Original Article

Correlation between Straight Length of Sacrum and Length of Auricular Surface in Both Sexes

Sultana N[1], Iqbal M[2], Kabir A[3], Parvin I[4] , Bose KS[5]

1. **Dr. Nishat Sultana, Department of Anatomy, Assistant Professor, Monowara Sikder Medical College*
2. *Dr. Mohammed Iqbal, Professor, Department of Anatomy, Monno Medical College*
3. *Dr. Anamul Kabir, Associated Professor, Department of Anatomy, Jahurul Islam Medical College*
4. *Dr. Irin Parven , Assistant Professor, Department of Anatomy, Monowara Sikder Medical College*
5. *Dr. Sanjeeb Kumar Bose, Assistant Professor, Department of Anatomy, Gonoshasthay Samaj Vittik Medical College*

**** For Correspondence***

Abstract

The large, wedge shaped sacrum in adult is composed of five fused sacral vertebrae. It transmits the weight of the body from the vertebral column to the femurs through the sacroiliac joints. Sacrum is one such important bone which helps in identification of sex in human skeletal system. The present study was performed on 150 (59 male and 91 female) adult human Sacra were obtained from Department of Anatomy of Mymensingh Medical College, Mymensingh, Bangladesh from January 2017 to December 2017. The sex of sacrum was done by previously determined of different parameters. The material for the present study was collected from the department of anatomy of Mymensingh Medical College and Community Based Medical College of Bangladesh, Mymensingh. Data collection was done by purposive sampling system. The parameters included the straight length of sacrum and length of auricular surface which were measured by digital vernier slide caliper and was expressed in mm. In present study the mean straight length of sacrum in male was 104.27±5.76 mm and in female was 92.82±7.59 mm. The mean length of auricular surface in male and female were 56.89±6.64 mm and 54.69±5.20 mm respectively. Comparison of each study factor was done by applying (Unpaired) Student't' test which was statistically significant.

Key words: *Straight length of sacrum, Length of auricular surface, Correlation.*

Introduction

The sacrum lies below the fifth lumber vertebra. Five progressively smaller sacral vertebrae and their costal elements fuse to make this bone. As a whole the bone is triangular. It has an upper end or base which articulate with the fifth lumber vertebra, a lower end or apex which articulate the coccyx, a concave anterior or (pelvic) surface, a convex posterior or (dorsal) surface, and right and left lateral surface[1]. The pelvic surface of sacrum is concave and directed downward and forward. Four Transverse ridges that indicate the line of fusion of five sacral vertebrae. Lateral to transverse ridges are four anterior sacral foramina through which ventral rami of upper four sacral nerves come out. The dorsal surface of sacrum is rough, irregular and convex. The upper half presents in front an ear shaped surface called auricular surface (facies auricularis) formed by the fusion of transverse and costal elements of sacral vertebrae which covered with hyaline cartilage in the fresh state. It articulates with the auricular surface of the hip bone to form sacroiliac joint[2]. The auricular surface is like an inverted letter L. The lower half is thin, and ends in a projection called the inferior lateral angle gives attachment to the lateral sacrococcygeal ligament[3].

Operational definition

Male sacrum: It is long and narrow. Straight length of sacrum is higher than width of sacrum. Auricular surface involves upper three sacral segments. Sacro-iliac joint permits limited movement.

Female sacrum: It is short and wide. Width of sacrum is higher than straight length of sacrum. Auricular surface extends up to the second sacral segment. Sacro-iliac joint permits rotatory movement during pregnancy due to relaxation of pelvic ligament.

Methods

The present study was conducted in the Department of Anatomy at Mymensingh Medical College, Mymensingh from January 2017 to December 2017. The study was cross sectional, descriptive and analytic type. Total 150 (59 male and 91 female) fully ossified dry human sacra were selected for this study.

Straight length of sacrum was measured with the help of digital vernier slide calipers from the midpoint of sacral promontory to the midpoint of apex of sacrum and was expressed in millimeter.

Figure 1: Procedure of measurement of straight length of sacrum

Length of the auricular surface was measured with the help of digital vernier slide calipers on the lateral surface of sacrum from the upper most point of auricular surface to its lower most point. The measurement was expressed in millimeter.

Figure 2: Procedure of measurement of Transverse diameter of 1st sacral vertebral body

Result

In the present study 150 adult sacra (91 male& 59 female) were studied. The maximum straight length of male sacrum ranged from 92.92 mm to 118 mm and in female sacrum ranged from 65.65 mm to 112 mm. The mean (±SD) straight length of sacrum were 104.27 (±5.76) mm in male and 92.82(±7.59) mm in female.

In this study length of auricular surface in 59 male sacra ranged from 34.20 mm to 80 mm. The length of auricular surface in 91 female sacra ranged from 40 mm to 73.02 mm. The mean (±SD) length of auricular surface in male was 56.89(±6.64) mm and in female was 54.69(±5.20) mm.

Table I: Linear Measurements of Sacrum (n=150)

Variable	Sex	R ange		Mean (±SD)	p value
		Maximum	Minimum		
Straight length of sacrum (mm)	Male	118	92.92	104.27±5.76	<0 .001
	Female	112	65.65	92.82±7.59	
Length of auricular surface of sacrum (mm)	Male	80	34.20	56.89± 6.64	<0 .001
	Female	73.02	40	54.69±5.20	

p = <0.001
Statistically highly significant

Table II: **Correlation between Straight Length of Sacrum and Length of Auricular Surface**

Variable	Correlation with length of auricular surface		
	Sex	r	p - value
Straight length of sacrum	Male	0.079	0.429
	Female	0.552	0.000 *

S= Significant at the 0.05 level (2-tailed).

r = Pearson's correlation

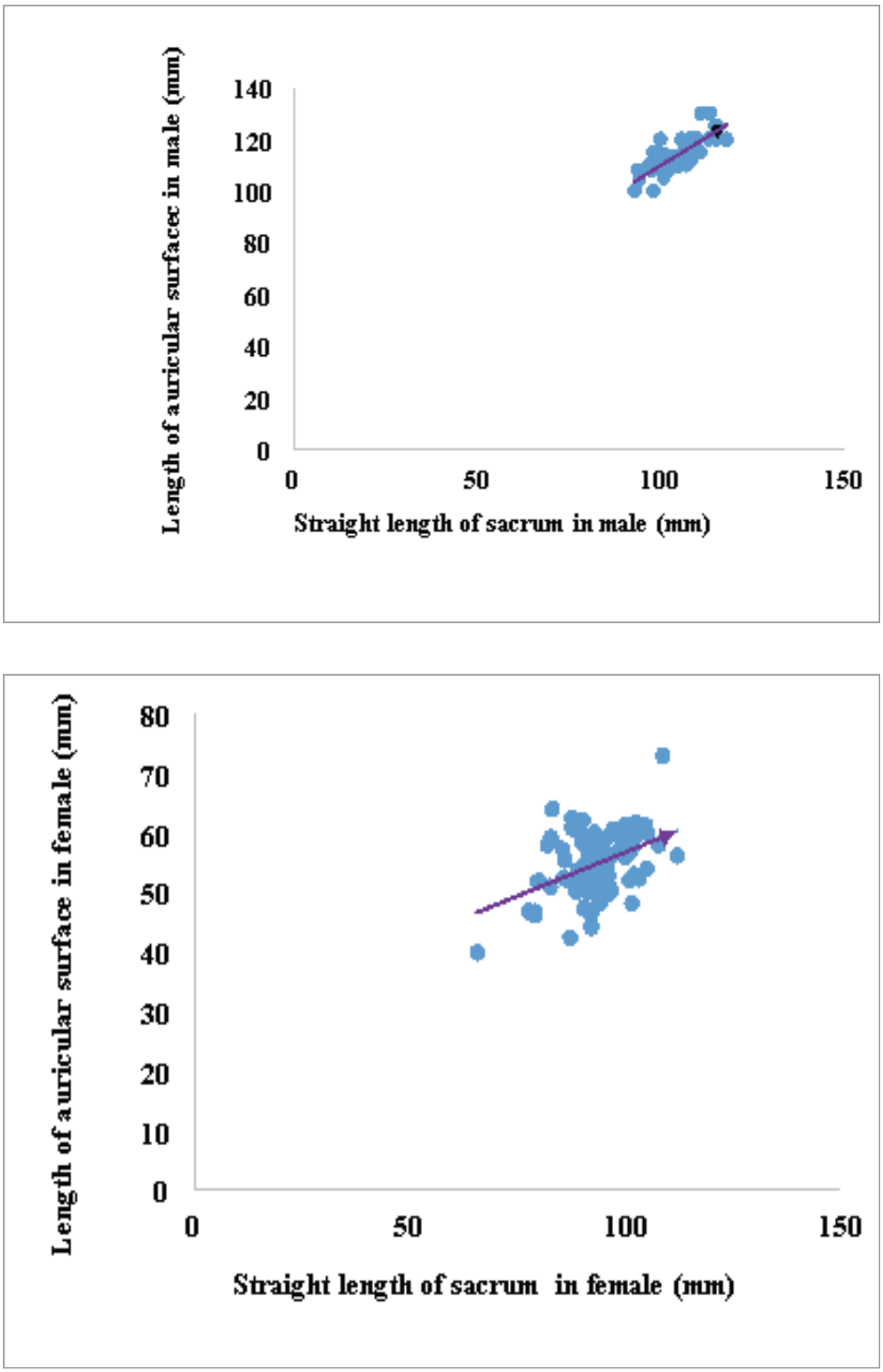

Figure 3: Scatter diagram showing correlation between straight length of sacrum and length of auricular surface in both sexes

In the present study, the correlation between the straight length of sacrum and length of auricular surface were done. It was observed that in both male & female, straight length of sacrum gradually increases with the increase of length of auricular surface. The regression line showed positive correlation and sthis difference was statistically non-significant in male where, r = 0.079, p value was 0.429 and highly significant in female where, r = 0.552, p value was 0.000.

Discussion

According to the present study, the mean straight length of sacrum in male was 104.27±5.76 mm and in female was 92.82±7.59 mm.

The mean (±SD) straight length of sacrum in male as 107.41±5.62 mm and in female as 92.57± 8.51 mm conducted by Ahankari & Ambali (2016)[5] and Mishra et al. (2003) estimated on 116 adult sacra (74 male and 42 female) and found the mean (±SD) straight length of sacrum in male as 107.53±7.03 mm and in female as 90.58 ± 4.42 mm[6].

The mean (±SD) straight length of sacrum in male as 106.7±8.23 mm and in female as 91.91± 9.01 mm observed by Kataria et al. (2014) on 74 human dry sacra (42 male and 32 female) [7]. The mean (±SD) straight length of sacrum in male as 104.7±5.94 mm and in female as 92.6± 6.1 mm was conducted by Yadev et al. (2015) on 140 (83 male and 57 female) dry human sacra[8].

Manisha et al. (2013) studied on 50 adult sacra and described the mean (±SD) straight length of sacrum in male as 102.94 ±6.85 mm and in female as 90.92 ± 2.24 mm[9]. Mamatha et al. (2012) performed on 50 dry human sacra and reported mean (±SD) straight length of sacrum in male as 87.2±1.17 mm and in female as 81.65± 1.26 mm[10].

Mazumdar et al. (2012) studied on 250 normal human adult sacra (127 male and 123 female) and found the mean (±SD) straight length of sacrum in male as 100.8±11.5 mm and in female as 87.3±7.4 mm[11].

The mean value of present study was nearly similar to the value described by the Ahankari & Ambali (2016)[5], Mishra et al. (2003)[6], Kataria et al. (2014)[7], Yadev et al. (2015)[8] & Manisha et al. (2013)[9]. But the findings of present study was higher than those of Mamatha et al. (2012)[10] & Mazumdar et al. (2012)[11].

In the present study the mean (±SD) length of auricular surface in male was 56.89(±6.64) mm and in female was 54.69(±5.20) mm.

Kamal et al. (2014) studied on 172 dry human sacra and found the mean (±SD) length of auricular surface in male as 56.65±6.24 mm and in female as 52.35±5.75 mm[12]. Mamatha et al. (2012) performed on 50 dry human sacra and described the mean (±SD) length of auricular surface in male as 56.4±0.7 mm and in female as 54.2 ± 0.5 mm[10].

Ahankari & Ambali (2016) conducted study on 150 dry human sacra and found that the mean (±SD) length of auricular surface in male was 54.65±3.82 mm and in female was 46.95± 3.84 mm[5]. Kothapalli et al. (2012) carried out a study on 81 adult human sacra and found the mean (±SD) length of auricular surface in male as 56.75±3.40 mm and in female as 53.37 ±3.30 mm[13].

Mishra et al. (2003) estimated on 116 adult sacra (74 male and 42 female) and described the mean (±SD) length of auricular surface in male as 62.54±3.40 mm and in female as 57.54 ±3.30 mm[6].

Findings of the present study regarding length of auricular surface was nearly similar to the value described by Kamal et al. (2014)[12], Mamatha et al. (2012)[10] & Kothapalli et al. (2012)[13]. But the results were inferior than those of Mishra et al. (2003)[6] and superior than those of Ahankari & Ambali (2016)[5].

Conclusion

In the present study, in case of male auricular surface involves upper three sacral segments and in case of female it extends upto the second sacral segment. In this result in both sexes straight length of sacrum gradually increased with the increased of length of auricular surface. The regression line showed positive correlation and this difference were statistically highly significant in both male and female. The results of present study would be useful in anatomy, orthopedics, forensic science, radiology, archeology and anthropology.

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