

## A COMPARATIVE STUDY OF SACRAL INDEX V/S KIMURA'S BASE WING INDEX IN SEX DETERMINATION THROUGH SACRUM

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### ABSTRACT

**Introduction:** Sacrum being a part of pelvis is an important bone for identification of sex from human skeleton remains.

**Aim:** To compare the accuracy of sacral index and kimura's base wing index in sex determination of sacrum.

**Material and Methods:** The material consisted of 60 adult sacra (30 males and 30 females). Measurement of various parameters was done using sliding vernier calliper.

**Result:** Using sacral index method, 53.33% of male sacra and 46.67% of female sacra can be accurately identified whereas by base wing index, on right side, 10% of sacrum in males and 13.33% of sacrum in females can be identified and on left side, 13.33% of sacrum can be identified on both sides.

**Conclusion:** Sacral index method is more reliable and should be applied for sex determination of sacrum in various anatomical, forensic and anthropological investigations.

**KEY WORDS:** Sacrum, Sacral Index, Kimura's Base Wing Index.

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### INTRODUCTION

Sacrum is an important bone for identification of sex from human skeleton remains. It is a component of axial skeleton and forms part of pelvic girdle. 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. 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. Demarking point helps in identifying the sacra with absolute certainty. Calculation of demarking point for the parameters used in sex identification increases the accuracy by 100 % [3].

The aim of the present study is to compare the accuracy of sacral index and kimura's base wing index in sex determination of sacrum.

## MATERIALS AND METHODS

The material consisted of 60 adult sacra (30 males and 30 females) 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 various parameters required for the study.

Measured parameters included:

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

3. Width of base: It is transverse width of superior surface of body of 1<sup>st</sup> sacral vertebrae.
4. Width of wing: It is distance between lateral margin of base to most lateral point on ala of sacrum.

Kimura's base wing index = width of wing X 100/ width of base

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

**Fig. 1:** measurement of maximum sacral breadth.



**Fig. 2:** Measurement of Maximum Sacral length.



**Fig. 3:** measurement of width of base.



**Fig. 4:** Measurement of width of wing.



## RESULTS

Mean sacral index in females (110.63) is found greater than males (93.8) and the difference is highly significant and using sacral index alone, 53.33% of male sacra and 46.67% of female sacra can be accurately identified.

Mean of base wing index on right side for males is 65.89 and females is 69.65 with no significant difference between them. It can only identify 10% of sacrum in males and 13.33% of sacrum in females.

There is no significant difference between base wing index of males (63.69) and females (70.82)

on left side and it can only identify 13.33% of sacra in both males and females.

### OBSERVATIONS AND DISCUSSION

As per Krogman, accuracy of sex determination using skull with pelvis is 98% and pelvis alone is 95%. Sacrum being a part of pelvis is often dealt with in determining sex of human skeletal remains. Mishra et al. (2003) [4] showed in their study that using sacral index method 39.2% of male sacra and 80.1% of female sacra were identified whereas only 2.7% of male sacra and 38% of female sacra can be identified by base wing index method. In the study done by Patel et al. (2005) [5], using sacral index method 62.5% of male sacra and 68.75% of female sacra were identified whereas by applying base wing index method, only 18.75% of male and female sacra were identified on both sides. Asthana et al. [6] also established in their study that sacral index is more reliable than kimura's base wing index in determining sex of sacrum.

Present study showed that using sacral index method, 53.33% of male sacra and 46.67% of female sacra can be accurately identified. By using base wing index method on right side, only 10% of male sacra and 13.33% of female sacra can be identified whereas on left side, only 13.33% of both male and female sacra can be identified. Thus result obtained is in accordance with the previous studies.

**Table 1:** Sacral Index Method (t=10.25, p<0.0001).

	Male (mm.)	Female (mm.)
<b>Range</b>	78.51-103.5	97.29-127.03
<b>Mean</b>	93.8	110.63
<b>S.D.</b>	5.98	6.91
<b>Demarking point</b>	<89.90	>111.74
<b>% of bone identified</b>	53.33	46.67

**Table 2:** Base wing index method (right side) (t=0.70, p>0.01).

	Male (mm.)	Female (mm.)
<b>Range</b>	45.20-105.51	54.81-107.78
<b>Mean</b>	65.89	69.65
<b>S.D.</b>	6.11	6.71
<b>Demarking point</b>	<49.52	>84.22
<b>% of bone identified</b>	10	13.33

**Table 3:** Base wing index method (left side) (t=1.41, p>0.01).

	Male (mm.)	Female (mm.)
<b>Range</b>	43.07-102.43	50.35-103.95
<b>Mean</b>	63.39	70.82
<b>S.D.</b>	6.5	7.11
<b>Demarking point</b>	<49.49	>83.34
<b>% of bone identified</b>	13.33	13.33

**Table 4:** Comparison with previous studies.

S.no.	study	Sacral index method		Kimura's method (right)		Kimura's method (left)	
		Male	female	Male	female	Male	female
1	Patel et al. 2005 [5]	62.50%	68.75%	18.75%	18.75%	18.75%	18.75%
2	Mishra et al. 2003 [4]	39.20%	80.10%	2.70%	38.00%	2.70%	38.00%
3	Present study	53.33%	46.67%	13.33%	13.33%	10%	13.33%

### CONCLUSION

As evident from this study that sacral index method is a more reliable criterion than Kimura's base wing index method for sex determination in sacrum in both males and females. Therefore it can be safely concluded that sacral index method is more accurate and should be applied for sex determination of sacrum in various anatomical, forensic and anthropological investigations.

**Conflicts of Interests: None**

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