



MORPHOMETRIC STUDY OF DISTANCE BETWEEN POSTERIOR SUPERIOR ILIAC SPINE AND ISCHIAL TUBEROSITY OF THE HUMAN HIP BONE

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ABSTRACT

Objective: To do study the distance between Posterior superior Iliac Spine and Ischial tuberosity (PSIS-IT) of human hip bone for determination of sex.

Methods: The study comprised unpaired 272 adult human hip bones of known sex. The posterior superior iliac spine and ischial tuberosity were identified in all the hip bones and a sliding caliper was used to measure the distance between them.

Results: The raw data obtained was statistically analyzed. Range, mean, standard deviation and standard error of mean were determined for parameter.

Conclusion: It was observed that out of 272 hip bones taken for study 160 were of males and 112 were of females. The Mean distance in males was observed to be greater in comparison to females. Statistically calculated t- test reveals that the parameter taken for study is very highly significant in terms of sex differentiation.

KEYWORDS : Posterior superior iliac spine, Morphometry, Sex determination

Introduction-

The posterior border is irregularly curved descending from the posterior superior iliac spine at first forwards, with a posterior concavity forming small notch, at the lower end of notch is a wide, low projection, the posterior inferior iliac spine, here the border turns almost horizontally forwards and finally down and back to join conspicuous ischial spine, together they form a deep greater sciatic notch. Below this the rounded border is the floor of lesser sciatic notch upto the upper end of ischial tuberosity.(8)

Hip bone is an ideal bone for sex determination because it not only reflects the general differences between the two sexes but also the special adaptation of female hip bone for child bearing. In the past, many workers have evolved various metrical parameters and indices for sexing of hip bone, Derry (1923), Sraus (1927), Schulter Ellis (1983), Turner (1986), Pal, Bose and Choudhary (2004). Following three parameters are commonly used in sexing the hip bones and are considered to be the most reliable i.e. chiotic line index, Derry (1923), Ischio-pubic index, Washburn (1949) and Acetabulo - pubic index, Schulter Ellis (1983). It has been claimed that these parameters could determine the sex in a high percentage of bones. Mewalal (1993) evaluated the reliability of many commonly used parameters, including the above three, on large number of hip bones.(9)

The hip or the innominate bone is one of the most informative bones in the skeleton because it is formed by three independent elements during the sub adult life. The hip bone has the appearance of a propeller with a large blade (the ilium) directed upwards and a smaller blade (composed of the pubis anteromedially and the ischium posterolaterally) directed downwards. The two blades are almost at right angles to one another and meet at a narrow, thick hub, in the acetabulum. Morphometry of the hip bone is important for the anatomist as well as for the anthropologist for population studies. Moreover, specimen identification and sex determination from skeletal remains has great importance in forensic medicine. (10) Non metric method for determination of sex is not so relevant. But metric methods used for sex determination of human hipbone have shown highest accuracy level.

Therefore, awareness of the average dimensions of the hip bone in both sexes will also help in early detection of disputed sex by forensic experts. In spite of this not much work has been done in Indian population. Therefore, the need for present study to be carried out was felt. The present study will hence provide valuable

parameters in the Indian population which would help the forensic experts, anthropologists and orthopaedicians.

Methods and materials-

Hip bones, sliding caliper - To measure, the known sample of 272 human hip bones from the Department of Anatomy, NSCB Medical college, Jabalpur, M.P was used for this study. They were undamaged and showed no pathological alterations that could lead to error in measurement;

Each variable was measured 2 times at 2 different sessions by the same observer and the mean value of the 2 measurements was calculated for each variable for each bone.

The distance between posterior superior iliac spine and upper end of ischial tuberosity (measured with caliper and scale).(MF) M for male and F for female.

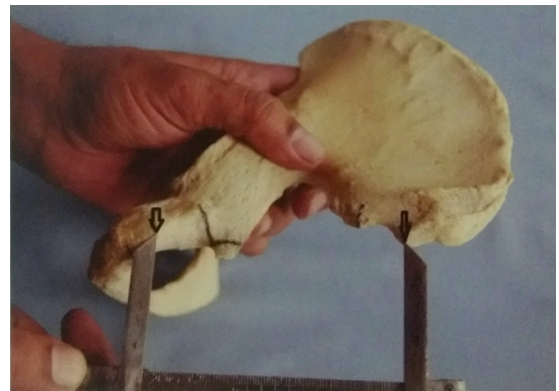


Figure showing measurement of distance between posterior superior iliac spine and the superior border of ischial tuberosity by sliding caliper (MF) (Measurement taken in centimeter)

Observation-

The value of MF is found to be ranging between 8.6 cm to 12.6 cm in the male hip bone of right side, while in male hip bone of left side the range is 8.3 cm to 13.5 cm. the mean value of MF being 10.14 cm for right side and 9.83 cm for the left side in males. The mean MF for male hip bone irrespective of side is calculated to be 9.98 cm.

In female hip bones MF is observed to be ranging from 8.2 cm to 11.2

cm for right side and 7.4 to 11.3 cm for the left hip bones. The mean being 9.79 cm for the bones of the right side and 9.70 cm for the left side. Irrespective of side the mean value of MF for female is 9.75 cm.

Irrespective of sex and side the mean value of MF is observed to be 9.87 cm.

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

Table 1 statistical value of MF

Sex	Side		MF
Male	Right	N	85
		Mean	10.14
		SD	.90
		SEM	.11
	Left	N	75
		Mean	9.83
		SD	.92
		SEM	.11
	Total	N	160
		Mean	9.98
		SD	.92
		SEM	.08
Female	Right	N	63
		Mean	9.79
		SD	.69
		SEM	.09
	Left	N	49
		Mean	9.70
		SD	.81
		SEM	.11
	Total	N	112
		Mean	9.76
		SD	.74
		SEM	.07

Table2-irrespective of sex

Side		MF
Total Right	N	148
	Mean	9.97
	SD	.82
	SEM	.07
Total Left	N	124
	Mean	9.78
	SD	.87
	SEM	.08
Total (Right +Left)	N	272
	Mean	9.87
	SD	.85
	SEM	.05

- number, SD- standard deviation, SEM-standard error of mean

Discussion -

In medico legal cases, there is necessary to determination of sex and age from the available intact bones or skeletal remains. Anatomists can give expert opinion regarding sex and age of the individual from the skeletal remains found under suspicious conditions. Many osteologists tried to establish the sex by visual impression of the individual bones. In 1891, Matthew and Billings first attempted to use measurements and indices to determine or confirm the sex of pelvises, as mentioned by Hoyme. A general rule is male bones are heavier and more massive than female bones. The length of male hip bone is found to be longer than the female as found many studies.(3)

Doshi et al worked on posterior border of the hip bone taking three parameters in consideration and found that the distance between

the PIIS-IS is one of the significant parameter for the determination of sex which also supports and re-enforces the findings. Margam et al. studied two parameters along the posterior border of human hip bone i.e. Dist. PSIS-IT & Dist. PIIS-IT and both were found significant for sexing of human hipbone.

Among these variables, the low probability of error (P<0.05) for demonstrating a statistically significant difference between the means related to sex is shown by the length of the border between the posterior superior iliac spine and the superior border of the ischial tuberosity (arch PB). This is the best of the variables studied for sexing human skeletal remains. Statistically significant difference between the means related to side were seen in the variables of the length of the notch between the posterior inferior iliac spine and the ischial spine, arch PIIS-IS (P< 0.05) and length of the border between the posterior superior iliac spine and the superior border of the ischial tuberosity, arch PB (P<0.05)(4).

It has been noticed that the posterior part of the hip bone is usually well preserved due to its hardness; hence the present study gains its importance.(5) value of western studies are higher compared to those Indian subjects. Our finding confirm the result of Issac B as the measurement of PSIS-IT parameter seen to be same range. Result of the present study therefore support the view that measurement along posterior border of hip bone is a reliable method for sex determination.

Results –

The mean MF for male hip bone irrespective of side is calculated to be 9.98 cm. irrespective of side the mean value of MF for female is 9.75 cm.

Irrespective of sex and side the mean value of MF is observed to be 9.87 cm.

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

Conclusion-

The present study was done to identify the measurements between PSIS-IT along the posterior border, which significantly differentiates the sex of human hip bone. There was a significant difference observed in the distance between posterior superior iliac spine and ischial tuberosity which will be useful in anatomical, anthropological, archaeological and forensic studies.

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