Section: Anatomy

Original Research Article

IDENTIFICATION OF SEX FROM GREATER SCIATIC NOTCH

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ABSTRACT

Background: Sexual dimorphism of the hip bone is present right from fetal life and could be due to the secretion of sexual hormones in intrauterine life. (IUL) Variations in the secretion of sex hormones may confuse the medico-legal expert; hence, a morphometric study of the greater sciatic notch is carried out.
Materials and Methods: 30 male and 20 female adult hip bones are studied metrically to know the parameters of GSN in both sexes. The depth and breadth were measured by a digital vernier caliper. The index of the sacral notch was $\frac{Depth\ of\ GSN}{Bread\ of\ GSN}\ X\ 100$
Was calculated Bread of GSN: **Result:** 4.13 (± 0.16) in males, 4.35 (± 0.19) in females, and the t-test was 4.40, and the p-value was significant ($p < 0.001$). Depth of GSN 3.42 (± 0.38), 2.22 (± 0.40); the t-test was 7.14 and 0.000 (highly significant). In the sacral notch index study, 119.6 (± 2.26) in males and 116.4 (± 2.40) in females, the t-test was 7.23 and $p<0.00$ (highly significant).
Conclusion: This GSN metrical study will be quite useful to medico legal expert, anthropologists and anatomists because morphometric values of mesodermal derivatives are uncertain.

INTRODUCTION

Determination of the sex of an unknown individual is a challenge to medico-legal experts.[1] It is rightly said that the skeleton of a particular individual is able to adopt to its owner's way of life. Because bone is the most plastic tissue, it has the ability to adapt its structure to meet the changing demands and to restore its structural integrity and functional efficiency under such scenarios sexual dimorphism is quite interesting and ambiguous.[2] It has been universally accepted that the pelvic girdle, or hip bone, being the most dimorphic bone, is the most reliable sex indicator.[3] Sex differences of the hip bones are present right from fetal life which could be due to the secretion of sex hormones in intrauterine life, but variations in the secretion may confuse the medico legal expert for sexual dimorphism study,[4] hence, an attempt is made to compare the male greater sciatic notch with the female greater sciatic notch by morphometric study.

MATERIALS AND METHODS

30 male and 20 female hip bones present in the Anatomy Department of Khaja Banda Nawaz University, Faculty of Medicine, Kalaburgi, Karnataka-585104 were selected for study.

Inclusion Criteria: Non-pathological, dried adult bones of known sex were included in the study.

Exclusion Criteria: Broken, pathological bones were excluded from the study.

Method: Three parameters were used to study the sexual dimorphism of the sciatic notch. Out of their three parameters depth and breadth of the sciatic notch were measured by digital caliper, while the third parameter was calculated as

Index of sacral notch = $\frac{Depth\ of\ sacral\ notech}{Bread\ of\ sacral}\ X\ 100$

Maximum depth was measured as perpendicular distance (CD in figure no-1), between sciatic notches. Maximum width: measured as the distance between the posterior inferior iliac spine (point B in figure no – 1) and ischial spine (point A in figure-1).

The sacral notch Index was calculated $\frac{CD}{AB}\ X\ 100$

The Duration of study was from February 2024 to March 2025.

Statistical Analysis: All three parameters were compared in both sexes by t-test. The statistical analysis was carried out using SPSS software.

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Figure 1: Dimensions of the great sciatic notch: (A) posterior inferior iliac spine; (B) Ischial spine; (AB) width of the greater sciatic notch; (CD) depth of the greater sciatic notch; (AC) width of the upper part of the greater sciatic notch.

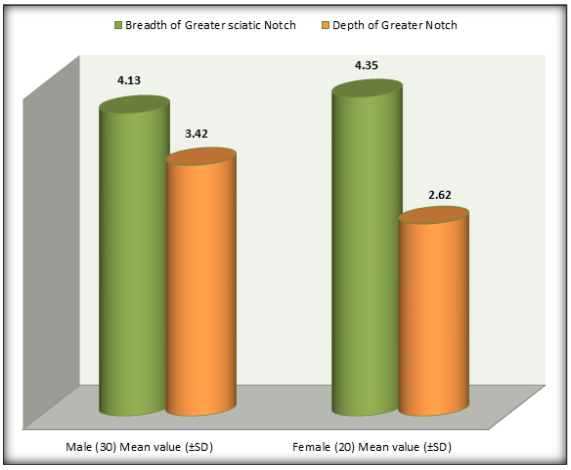

Image 1: Comparison of Breath and depth of Greater sciatic notch in both sexes

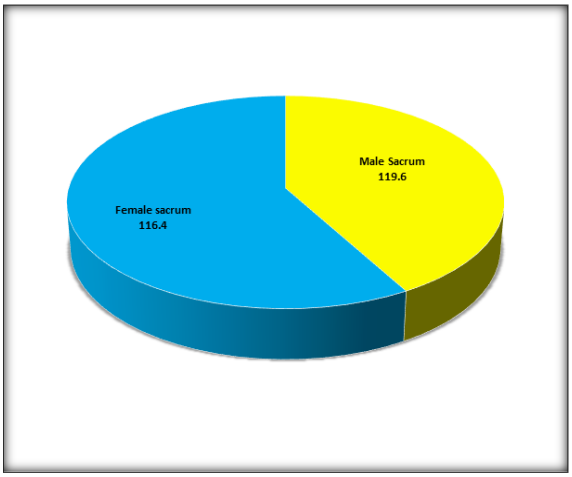

Image 2: Comparison of sacral Notch in both sexes

RESULTS

Table 1: a) Comparison of Breadth of greater sciatic notch 4.13 (SD± 0.16) in males, 4.35 (SD± 0.19) in females, t test 4.40 and p value is highly significant (p<0.001).

b) Depth of greater sciatic notch – 3.42 (SD± 0.42) in males, 2.62 (SD± 0.40) in females and t test 7.14 and p<0.00 (highly significant)

Table 2: Comparison of sacral notch Index in both sexes 119.6 (SD± 2.26) in males, 166.4 (SD± 2.42) in females, t test was 7.23 and p value was highly significant (p<0.00).

Table 1: Comparison of Breath and depth of Greater sciatic notch in both sexes

Sl. No	Parameters	Male (30) Mean value (±SD)	Female (20) Mean value (±SD)	t test	p value
a	Breadth of Greater sciatic Notch	4.13 (± 0.16)	4.35 (± 0.19)	4.40	P<0.001
b	Depth of Greater Notch	3.42 (± 0.38)	2.62 (± 0.40)	7.14	P<0.001

Table 2: Comparison of sacral Notch in both sexes

Parameter	Male Sacrum Mean value (±SD)	Female sacrum Mean value (±SD)	t test	p value
Sacral notch Index	119.6 (± 2.26)	166.4 (± 2.40)	7.23	P<0.001

(p<0.001 = p value is highly significant)

DISCUSSION

In the present study of sexual dimorphism of GSN in the North Karnataka population. The breadth of the GSN was 4.13 (SD ± 0.16) in males and 4.35 (SD ± 0.19) in females; the t-test was 4.40, and the p-value was 7.14, which was highly significant (p < 0.001). The depth of the GSN was 3.19 (SD ± 0.38) in males and 2.62 (SD ± 0.40) in females; the t-test was 7.14, and the p-value was highly significant (Table 1). Comparative study of sacral notch Index 7.14 (SD± 2.26) in males and 116.4 (SD± 2.40) in females; the t-test was 7.23, and the p-value was highly significant (p<0.00) (Table 2). These findings are more or less in agreement with previous studies.[5,6,7]

In early 1875, it was observed that the GSN was found to be significantly wider in females than males

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irrespective of the side of the bone during archaeological studies.[8]

The main feature of the sacral margin of the human ilium is the GSN. This U-shaped indentation is functionally related to the orientation and position of the sacrum in its articulation with the ilium. The sacrum is bent and becomes deeper in females to widen the pelvis and GSN also. Moreover, anterio-posterior orientation of the sacrum is a unique morphology that is a specific adaptation to bipedal locomotion. The morphology of the sacrum has a greater impact on the GSN because the GSN is functionally related to the orientation and position sacrum; hence, the GSN is wider in females than in males, as bipedal locomotion differs in both sexes.[9]

In comparing male and female hip bones, it is noticed that the GSN, or iliosciatic notch, as it is better termed, differs markedly in the two sexes. In men, the margins of the notch enclose a relatively deep and narrow excavation; in the posterior margin slopes backwards in such a way as to form a shallow side arch in striking contrast to that in the male. This difference in shape is associated with a difference in the position of the particular surface for the sacrum and therefore of the sacrum itself, such that it stands further back in the pelvis. This implies a greater length of the iliac part of the ilio-pectineal line in women, and in conjunction with this, there is a lessening in the extent of rough area behind the auricular surface. These are well-recognized sexual characters.

It is also reported that hormones play a vital role in the growth and modeling of bones in both sexes; hence, there could be variations in the metrical parameter of GSN.[10]

As tuberosities and tubercles and the degree of elevation of the crest are formed in direct response to the pull of tendons or ligaments, hence, due to the heavy pelvis in adult females have more pronounced tuberosities and tubercles, leading to variations in metrical parameters of bony elements.[11]

CONCLUSION

The present study of sexual dimorphism in the greater sciatic notch is useful to medico-legal experts, anthropologists, and anatomists to identify the sex as the adult hip bones are studied. It will be more useful to medico-legal expert because crimes in adult rather than elderly people. But this study demands genetic embryological, nutritional, studies because exact mechanism and factors of ossification in both sexes is still unclear.

Limitation of study: Owing to tertiary location of research centre, small number of patients lack of latest techniques we have limited finding and results.

- This research work was approved by the ethical committee of KBN University, Faculty of Medicine, Kalaburgi, Karnataka-585104.
- No Conflict of Interest
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