

Posterior Inferior Iliac Spine and Ischial Spine (PIIS-IS) Distance: Parameter for sexing of hip bone

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Abstract

Objective of current study was to study the distance between Posterior Inferior Iliac Spine and Ischial Spine (PIIS-IS) of human hip bone for determination of sex. The study comprised unpaired 83 adult human hip bones of known sex. The posterior inferior iliac spine and ischial spine were identified in all the hip bones and a vernier caliper was used to measure the distance between the PIIS-IS. It was observed that the mean distance of PIIS-IS in males were 45.52 mm & 45.06 mm right and left side respectively and females were 41.02 mm and 37.22 mm respectively. The standard deviation in males was 2.16 mm & 3.00 mm and that of females was 4.59 mm & 0.87 mm. 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 inferior iliac spine, Hip bone, Ischial spine, Topography, Sex determination

Introduction

The hip bone, due to its irregularity in shape, called os-innominatus. It is constricted in the center and expanded at its two ends. It is composed of three bones: ilium, ischium, and pubis which fuse with each other in acetabular cavity to form a single hip bone. Sex determination by using skeletal remains is of great importance for archaeologists and forensic experts. The metric and non-metric differences in skeletal component among populations are evident. Human hip bone has several parameters which can be helpful in determination of sex compared to other skeletal remains like sacrum, femur, clavicle, mandible etc.

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.³ Superiority of objective assessment by metrical methods over simple morphological observations has been well stressed.¹¹ Indices and angles of greater sciatic notch are known to be highly sexually dimorphic. Consequently they have been considered to be reliable sex discriminators. The greater sciatic notch and acetabulum are located in central portion of the hip bone; hence they are better preserved.⁵ Several studies has been done taking into consideration various parameters along the anterior border as well as posterior border of the human hip bone.

The present study was undertaken since there were very few studies set out to establish the morphological pattern of distance between posterior inferior iliac spine and ischial spine of hipbone along its posterior border.

Methods

83 unpaired adult human hip bones (39 males and 44 females) of known sex obtained from department of anatomy of our institution. The hip bones were selected after rejecting the bones, having fractures and pathological deformities. Only the bones with intact posterior border were used for the study. The side of the hip bone was determined morphologically on the basis of predetermined criteria. For each hipbone, the distance between Posterior Inferior Iliac Spine and Ischial Spine (PIIS-IS) was measured using vernier caliper and metallic scale to avoid all possible errors (Figure 1).

The measurements were taken twice and the mean value of it was taken for purpose of data analysis to avoid maximum probable errors. The mean and standard error of the distance between PIIS-IS of male & female were calculated. T test calculation was also done to establish the significance of the study. The data were analyzed using the Statistical Package for the Social Sciences (SPSS). The graph was drawn using Microsoft excel (Table 1).

Results

In the present study the mean distance between Posterior Inferior Iliac Spine and Ischial Spine (PIIS-IS in mm) were calculated in both the sexes. It was observed that the mean distance of PIIS-IS in males were 45.52 mm & 45.06 mm right and left side respectively and females were 41.02 mm and 37.22 mm respectively. The standard deviation in males was 2.16 mm & 3.00 mm and that of females was 4.59 mm & 0.87 mm. The Mean distance in males was observed to be greater in comparison to females which is highly significant statically ($p=0.002309$).

Discussion

Recently many researchers have attempted to determine the sex from various parameters of the hip bone. The posterior border of the hip bone is used in different studies considering different populations for sex determination. Issac et.al has done substantial work on various parameters related to the posterior border of the hip bones. The measurements of 42 hip bones (27 males and 15 females) of known sex were used to study eight variables on its posterior border for the determination of sex.⁵ Highest average accuracies were 88% for males (pubic length, greater sciatic notch posterior width, acetabulum diameter, total height) and 85% for female (pubic length, greater sciatic notch posterior width, acetabulum diameter, iliac breadth).

M. Steyna used the geometric morphometric method to study the greater sciatic notch of 115 known skeletons of South African origin, and observed that the South Africans have the typical narrow shape of the greater sciatic notch, while both black and white females have typical greater sciatic notches.⁷ Hence they indicated that for identification of sex the width of greater sciatic notch may not be a reliable criteria, especially in South Africans white males. Iiknur Ari studied the morphometry of greater sciatic notch on 26 adult hipbone excavated from remains of male.⁴ He measured the width and depth of posterior segment and two indexes to find out the variation in right and left. 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 5 present findings.² 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.¹²

Conclusion

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

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FIGURE-1: Measurement of distance (PIIS-IS) using vernier caliper



Table 1: Mean distance between Posterior Inferior Iliac Spine and Ischial Spine (PIIS-IS) in males and females

Parameters		Range (in mm.)		
SEX	SIDE	QUANTITY	MEAN	STDEV ±
MALE	RIGHT	19	45.52	2.16
	LEFT	20	45.06	3.00
FEMALE	RIGHT	22	41.02	4.59
	LEFT	22	37.22	0.87

FIGURE-2: Mean distance between posterior inferior iliac spine and ischial spine and SD in males and females.

