 mm with mean value of 17.56±2.20 mm. There was no significant difference between the two sides.

The mean lobule breadth on the left side was 21.71±2.39 mm with maximum length of 26.67 mm and minimum length being 12.67 mm whereas the minimum length on the right side was 12.68 mm and maximum length was 26.65 mm with mean value of 21.08±2.46 mm. There was significant difference between the two sides.

Table 2. Comparison of Lobule length and Lobule breadth -

s.no.	Authors	Population Studied	Sample size	Lobule length (LL)				Lobule breadth (LB)			
				male		Female		male		Female	
				L	R	L	R	L	R	L	R
1.	L.Aroraet.al.(2016)[33]	North-West India	50	17.82	18.3	17.03	17.00	18.68	18.77	16.06	16.03
2.	Vijay laxmiet.al.(2017)[22]	Punjab, India	100	1.22	1.21	1.20	1.23	1.69	1.71	1.69	1.64
3.	Ertugrultatlisumaket.al.(2015)[39]	Manias, Turkey	400	18.37	18.40	17.31	17.33	18.37	18.40	17.31	17.33
8	Divyakalraet.al.(2015)[36]	Yamunanagar, India	177	1.69	1.67	1.68	1.66	1.96	1.96	1.95	1.92
9.	D.Deopaet.al.(2013)[44]	Uttarakhand, india	177	1.69	1.67	1.68	1.66	1.96	1.96	1.95	1.92
10.	**Present study**	**Uttar Pradesh, India**	**420**	**17.76**	**17.56**	**16.74**	**16.65**	**21.71**	**21.08**	**19.76**	**19.08**

Discussion: According totable no. 2, L. Arora et. al. (2016) a study consisting of 50 males and female found the Lobule length to be 17.82 mm for the left ear and 18.3 mm for the right ear in male, and to be 17.03 mm for the left ear and 17.00 mm for the right ear in female. Lobule breadth was found the 18.68 mm in left and 18.77 mm for the right ear in male, and to be 16.06 mm for the left ear and 16.03 mm for right ear in female[5].
In the study of Vijay Laxmi et. al. (2017) observed length of the left lobule 1.22 cm in male and 1.20 cm in female and right ear was observed 1.21 cm in male and 1.23 cm in female. Lobule breadth was observed 1.69 cm in male and 1.69 cm in female for the left ear, and to be 1.71 cm in male and 1.64 cm in female for the right ear[10].

A study done by ErtugrulTalisumak et. al. (2015) on Turkey population showed that the lobule length was 18.37 mm in male and 17.31 mm in female of left ear and 18.40 mm in male and 17.33 mm in female for the right ear. Lobule breadth was found 18.37 mm in male and 17.31 mm in female for the left ear, and 18.40 mm in male and 17.33 mm in female for the right ear[7].

Accordioning to Divya Kalra et. al. (2015) lobule length was found 1.69 cm in male and 1.68 cm in female for the left ear, and 1.67 cm in male and 1.66 cm in female for the right ear. Lobule breadth was found 1.96 cm in male and 1.95 cm in female for left ear, and 1.96 cm in male and 1.92 cm in female for the right ear[8].

In the study of D. Deopa et. al. (2013) studied on 177 young medical students of population of Uttarakhand of both sexes; lobule length was found 1.69 cm in male and 1.68 cm in female for left ear, and 1.67 cm in male and 1.66 cm in female for right ear. Lobule breadth was found 1.96 cm in male and 1.95 cm in female, and 1.96 cm in male and 1.92 cm in female for right ear[9].

In our studystudy shows length of lobule is 17.76 mm in male and 16.74 mm in female of left and 17.56 mm in male and 16.65 mm in female of right ear and also breadth of lobule is 121.71 mm in male and 19.76 mm in female of left ear and 21.08 mm in male and 19.08 mm in female of right ear. The present study shows existence of sexual dimorphism in the ear lobule dimensions on both ears, significant differences were observed in right and left sides respectively.

IV. CONCLUSION

The present study is attempted provide anthropometric data on normal adult male and female auricles from population of Uttar Pradesh. This study is required for better designing of hearing aids, mufflers, and also for plastic surgeons to plan reconstructive surgeries. Both the ears are equal dimension except for lobule breadth, irrespective of the sex. Length of the ear is almost thrice the minimum breadth

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