



**ORIGINAL RESEARCH PAPER**

**Medical Science**

**RELATION OF SEX WITH INDEX OF GREATER SCIATIC NOTCH OF HUMAN HIP BONE**

**KEY WORDS:** pelvis, sexual dimorphism, sciatic tubercle.

**Dr Gautam kumar singh**

Associate professor in department of anatomy, N.S.C.B. Medical college, Jabalpur(M.P).

**Dr S.K. Shrivastava\***

Professor and head of department of anatomy, S.S. Medical college and hospital , Jabalpur (M.P) \*Corresponding Author

**ABSTRACT**

Many researchers have emphasized the need for population specific data for methods which are based on measurements, as there are vast differences in body size in various populations. The pelvis is known to be the most sexually dimorphic part of the human body, the greater sciatic notch is the one of the most important discriminators between male and female and when we take the index value of greater sciatic notch ranging between 60.40 to 187.90 in male and the value of female hip bones ranging between 65.0 to 164.30. The purpose of this study was therefore to develop discriminant functions which can be used for sex determination on measurements of the pelvis.

**Introduction:**

Sexing of the hip for medico-legal cases should be given a first line charge in our society. The best indicators of sex in the skeleton are to be found in the pelvis. The reliable estimation of sex from the skeleton represents an important contribution of forensic anthropologist to the investigation in case of death. Correct sex identification of the human skeleton is important in bioarcheological and forensic practice (Bruzek, 2002)(7). There is clear sexual dimorphism observed in some bones such as hip bones, skull etc. But the hip bone has a number of distinctive features which indicate sexual dimorphism. According to Krogman and İşcan , 95% accuracy can be obtained if the pelvis is complete, although Bruzek found that accuracies ranged from 59% to 96%. . It is not surprising, therefore, that ever since Fehling (1876) (5) reported sexually distinctive features of the fetal and neonatal pelvis, there have been many attempts to develop both metrical and morphological techniques for estimating sex in juvenile skeletons. Stewart feel that for entire adult skeleton or for the adult pelvis or for one adult hip bone he can sex correctly 90-95% of cases.

The hip bone is the most reliable skeleton in sexual dimorphism (Ferebambach et al., 1980)(1). Akpan et al.(2) (1998) used a total of 150 X-ray films (A-P view) of the pelvis of adult (90 male and 60 female) Nigerians to measure the width, depth, posterior segment, total and posterior angles of the greater sciatic notch. Kalsey et al. (2011) made an attempt to find the baseline data of various parameters greater sciatic notch. it is surprising that relatively little research has been done on sex determination from the skeleton in this part of the world. Ari(9) studied the morphology of the greater sciatic notch in male Byzantine skeletons from Turkey, Duric et al. studied remains from mass graves in Serbia, and found that they were very sexually dimorphic, such that they could be sexed with 100% accuracy using morphology alone .

Schutzkowanski(1993)(8) noted the greater sciatic notch were the best discriminators and 95% of individuals as a narrow notch were boys where 71.4% of those with a wider sciatic notch were girls, using depth of the greater sciatic notch 81.2% of boys(deep notch) and 76.5 % of girls(shallow notch) were correctly sexed.

The research trend in sex determination is that "The early quantitative morphological assessments of sex were gradually replaced by quantitative osteometric approaches" Oscan 1988). This concerns essentially discriminant function analysis (DFA). According to the statistical theory of DFA, the resulting discriminant function can only be used for the population that provided the sample used to establish it (e.g., Tomassone 1988)(10)

**Methods and materials:**

The bones used in this study were obtained from N.S.C.B. Medical

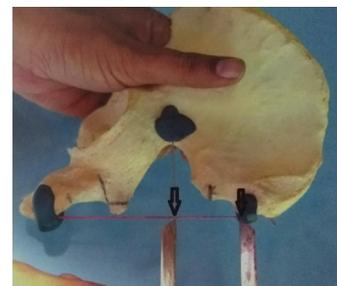
College, Jabalpur, M.P. For the study, fully ossified dry bones, free of damage or deformity were used. Total of 342 bones were selected for the study out of which 221 were of males(113 right and 108 left) and 121(65 right and 56 left) were of females. All the measurements were measured in centimeters. Present study was done on dry human bones, so ethical issues were not arised.

1. The distance between posterior superior iliac spine to the sciatic tubercle (a most medial elevation present on the ischial tuberosity. (PQ) P for end of posterior superior iliac spine and Q for sciatic tubercle.
2. The depth of greater sciatic notch is measured between the deepest point of the the greater sciatic notch and the perpendicular line that cuts PQ line.(RS)R for point where depth line cuts PQ line and S for deepest point of greater sciatic notch.



**Figure 1 measurement of the depth of greater sciatic notch(RS)**

3. The distance between posterior superior iliac spine and the point where the depth line cuts the PQ line.(PR) P denotes end of posterior superior iliac spine and R for point where depth line cuts PQ line.



**Figure 2 measurement of PR line**

4. The index of PR of greater sciatic notch obtained by PR multiplied by 100 and divided by RS( $PR \times 100 / RS$ )

**Observation- PQ:**

The value of PR is found to be ranging between 9.8 cm to 16.4 cm in the male hip bone of right side, while in male hip bone of left side the range is 9.7 cm to 14.1 cm. The mean value of PQ being 11.42 cm for right side and 11.27 cm for the left side in males. The mean PQ for male hip bone irrespective of side is calculated to be 11.34 cm.

In females hip bones PQ is observed to be ranging from 8.8 cm to 12.6 cm for right side and 9.2 to 13.1 cm for the left hip bones. The mean being 11.10 cm for bones of the right side and 10.86 cm for the left side. Irrespective of the side the mean value of PQ for female is 10.99 cm.

Irrespective of sex and side the mean value of PQ is observed to be 11.18 cm.

The mean value of male hip bone is significantly higher than female hip bone.

**RS:**

The value of RS is found to be ranging between 3.2 cm to 5.1 cm in the male hip bone of right side, while in male hip bone of left side the range is 3.2 cm to 4.8 cm. The mean value of RS being 3.90 cm for right side and 3.91 cm for the left side in males. The mean RS for male hip bone irrespective of side is calculated to be 3.90 cm.

In female hip bones RS is observed to be ranging from 2.8 cm to 4.5 cm for right side and 2.7 to 4.7 cm for the left hip bones. The mean being 3.60 cm for the bones of the right side and 3.64 cm for the left side. Irrespective of side the mean value of RS for female is 3.61 cm.

Irrespective of sex and side the mean value of RS is observed to be 3.77 cm.

The mean value of male hip bone is significantly higher than female hip bones (p<0.05).

**PR:**

The value of PR is found to be ranging between 3.1 cm to 6.2 cm in the male hip bone of right side, while in male hip bone of left side the range is 2.9 cm to 5.9 cm. The mean value of PR being 4.25 cm for right side and 4.09 cm for the left side in males. The mean PR for male hip bone irrespective of side is calculated to be 4.17 cm.

In female hip bones PR is observed to be ranging from 2.7 cm to 5.1 cm for right side and 2.6 to 5.2 cm for the left hip bones. The mean being 4.10 cm for the bones of the right side and 3.97 cm for the left side. Irrespective of side the mean value of PR for female is 4.04 cm.

Irrespective of sex and side the mean value of PR is observed to be 4.10 cm.

The mean value of male hip bone is higher than female hip bone but not significant (p>0.05).

**Index of greater sciatic notch (PRX100/RS):**

The value of index is found to be ranging between 68.80 to 187.90 in the male hip bone of right side, while in male hip bone of left side the range is 60.40 to 163.90. The mean value of index being 110.33 for right side and 106.16 for the left side in males. The mean index for male hip bone irrespective of side is calculated to be 108.10.

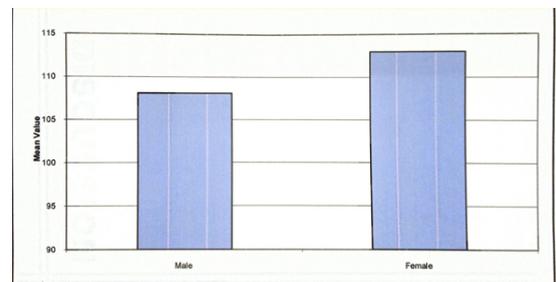
In female hip bone index is observed to be ranging from 73.0 to 145.50 for right side and 65.0 to 164.30 for the left hip bones. The mean being 114.73 for the bones of right side and 110.98 for the left side. Irrespective of side the mean value of index for female is 112.99.

Irrespective of sex and side the mean value of index is observed to be 110.299.

The index of female hip bone is higher than male hip bone

Sex	Side	N	Mean	Std. Deviation	minimum	maximum
Male	Right	113	110.3303	22.62153	68.80	187.90
	Left	108	106.1645	20.31030	60.40	163.90
	Total	221	108.1007	21.43998	60.40	187.90
Female	Right	65	114.7355	16.36958	73.00	145.50
	Left	56	110.9870	21.02870	65.00	164.30
	Total	121	112.9905	18.69392	65.00	164.30
Total	Right	178	112.4641	19.88725	68.80	187.90
	Left	164	108.1677	20.66890	60.40	164.30
	Total	342	110.2992	20.35948	60.40	187.90

**Table 1 index of the greater sciatic notch**



**Graph 1 of index of greater sciatic notch**

**Discussion**

Forensic anthropologists are continually attempting to improve methods of skeletal identification through development of new methods of determining sex or fine-tuning of existing methods on various parts of the skeleton so that it can be admissible in court.

Sex determination is the most significant information which can be obtained from bones. Takahashi H. found that the posterior angle is the best discriminating variable with an accuracy of 91% and sex was determined correctly in 88% of cases. Singh S et al found that the length of posterior segment and posterior angle of greater sciatic notch were very useful in sex determination. The sex was identified correctly in 88-92%. Rajangam S et al, studied hip bones of unknown sex of Karnataka origin. 87.7% of hip bones could be accurately classified. The total pelvic height, sciatic notch height and the acetabular height were the most useful indicators in sexing of hip bones. Akpan T.B et al studied using greater sciatic notch to determine the sex in hip bones. Posterior angle was found to be most useful in assigning sex with an accuracy of 75-90%. The accuracy of a method for visually scoring sex differences in the greater sciatic notch was tested by Jaroslav Bruzek.

The aim of this paper was to follow in this tradition, by developing population specific formulae that could be used on people living near Jabalpur M.P. Some measurements in the pelvis may be very difficult to record accurately. In this study it was found that all measurements were highly repeatable.

**Summary and Conclusions:**

The mean index for male hip bone irrespective of side is calculated to be 108.10.

Irrespective of side the mean value of index for female is 112.99.

The index of female hip bone is higher than male hip bone. In conclusion, our results suggest that metric assessment of the features of the greater sciatic notch should be used cautiously in sex determination, particularly in the case of fragmentary forensic or rare archaeological remains. In this respect, even anthropometric measurements of the skeletal remains of a single archaeological population should afford valuable information about the features of different populations.

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