

Frequency of Sacralisation of Fifth Lumbar Vertebra in South Punjab Pakistani Population

SABAHAT GUL¹, SUMMAIRA HASSAN², SAEED KANWAL³, OWAIS HAMEED⁴

¹Associate Professor, Anatomy, Quaid-e-Azam Medical College Bahawalpur.

²Associate Professor, Community Medicine, Quaid-e-Azam Medical College Bahawalpur

³Associate Professor, Anatomy, Allama Iqbal Medical College Lahore

⁴Professor of Anatomy, Sheikh Zayed Medical College Rahim Yar Khan

Correspondence to Dr. Sabahat Gul, Email: noshee02@hotmail.com Cell: 03006812232

ABSTRACT

Background: Lumbosacral joint carries whole body weight and transmits it to tibia. As the 5th Lumbar Vertebra transits into first Sacral Vertebra, fifth Lumbar Vertebra may be fused on one or both sides to the first Sacral Vertebra, Condition known as 'Sacralisation'.

Aim: To find the frequency of sacralisation of 5th Lumbar Vertebra in South Punjab Pakistani Population.

Methods: It was a descriptive observational study conducted in Anatomy Department Quaid-e-Azam Medical College, Bahawalpur. This was descriptive observational study conducted on cadaveric sacra collected in last 7 years. 86 dry Human adult sacra of known sex were observed and results were noted for Sacralisation of Lumbar Vertebra.

Results: Out of 86 cadaveric Sacra, Sacralisation was found in 12(14%). Out of these 12, 8 Sacra showed complete Sacralisation while 4 Sacra showed incomplete Sacralisation.

Conclusion: Sacralisation of 5th Lumbar Vertebra is common (14%) in cadaveric sacra of South Punjab, Pakistani Population.

Key words: Lumbar Vertebra, Sacralisation, Cadaveric, L5 (5th lumbar vertebrae), S1 (1st Sacral Vertebrae).

INTRODUCTION

Human sacrum is a large, triangular bone and formed by fusion of five sacral vertebrae and inserted like a wedge between the two innominate bones¹. Base of sacrum is present cranially and articulates with fifth lumbar vertebra, Apex is present caudally and articulates with first coccygeal vertebra, forming four pair of sacral foramina². Vertebrae form from the sclerotome portion of the somites, which are derived from paraxial mesoderm³. Embryologically vertebrae are bi-segmental in development and each vertebra receives contribution from the caudal half of one sclerotome and cranial half of succeeding one (Breathnach, 1958)⁴. The neural arch, pedicles and costal elements develop almost entirely from the dense caudal half of a somite and thus attach to upper half of vertebral body. Thus cranial shift results in sacralisation of the last lumbar vertebra and caudal shift result in lumbarisation of the first sacral vertebra. Improper formation, migration, differentiation and union of somites results into segmental vertebral abnormalities. Cranial shifts are dominant over caudal shifts, so sacralisation is more common than lumbarisation (Sharma et al., 2011)⁵. Vertebral foramen of 5th lumbar vertebra contains cauda equina and spinal meninges¹. Sacralisation or lumbarisation is seen in Lumbo-Sacral transitional vertebra. Sacrum may consist of six vertebrae due to additional element of last lumbar vertebra incorporation. This inclusion of 5th Lumbar vertebra is called sacralisation. Reduction of constituents of sacrum of sacral vertebra may occur and is called lumbarisation. Complete sacralisation is when complete bony fusion of body and transverse process of 5th Lumbar vertebra and Sacrum. If there is distinct joint line between

process and sacrum, it is incomplete sacralisation⁶. It may be unilateral and bilateral. If sacrum has 5 pairs of sacral foramina and 6 vertebral segments it is frank sacralisation. If sacrum is high in pelvis and spinous process of last Lumbar vertebra is above iliac crests it is occult sacralisation⁴. So there exists a need to rule out that is there a strong relationship of lumbosacral vertebral anomalies and low back pain, degenerative spondylolisthesis, Lumbar disc herniation.

The aim of the study was to find the frequency of sacralisation of 5th Lumbar Vertebra in South Punjab Pakistani Population.

MATERIAL AND METHODS

This descriptive observational study was conducted after ethical committee approval, in the Department of Anatomy, Quaid-e-Azam Medical College Bahawalpur. This study was conducted on 86 dried cadaveric Human sacra of known sex, collected in last 7 years. Damaged, broken bones were excluded from the study. All the sacra were carefully observed with naked eyes for the frequency of sacralisation, Lumbarisation, Pelvic sacral foramina, dorsal sacral foramina, no. of sacral segments, sacral hiatus & sacral cornua, complete & incomplete sacralisation was also noted. All observations were noted, simple frequencies and percentages were calculated & presented in the form of tables and figures.

RESULTS

This study conducted on 86 cadaveric dried sacra, showed that in out of 86 sacra, 58(67.44%) were males and 28 (32.55%) were females (fig.1) Sacralisation was found in 12 (14%) [fig.2]. Out of these 12, 8(66.66%) showed complete sacralisation while 4(33.33%) showed

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incomplete sacralisation (fig. 3). 8 sacra showed complete fusion of L5 and S1, no space was found between vertebral bodies, laminae and transverse process were completely fused. (Fig. 5,6,8). Out of 4 incomplete sacralisation, one sacrum (Fig. 4) had visible suture line between 5th lumbar and first sacral segment while laminae, transverse process and spinous process showed complete fusion. Another sacrum (Fig. 7) showed distinct space between L5 and S1 vertebral bodies (7a) while on dorsal surface (7b) incomplete fusion of Laminae, transverse processes and spinous process was observed. One of the incompletely sacralised sacrum (Fig. 9) showed unilaterally incomplete sacralisation on ventral surface (9a) right side. Transverse process of L5 is completely separated from transverse process of S1 (9a) while on dorsal surface (9b) incomplete fusion of laminae and spinous processes is clearly visible. Out of 8 sacra showing complete sacralisation, one had visible suture line in between 5th Lumbar and first sacral segment while the transverse processes were completely fused (fig.04) while rest of the 7 completely sacralised sacra showed complete fusion (fig 5, 6, 7, 8) out of 4 incompletely sacralised sacra, one sacrum showed unilateral fusion of transverse process on the left side while on the right side no fusion was found (Fig. 9)

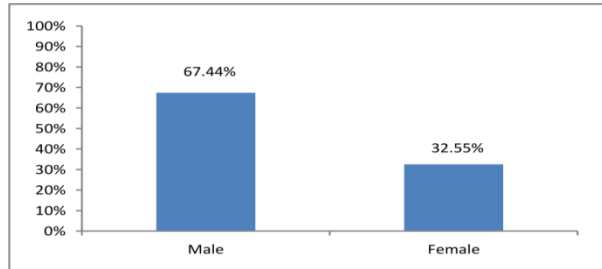


Fig.1: Gender distribution of cadaveric sacra

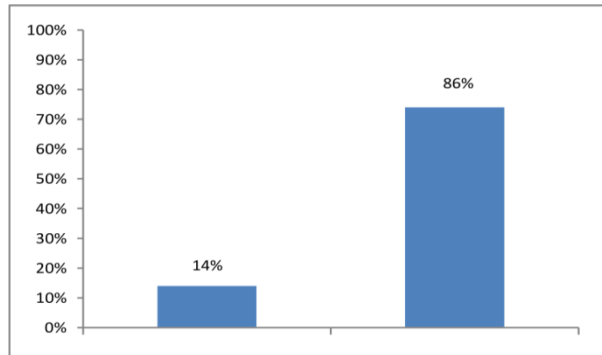


Fig: 2: Frequency of Sacralisation.

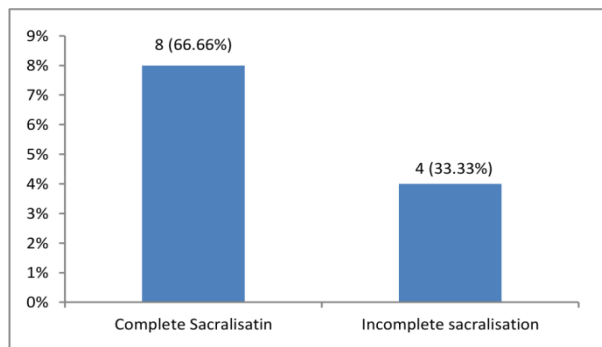


Fig: 3: Complete and incomplete sacralisation

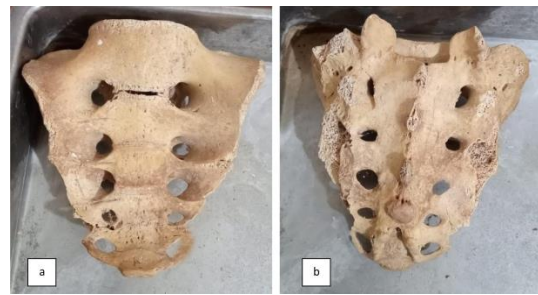


Fig: 4: Incomplete Sacralisation
Ventral (a) and dorsal (b) surfaces of sacrum showing five pairs of ventral & dorsal sacral foramina between six vertebral bodies and incomplete fusions of vertebral bodies between L5 and S1.

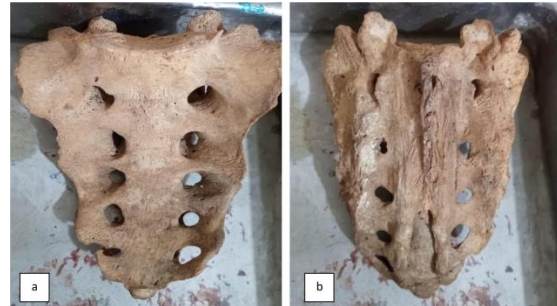


Fig: 5: Complete Sacralisation
Ventral (a) and dorsal (b) surfaces of sacrum showing five pairs of ventral and dorsal sacral foramina between six vertebral bodies and complete fusion of the vertebral bodies & laminae of L5 and S1 vertebrae without any disc space between them. However sacral hiatus was noted higher near 3rd sacral dorsal foramen.

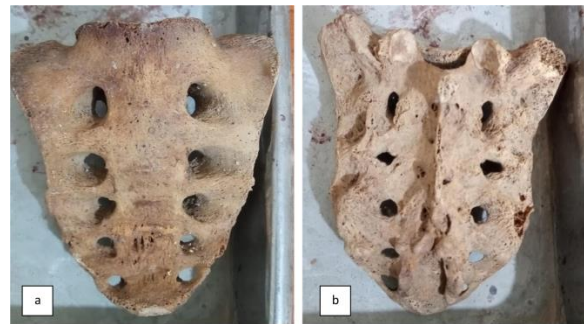


Fig: 6: Complete Sacralisation.
Ventral (a) and dorsal (b) surfaces of sacrum showing five pairs of ventral and dorsal sacral foramina between six vertebral bodies and complete fusion of vertebral bodies, Laminae of L5 are also fused between L5 and S1.



Fig: 7: Incomplete Sacralisation
Ventral (a) and dorsal (b) surfaces of sacrum showing five pairs of ventral and dorsal sacral foramina between six vertebral bodies

and complete fusion between L5 and S1, while sacral hiatus is higher.

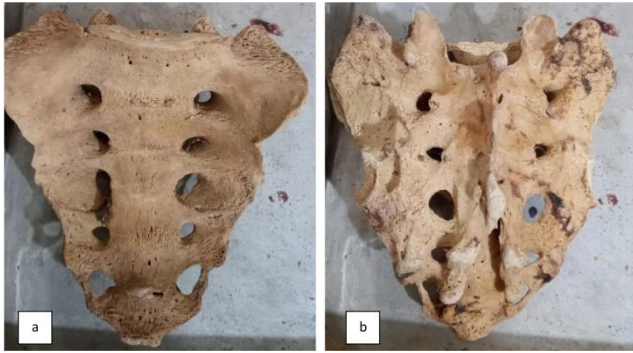


Fig. 8: Complete Sacralisation

Ventral (a) and dorsal (b) surfaces of sacrum showing five pairs of ventral and dorsal sacral foramina between six vertebral bodies and incomplete fusion of Laminae of L5 and S1. Vertebral bodies spinous process, laminae and transverse process of L5 and S1 are not fused on dorsal surface (b)

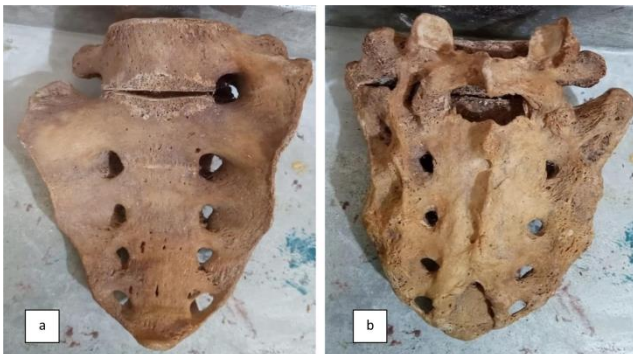


Fig. 9: Incomplete Sacralisation (unilateral)

Ventral (a) and dorsal (b) surfaces of sacrum showing incomplete sacralisation between L5 and S1. Distinct space between L5 & S1 (9a) Lamina, transverse process & Spinous process of L5 shows incomplete fusion with S1 on dorsal surface (9b).

DISCUSSION

This study conducted on 86 dried cadaveric sacra, 58(67.44%) were males and 28(32.55%) were females. These findings were similar to study conducted in India where 76.9% sacra were of Males and 23.1% of females¹.

Our study proved that out of all sacra, sacralisation was found in 14% of sacra. This was in contrast to study conducted in India where 7.7% sacra showed sacralisation⁷. This was also in contrast to another study in Chennai India where sacralisation was found in 6% of Sacra⁶.

Out of 12 sacralised sacra, 66.66% showed complete sacralisation which was nearly similar to study conducted in India where 50% showed complete sacralisation.⁷

Our study showed that out of 4 incompletely sacralised sacra, 3 (75%) sacra showed distinct residual space present between L5 and S1 which was nearly similar to findings of study on Cadaveric Sacra in Dhule, India, where all of incompletely sacralised sacra showed residual space.⁷

It was proved in this study that ventral and dorsal surfaces of all sacra having sacralisation showed 5 pairs of sacral foramina in between the six vertebral bodies similar to study of Dhule, India where 5 sacral foramina were found on ventral and dorsal surfaces of all sacra⁷.

Studies have shown association of sacralisation with low back pain and leads to various spinal conditions like disc herniation, disc degeneration and spinal stenosis. Knowledge about sacralisation is necessary for anesthetic and surgical intervention for physicians as well as surgeons.

CONCLUSION

Sacralisation is common in south Punjab Pakistani population and its correct identification can help physicians and surgeons to prevent complications while treating patients. This present study therefore highlights its frequency in south Punjab Pakistani population and its clinical relevance in day to day clinical practices.

Conflict of interest: Nil

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