

A STUDY ON SACRAL INDEX IN KERALA POPULATION OF SOUTH INDIA

Girish V. Patil¹, Shishirkumar², Thejeshwari³, Apoorva D⁴, Javed Sharif⁵, C. Sheshgiri⁶, Sushant N. K⁷

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ABSTRACT: Human sacral bones are of great interest to the anatomists, forensic experts and anthropologists as it is one of the important bones used for identification of sex in skeletal remains. Various parameters and indices are available based on which the sex can be determined using sacrum. One such important parameter is the sacral index. Studies show that sacral index significantly varies among male and female gender and among different populations. The materials for the present study consisted of 150 adult sacra (75 males and 75 females) of known sex available in the Department of Anatomy, DM- Wayanad Institute of Medical Sciences, Wayanad Kerala. Based on the sacral index, anthropologists have classified the sacra into specific groups. The mean sacral index of the male and female sacra in the present series are 114.94mm and 126.2mm respectively falls under the platycheiric group (sacral index>106). The present study showed a significant difference among the average male and female sacral indices and considers SI as a valuable parameter in identification of sex.

KEYWORDS: Gender, Populations, Sacrum, Sacral index and Skeletal.

INTRODUCTION: Pelvic bones are most important for sex determination, followed by skull and the long bones. Sacrum is a large, triangular bone formed by fusion of five vertebrae and forms postero-superior wall of pelvic cavity, wedged between the two innominate bones. Its blunted caudal apex articulates with the coccyx and its superior wide base with the fifth lumbar vertebra at the lumbosacral angle. Since it is a component of axial skeleton and because of its contribution to the pelvic girdle and in turn to functional differences in the region between the sexes, it has an applied importance in determining the sex with the various measurements carried upon it (Standrig et al, 1988).⁽¹⁾

Sacral Index (SI) is one of the important indices used to identify the gender of the bone. The SI is computed by multiplying the width of the sacrum by 100 and dividing it by the height (length) of the sacrum. In women the breadth of the sacrum as a rule is longer than the height when compared to men. Therefore, the SI also differs between men and women and hence it is used as a parameter to identify sex. However identification of sex using observations on multiple bones using different parameter is recommended than using a single bone [Patel MM, Mishra SR, Stewart T].^(2,3,4) The geometry of sacra (length and breadth) also varies among different populations leading to variations in average SI among different populations [Davivongs V, Singh S].^(5, 6)

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MATERIAL AND METHODS: The materials for the present study consisted of 150 adult sacra (75 males and 75 females) of known sex available in the Department of Anatomy, DM- Wayanad Institute of Medical Sciences, Wayanad Kerala. These sacra are selected after rejecting the bones, having fractures, pathology or wear and tear. With the help of a stainless steel sliding caliper and flexible steel tape, the following measurements were taken (each linear measurement was recorded to the nearest millimeter).

1. Maximum length of sacrum (Wilder's mid-ventral Straight length) it is measured along the mid-line of sacrum with the sliding caliper from the middle of anterosuperior margin of the last sacral vertebra.
2. Maximum breadth of sacrum It is measured with the sliding caliper by taking points at the upper part of auricular surface anteriorly (or lateral most part of ala of sacrum); thus, maximum breadth is measured on anterior aspect of sacrum.

By using the above measurements, the Sacral Index was calculated.

Sacral Index = $\text{Width} \times 100 / \text{Straight Length}$

RESULTS:

Sex	Mean Length (mm)	Mean Breadth (mm)	Mean Sacral index	Range of Sacral index	S.D of Sacral index	p value of t test
Male	110.2	98.57	114.94	88.7 – 126.4	5.36	<0.0001
Female	102.4	112.65	126.2	96.1 – 132.8	4.12	

Table -1: Shows average length, breadth and sacral index for males and females

The mean SI for male and female sacra were found to be 114.94 (S.D = 5.36) and 126.2 (S.D=4.12) respectively. The student "t test" for significance of difference between male and female values showed highly significant difference ($p < 0.0001$). The mean length of male and female sacra was 110.2 mm and 102.4 mm respectively. The mean width was 98.57 mm and 112.65 mm respectively for males and females. The results are tabulated in [Table-1].

DISCUSSION:

Types of Sacrum	Sacral index
Dolichoheiric	Narrow sacra with SI <100
Hyplatycheiric	Medium sacra with SI 100–105.9
Platycheiric	Broad sacra with SI more than 106

Table-2: showing classification of sacra by sacral index

The sacrum has always attracted the attention of the medico-legal experts for establishing the sex, because of its contribution to pelvic girdle and associated functional sex differences.

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While teaching sex differences in bones much stress is laid on the importance of sacrum. Actually, very little data is available to test the validity of the number of parameters described to identify the sex of sacra (Devivongs V, 1963).⁽⁵⁾ The demarking points of various parameters will help to identify the sex with certainty, which is of paramount importance in medico-legal cases.

A review of literature showed that not many studies are available in quotes the normal geometrical values (Sacral Index and Demarcating Point) of the South Indian sacra belonging to Kerala, India region. The present study is attempted to create a database of the above mentioned parameters in the said population.

Based on the sacral index, anthropologists have classified the sacra into specific groups shown in table 2. The mean sacral index of the male and female sacra in the present series are 114.94mm and 126.2mm respectively falls under the platycheiric group (sacral index>106). Similar observation was reported by Martin (1960) (males: 112.4mm and females: 114.8mm), Raju et al (1981) and Davivongs (1963).^(5, 7)

However Mishra et al, in his study has classified the male sacra (sacral index: 98.22mm) under dolichoheiric group (narrow sacrum with sacral index up to 99.9) and female sacra (sacral index: 125.2mm) under platyheiric group similar to the present study.⁽³⁾ Any way an attempt to use the sacral index for ethnic discrimination is very doubtful (Davivongs, 1963).⁽⁵⁾ However, its importance in sex determination cannot be denied since the differences between the males and females are highly significant.

CONCLUSION: The present study showed a significant difference among the average male and female sacral indices and considers SI as a valuable parameter in identification of sex. The male and female sacra of the studied population are classified under Dolichoheiric, Hyplatycheiric and Platycheiric category respectively. This study will be useful for the anatomists, anthropologists and experts in forensic medicine for accurate sexing of sacra and various other clinical tenacities.

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AUTHORS:

1. Girish V. Patil
2. Shishirkumar
3. Thejeshwari
4. Apoorva D.
5. Javed Sharif
6. C. Sheshgiri
7. Sushant N. K.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Anatomy, DM-Wayanad Institute of Medical Sciences, Meppadi, Kerala, India.
2. Assistant Professor, Department of Anatomy, DM-Wayanad Institute of Medical Sciences, Meppadi, Kerala, India.
3. Assistant Professor, Department of Anatomy, DM-Wayanad Institute of Medical Sciences, Meppadi, Kerala, India.
4. Assistant Professor, Department of Anatomy, DM-Wayanad Institute of Medical Sciences, Meppadi, Kerala, India.

5. Professor, Department of Anatomy, DM-Wayanad Institute of Medical Sciences, Meppadi, Kerala, India.
6. Professor & HOD, Professor, Department of Anatomy, DM-Wayanad Institute of Medical Sciences, Meppadi, Kerala, India.
7. Tutor, Professor, Department of Anatomy, DM-Wayanad Institute of Medical Sciences, Meppadi, Kerala, India.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Girish V. Patil,
Associate Professor,
Department of Anatomy,
DM-Wayanad Institute of Medical Sciences,
Meppadi, Kerala, India.
E-mail: girivpatil@rediffmail.com

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