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Original Research Article

SIGNIFICANCE OF SACRAL INDEX IN SEX DETERMINATION AND ITS COMPARATIVE STUDY IN DIFFERENT RACES

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ABSTRACT

Aim: The objective of present study is to determine the significance of sacral index in sex determination and to compare the findings with different races.

Material and Methods: 60 adult sacra (30 male &30 female) were studied. Mean maximum sacral length and mean maximum sacral breadth were taken by sliding vernier caliper & sacral index was calculated. Data was statistically analyzed.

Result: Mean maximum sacral length is significantly greater in males (113.5mm) than females (94.6). The difference between mean maximum sacral breadths is not significant. (Males-105.83 Females-104.33). Mean sacral index in females (110.63) is significantly greater than males (93.8). As per present study sacral index can reliably identify 53.33% of male sacrum and 46.67% of female sacrum.

Conclusion: Sacral index is a reliable criterion for sex determination and is useful for anatomical, medico legal and anthropological purposes.

KEY WORDS: Sacral Index, Sex determination, Sacral Length, Sacral Breadth.

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INTRODUCTION

Sex determination using sacrum is often considered with various available parameters and indices when dealing with human skeleton remains. The human sacrum is large triangular bone composed of five fused sacral vertebrae. It forms postero-superior wall of pelvic cavity wedged between two hip bones. Being a part of axial skeleton, it supports erect spine, provides stability to bony pelvis, helps in weight transmission and allows some mobility of pelvis during pregnancy. Sacral index is the most important criteria for sex determination using sacrum. As per Frazer [1], female bone is broader than the male and shows a different anterior curve, in the males curve is almost uniform from above downwards but in females it is more marked at the lower part and the upper part is almost flat.

Comas and Charles [2] stated that wide variations exist between male and female sacrum in Chinese and Negroes.

According to Krogman, accuracy of sex determination using complete skeleton is 100%, skull

with pelvis 98% and pelvis alone is 95%. Sacrum being a part of pelvis is almost always considered while dealing with sex determination of human skeleton material.

Thus present study aims at determining the significance of sacral index in sex determination and compares the findings with different races according to literature available.

MATERIALS AND METHODS

The material consisted of 60 adult sacrum bones (30 male and 30 female) obtained from department of Anatomy, Govt. Bundelkhand medical college, Sagar and N.S.C.B Medial College, Jabalpur, MP. Study permission was obtained from ethical committee. All the bones included in the study were free of deformities or pathological changes. The sliding vernier calliper was used to take maximum length and maximum breadth of sacrum.

Fig. 1: Measurement of maximum sacral breadth.

Fig. 2: measurement of maximum sacral length.

Measured parameters were:

1. Maximum length: It is the distance between middle points on antero-superior margin of promontory to middle of antero-inferior margin of last sacral vertebrae.

2. Maximum breadth: It is most distant points on the sides of ala of sacrum.

Sacral index = maximum breadth X 100/ maximum length

Mean, standard deviation, range, demarking point were calculated and data was statistically analysed using t-test.

RESULTS

The mean maximum sacral length is significantly greater in males (113.5) than in females (94.6). But no significant difference was found between mean maximum sacral breadths of males (105.83) and females (104.33). Mean sacral index is found greater in females (110.63) than males (93.8) and the difference is highly significant.

Present study shows that using sacral index alone, 53.33% of male sacra and 46.67% of female sacra can be accurately identified.

DISCUSSION

In present study mean sacral length is found to be higher than Indians of Gujarat and Rajasthan region and Australians and Americans as shown in the table below. In females, the value is found to be more than Indians of Agra and Rajasthan region but lower than Australian and Americans.

Similarly, variations in sacral breadth and sacral index were also observed as shown in Table-1 [3-8].

These observations are in accordance with those of Davivongs in Australian aborigines and Flander in American Blacks and Kataria in Indians of Rajasthan region.

Flander [4] used univariate and multivariate analysis methods for sex determination of sacrum. Stradalova [9] implied a complex method for sex determination of sacra using 1.5 dimensions and depending on the number of measurements considered, found accuracy between 86.5% and 88.5%.

Thus present study clearly indicates the presence of racial and regional differences in sacrum especially length parameter and sacral index method can be used as an effective method of sex determination of sacrum.

Table 1: Comparative analysis of sacral measurements.

study	Race	N	Max length		Max breadth		sacral index	
			male	female	male	female	male	female
Davivongs 1963 [3]	Australian aborigine	50	96.52	88.12	99.92	101.24	104.16	115.4
Flander 1978 [4]	American white	50	110.2	109.64	116.42	117.62	106.49	108.59
Flander 1978 [4]	American black	50	105.5	99.98	111.14	111.36	106.49	112.85
Mishra et al 2003 [5]	Indians (Agra region)	116	107.53	90.58	105.34	105.79	98.21	117.84
Patel et al 2005 [6]	Indians (Gujarat region)	64	-	-	-	-	96.25	113.25
Kataria et al 2014 [7]	Indians (Rajasthan region)	74	106.7	91.91	110.3	109.88	104.11	120.01
Bindra et al 2015 [8]	Indians (Haryana region)	60	106.85	90.89	108.24	106.87	101.3	117.56
Present study	Indians (MP)	60	113.5	94.6	105.83	104.33	93.8	110.63

CONCLUSION

It is evident from present study that sacral index alone can differentiate 53.33% of male sacra and 46.67% of female sacra bones. It is therefore quite reliable and significant criteria for sex determination of sacrum. Thus regional and racial differences in sacrum along with sacral index can be useful for anatomical, medico-legal and anthropological purposes.

Conflicts of Interests: None

REFERENCES

[1]. Frazer JE. Anatomy of Human Skeleton.3rd ed. London: Churchill Livingstone; 1933.p.3.
[2]. Comas J, Charles C. Manual of Physical Anthropology. Illinois, USA: Thomas Springfield; 1961: p.415-16.
[3]. Davivong V. The Pelvic Girdle of the Australian Aborigenes; sex differences and sex determination. Am J Phys Anthropo 1963; 21:443-55.
[4]. Flander LV. Univariate and multivariate methods for sexing the sacrum. Am J Phys Anthropo 1978;49: 103-10.
[5]. Mishra SR, Singh PJ, Agrawal AK, Gupta RN. Identification of sex of sacrum of Agra region. J Anat Soc of India 2003; 52 : 132-6.
[6]. Patel MM, Gupta BD, Singel TC. Sexing of sacrum by sacral index and kimura's base wing index. JIAFM 2005; 27: 5-9.
[7]. Kataria SK, Kulhari P, Kataria KR, Potaliya P. A study of the sacral index in western Rajasthan population in comparison with other races. Int J Anat Res 2014;2:383-5.
[8]. Bindra GS, Mohan A. Sacral Index: Application in sex determination of sacrum. Int J Sci Stud 2015;2(10):79-81.
[9]. Stradalova V. Proceedings: Determination of sex from material characteristics of the sacrum. Folia Morphol (Praha) 1974;22;408-12.

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