International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 1, January 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.1.2025.60

ORIGINAL RESEARCH

Anthropometric Measurements of External Ear Parameters and its Analysis with Sexual Dimorphism in Medical Students of Dehradun

[1]Sumita Agarwal, [2]Anusha Malasi

[1]Associate Professor, [2]Research Scholar, Department of Anatomy, Gautam Buddha Chikitsaa Mahavidyalaya, Jhajra, Dehradun, India

Corresponding Author
Sumita Agarwal
Associate Professor, Department of Anatomy, Gautam Buddha Chikitsaa Mahavidyalaya, Jhajra, Dehradun, India
Email: docsumita29@gmail.com

Received: 17 November, 2024 Accepted: 11 January, 2025 Published: 22 January, 2025

ABSTRACT

Introduction: The anthropometric Auricular measurements play a crucial role for reconstruction of absent, congenitally deformed or lost ears in cases of burns and accidents. Even essential for the effective designing of hearing aids ensuring their fit and function optimally.The present study aim is to determine the lengths and widths of auricle, lobule, concha,base of the ear and auricular, lobular and conceal indices.The objective of the study is to derive linear regression equations to estimate ear dimensions from side and gender. **Methods:** The present study was conducted on 240(120 male and 120 female) medical students with 18 to 25 years of age, Department of Anatomy, Gautam Buddha Chikitsa Mahavidyalaya, affiliated to Ras Bihari Bose Subharti university,Dehradun,India. **Results:** The findings of the present study confirmed prominent Sexual dimorphism in Auricular parameters along with bilateral symmetry in medical students of Dehradun. **Conclusion:** This study's uniqueness lies in its focus on deriving linear regression equations from side and gender, which is a departure from traditional studies that have relied on stature, age, and other anthropometric models.

Keywords: Auricular index, Conchal index,Lobular index,Regression Equation.

INTRODUCTION

“ The ear is the most telling feature of the human face and its morphometric features reflects the shape of the soul”

In conjunction with palmistry and face reading, **Earology** is though not a scientifically recognised field, it can be an intriguing area of study where ear analysis is done to explore different sizes and normal morphometry of ear to reveal and predict individual character, behaviour and unique personality traits.

Earology can benefit from integration with scientific methods as anthropometric measurements. Moreover the changing trends in quantitative data of ear dimensions during growth period and aging process in different ethnic populations across the world.

Ellis A., the author proposes the term “ **Otomorphology**” as the science of the external ear but from the Phrenology point gives the term “ **Earistry**”[1] The human ears acts as a door that can be both opened and closed while the act of hearing and even maintaining body balance. They also enhance facial beauty and its unique shape and size can make a lasting impression.

Anthropometric applications of Human ears

- **Forensic anthropology :** Ear morphology and morphometry to estimate age, sex and ancestry from skeletal remains and also to estimate ear dimensions or other variables from skeletal remains.
- **Biometric research**: to develop more accurate ear-based biometric systems.
- **Medical research**: to study the relationship between ear dimensions and various health conditions.
- **Biological anthropology:** To study human ears variations and evolution patterns.
- **Clinical anthropology :** To diagnose various developmental defects of the external ear as congenital and acquired genetic disorders.

DOI: 10.69605/ijlbpr_14.1.2025.60

- **For Plastic surgeons,** anthropometric Auricular measurements play a crucial role for reconstruction of absent, congenitally deformed or lost ears in cases of burns and accidents. Even essential for the effective designing of hearing aids ensuring their fit and function optimally.

AIMS & OBJECTIVES

The present study aim is to determine the following:

1. Length of the auricle.
2. Width of the auricle.
3. Lobular length.
4. Lobular width.
5. Conchal length.
6. Conchal width.
7. Base of the auricle.
8. Auricular index = the width of the auricle × 100 / length of the auricle.
9. Lobular index= the lobular width × 100 / lobular length.
10. Conchal index = the conchal width × 100 / conchal length.

The objective of the study is to derive linear regression equations to estimate ear dimensions from side and gender.

MATERIALS & METHODS

Place of study – This study was conducted in the Department of Anatomy,Gautam Buddha Chikitsa Mahavidyalaya, affiliated to Ras Bihari Bose Subharti university,Dehradun,India.Ethical Clearance was obtained from Institutional Ethical Committee vide letter no.GBCM/IEC/2024/10-02 dated on 25/10/2024.

Number of subjects– 240 medical students (120 males and 120 females) from different origins calculated using slovin's formula, used for a purposive sampling method**.**

Age group–17to25yrs.

Sampling method – Purposive sampling method - As this sampling method is best while studying a particular set of subjects,medical students.

Study Design – Exploratory study.

- **Exclusion criteria–**Those students having obvious ear deformity either congenital or acquired will be excluded.
- **Inclusion criteria-**Students with complete and well structured external ear and who fills and submit consent form.

Data collection technique - For all the measurements, the subjects were seated upright with their head in the Frankfort horizontal plane. Detailed consent forms were given to the students before the conduction of the study to be filled by them .Oral instructions and the purpose of the study were explained to the subject before the measurements of the ear taken with the help of digital vernier caliper.

Measurements of 7 ear dimensions(Fig. 1)

Auricle length –The distance from the most inferior projection of the ear lobule (2) to the most superior projection of the helix(1).

Auricle width-The distance between the most anterior (3)and posterior(4)points of the ear.

Lobular length-The distance from the most Inferior end of the lobule(2) to the base of the tragal notch(6).

Lobular width-The transverse or horizontal width of the lobule(9-10)

Conchal length–This is the straight distance between the concha superior(5) and the incisura intertragica inferior (6).

Conchal width - The linear distance from the most posterior point on the edge of the incisura anterior auris(8) to the strongest antihelical curvature (7).

Base of the auricle–(3-9**).**

Auricular index: the width of the auricle×100/length of the auricle.

Lobular index: the lobular width×100/lobular length.

Conchal index: the conchal width×100/conchal length.

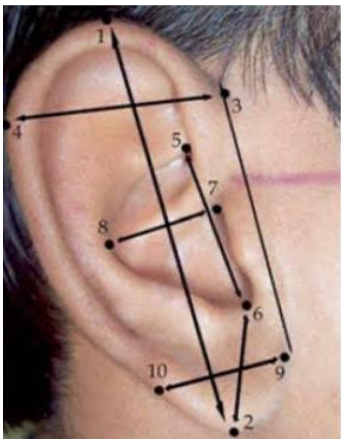

Fig.1 Auricular Parameters

All the measurements were taken in mm to an accuracy of 0.1mm.

All the measurements were taken at 9:00 to 11:30am to avoid diurnal variations, by only one observer to avoid interobserver error.

Statistic Analysis

The data collected were subjected to find –:

- The mean ± standard deviation, range of all ear parameters of both sided ears. The Associations will be considered statistically significant at $P < 0.005$ level evaluated with Z- Test.
- Pearson's coefficient of correlation between all ear parameters using 2 variables gender and side of the ear.
- If Pearson's coefficient of correlation comes out positive, linear regression equation will be derived for all ear parameters using 2 variables as

DOI: 10.69605/ijlbpr_14.1.2025.60

gender and side of the ear along with standard error of Estimate (SEE).

RESULTS

In the present study, the descriptive statistics of all Auricular parameters of both male and female students were evaluated. The mean values of all Auricular parameters of male students were found to be greater as compared to female counterparts except for Right Auricular index and Left lobular index (Table 1,2,3,4). Even all Auricular parameters of both genders, belonging to left ears were found to be on higher side (Table 2 & 4) as compared to the right ears except for mean Conchal lengths in both male and female students were found almost similar bilaterally and in female students mean Auricular indices were also found similar bilaterally (Table 1 & 3).

Table 1. Descriptive Statistical Analysis of Right Auricular parameters of Male Students

Parameters	Maximum	Minimum	Mean	Standard deviation	Skewness	Confidence Interval	Variance	Kurtosis	Standard Error of Mean (SEM)
Auricular length	72.33	48.53	60.63	4.81	0.09	0.29	23.20	-0.06	0.43
Auricular Width	37.68	23.45	29.07	3.95	0.13	0.24	8.68	-0.11	0.36
Lobular Length	21.56	10.29	16.84	2.52	-0.31	0.15	6.37	-0.35	0.23
Lobular Width	23.07	10.09	16.55	2.50	-0.08	0.15	6.27	0.33	0.22
Conchal Length	36.22	20.47	26.17	2.77	0.93	0.17	7.71	2.68	0.25
Conchal Width	38.78	20.08	26.99	2.86	0.89	0.17	8.21	3.62	0.26
Base of Ear	57.77	33.55	46.43	5.65	-0.39	0.34	31.98	-0.37	0.51
Auricular Index	76.00	39.86	48.18	5.85	1.78	0.36	34.24	6.97	0.53
Lobular Index	159.96	63.08	99.59	16.65	0.91	1.02	277.40	1.93	1.52
Conchal Index	151.18	67.40	103.84	13.79	0.66	0.85	190.22	1.45	1.26

Table 2. Descriptive Statistical Analysis of Left Auricular parameters of Male Students

Parameters	Maximum	Minimum	Mean	Standard deviation	Skewness	Confidence Interval	Variance	Kurtosis	Standard Error of Mean(SEM)
Auricular length	72.25	50.55	61.43	4.59	0.10	0.28	21.11	-0.13	0.41
Auricular Width	35.98	22.32	30.53	2.80	-0.27	0.17	7.87	0.30	0.25
Lobular Length	23.46	11.09	17.29	2.80	-0.08	0.17	7.88	-0.38	0.25
Lobular Width	22.71	11.07	17.97	2.80	-0.62	0.17	7.87	0.12	0.25
Conchal Length	30.25	21.03	26.06	2.17	-0.19	0.13	4.74	-0.29	0.19
Conchal Width	33.30	22.88	27.97	2.21	0.11	0.13	4.90	0.25	0.20
Base of Ear	60.33	37.32	48.70	5.75	-0.03	0.35	33.16	-0.78	0.52
Auricular Index	61.80	31.15	49.68	4.74	-0.68	0.29	22.55	2.97	0.43
Lobular Index	159.52	64.50	105.50	17.92	0.81	1.10	321.16	0.56	1.63
Conchal Index	135.00	85.90	107.67	11.28	0.53	0.69	127.29	-0.40	1.03

DOI: 10.69605/ijlbpr_14.1.2025.60

Table 3. Descriptive Statistical Analysis of Right Auricular Parameters in Females

Parameters	Maximum	Minimum	Mean	Standard deviation	Skewness	Confidence Interval	Variance	Kurtosis	Standard Error of Mean(SEM)
Auricular length	64.97	22.87	56.04	5.94	-2.85	0.36	35.36	14.68	0.54
Auricular Width	34.35	10.82	27.50	3.49	-1.64	0.21	12.21	7.16	0.31
Lobular Length	21.15	11.46	15.90	2.27	0.26	0.14	5.15	-0.25	0.20
Lobular Width	19.06	7.07	14.04	2.47	-0.58	0.15	6.11	0.39	0.22
Conchal Length	35.46	19.20	24.76	2.65	0.72	0.16	7.03	3.18	0.24
Conchal Width	29.50	18.39	25.48	2.44	-0.64	0.15	5.99	0.14	0.22
Base of Ear	55.94	21.22	42.18	6.89	-0.66	0.42	47.52	0.59	0.62
Auricular Index	57.40	39.60	49.14	4.82	-0.08	0.29	23.31	-0.86	0.44
Lobular Index	142.70	52.50	89.02	16.34	0.89	1.09	267.30	1.40	1.49
Conchal Index	133.40	73.20	103.80	13.49	-0.01	0.83	182.16	0.15	1.23

Table 4. Descriptive Statistical Analysis of Left Auricular Parameters in Females

Parameters	Maximum	Minimum	Mean	Standard deviation	Skewness	Confidence Interval	Variance	Kurtosis	Standard Error of Mean (SEM)
Auricular length	65.38	26.01	57.02	4.92	-2.41	0.30	24.25	11.89	0.44
Auricular Width	38.67	13.89	28.47	3.07	-1.30	0.18	9.47	8.60	0.28
Lobular Length	22.13	10.78	16.48	2.50	-0.10	0.15	6.28	-0.25	0.22
Lobular Width	22.65	10.05	16.30	2.59	-0.19	0.15	6.70	0.02	0.23
Conchal Length	28.74	11.67	24.21	2.44	-2.20	0.15	4.90	7.83	0.22
Conchal Width	31.65	21.20	26.47	2.17	0.04	0.13	4.74	0.02	0.19
Base of Ear	58.41	25.55	43.21	5.86	0.04	0.36	34.38	0.75	0.53
Auricular Index	69.06	38.00	49.95	4.45	1.07	0.27	19.84	4.79	0.40
Lobular Index	130.80	65.60	99.70	14.24	0.03	0.87	202.79	-0.10	1.30
Conchal Index	135.61	84.32	109.89	10.12	0.12	0.62	102.58	0.76	0.92

From table 5, comparing right and left Auricular parameters including Auricular, Lobular and Conchal indices of male students, found Pearson's Correlation Coefficient 'r' values of auricular lengths, lobular lengths and Base of ears were 0.88 showing maximum and significant correlation followed by 'r' value lobular widths as 0.65 and minimum 'r' value seen among Conchal widths and conchal indices as 0.37,suggestive off that conchal dimensions can be helpful in designing hearing aid instruments that fit into it.

DOI: 10.69605/ijlbpr_14.1.2025.60

Table 5. Statistical differences between Right and Left Auricular Parameters in Males

Parameters	Covariance	Correlation Coefficient 'R'	Coefficient of Determination 'R^2'	Slope	Intercept
Auricular length	27.01	0.92*	0.84	1.11	-7.4
Auricular Width	7.21	0.67*	0.44	0.76	12.23
Lobular Length	4.55	0.79*	0.62	0.72	3.96
Lobular Width	4.86	0.76*	0.57	0.72	5.11
Conchal Length	3.26	0.55*	0.30	0.66	8.60
Conchal Width	2.56	0.48*	0.23	0.53	15.58
Base of Ear	32.49	0.80*	0.64	0.94	1.34
Auricular Index	7.52	0.34*	0.11	0.37	34.09
Lobular Index	147.65	0.63*	0.39	0.72	16.43
Conchal Index	47.61	0.34*	0.11	0.46	82.08

p- value <0.05, therefore strongly significant (*)

Table 6. Statistical differences between Right and Left Auricular Parameters in Females

Parameters	Covariance	Correlation Coefficient 'R'	Coefficient of Determination 'R^2'	Slope	Intercept
Auricular length	19.69	0.88*	0.77	0.93	3.33
Auricular Width	4.28	0.52*	0.27	0.49	15.99
Lobular Length	6.28	0.88*	0.77	0.79	3.05
Lobular Width	4.57	0.65*	0.42	0.72	5.90
Conchal Length	3.64	0.60*	0.36	0.81	4.72
Conchal Width	2.35	0.37*	0.13	0.28	20.24
Base of Ear	28.88	0.88*	0.77	0.87	6.77
Auricular Index	11.81	0.42*	0.17	0.34	22.16
Lobular Index	58.41	0.59*	0.34	0.55	41.30
Conchal Index	177.44	0.37*	0.13	0.30	54.43

p- value <0.05, therefore strongly significant (*)

Similarly 'r' values of right and left Auricular parameters including 3 indices of female students according to table 6, showed maximum 'r' value of Auricular lengths as 0.92 followed by Base of ear as0.80 and least value of Auricular and Conchal indices as 0.34 and all values were statistically significant.

The present study showed all right and left auricular parameters comparing data of both male and female students were found to be statistically significant except Auricular and Conchal indices (Table 7 & 8).

Table 7.Statistical comparison between Male & Female Right auricular parameters

Parameters	Z test	p -Value	SEM	Intercept	Slope
Right Auricular length	6.57*	0	0.69	60.21	0.007
Right Auricular Width	3.26**	0.001	0.48	28.43	0.02
Right Lobular Length	3.26**	0.001	0.48	16.74	0.006
Right Lobular Width	7.82*	0	0.32	15.19	0.09
Right Conchal Length	4.02*	0	0.34	25.91	0.01
Right Conchal Width	4.39*	0	0.34	33.61	-0.25
Right Base of Ear	5.22*	0	0.81	51.36	-0.11
Right Auricular Index	1.38	0.16	0.69	53.09	-0.09
Right Lobular Index	4.96*	0	2.12	94.64	0.05
Right Conchal Index	0.02	0.98	1.76	105.69	-0.01

(p- value > 0.05; *significant) &. ** strongly significant

Table 8. Statistical comparison between Male & Female Left auricular parameters

Parameters	Z test	p -Value	SEM	Intercept	Slope
Left Auricular length	7.17*	0	0.61	58.49	0.05
Left Auricular Width	5.43*	0	0.37	32.13	-0.05
Left Lobular Length	2.36**	0.01	0.34	16.63	0.03
Left Lobular Width	2.36**	0.01	0.34	20.72	-0.16
Left Conchal Length	6.20*	0	0.29	24.75	0.05
Left Conchal Width	5.30*	0	0.28	26.68	0.04

DOI: 10.69605/ijlbpr_14.1.2025.60

Left Base of Ear	7.32*	0	0.74	50.96	-0.05
Left Auricular Index	-0.45	0.64	0.59	47.65	0.03
Left Lobular Index	2.77**	0.005	2.08	114.20	-0.08
Left Conchal Index	-1.60	0.10	1.38	112.37	-0.04

(p- value <0.05; *significant) & ** strongly significant

Above all, derived linear regression equations for all Auricular parameters from 2 variables, side(Right and left) and gender(Male and female) from table 9,10,11 & 12 respectively is a novel approach, especially in the Indian context. Previous studies have focused on stature, age, and other anthropometric measures to develop regression equations.

Derived regression equations for Side (Right and Left) Auricular widths from both male and females students as 28.43+ 0.02(Rt. AW) 32.31+(-0.05)(Lt. AW) with least Standard Error of Estimate (SEE) as 0.08mm and 0.34 mm respectively.

Table 9. Regression Equations comparing both Genders Right Auricular Parameters

Parameters	Regression Equations	Standard Error of Estimate (SSE) in mm
Right Auricular length	60.21+0.007(Rt.Al)	3.61
Right Auricular Width	28.43+0.02(Rt.AW)	0.08
Right Lobular Length	16.74+0.006(Rt.LL)	0.93
Right Lobular Width	15.19+0.09(Rt.LW)	1.50
Right Conchal Length	25.91+0.01(Rt.CL)	0.68
Right Conchal Width	33.61+(-0.25)(Rt.CW)	0.37
Right Base of Ear	51.36+(-0.11)(Rt.BE)	4.23
Right Auricular Index	53.09+(-0.09)(Rt.AI)	0.5
Right Lobular Index	94.64+0.05(Rt.LI)	9.5
Right Conchal Index	105.69+(-0.01)(Rt.CI)	0.79

Table 10. Regression Equations comparing both Genders Left Auricular Parameters

Parameters	Regression Equations	Standard Error of Estimate (SEE) in mm
Left Auriular Length	58.49+0.05(Lt.AL)	4.3
Left Auricular Width	32.31+(-0.05)(Lt.AW)	0.34
Left Lobular Length	16.63+0.03(Lt.LL)	0.66
Left Lobular Width	20.72+(-0.16)(Lt.LW)	0.97
Left Conchal Length	24.75+0.05(Lt.CL)	0.54
Left Conchal Width	26.68+0.04(Lt.CW)	1.29
Left Base of Ear	50.96+(-0.05)(Lt.BE)	3.00
Left Auricular Index	47.65+0.03(Lt.AI)	0.80
Left Lobular Index	114.20+(-0.08)(Lt.LI)	0.54
Left Conchal Index	112.37+(-0.04)(Lt.CI)	0.98

Derived regression equations for Gender (Male and Female) Auricular parameters from both Right and Left ears as

Male- 15.99+0.49(AW)

Female- 3.96+0.72(LL) with least SEE as 0.36 mm and 0.50 mm respectively. A lower value of SEE means higher reliability in estimation.

Table 11. Regression Equations for Auricular Parameters in Males comparing Right and left sides

Parameters	Regression Formulae	Standard Error of Estimate (SSE) in mm
Auricular length	3.33+0.93(AL)	0.57
Auricular Width	15.99+0.49(AW)	0.16
Lobular Length	3.05+0.79(LL)	0.36
Lobular Width	5.90+0.72(LW)	1.14
Conchal Length	4.72+0.81(CL)	0.28
Conchal Width	20.24+0.28(CW)	0.95
Base of Ear	6.77+0.87(BE)	1.23
Auricular Index	22.16+0.34(AI)	4.61
Lobular Index	41.30+0.55(LI)	3.08
Conchal Index	54.43+0.30(CI)	18.21

DOI: 10.69605/ijlbpr_14.1.2025.60

Table 12. Regression Equations for Auricular Parameters in Females comparing Right and left sides

Parameters	Regression Formulae	Standard Error of Estimate (SSE) in mm
Auricular length	7.46+1.11(AL)	12.62
Auricular Width	12.23+0.76(AW)	5.04
Lobular Length	3.96+0.72(LL)	0.50
Lobular Width	5.11+0.72(LW)	1.20
Conchal Length	8.69+0.66(CL)	0.55
Conchal Width	15.58+0.53(CW)	4.00
Base of Ear	1.34+0.94(BE)	13.10
Auricular Index	34.09+0.37(AI)	2.64
Lobular Index	16.43+0.72(LI)	0.59
Conchal Index	82.08+0.46(CI)	20.00

The above findings of the present study confirmed prominent Sexual dimorphism in Auricular parameters along with bilateral symmetry in medical students of Dehradun. The derived linear regression equations to estimate ear dimensions from gender and side will be of immense help in reconstructing deformed or lost ears by Plastic surgeons and creating accurate ear prostheses and hearing aids.

DISCUSSION

The ear, as a microcosm organ of the face, plays a significant role in defining beauty. Auricular dimensions and size contribute to facial harmony and attractiveness. Any deviation from normal leads to Auricular defects which are of major concern to plastic surgeons for their reconstruction.

Even in ancient cultures of Egyptian and Greece, the ear was considered a symbol of beauty, wisdom and spiritual connection.

Auricular dimensions and linear regression equations collected from different races and large populations are helpful in defining population standards and also ergonomic design of hearing aids.

Table 13. Comparison findings of Present study with previous studies

Authors	Study location with Year	Sample size with age	Findings
Present Study	Dehradun, 2025	240(120 M & 120	• The mean values of all Auricular parameters of male students were found to be greater as compared to female counterparts except for Right Auricular index and Left lobular index. • All Auricular parameters of both genders, belonging to left ears were found to be on higher side as compared to the right ears except for mean Conchal lengths in both male and female students were found almost similar bilaterally and in female students mean Auricular indices were also found similar bilaterally. • All right and left auricular parameters comparing data of both male and female students were found to be statistically significant except Auricular and Conchal indices. • The derived linear regression equations for all Auricular parameters from 2 variables, side(Right and left) and gender(Male and female) fr, is a novel approach, especially in the Indian context. Previous studies have focused on stature, age, and other anthropometric measures to develop regression equations. • The findings of the present study confirmed prominent Sexual dimorphism in Auricular parameters along with bilateral symmetry in medical students of Dehradun.

DOI: 10.69605/ijlbpr_14.1.2025.60

Singh et al.[2]	ENT Dept., KGMU,Lucknow,India,2022	130(78 M & 52 F) Age- 18-25 years	All auricular parameters of both right and left ears were more in males than females except both Rt. & Lt.Lobular indices values higher in females than males.
Kumari A.et al.[3]	Anatomy Dept.,Institute of Medical Sciences, BHU, Varanasi, U.P., India, 2022	200(100 M & 100 F) Age- 17-25 years	They found significant correlation between Stature and ear parameters in both males and females but values of Correlation were higher in females than males. All ear parameters values were found significantly higher in males.
Prasad et al.[4]	National Medical College, Nepal,2022	220(110M & 110 F) Age- 18-25 years	The ear anthropometric measurements of male students were higher than females. Moreover, length of ear was found higher than the ear width in both sexes.
Obaje SG. et al.[5]	Nigeria,2020	240(120M & 120 F) Age- 18-35 years	The right ear indices were higher in females than in males while males were taller in stature. lobular indices values were same in both genders. Strongly predicted that both ear and lobular indices with stature for both genders were significant ($p<0.001$)
Asadujjaman et al.[6]	Bangladesh, 2019	150M & 163 F) Age- 18-75 years	All ear dimensions were found larger than females. Moreover, with increase in age, dimensions of all ear parameters increased proportionally except Lobular breadths in both sided ears and in both genders.

Old literature as well as many studies conducted in the past all over the world documented that the external ear dimensions in men were found to be slightly higher than the female counterparts because of hormonal influence, genetic and evolutionary factors as adaptation for better hearing and communication. Similar findings, the mean values of all Auricular parameters of male students were found to be greater as compared to female counterparts except for Right Auricular index and Left lobular index (Table 13).

CONCLUSION

The present study findings showed Sexual dimorphism in Auricular parameters along with bilateral symmetry in medical students of Dehradun.

This study's uniqueness lies in its focus on deriving linear regression equations from side and gender, which is a departure from traditional studies that have relied on stature, age, and other anthropometric models.

Male ear parameters of the left ear on the higher side suggest genetic and hormone Testosterone Influence with brain lateralization influencing behavioural and cognitive processes.

LIMITATIONS

1. Collecting a larger, more diverse dataset including Facial indices, Cephalic index, age etc to improve the equations' generalizability
2. Investigating the application of these equations in various fields and other industries will provide valuable insights for future research.

REFERENCES

1. Ellis M. A:The Human Ear, its identification & Physiognomy.London: A.& C. Black.1900.p x+ 225.
2. Singh A. B.,Gupta P. & Singh P. Anthropometric assessment of human auricle in North Indian population.Natl J Maxillofac Surg 2022;13:234-7.
3. Kumari A.,Devadas D.,Patel JK.More RS.,Dubey P.,Kumari K.Morphometric Analysis of External Ear to Estimate the Stature and Sexual Dimorphism in North Indians: A Cross-sectional.Journal of Clinical and Diagnostic Research. 2022 May;Vol-16(5): MC10-MC14.
4. Prasad RJ.,Shakya A.,Acharya A., Neupane GP. Anthropometric Study of External Ear: A Comparative Study.MedPhoenix: JNMC.Aug 2022;7(1):36-41.
5. Obaje GS.,Nwankwo SC.,Egwu AO..Stature Estimation from the Right External Ear of Undergraduate Students in South-East Nigeria. South eastern European Medical Journal.2020;4(2):12-19.
6. Asadujjaman,Harum, Rana S.Anthropometric Measurement of External Ear and Correlation with Age in North Regional People of Bangladesh. Bangladesh Journal of Medical Science. 2019;18(02):206-210.