

**Original Article****A study of greater sciatic notch as an indicator of sex determination of adult human hip bone**

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**ABSTRACT**

**Background:** Sex determination from bone is very useful for anatomy, forensic and anthropology personnel. Hip bone is most commonly used bone for sex identification.

**Aims:** Present study was carried out to assess the efficacy of greater sciatic notch to determine sex.

**Material & Methods:** Study sample consisted of 108 adult human hip bones (27 male and female, each of both side) obtained from Anatomy department, P.D.U. Medical College, Rajkot, Gujarat. Present study focused on two indices of greater sciatic notch. Index1 = (maximum breadth of greater sciatic notch/maximum depth of greater sciatic notch)\*100 and Index2= (length of posterior segment of maximum breadth of greater sciatic notch /maximum breadth of greater sciatic notch)\*100.

**Results:** Index 1 identified correct sex in 51.85% of right male, 44.44% of right female, 44.44% of left male and 48.14% of left female bones. While index 2 identified correct sex in 70.37% of right male, 66.66% of right female, 55.55% of left male and 59.25% of left female bones.

**Conclusion:** This study indicates that these indices are helpful for sex determination in both sexes with index 2 being more sensitive as compared to index 1.

**Key Words:** sex determination, hip bone, greater sciatic notch, greater sciatic notch index

**INTRODUCTION**

Hip bone is most commonly used bone for sex determination [1]. Morphological criteria like, greater sciatic notch, width of pelvis, preauricular sulcus, diameter of acetabular fossa and obturator foramen are used by most of investigator for study of sex determination [2].

Pubic bone is the most reliable sex indicator but it is very fragile, so greater sciatic notch is especially valuable in such situations because it is highly sexually dimorphic, is resistant to damage and thus can often be scored in poorly preserved skeletons. In male, the greater sciatic notch tends to be narrow and U shaped while in females, it is comparatively open with a lower width to depth ratio.

The greater sciatic notch attracted the attention of anthropologist as early as 1875; Veneu noticed that it was narrower in males and shallower in female, according to Strauss (1929) the greater sciatic notch in man is better developed than and, shows sex differences not observed in other primates;

Wash burn (1941) pointed out that the sex differences in the greater sciatic notch belonged to a system different from that of pubic bone and that was not correlated with the sub- pubic angle, while Derry (1923) and Caldwell & Imloy (1932) emphasized the importance of dimensions of the greater sciatic notch in parturition [3,4]

Age at the time of death is also a one factor. Males and females dying at younger ages tend to have a more feminine morphology than do older people.

**MATERIALS AND METHOD**

Present study was carried out at Anatomy department, P.D.U. Medical College, Rajkot, Gujarat. Study sample consisted of 108 adult human hip bones (27 male and female each of both side). The bones were devoid of any abnormalities or pathology and intact.

**Materials used-** pencil, marker, scale, divider and needle

#### Method:

As shown in figure: 1, point A-marked on posterior border of hip bone at piriform tubercle (where highest fibers of piriformis muscle are attached), If it was not clearly identified then we can use posterior inferior iliac spine (PIIS). Point B was marked on ischial spine.

**Maximum breadth of Greater Sciatic notch (GSN):**  
Two arrow needle points were arranged on described points A & B, and marked transparent scale put on them to obtain the maximum breadth (AB) of GSN.

**Maximum depth of Greater Sciatic notch (GSN) :**  
The deepest point on curvature of notch was marked C. Long needle is arranged on AB as breadth and another needle at 90 degree to first needle and up to point C, where two lines are intersecting is point O. This is the maximum depth of (OC) GSN

Distance between O to B means OB is posterior segment of maximum breadth. (Figure: 1)

All measurements were in centimetre.

#### Calculations:

Index 1= (max depth OC/ max.breadth AB) \*100  
Index 2 = (Post. Seg OB/max breadth AB) \*100

Range, mean, standard deviation (S.D.) and demarking points were calculated for both indices.

Jit and Singh (1966) [5] had evolved "demarking Points" based on statistically calculated ranges of various measurable characters of Punjabi clavicles, which identify sex with 100% accuracy [4]. D.P. was calculated by mean  $\pm$  1SD, 2SD or 3SD. They cover most of observations of study and having almost 100% accuracy.

#### OBSERVATION

Table 1 & 2 shows Range, mean, standard deviation (S.D.) and demarking points for index 1 and index 2 respectively

#### DISCUSSION

Table 3 shows the comparison of results of present study with that of Shamer Singh and Butchi raju [6] for index 1. In present study in right sided bones

percentage of identified bones beyond D.P. are 51.85% and 44.44% in male and female respectively; while in study by Shamer et al [6] they were 10% and 0% in male and female respectively.

Table 1: Statistical parameters for INDEX 1

	Right Side		Left Side	
	Male	Female	Male	Female
<b>Range</b>	51.78 – 91.11	43.33 – 75.92	50.94 – 106.97	45.58 – 81.25
<b>Mean</b>	66.58	58.17	69.32	59.15
<b>S.D.</b>	8.76	7.4	11.02	9.13
<b>Mean +1 SD</b>	57.82 - 75.34	50.77- 65.57	58.30 – 80.34	50.02 – 68.28
<b>Demarking point</b>	>65.57	<57.82	>68.28	<58.3
<b>% Beyond DP</b>	N= 14, 51.85%	N=12, 44.44%	N= 12, 44.44%	N=13, 48.14%
<b>Mean +2 SD</b>	49.06 – 84.10	43.37 – 72.97	47.28 - 91.36	40.89 - 77.41
<b>Demarking point</b>	>72.97	<49.06	>77.41	<47.28
<b>% Beyond DP</b>	N=5, 18.51%	N=3, 11.11%	N=3, 11.11%	N=3, 11.11%
<b>Mean +3 SD</b>	40.30 – 92.86	35.97 – 80.37	36.26 - 102.38	31.76 – 86.54
<b>Demarking point</b>	>80.37	<40.3	>86.54	<36.26
<b>% Beyond DP</b>	N=1, 3.7%	N=0, 0%	N=0, 0%	N=0, 0%

Table 3 also shows that on left side, In present study percentage of identified bones beyond D.P. are 44.44% and 48.14% in male and female respectively ; while in study by Shamer et al [6]

Table 2: Statistical parameters for INDEX 2

	Right Side		Left Side	
	Male	Female	Male	Female
<b>Range</b>	12.76 – 66.66	19.60 – 76.92	10.00 – 53.22	17.02 – 60.60
<b>Mean</b>	28.98	44.04	31.46	44.24
<b>S.D.</b>	11.38	10.96	10.86	10.09
<b>Mean +1 SD</b>	17.6 - 40.36	33.08 - 55	20.6 – 42.32	34.15 - 54.33
<b>Demarking point</b>	<33.08	>40.36	<34.15	>42.32
<b>% Beyond DP</b>	N= 19, 70.37%	N=18, 66.66%	N= 15, 55.55%	N=16, 59.25%
<b>Mean +2 SD</b>	6.22 – 51.74	22.12 – 61.96	9.74 – 53.18	24.06 – 64.42
<b>Demarking point</b>	<22.12	>51.74	<24.06	>53.18
<b>% Beyond DP</b>	N=7, 25.92%	N=6, 22.22%	N=8, 29.62%	N=4, 14.81%
<b>Mean +3 SD</b>	-5.16 – 63.12	11.16 – 76.92	-1.12 – 64.04	13.97 – 74.51
<b>Demarking point</b>	<11.16	>63.12	<13.97	>64.04
<b>% Beyond DP</b>	N= 0, 0%	N=1, 3.7%	N=1, 3.7%	N=0, 0%

they were 15% and 0% in male and female respectively

Table 3: Comparison of INDEX 1 in various studies

	Present study		Shamer singh and butchi raju	
	Male	Female	Male	Female
RIGHT SIDE				
<b>Mean</b>	66.58	58.17	65.12	53.69
<b>S.D.</b>	8.76	7.4	8.24	8.9
<b>Mean +1 SD</b>	57.82 - 75.34	50.77- 65.57		
<b>Demarking point</b>	>65.57	<57.82	>80.01	<40.40
<b>% Beyond DP</b>	N= 14, <b>51.85%</b>	N=12, <b>44.44%</b>	<b>10 %</b>	<b>0 %</b>
LEFT SIDE				
<b>Mean</b>	69.32	59.15	64.48	53.03
<b>S.D.</b>	11.02	9.13	12.17	7.28
<b>Mean +1 SD</b>	58.30 – 80.34	50.02 – 68.28		
<b>Demarking point</b>	>68.28	<58.3	>74.87	<27.97
<b>% Beyond DP</b>	N= 12, <b>44.44%</b>	N=13, <b>48.14%</b>	<b>15 %</b>	<b>0 %</b>

Table 4: Comparison of INDEX 2 in various studies

	Present study		Shamer singh and butchi raju	
	Male	Female	Male	Female
RIGHT SIDE				
<b>Mean</b>	28.98	44.04	14.61	33.7
<b>S.D.</b>	11.38	10.96	3.41	6.76
<b>Mean +1 SD</b>	17.6 - 40.36	33.08 - 55		
<b>Demarking point</b>	<33.08	>40.36	<13.48	>24.84
<b>% Beyond DP</b>	N= 19, <b>70.37%</b>	N=18, <b>66.66%</b>	<b>45 %</b>	<b>95 %</b>
LEFT SIDE				
<b>Mean</b>	31.46	44.24	15.0	32.81
<b>S.D.</b>	10.86	10.09	4.23	5.93
<b>Mean +1 SD</b>	20.6 – 42.32	34.15 - 54.33		
<b>Demarking point</b>	<34.15	>42.32	<15.95	>27.68
<b>% Beyond DP</b>	N= 15, <b>55.55%</b>	N=16, <b>59.25%</b>	<b>48 %</b>	<b>82 %</b>

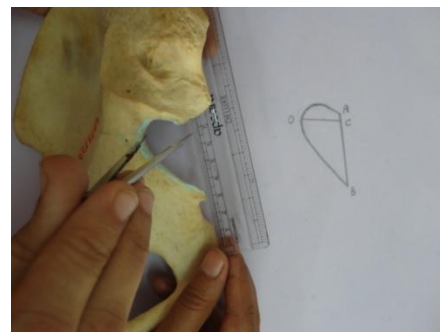
Table 4 shows the comparison of results of present study with that of Shamer Singh and Butchi raju [6] for index 2. In present study percentage of identified bones beyond D.P. are 70.37% and 66.66% in right sided male and female respectively; while in study by Shamer et al [6] they were 45% and 95% in male and female respectively.

Table 4 also shows that on left side, In present study percentage of identified bones beyond D.P. are 55.55% and 59.25% in male and female respectively ; while in study by Shamer et al [6] they were 48% and 82% in male and female respectively

Index 1, which depends on depth and width of the greater sciatic notch, was accordingly not much help in the sexing of hip bones. It was found to be higher in males which confirm earlier reports. (Figure: 2)

The length of the posterior segment and index 2 are found to be very useful in sex determination. (Figure: 2)

Figure 1: Measurement of greater sciatic notch

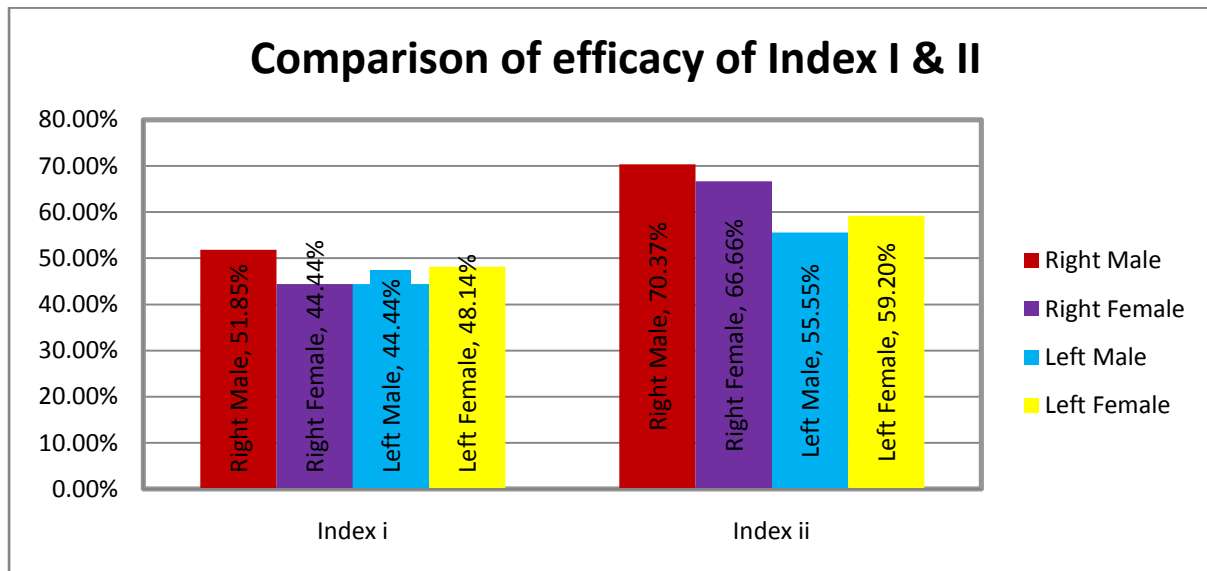


## CONCLUSION

From the above findings of study it proves that posterior segment of GSN is more useful and percentage bones correctly identified by index II are more than index I.

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Date of Submission: 07.12.2013  
Date of Acceptance: 21.12.2013

**How to cite this article:** Gohil D, Rathod SP, Adhvaryu M, Chauhan A, Joshi H. A study of greater sciatic notch as an indicator of sex determination of adult human hip bone. J Res Med Den Sci 2013;1(2):52-55

**Source of Support:** None  
**Conflict of Interest:** None Declared