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Original Research Article

ANTHROPOMETRIC MEASUREMENTS OF EXTERNAL EAR IN TRIBAL POPULATION OF UDAIPUR DISTRICT IN RAJASTHAN

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ABSTRACT

Background: The human ears are very important organ of the face. Its structure gives information about age and sex. Anatomically ear is divided into three parts i.e. External ear, Middle ear and Internal ear. External ear consists of auricle (helix, choncha, antihalix, tragus, anti tragus, cymba choncha, cavum choncha), external auditory meatus. Anthropometric data of present study help in better objective referred material for the aesthetic plastic surgeon, sex determination and in industrial ears product design.

Material and methods: This anthropometric study was started after taking ethical clearance from the institution. Before taking measurement, the informed written consent was taken from the entire participant selected for the study. Number of cases in this study was 119 between the age group of 16 to 26 years and without any acquired or congenital deformities. The study was conducted on 65 males and 54 females. All measurements were taken from digital vernier calliper and recorded in centimetre.

Results: In this study the mean and standard deviation (SD) of Total ear height (TEH) of right and left ear in male and female was 6.08+ 0.35 cm 5.97+ 0.32 cm and 5.69+ 0.34 cm, 5.66+ 0.37cm. Total Ear width (EW) of right and left ear in male and female was 2.93+ 0.23 cm, 2.95+ 0.21 cm and 2.55 + 0.23 cm, 2.59 + 0.24 cm. Respectively lobular Height (LH) of right and left ear in male and female was 1.58 + 0.19 cm, 1.65+ 0.16 cm and 1.56+ 0.16 cm, 1.63 + 0.17 cm. Lobular width (LW) of right and left ear in male and female was 1.7 + 0.25 cm, 1.73 + 0.25cm and 1.67 + 0.26cm, 1.72 + 0.20 cm found.

Conclusion: All parameters were found higher in male than female. All the parameters were highly significant.

KEY WORDS: Vernier Calliper, Total Ear Height (TEH), Ear Width (EW), Lobular Height (LH), Lobular Width (LW).

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INTRODUCTION

The human ears are very important part of the face its structure gives information about age and sex. The ear lobe is considered to be an important attribute of beauty in society. Protruding ears have been considered unattractive particularly if asymmetric. Ear is divided into three parts External ear, middle ear, internal ear.

The external ears consist of pinna or auricle, external auditory meatus which concerned with collection and transmission of sound waves to the tympanic membrane.

Anthropometric measurements of ears are very helpful to surgeons in plastic surgery. When ears has to be reconstructed in case of burns, road traffic accidents, congenital malformation also play an important role in designing prosthetics in cases where there was complete removal oblique damage of external ear. Even design of hearing aids makes use of precise measurements of external ear.

Since the shape, size of external ear varies considerable among different individuals belonging to same family, community and different raises. It is of at most importance in personal identification of an individual in medico legal scenario like unidentified burn dead bodies.

Sharma A, Sidhu NK, Sharma MK in 2007 observed that the ears lobules size in north, west Indians are smaller as compared to Japanese and caucasion population. Belt found similar in Andhra tribe and in newars of Nepal [1].

T.J coward, R. Richard (2000) suggest that dimension of the ear and its position respect to landmark in the midline of the face measured through laser scanning which is useful for planning and monitoring facial reconstruction of ear [2].

The study describes the anatomical height and width of external ear, lobular height and width of tribal population. Anthropometric data of present study help in better objective referred material for the aesthetics plastic surgeon and in industrial ears product design.

AIMS AND OBJECTIVES

1. To measure the external ear in both male & female in tribal population of Udaipur.

2. Comparison of the measurements according to the gender.

MATERIALS AND METHODS

This anthropometric study was carried out on tribal population in and around Udaipur district of Rajasthan, after taking ethical clearance from the institutional ethical committee.

No invasive procedures were involved in this study. Before beginning the procedure informed written consent were taken from all the subjects involved in the study.

By using digital vernier caliper the following dimensions of right and left ears were taken.

1. Total Ear Height (TEH):- Distance from the most inferior projection of the ear lobule to the most superior projection of the ear.

2. Ear Width (EW):- Distance between the most anterior and posterior points of the ear.

3. Lobular Width (LW):- Transverse or horizontal width of the lobule.

4. Lobular Height (LH):- Distance from the most inferior end of the lobule to the base of tragal notch.

Inclusion Criteria: Number of cases for this study was 119, between the age group of 16 to 26 years.

Exclusion Criteria: Males and females having physical deformity such as ear lobule ptosis, missing external ears, prominent ear, microtia may result from trauma, surgical resection or congenital deformation.

RESULTS

In this study we compared the right and left ears measurements of males and females. During this study we found that the maximum and minimum TEH of right ear males and females was 6.89cm to 5.33cm, 6.35cm and 4.72cm respectively. The mean and SD of males was 6.08 ± 0.35cm and 5.69± 0.34cm in females. Maximum and minimum EW of right ear male was 3.29 and 2.14cm, 3.27 and 2.14cm in females. The mean and SD of males was 2.93± 0.23cm and 2.55± 0.23cm in females. Maximum and minimum LH of right ear males was 2 to 1cm and 1.94 to 1.23cm in females. The mean and SD of male was 1.58 ± 0.16cm and 1.56 ± 0.16cm in females. The maximum and minimum LW of right ear males was 2.29 to 1.17cm and 2.15 to 1.05cm in females. The mean and SD of males was 1.70 ± 0.25 and 1.67 ± 0.26cm in females (Table 1).

The maximum and minimum TEH of left ear males and females was 6.78cm and 5.24cm, 6.38cm and 4.81cm respectively. The mean and

SD of males was 5.97± 0.32cm and 5.66 ±0.37cm in females. Maximum and minimum EW of left ear male was 3.44 and 2.52cm, 3.63 and 2.10cm in females. The mean and SD of males was 2.95 ± 0.21cm and 2.59 ± 0.24cm in females. Maximum and minimum LH of left ear males was 1.97 to 1.3cm and 1.98 to 1.16cm in females. The mean and SD of male was 1.65 ± 0.16cm and 1.63 ± 0.17cm in females. The maximum and minimum LW of left ear males was 2.32 to 1.11cm and 2.21 to 1.27cm in females. The mean and SD of males was 1.73 ± 0.25 and 1.72 ± 0.20cm in females (Table 2).

The comparative analysis of P and T value for right ear TEH = 0.000, EW = 0.000, LH = 0.553 and LW = 0.539 was found and T value of TEH = 6.196, EW = 8.919, LH = 0.594 and LW = 0.615 was found. According to these data we found P value of TEH and EW is significant (P ≤ 0.005).

The comparative analysis of P and T value for left ear TEH = 0.000, EW = 0.000, LH = 0.425 and LW = 0.916 was found and T value of TEH = 4.790, EW = 8.610, LH = 0.801 and LW = 0.105 was found. According to these data we found P value of TEH and EW is significant (P ≤ 0.005).

Table 1: Detailed data of right ears of males and females.

Parameters (cm)	Range		Mean		Standard Deviation	
	Male (n=65)	Female (n=54)	Male (n=65)	Female (n=54)	Male (n=65)	Female (n=54)
TEH	5.33-6.89	4.72-6.35	6.08	5.69	0.35	0.34
EW	2.14-3.29	2.14-3.27	2.93	2.55	0.23	0.23
LH	1.00-2.00	1.23-1.94	1.58	1.56	0.19	0.16
LW	1.17-2.29	1.05-2.15	1.7	1.67	0.25	0.26

Table 2: Detailed data of left ears of males and females.

Parameters (cm)	Range		Mean		Standard Deviation	
	Male (n=65)	Female (n=54)	Male (n=65)	Female (n=54)	Male (n=65)	Female (n=54)
TEH	5.24-6.78	4.81-6.38	5.97	5.66	0.32	0.37
EW	2.52-3.44	2.10-3.63	2.95	2.59	0.21	0.24
LH	1.30-1.97	1.16-1.98	1.65	1.63	0.16	0.17
LW	1.11-2.32	1.37-2.21	1.73	1.72	0.25	0.2

DISCUSSION

On total ear height of right and left ear: Total ear height is evolutionary very important in down syndrome. Kalcioglu NT 2003 said that vertical auricular growth was complete in girls at the age of 11 and in boys at the age of 12 year [21]. D.Deopa et al study addressed specifically in elastic surgery and obtained data from 177 healthy young students total ear height 6.04±0.36 of right ear and 6.03±0.33 of left ear in male, in female 5.74±0.38 ,5.77±0.38 right and left ear respectively found [14]. According to Bozkir study the measurements from 341 healthy young adult found 63.1±3.6mm in male and 59.7±.3 in female were found [5]. In our study the total ear height of right and left ear of male 6.08±0.35 and 5.97±0.32 found and in female it is 5.69±0.34 and 5.66±0.38 respectively, so according to above study and our study significant difference is found between male and female. In our study male right and left total ear height is also significant.

On total ear width of right and left ear: In the study of Balogh B and Millesi H in 1992 in 100 cases of male and 100 cases of female found that the Ear width 33mm for right ear 32.4mm for left ear in men 32.4mm of right and 31.9mm for left ear in female [8]. In study of Bozkir et al showed Ear width 33.1mm for right and 33.3 mm for left ear in 191 young men as compared with 31.2mm for right ear and 31.3mm for the left ear in 150 young women [5]. Della croce et al reported the Ear width to be 30.5mm.In our study we found Ear width in male for right ear is 2.93 ± 0.23 and Ear width for left ear is 2.9 ± 0.21 [12]. When we compared our study with above literature it is found more or less in value.

On lobular height of right and left ear: According to Brucker study Lobular height was 1.88cm [7]. Azaria study said that earrings causes additional weight on ear and thats why it effect the ear lobular height. In the study of uttarakhand medical student Lobular height of right and left ear in male was 1.67±0.20 cm and 1.69±0.20,Lobular height of right and left ear in female was 1.66±0.24 and 1.68±0.21were found [27]. In our study Lobular height is significantly more in the case of male and female.

On lobular width of right and left ear: Brucker et al observed that the ear lobe width was 1.95 cm and 1.97cm in women. In our study Lobular width of right and left ear 1.70 ±0.25 and 1.73±0.25 found in male and 1.67±0.26 and 1.72±0.20 found in female respectively. This data also show the more Lobular width in male than in female [7].

CONCLUSION

The normal ear dimensions are important in the

diagnosis of congenital malformation, syndromes and acquired deformities, as well as in plastic surgery and hearing instrument industries. All parameters are found higher in male than female. In these parameters we found right ear T.E.H (p=0.000), right ear width (p=0.000), left T.E.H (p=0.000) and left ear E.W (p=0.000) are highly significant ($P \leq 0.005$). This study provides the mean values of the different morphometric measurements of the right and left ear in tribal population of Udaipur region. It gives new ear measurements for tribal population of Udaipur.

Conflicts of Interests: None

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