

A Study of Upper & Lower Posterior Border of Human Hip Bone



Medical Science

KEYWORDS: posterior superior iliac spine, posterior inferior iliac spine, ischial spine, ischial tuberosity

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ABSTRACT

It is a measurement based study where we studied the posterior border of hip bone. The Hip bone which is the important bone for the determination of sex in human being, it has posterior and anterior border which will be longer than other borders of this bone. The posterior border which has following landmarks i.e. above to downwards, they are posterior superior iliac spine(PSIS), posterior inferior iliac spine(Piis), ischial spine(is), ischial tuberosity(it).we studied the distance between PSIS and Piis which is measured by sliding caliper and length between them measured by thread along its border, and another measurement the distance and length between IS and IT.we have found some important relations between male and female, male has higher value in comparison to female and right and left sides does not show significant relations. these are because in Indian subcontinent average height of males are more than females.

Introduction-The study of morphology of human bones is not only for Anatomists, but also for Anthropologists and Forensic experts. The pelvis bone which has more importance to those who would identify skeleton remains. In spite of numerous efforts there still is no certain method of determining the sex of individual skeleton. Hooton states that "the determination of the sex from the postcranial skeleton in adult is easy and certain are about 80% cases, difficult but possible in another 10% in cases and quite dubious in the remainder." In spite of this, some postulates and papers presented and prove that female and male skeleton have some different characters and some bones of human beings show important characters after that accurate sex determination. A postulate in evolutionary biology is that there is an inverse relationship between the intensity of stabilizing selection and variance in phenotypes and genotypes within a population (Stansfield, 1977). This relationship has been used to explain differences between human males and females in their ranges of variation in morphology. Stini (1975, 1982) and Hamilton (1975, 1982) have argued that body size is subject to stabilizing selection, but the selective pressures affecting body size are somewhat different between the sexes. Both Stini and Hamilton reasoned that the intensity of selection is greater in females because of the requirements of reproduction and lactation.

A definite opinion about the sex of the person from examination of the bones (brought by the investigating authorities) is of great help to them. There is clear sexual dimorphism observed in some bones such as hip bone, skull etc. But the hip bone has a number of distinctive features which indicate sexual dimorphism. This creates more interest for Anatomist and Forensic experts many authors have studied these bones by comparing the features like its total border, the symphyseal surface, the acetabulum, the obturator foramen, and arcuate line. They are Verneau, 1875 (who worked on greater sciatic notch); Lazorthes & Lhez, 1939, (La grande échancrure sciatique. Etude de sa morphologie et de ses caractères sexuels); Washburn 1948, (sex differences in the pubic bone); Sauter & Privat, 1951/1952, (the method for measurement of the greater sciatic notch); Martin & Saller, 1957, 1959, (Lehrbuch der Anthropologie); Oliver, 1960, 1965, (Pratique and Anatomie Anthropologique); Jovanovic & Zivanovic, 1965, (the establishment of the sex by the great sciatic notch); Phenice, 1969, (a newly developed visual method of sexing the os pubis); Jovanovic, Zivanovic & Lotric, 1973, (a study of sex-determined characteristics of the hip bones in pathologically deformed female pelvis); Singh and Potturi, 1978, (greater sciatic notch in sex determination); Kelly, 1979, (sex determination with fragmented skeletal remains); Orban-Segebarth, 1984, (Procédé métrique

pour la diagnose du sexe de l'os coxal); Leoppold & Novotny, 1985, (Geschlechtsbestimmungen am Schadel und an Teilen des Os Coxae); MacLaughlin & Bruce, 1986, (The sciatic notch acetabular index as a discriminator of sex in European skeletal remains); Schutkowsky, 1986, (Geschlechtsdifferente Merkmale an kindlichen Skeletten); Schulter-Ellis & Hayek, 1988, (Sexing North American Eskimo and Indian innominate bones with the acetabulum/pubis index); Tague, 1989, (Variation in pelvic size between males and females); Budinoff & Tague, 1990, (Anatomical and developmental bases for the ventral arc of the human pubis); Milne, 1990, (sexing of human hip bones); Holcomb & Konigsberg, 1995, (statistical study of sexual dimorphism in the human fetal sciatic notch); Sharma & Lal, 1999, (sex determination of human hip bones from genoves sciatic notch index); R.G. Tague, 2000, (do big female has big pelvis); Ubelaker and Volk, 2002, (A test of Phenice method for estimation of sex); Jaroslav Bruzek, 2002, (a method for visual determination of sex).

The reliable estimation of sex from the skeleton represents an important contribution of forensic anthropologist to the investigation in case of death. Although many bones of the skeletons present size related sexual differences, those of the pelvis usually display marked sex differences include the sub pubic angle, sciatic notch, preauricular sulcus, auricular area, and pubis. The sciatic spine, which is the lower point of the great sciatic notch, has different morphological forms. Lazorthes and Lhez (1939) described 3 morphological types of spines which in most cases make the measuring very difficult or even impossible. The spine is very often absent in osteological material or it is more or less broken. Even in very good osteological collections the spine is often spoiled or completely destroyed. Because of that reason Genoves (1921) took his measurements from the base instead of from the tip of the sciatic spine. The upper point of the great sciatic notch classically used, is the posterior inferior iliac spine - Verneau (1875), Letterman (1941), Martin & Saller (1957). But Lazorthes and Lhez (1939) in their work on the morphology and sexual variations of great sciatic notch, emphasized that the upper point of notch is not the posterior inferior iliac spine, but another spine on the posterior border of the iliac bone about 1 cm in front of the posterior inferior iliac spine. Lazorthes and Lhez gave the name "tubercle of the pyriform muscle" to this spine and named "Bouisson's tubercle". Because of that Genoves (1921) and Lazorthes and Lhez (1939) took the measuring point at the tubercle of pyriform muscle instead of posterior inferior iliac spine. But the tubercle of the pyriform muscle is morphologically very variable and sometimes absent; especially in female. Lazorthes and Lhez (1939) found that it was absent

in 27% on the right and in 24.4% on the left bone. The same authors said that this tubercle is larger in the male and found what is absent in the male only in 3.7% on the right and in 5% on the left side. Issac B has concentrated on different measurements at the posterior border of hip bones. He has presented the result of his study on 42 human hip bones and draw some important conclusions which help in determination of sex and side of hip bones. we concluded the study of morphology of human hip bones is the important bones for anatomists, anthropologists, forensic experts and archeological persons and it has many features which differentiate between sex, useful for parturition, This creates more interest to specialist in this field and due to this reason more work has been done on this bone and its different characters to give definite results ,so I decided to work on this bone because there was less work on the posterior border of the hip bone done. References available in this regards are not sufficient to make a definite opinion for bones of a subject belonging to central india region.

Therefore it was decided study a good number of bones available in the department of anatomy and to take smaller segment along the posterior border of hip bone and especially its greater sciatic notch to make an attempt to find out some correlation between different variables, so that the sex of bone can be determined even by study of smaller pieces of bones

Aims and Objectives-

A good number of hip bone is available in department of Anatomy Netaji Subhash Chandra Bose Medical College, Jabalpur(M.P).

(A). It was planned to take measurements in the male and female hip bones and to identify those parameter and indices which help in sex and side determination accurately.

Following measurements were taken :

- (1) Length between posterior superior iliac spine to the posterior inferior iliac spine along the posterior border.
- (2) Distance between posterior superior iliac spine to the posterior inferior iliac spine.
- (3) Length between base of ischial spine along the lesser sciatic notch to the upper most part of posterior border of ischial tuberosity.
- (4) Distance between base of ischial spine along the lesser sciatic notch to the posterior border of ischial tuberosity
- (B) To find out any difference in value between the right and left.
- (C) To find any difference in the values between male and female
- (D) To find out statistically significant difference in mean values in male and female.
- (E) To find out correlation between different parameter studies.
- (F) To compare our data with those of other studies.

Material and methods

Material:

Bones :

The study has been done on 258 hip bones and all these bones are of known sex and then measurement was taken in approximately same temperature and fix humidity to avoid any bias due to environmental changes. The male and female bones were identified and kept in groups of right and left bones for each sex separately.

Instruments:

scale
sliding caliper
Inextensible thread
Measuring tape

Plasticine

Method:

For each hip bone, the following 4 measurements along the posterior border were taken:

1. The length of the posterior border between posterior superior iliac spine and posterior inferior iliac spine.(M1F1)M1 and F1 for male and female respectively for 1st value.
2. The distance between the posterior superior iliac spine and posterior inferior iliac spine.(M2F2)M2 for male and F2 for female for 2nd parameter.
3. The length of posterior border from the base of ischial spine along the lesser sciatic notch which is identified by a point where horizontal line drawn from the upper part of ischial tuberosity which cuts the posterior border of lesser sciatic notch and the upper part of posterior border of ischial tuberosity.(M3F3) M3 for male and F3 for female for 3rd parameter.
4. The distance between the base of ischial spine along the lesser sciatic notch (which is identified by a point where horizontal line drawn from upper part of ischial tuberosity which cuts the posterior border of lesser sciatic notch) and the upper part of posterior border of ischial tuberosity. (M4F4) M4 for male and F4 for female for 4th parameter.

OBSERVATION-

In this study 258 hip bones were taken, Out of this 142 were male and 116 were female. Right and left bone of both the sexes were separated .Thus in male sex there were 66 bones of right side and 76 of left side. In female 62 of right side and 54 of left side. All the variable was measured in this bones.

M1F1: The value of M1F1 is found to be ranging between 1.8 cm to 5.5 cm in the male hip bone of right side, while in male hip bone of left side the range is 2.1 cm to 5.5 cm. The mean value of M1F1 being 3.28 cm for right side and 3.30 cm for the left side in males. The mean M1F1 for male hip bone irrespective of side is calculated to be 3.29 cm.

In female hip bones M1F1 is observed to be ranging from 1.5 cm to 4.0 cm for right side and 1.6 cm to 4.2 cm for the left hip bones. The mean being 2.82 cm for the bones of the right side and 2.84 cm for the left side. Irrespective of side the mean value of M1F1 is 2.83 cm.

Irrespective of sex and side the value of M1F1 is observed to be 3.08 cm.

M2F2: The value of M2F2 is found to be ranging between 1.9 cm to 4.4 cm in the male hip bone of right side, while in male hip bone of left side the range is 1.6 cm to 4.8 cm. The mean value of M2F2 being 2.77 cm for right side and 2.70 cm for the left side in males. The mean M2F2 for male hip bone irrespective of side is calculated to be 2.73 cm.

In female hip bones M2F2 is observed to be ranging from 1.1 cm to 3.5 cm for right side and 1.2 cm to 3.6 cm for the left hip bones. The mean being 2.40 cm for the bones of the right side and 2.31 cm for the left side. Irrespective of side the mean value of M2F2 is 2.36 cm..

Irrespective of sex and side the value of M2F2 is observed to be 2.57 cm.

M3F3: The value of M3F3 is found to be ranging between 1.1 cm to 2.9 cm in the male hip bone of right side, while in male hip bone of left side the range is 1.0 cm to 2.4 cm. The mean value of M3F3 being 1.76 cm for right side and 1.57 cm for the left side in males. The mean M3F3 for male hip bone irrespective of side is

calculated to be 1.66 cm.

In female hip bones M3F3 is observed to be ranging from 0.8 cm to 2.2 cm for right side and 0.6 to 1.9 cm for the left hip bones. The mean being 1.55 cm for the bones of the right side and 1.33 cm for the left side. Irrespective of side the mean value of M3F3 is 1.45 cm. Irrespective of sex and side the value of M3F3 is observed to be 1.56 cm.

M4F4: The value of M4F4 is found to be ranging between 0.5 cm to 2.1 cm in the male hip bone of right side, while in male hip bone of left side the range is 0.6 cm to 1.9 cm. The mean value of M4F4 being 1.28 cm for right side and 1.13 cm for the left side in males. The mean M4F4 for male hip bone irrespective of side is calculated to be 1.20 cm.

In female hip bones M4F4 is observed to be ranging from 0.4 cm to 1.8 cm for right side and 0.5 cm to 1.8 cm for the left hip bones. The mean being 1.13 cm for the bones of the right side and 1.04 cm for the left side. Irrespective of side the mean value of M4F4 is 1.09 cm.

Irrespective of sex and side the value of M4F4 is observed to be 1.15 cm.

Statistical value of different parameters

Sex	Side		M1F1	M2F2	M3F3	M4F4
Male	Right	N	66	66	66	66
		Mean	3.28	2.77	1.76	1.28
		SD	.66	.50	.41	.40
		SEM	.08	.06	.05	.05
	Left	N	76	76	76	76
		Mean	3.30	2.70	1.57	1.13
		SD	.66	.59	.32	.35
		SEM	.08	.07	.04	.04
	Total	N	142	142	142	142
		Mean	3.29	2.73	1.66	1.20
		SD	.66	.55	.37	.38
		SEM	.06	.05	.03	.03

Female	Right	N	62	62	62	62
		Mean	2.82	2.40	1.55	1.13
		SD	.45	.43	.31	.36
		SEM	.06	.05	.04	.05
	Left	N	54	54	54	54
		Mean	2.84	2.31	1.33	1.04
		SD	.68	.59	.30	.29
		SEM	.09	.08	.04	.04
	Total	N	116	116	116	116
		Mean	2.83	2.36	1.45	1.09
		SD	.56	.51	.32	.33
		SEM	.05	.05	.03	.03
Total	Right	N	128	128	128	128
		Mean	3.06	2.59	1.66	1.21
		SD	.61	.50	.38	.39
		SEM	.05	.04	.03	.03
	Left	N	130	130	130	130
		Mean	3.11	2.54	1.47	1.09
		SD	.70	.62	.33	.33
		SEM	.06	.05	.03	.03
	Total	N	258	258	258	258
		Mean	3.08	2.57	1.56	1.15
		SD	.66	.56	.37	.36
		SEM	.04	.03	.02	.02

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