

# Retrospective Study of Magnetic Resonance Imaging (MRI) Findings in Pott's Spine

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## ABSTRACT

### Introduction:

Skeletal tuberculosis accounts for approximately two percent of all infected tuberculosis (TB). Magnetic resonance imaging (MRI) due to its inherent soft tissue contrast is a very good tool to diagnose the condition and look for its extent and deformities. This study aims to study the MRI findings in a patient with diagnosed case of spinal tuberculosis.

### Methods:

The study was carried out in a referral diagnostic imaging center in western Nepal. All MRI studies of the spine performed in a patient with diagnosed spinal tuberculosis during the study period were included in the study. Patients lacking microbiological or pathological diagnoses of spinal tuberculosis were excluded from the study.

### Results:

A total of 70 patients were included in the study. The mean age of the patients was  $45.6 \pm 16.8$  years. All patients in the study had a spondylodiscitis pattern of involvement. Single intervertebral disc and adjacent vertebrae were involved in 85.7% and multiple contiguous vertebrae and IV discs were involved in 14.3% of cases. Gibbus deformity was seen in 17.1% of cases. Pre/paravertebral and Epidural collections were seen in 95.7% and 72.9% of patients respectively, whereas psoas abscess was seen in 28.6% of patients. Cord compression with myelopathy was seen in 8.6% of patients. Involvement of posterior elements was seen in 27.1% of patients.

### Conclusion:

MRI is an excellent tool to see the extent, deformity, and abscess in spinal tuberculosis. Most patients with tuberculosis present late with collections and deformities.

**Keywords:** *Magnetic Resonance Imaging; Psoas Abscess; Tuberculosis, Spinal*

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## INTRODUCTION

Tuberculosis (TB) remains a leading infectious cause of death worldwide.<sup>1</sup> Skeletal TB accounts for approximately 2% of all infected tuberculosis. Tuberculosis of the spine, also known as Pott's disease, accounts for less than 1% of all cases of TB.<sup>2</sup> Two distinct types of spinal TB can be identified, the classic form, called spondylodiscitis (SPD), and a more common atypical form characterized by spondylitis without disc involvement (SPwD). This infection poses a difficult task in the initial stages for diagnosis before kyphotic deformity or neurological deficit takes place. It can also lead to the involvement of soft tissues and cause abscess and in worse cases, it can give rise to gibbus deformity and neurological complications.<sup>3</sup> The neurological symptoms include radicular pain, severe cauda equina syndrome, and spinal cord compression. They may result from edema, vascular engorgement, vertebral collapse, retropulsion debris, meningomyelitis, or subarachnoid collections.<sup>4</sup> The objective of this study was to assess for a pattern of involvement of the spine, associated collections, deformities, and complications in spinal tuberculosis on MRI.

## METHODS

This was a retrospective study conducted at Referral Diagnostic imaging center in Nepalgunj. Ethical approval for the study was obtained from the Nepal Health research council. All patients diagnosed with Pott's spine (spinal tuberculosis) undergoing MRI scans between May 2018 and May 2021 were included in the study. MRI of patients with no pathological/microbiological diagnosis of tuberculosis of the spine was excluded from the study. Only MR scans at presentation were included in the study. Repeat MRI or follow-up scans were excluded.

The scans were performed on a 1.5T Siemens MRI machine using our protocol as mentioned in Table 1.

Demographic data and MRI findings for each patient were collected and recorded in pre-designed data collection sheet. All relevant collected data were compiled and analyzed by using IBM SPSS 21.0.

## RESULTS

A total of 70 patients were included in the study, out of which 44 (62.9%) were male and 26 (37.1%) were female with a male to female ratio of 1.69:1. The age of the patients ranged from 8 to 82 years with a mean age of  $45.6 \pm 16.8$  years and the median age of 45 (IQ-25.25) years. The highest number of patients belonged to the 20-50 years of age group while the age group of fewer than 20 years was least affected (5.7%). (Figure 1)

None of the patients in our study had cervical involvement, 20% had only thoracic involvement. Thoraco-lumbar vertebra involvement was seen in 12% of cases, lumbar vertebrae & lumbosacral vertebrae involvement were seen in 57% and 10% of cases respectively (Figure 2).

All cases in our study had classic form i.e., spondylodiscitis. Isolated involvement of the vertebral body (spondylitis) was not seen in our study. Involvement of a single intervertebral (IV) disc and its adjacent vertebra was seen in 85.7% of cases whereas the involvement of more than one IV disc and more than two vertebrae were seen in 14.3% of cases. All of this multi-level involvement were contiguous. We did not find skip lesions in our study.

Alteration of curvature with gibbus deformity was seen in 17.1% of cases. Pre/paravertebral collection was seen in 95.7% of cases. The epidural collection was seen in 72.9% of patients whereas psoas abscess was seen in 28.6% of patients. Cord compression with myelopathy was seen in 8.6% of patients. (Figure 3, 4, and 5) Involvement of posterior elements was seen in 27.1% of patients.

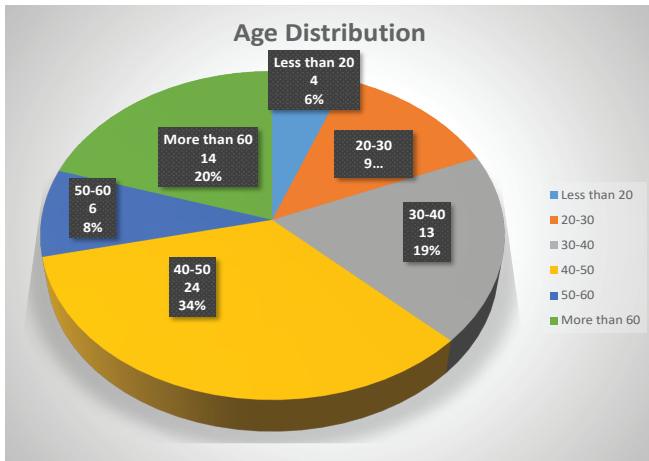


Figure 1: Age distribution of the patients

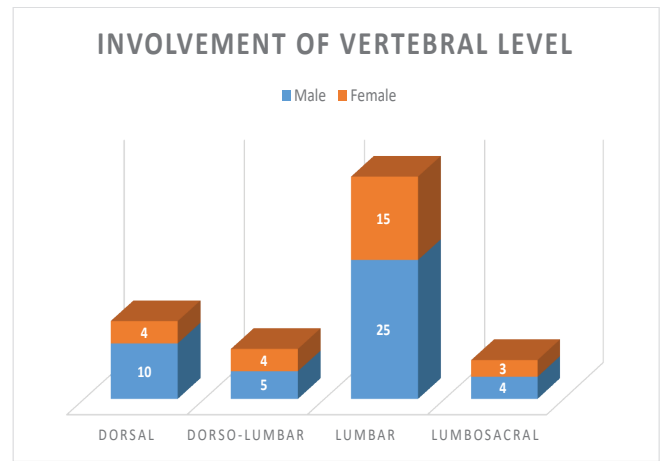


Figure 2: Involvement of various vertebral levels

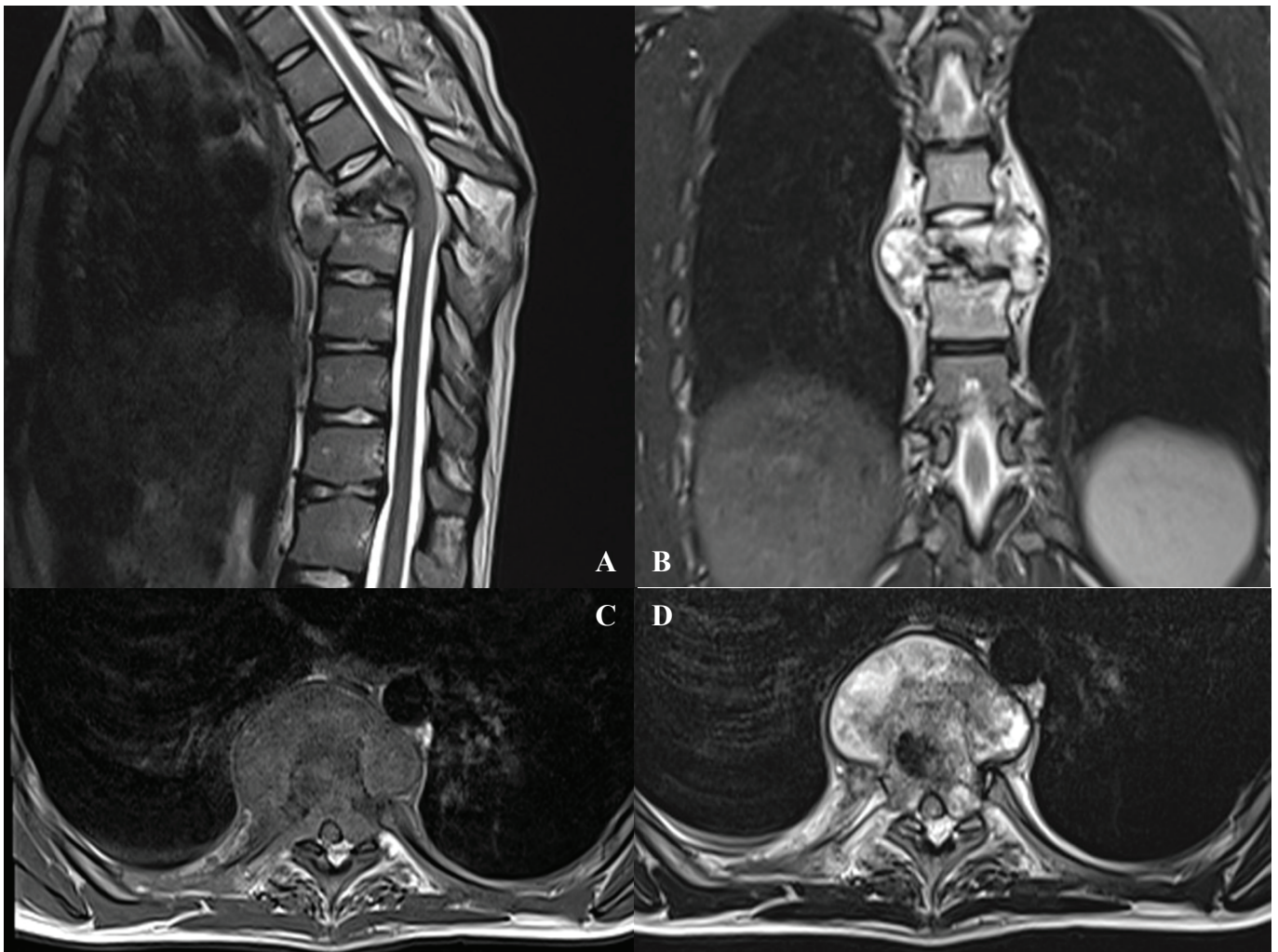
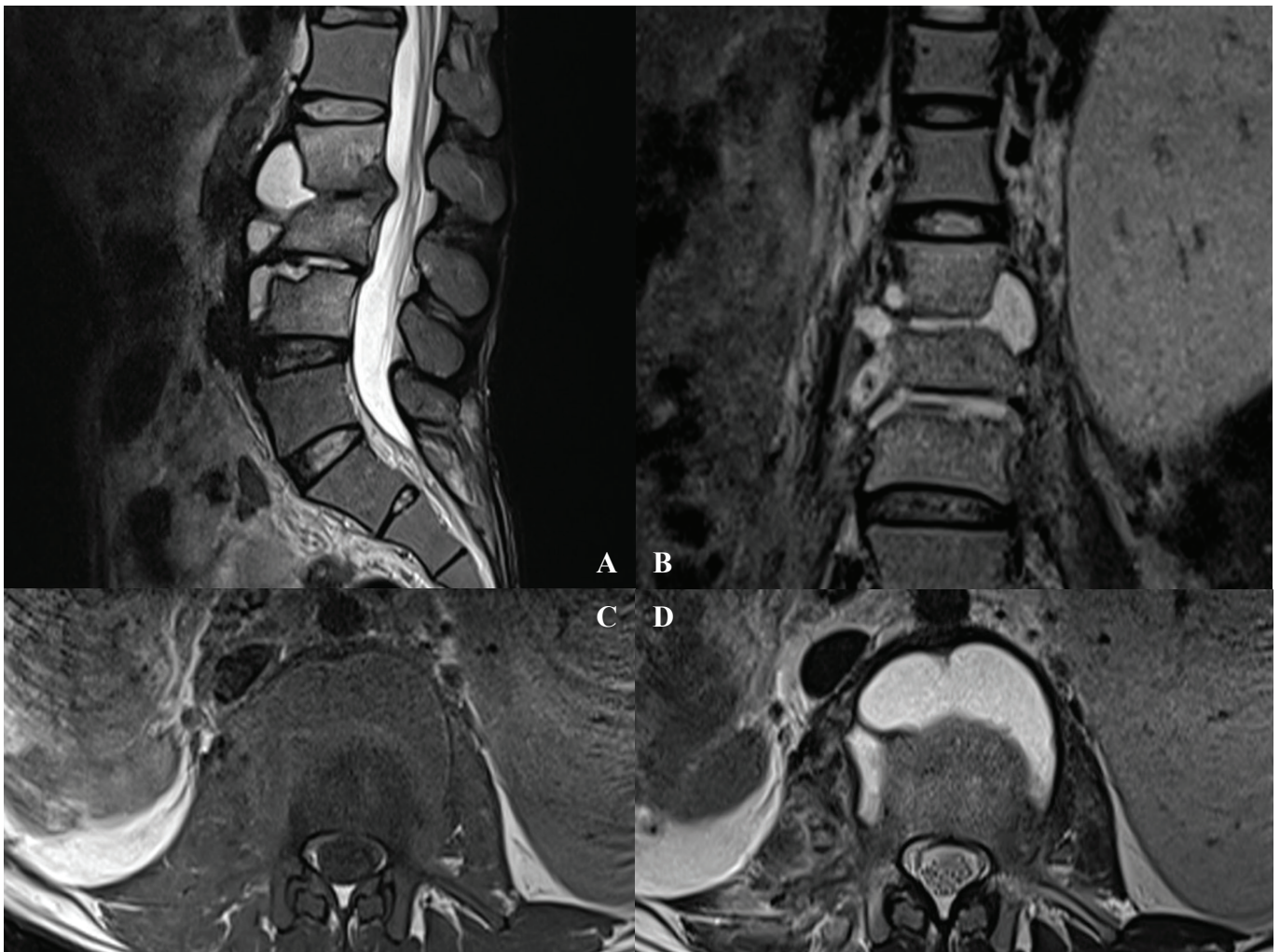


Figure 3: Saggital T2W (A), STIR Coronal (B),T1W (C) and T2W Axial (D).Near complete collapse of D6 vertebra with decrease in disc space at D6 -D7 level with marked pre and bilateral paravertebral and epidural component/collection. Moderate canal compromise at D6-D7 level with cord compression and T2W/STIR high signal intensity in cord at same level suggestive of myelopathy.

***Table 1: Protocol for MRI used in our center for Pott's spine***

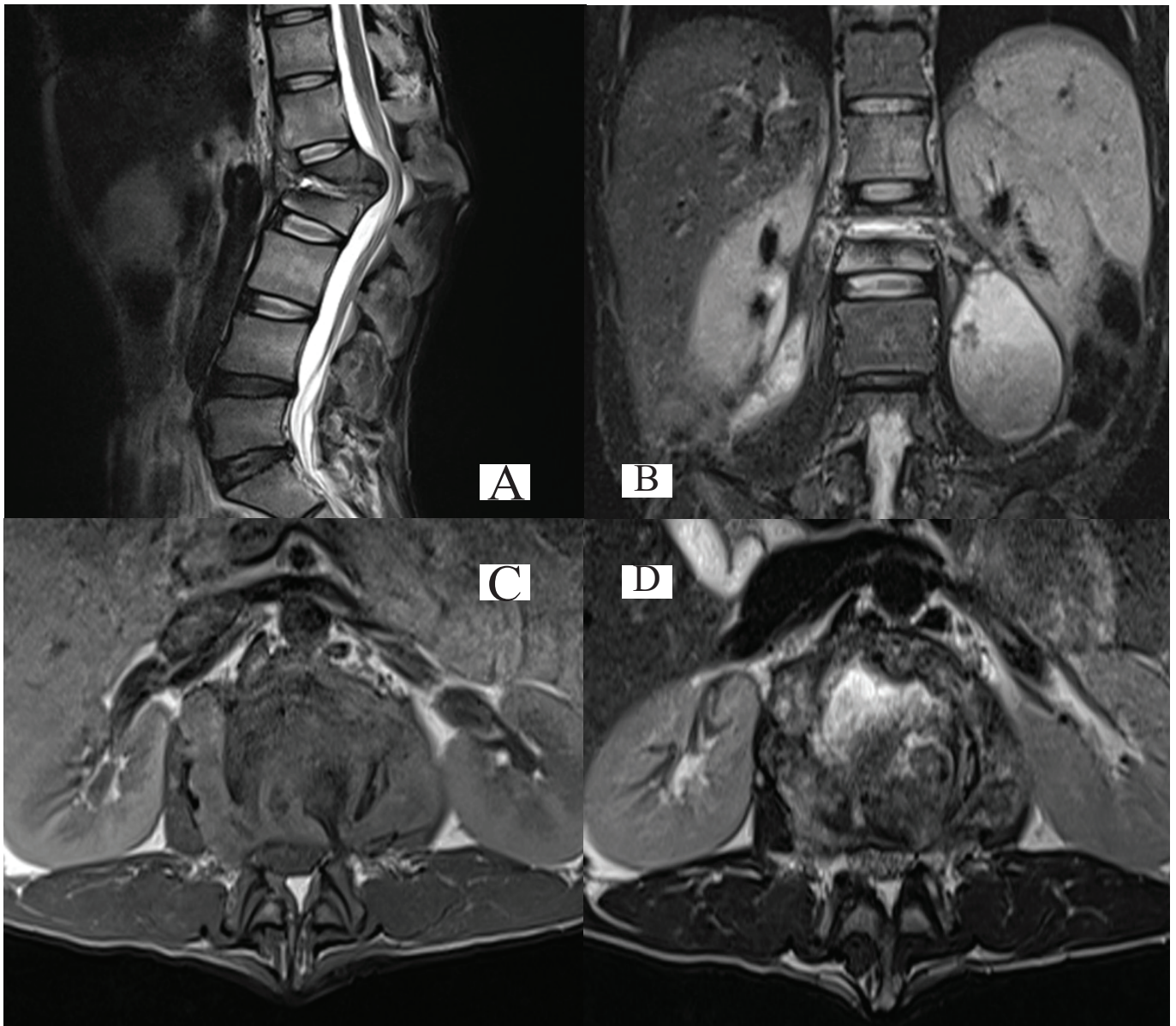
Plane	Sequences
Saggital	T2W(screening of whole spine) T1W, T2W, STIR, Myelogram ,Precontrast Fat suppressed ( Affected parts)
Axial	T1W,T2W
Coronal	STIR,Myelogram
Multiplanar (Axial, Coronal & Saggital)	Post contrast Fat suppressed in selected cases



**Figure 4:** Saggital T2W (A) ,STIR Coronal (B),T1W (C) and T2W Axial (D). STIR high signal intensity s/o marrow edema involving L2,L3 & L4 levels with end plate irregularity with decrease in dis space at L2-L3 and L3-L4 levels with pre/paravertebral collection at same level, epidural soft tissue component / collection with mild canal compromise at L2-L3 level

There was no significant difference in demographics or MRI findings among sex (Table 2). Multiple vertebral levels were more frequently involved in other vertebral levels than the lumbar region. Other demographics and MRI findings also did not differ

significantly among patients with different level involvements (Table 3).



**Figure 5:** Saggital T2W (A) ,STIR Coronal (B),T1W (C) and T2W Axial (D). End plate irregularity with partial destruction involving L1/L2 vertebra with decrease in disc space at L1 –L2 level ;focal kyphosis at D12-L2 level with minimal pre and B/L paravertebral collection with moderate canal compromise at same level .No evidence of altered signal intensity in cord. B/L psoas abscess (left > right)

## DISCUSSION

Pott's spine is the commonest manifestation of musculoskeletal tuberculosis, accounting for approximately 40-50% of cases. Osborn stated that in the developing countries it was prevalent in the younger age group, while in the western world, it was found in the middle

age (mean 40-45 years).<sup>5</sup> Most of the patients in this study were in the productive age group (20-50 years) causing a huge impact on the economy. This suggests that in developing nations like Nepal, TB of the spine still affects economic productivity and also leads to disability at a young age.

**Table 2: Characteristics of patient and MRI findings according to sex**

	Male (N=44)	Female (N=26)	p-value
Age (Mean)	47.2± 15.6	43.1±18.8	0.33
Number of vertebra			
2	38(86.3)	22(84.6)	0.84
> 2	6(13.7)	4(15.4)	
Vertebral Level			
Dorsal	10(22.7)	4(15.4)	0.71
Dorsolumbar	5(11.4)	4(15.4)	
Lumbosacral	29(65.9)	18(69.2)	
Alteration in curvature	6 (13.6)	6(23.1)	0.31
Paravertebral collection	42(95.4)	25(96.1)	0.88
Epidural collection	30(68.2)	21(80.8)	0.25
Psoas abscess	10(22.7)	10(38.5)	0.15
Myelopathy	4(9.0)	2(7.7)	0.84
Posterior elements	10(22.7)	9(34.6)	0.28

**Table 3: Characteristics of Patient and MRI findings according to involved vertebrae**

	Dorsal N=14	Dorsolumbar N=9	Lumbar N=40	Lumbosacral N=7	p-value
Age (Mean)	53.9± 16.9	49.3± 12.1	42.7± 16.7	40.8±19.7	0.13
Number of vertebra					
2	10(71.4)	6(66.7)	39(97.5)	5(71.4)	0.013
> 2	4(28.6)	3(33.3)	17(2.5)	2(28.6)	
Alteration I n curvarure	5(35.7)	2(22.2)	4(10.0)	1(14.3)	0.16
Paravertebral collection	14(100)	8(88.9)	38(95.0)	7(100)	0.57
Epidural collection	10(71.4)	7(77.8)	27(6.5)	7(100)	0.34
Psoas abscess	2(14.3)	4(44.4)	13(32.5)	1(14.3)	0.32
Posterior elements	7(50)	3(33.3)	8(20.0)	1(14.3)	0.14

Tuberculosis of the spine was found to be more common in males than in females in most of the previously published series which was similar to our study.<sup>6-8</sup> In our study, the most commonly affected vertebrae were lumbar vertebrae followed by dorsal vertebrae which were similar to the findings of Sinan et al.<sup>6</sup> However, the dorsolumbar spine has been reported to be the most common site in many studies.<sup>6,8,9</sup> The atypical findings

of the tuberculous involvement of the spine are infection of a single intervertebral disc or multiple nonadjacent vertebrae (skip lesions). There is large variability in the reported incidence of skin lesions in tuberculosis of the spine, ranging from 1.1% to 71.4%.<sup>10,11</sup> We did not find a skip lesion in any of the cases. We did post-contrast enhancement only in selected cases to decrease the cost of the patient as it does not significantly alter the management of the

patient. In all our cases, there was the involvement of both vertebral endplates along with IV disc suggesting a delayed presentation. This might be due to the catchment area of our center which includes mostly rural populations with some semi-urban and urban populations with low to middle-class socioeconomic strata. The delayed seeking of health care services in lower socioeconomic society in Nepal is probably due to of pocket health care expenditure system.

Osborn stated that pre/paravertebral abscess was present in 55-95% of the cases of Tuberculosis.<sup>5</sup> In our study, pre/paravertebral collection was noted in 95.7% of the cases which was similar to the study of Maurya et al.<sup>12</sup> Although many of the studies demonstrated rare involvement of posterior elements in tuberculosis, we found involvement of posterior elements in 27% of cases. But, isolated involvement of posterior elements was not seen in any case. Gibbus, which occurs late in the course of the illness in a large number of patients, is caused due to collapse of vertebral bodies usually in the dorsal and upper lumbar vertebrae. It is commonly seen in countries with delayed health care seeking practice as in Nepal. Gibbus was observed in 17.1% of the cases in our study, as compared to 27.5% of the cases in a study by Maurya et al.<sup>12</sup> Epidural soft tissue component or collection is one of the serious complications as it may lead to severe compression of the thecal sac and spinal cord. Epidural involvement was seen in over 72.9% of the cases in our study. Gehlot et al., found psoas abscess in 37.1% of the cases, which was 28.6% of the cases in our study.<sup>13</sup>

Our study has certain limitations. Firstly, the sample size of the study is small. Clinical correlation and clinical recovery were not considered in our study. We conclude that the MRI spine is the most valuable investigating modality for the evaluation of suspected spinal tuberculosis. It gives information about the extent of involvement of soft tissues as well as bone. It provides the required information to the surgeon for planning treatment

by providing information like vertebral destruction /collapse, disc involvement, skip lesions, pre/paravertebral collection, epidural collection, psoas abscess, involvement of posterior elements, and canal compromise more precisely.

## CONCLUSION

MRI is an excellent tool to see the extent, deformity, and abscess in spinal tuberculosis. Most patients with tuberculosis present late with collections and deformities.

## CONFLICT OF INTEREST

None

## SOURCES OF FUNDING

None

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