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A Study of Sciatic Notch Index in Adult Human Pelves to Establish their Sexual Dimorphism

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Abstract

Objective: To find out the relation between sciatic notch index of adult human male and female from specimens present in the museum and inventory.

Methodology: All bony specimens for study were taken from the museum of Forensic Medicine Department and Anatomy Department of Medical College, Kolkata and also from the inventory of Kolkata Police Morgue, based on the exclusion and inclusion criteria. They are arranged systematically by putting a unique number code against each specimen and measurements are taken of dimensions of sciatic notch using the standard measuring tools and following standard anthropometric methods.

Results: Z test is done. n= 104, F=56 and M=48. For males and for females the mean Depth of sciatic notch is found to be 3.81 and 2.98 respectively.(Table 2) The mean Width of the same in males and females are found to be 3.48 and 4.23 respectively. SN Index of males and females are found to be 103.93 and 146.02 respectively.(Table 3)

Conclusion: The differences are found to be statistically significant from the specimens taken for study. As such sciatic notch index in adults may be considered to be a dependable anthropometric entity for sexing of human pelvis, particularly in mutilated and fragmented skeletal parts.

Keywords: Sciatic notch index; Adult human pelvis; Sexual dimorphism; Variability.

Introduction

In forensic and archaeological studies, there is the need for identification of human skeletal remains, particularly in respect to the "big four" traits of identification that is- age, sex, race and stature.[1] Distinctive morphological patterns and sexual dimorphism of the human hip bone makes it of interest from the- anthropological, anatomical and forensic point of view.[2] Shape of the greater sciatic notch has attracted great attention in the past. Kelley used the sciatic notch is to acetabular ratio as the osteometric method to differentiate between male and female hipbones.[3] In the present study an attempt has been made to find out the baseline data of specified parameters pertaining to the sciatic notch of 104 hip bones of predetermined sex.

Aims and Objectives

1. To measure the depth and width of sciatic notch of the coded pelves.
2. To calculate the sciatic notch indices from data such generated.
3. To calculate the statistical significance of sciatic notch indices in relation to sexual dimorphism.
4. To create a baseline data in relation to different parameters studied.

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Materials and Method

Study design: Cross sectional Observational study.

Study period: 8 (eight) days.

Place of study–

- Department of Anatomy, Medical College, Kolkata.
- Department of Forensic Medicine, Medical College, Kolkata.
- Kolkata Police Morgue of Medical College, Kolkata.

Study population: All dried specimens of completely ossified human pelves / hip bones were collected from the museum and inventory. Total 104; Female 56 and Male 48.

Inclusion criteria:

1. All the adult hip bone of both the sexes (predetermined) was collected from the museum of Anatomy and Forensic Medicine Department and also from the inventory of Kolkata Police Morgue.
2. Sex - all inclusive
3. Age – Completely ossified hip bones i.e. Adult hipbones and pelves

Exclusion criteria:

1. Charred, mutilated and fragmented bones.
2. Hip bones/ pelves with discernible pathologies and anomalies both congenital and acquired.
3. Hip bones/ pelves lacking evidence of complete ossification of all the secondary ossification centres.

Sample size: Total 104, male-48, female-56.

Study tools and techniques

All cases presented during the period of study were considered for study after observing the inclusion and exclusion criteria. Measurements were taken with the help of a vernier caliper. For width of sciatic notch (AB) (Fig. 1) first ischial spine was marked as 'A' and posterior inferior iliac spine was marked as 'B'. A straight line was drawn between A and B using a simple metallic ruler. For depth of sciatic notch (CO) - perpendicular line was drawn from midpoint of apex of the notch "C" to the Width of the notch and marked as 'O' applying standard anthropometric tools and techniques.

The data thus collected were tabulated in MS Excel sheets and analysed using SPSS software.

Review of literature

Over the years, different authors had carried various types of studies based on measurements of human greater sciatic notch of different sex and races. According to Straus (1929) the greater sciatic notch in man is better developed than and, shows sex differences not observed in, other primates . Washburn (1948) pointed out that the sex difference in the greater sciatic notch belonged to a system different from that of the pubic bone, and that it was not correlated with the subpubic angle 4 . This study was carried out to determine if indices in the sciatic notch can be used in sexing of the hip and as such entire skeleton. Sex determination from bone is very useful for anatomy, forensic and anthropological field work. Hip bone is most commonly used bone for sex identification. Reddy K. S. N., Murty O. P., in the textbook, "The Essentials of Forensic Medicine and Toxicology", 34th edition, states that sciatic notch index of male is 4 to 5 and that of female is 5 to 6 in case of foetuses. Aggrawal A., in the, "Textbook of Forensic Medicine and Toxicology", 3rd edition, states that the sciatic notch index in adult male is 145 and in adult female is 166. In male fetus its 4–5 and in female fetus it is 5–6.[5] Biswas G. in his book, "Review of Forensic Medicine and Toxicology", 2nd edition states that the greater sciatic notch index in male is 4–5 and in female it is 5–6 (fetus).[6] Knight B., Saukko P. in his book, "Knight`s forensic Pathology", 3rd edition, states that the greater sciatic notch is an important criterion, being deep and narrow in male and wide and open in female. They also mentioned that the greater sciatic notch was one of the best discriminants for sex, claiming 75% success rate using this criterion alone.[7] Dnyanesh S, Dnyanesh DK, Phaniraj S, Mallikarjun M, Vijayshri BH, Kapil A et al. in the study in 2013 on 100 dry hip bones in the Jawaharlal Nehru Medical College, at Belgaum over a period of 1 year noted that the greater sciatic notch of hip bone is found to be useful in sex determination which is a critical question encountered when a bone of unknown sex is found. It was found that the mean values of width, posterior segment, posterior angle, total angle, index I and index II of males were significantly lesser than that of females both on right and left sides.[8] Thus we would have better guidelines for archeological and forensic analyses.

Consent for study

As the study was carried out on the bones taken from the museum and inventories of Medical College, patient consent was not required. Permission to get access to the museum of the departments of anatomy, and FSM and inventory of Kolkata Police Morgue for the study was obtained from the HODs of Anatomy Department and FSM Department of Medical College, Kolkata.

Results and Analysis

Table 1: Comparison of Mean Depth of Sciatic Notch.

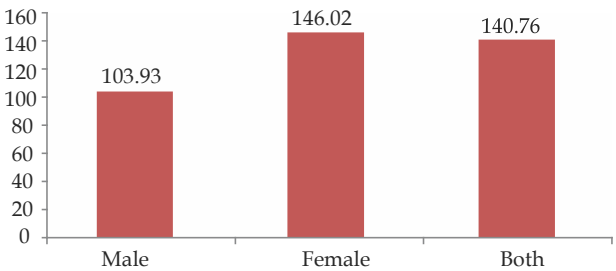
Variable	Sex	Total (n) 104	Mean (cm)	Median (cm)	Mode (cm)	SD (cm)	p Value
Depth of Sciatic Notch	M	48	3.81	3.80	3.30	0.87	<0.05
	F	56	2.98	3.00	3.00	0.55	
	M+F	104	3.08	3.00	3.00	0.66	

Table 2: Comparison of Mean Width of Sciatic Notch in males and female.

Variable	Sex	Total (n) =104	Mean (cm)	Median (cm)	Mode (cm)	SD (cm)	p Value
Width of Sciatic Notch	M	48	3.48	3.45	3.30	0.84	<0.05
	F	56	4.23	4.00	3.00	0.57	
	M+F	104	4.13	4.00	3.00	0.65	

Table 3: Comparison of Sciatic Notch Index of males and females.

Variable	Sex	Total (n)=104	Mean (cm)	Median (cm)	Mode (cm)	SD (cm)	p Value
Sciatic Notch Index	M	48	103.93	91.45	N/A	28.81	<0.05
	F	56	146.26	143.00	160.00	31.34	
	M+F	104	140.76	134.00	160.00	33.86	



Graph: Sciatic Notch Index of female>male.

Z test was done. N= 104, F=56 and M=48. For males and for females the Mean Depth of sciatic notch was found to be 3.81 and 2.98 respectively. The Mean Width of males and females was found to be 3.48 and 4.23 respectively. SN Index of males and females were found to be 103.93 and 146.02 respectively.(Table 1)

Table 4: Comparison of Range of Depth, Width and Sciatic Notch Index in males and females.

	Male	Female	Both
Range of Depth	2.30–5.10	1.5–4.10	1.5–5.10
Range of Width	2.00–4.50	3.00–6.00	2.00–6.00
Range of Sciatic Notch Index	88.00–173.00	103.00–253.00	88–253.00

Fig. 1: Sciatic Notch, showing AB = width, OC= depth.

Discussion

Sexual dimorphism of the human hipbone has been extensively researched, reviewed and published in forensic as well as in anthropological literature. Bernard Knight states that- greater sciatic notch was one of the best anatomical landmark for sex determination claiming 75% success rate . In studies of Dnyanesh ($p<0.05$) , Kalsey ($p=0.02$)[9] and Devadas ($p=0.0003$)[10] width of female > male. Patriquin, reported Depth of the greater sciatic notch of males > females. Width of the greater sciatic notch of females > males. Sex determination was attempted by Rajangam on 140 hip bones. 87.7% of hip bones was accurately classified pelvic height, sciatic notch width, acetabular height were the most useful indicators.[11] A study was done in P D U Medical College of Gujrat to see the efficacy of sciatic notch index, n = 108 hip bone. Sciatic Notch Index was found to be 51.85% accurate in determining males.(Table 4 and graph 1) In this study also the difference in the mean values of

Sciatic Notch Index of male and female hip bones was found to be statistically significant ($p<0.05$).[12]

Limitations of the study

- The degree of sexual dimorphism is population and region specific.
- Study with a larger number of specimens of both sexes might have yielded more accurate result.

Conclusion

The difference between mean depth and mean width of Sciatic notch were statistically significant among male and female. Sciatic Notch Index of female was found to be more than that of male. Depth of sciatic notch was found to be more in males. Replicative studies need to be performed using digital calliper measurements. Recommendations- Approach needs to be further worked out with a larger sample preferably in a multicentre study. Ample scope to examine the regional variations in Indian bones and its applicability in sexual dimorphism of skeletal remains.

Conflict of interest: Nil.

Ethical clearance: Ethical clearance and approval taken from the Institutional Ethics Committee of Medical College, Kolkata.

Source of funding: The study was conducted within the set-up of a state government medical college with the help of self-funding when and where required.

References

1. Reddy KS, Murty OP. The essentials of forensic medicine and toxicology. 34th ed. New Delhi:Jaypee;2017.p.55–97.
2. Shah S, Zalawadia A, Ruparelia S, Patel S, Rathod S P and Patel SV : Morphometric study of a greater sciatic notch of dry human hip bone in Gujrat region. Gandhinagar : NJIRM, 2011; Vol. 2, Issue 2, p 27–30.
3. Mukhopadhyay P P. Determination of Sex by Sciatic Notch/Acetabular Ratio (Kelley's Index) in Indian Bengali Skeletal Remains. J Indian Acad Forensic Med. Jan- March 2012, Vol. 34, No. 1 : 27–30.
4. Singh S and Potturi B R : Greater sciatic notch in sex determination, Varanasi : J Anat (1978), 125 p 619–24.
5. Aggrawal A. Textbook of Forensic Medicine and Toxicology. 3rd ed. New Delhi: Avichal Publishing Company; 2017. p170–2.
6. Biswas G. Review of Forensic Medicine and Toxicology 2nd edition. Jaypee Publications. 2012. p67.
7. Knight B, Saukko P.Knight`s Forensic Pathology 3rd edition. Hodder Arnold. 2004. P111.
8. Dnyanesh S,Dnyanesh DK, Phaniraj S, Mallikarjun M, Vijayashri BH, Amgain K. Study of greater sciatic notch in sex determination of hip bone by metric method. IOSR Journal of Dental and Medical Sciences. 2013;10(4):18–23.
9. Kalsey G, Singla R, Sachdeva K. Role of the greater sciatic notch of the hip bone in sexual dimorphism: a morphometric study of the North Indian population. Medicine, Science and the Law. 2011;51(2):81–86.
10. Devadas P, Bansode SA, Vinila BS. Greater sciatic notch as an indicator of sex in human dead fetuses of south indian origin. Int J Anat Res. 2017;5(2.3):3930– 33.
11. Rajangam S, Janakiram S, I.M. Thomas, Sexing of hip bones of Karnataka origin, J. Anat. Soc. India, 40, 1991, 105–8.
12. Gohil D, Rathod SP, Adhvaryu M, Chauhan A and Joshi H : Greater sciatic notch as an indicator of sex determinantion of adult hip bone. Gujrat : JRMDS,2013; Vol.1, Issue 2, p 52–5.