



Original Research Article

Sacral index and its clinical importance in human dry sacral bones - Morphometric study

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ABSTRACT

Background: Sacral Index is the most important parameter in assessing the sexual dimorphism.**Materials and Methods:** A total of 42 dry adult human sacral bones of known sex (19 – female sacra; 23- male sacra) collected from Anatomy Department, Santhiram Medical College, Nandyal. The sacral length measured from the promontory to the middle of antero-inferior margin of last sacral vertebra. The sacral breadth measured from the lateral most points of ale of sacrum. The sacral index (SI) is calculated and statistically analyzed.**Results:** We noted the mean sacral index 101.142+2.148 in male sacra, and 103.668+2.271 in female sacra with significantly higher sacral index in female sacra than male sacra in the present study.**Conclusion:** Our study acknowledges the importance of sacral index and its significance can be useful in sexual dimorphism.© 2020 Published by Innovative Publication. This is an open access article under the CC BY-NC license (<https://creativecommons.org/licenses/by-nc/4.0/>)

1. Introduction

In identification of sex, sacral bones are of greatest interest to the forensic experts and anthropologists.¹ The morphometric parameters of sacrum varies in different populations leads to variations in sacral index.^{2,3} The sacral length, sacral breadth, curved length of sacrum, first sacral vertebral dimensions, ala of sacrum length play a greater role in sex determination. The sacral index is one of the best parameter in identify the sex.³ The sacral index plays a significant role as sex determining parameter among populations observed in previous literature.^{4,5} Our study aimed to analyze the sacral index and its significance in sex determination.

2. Materials and Methods

A total of 42 dry adult human sacral bones of known sex (19 – female sacra; 23- male sacra) collected from Anatomy Department, Santhiram Medical College, Nandyal

to measure the sacral index and its significance. The length and breadth of male and female sacra were measured separately using vernier calipers. The sacral length measured from the promontory to the middle of antero-inferior margin of last sacral vertebra (Figure 1). The sacral breadth measured from the lateral most points of ale of sacrum (Figure 2). The parametric values were statistically analyzed.

The sacral index (SI) is calculated by the following formula

$$\text{Sacral Index (SI)} = \frac{\text{Sacral Breadth} \times 100}{\text{Sacral Length}}$$

3. Results

The sacral bones are collected and categorized based on their sex and considered for the current study (Figure 3). We noted the mean sacral length in male sacra was 96.739+1.912, and mean sacral breadth was 96.521+1.805. The mean sacral length in female sacra was 95.894+2.643 and mean sacral breadth was 99.842+3.287 in

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Table 1: Distribution of adult sacra and their sacral index

S.No.	Sex	Parameters of Male Sacrum			S.No	Sex	Parameters of Female Sacrum		
		Length (mm)	Breadth (mm)	Sacral Index			Length (mm)	Breadth (mm)	Sacral Index
1	Male	97	98	101	1	Female	98	103	105
2	Male	96	95	98.9	2	Female	96	98	102
3	Male	96	98	102	3	Female	89	91	102
4	Male	97	98	101	4	Female	98	104	106.1
5	Male	98	96	97.9	5	Female	96	98	102
6	Male	96	98	102	6	Female	94	98	104.2
7	Male	98	98	100	7	Female	98	103	97.9
8	Male	98	96	97.9	8	Female	97	104	107.2
9	Male	96	101	105	9	Female	96	102	106.2
10	Male	96	98	102	10	Female	98	101	103
11	Male	98	98	100	11	Female	96	98	102
12	Male	96	98	102	12	Female	98	103	105.1
13	Male	97	101	105	13	Female	98	101	103
14	Male	95	96	101	14	Female	92	98	106.5
15	Male	98	96	97.9	15	Female	95	98	103.1
16	Male	94	96	104	16	Female	91	96	105.4
17	Male	92	94	102.1	17	Female	97	101	104
18	Male	96	98	102	18	Female	97	98	101
19	Male	98	98	100	19	Female	98	102	104
20	Male	102	96	94.1	Mean		95.894	99.842	
21	Male	98	102	104	Sd		2.643	3.287	2.271
22	Male	95	98	103					
23	Male	98	103	105					
Mean		96.739	96.521	101.142					
Sd		1.912	1.805	2.148					

Table 2: Statistical analysis

S. No.	Sex	Length Mean+Sd	Breadth Mean+Sd	Sacral Index Mean+Sd
1	Male	96.739+1.912	96.521+1.805	101.142+2.148
2	Female	95.894+2.643	99.842+3.287	103.668+2.271

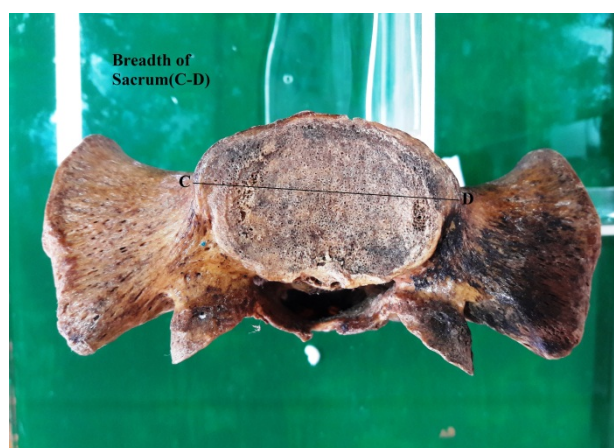
**Fig. 1:** The length (A-B) of the sacrum measured from the midline from antero-superior margin of the promontory to the middle of antero-inferior margin of last sacral vertebra**Fig. 2:** The breadth(C-D) of the sacrum measured between the lateral most points of sacrum



Fig. 3: Distribution of Sacral bones

the present study (Table 1). We noted the mean sacral index 101.142+2.148 in male sacra, and 103.668+2.271 in female sacra with significantly higher sacral index in female sacra than male sacra in this study (Table 2)

4. Discussion

The female sacral length is lower than length of male sacra.^{6,7} Greater length may be due to the incidence of six piece sacrum in male sacra.⁴ The sacral index and mean breadth were significantly higher in female sacra compared with male sacra in the present study. The results are in agreement with previous literature.^{8–10} In determination of sex, the veracity of sacral index is 95% and also there is a variation of sacral index populations due to difference in morphometric parameters of the sacra.⁵ In this study, the sacral index of male and female are 101.1, 103.6 classified under medium sacra category (Hyplatycheiric category - Sacral Index from 100 to 105.9) according to previous literature.¹⁰ Sacral index in male sacra is much higher compared to Telangana Region and Punjab Region studies on sacral index.^{11,12} The female sacral index is much higher compared to Madhya Pradesh Region and Varanasi Region studies.^{13,14} The sacral index was higher in female sacra in Whites and Blacks (White males-106.49, Black males -106.17; white females- 108.69, Black females - 112.35) The lower sacral index in males compared to sacral index in females affirms that sacral index varies in divergent populations.^{13–16}

5. Conclusion

Our study acknowledges the importance of sacral index and its significance can be useful in sexual dimorphism.

6. Source of Funding

None.

7. Conflict of Interest

None.

8. Acknowledgement

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