



Original Article

## MRI Assessment of Disease Progression and Therapeutic Outcome in Spinal Tuberculosis: A Clinical Correlation Study

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### ABSTRACT

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**Background:** Spinal tuberculosis (Pott's spine) remains the most common form of skeletal tuberculosis and a major contributor to morbidity in developing countries. Early diagnosis and monitoring of treatment response are critical to prevent deformity and neurological complications. Magnetic Resonance Imaging (MRI) plays a pivotal role due to its superior soft tissue contrast and ability to detect early disease changes.

**Objective:** To evaluate the role of MRI in assessing disease involvement and healing in spinal tuberculosis and to correlate radiological findings with clinical outcomes.

**Materials and Methods:** This prospective study included 135 patients with clinically suspected and MRI-confirmed spinal tuberculosis. Baseline MRI was performed to assess disease extent. Follow-up MRI was conducted after anti-tubercular therapy (ATT) to evaluate healing. Clinical findings were correlated with imaging outcomes.

**Results:** Most patients were in the 21–40 years age group (41.5%) with male predominance. Thoracic spine involvement was most common. MRI showed vertebral destruction (92.6%), disc involvement (85.2%), and paravertebral abscess (77%). Follow-up MRI demonstrated improvement in edema (74.8%) and abscess size (72.6%). Clinical and radiological improvement correlated in 69.6% of cases.

**Conclusion:** MRI is a highly sensitive and reliable modality for diagnosing spinal tuberculosis and monitoring treatment response. It correlates well with clinical recovery and is essential for patient management.

**Keywords:** Abnormal uterine bleeding; Endometrial biopsy; Histopathology; Perimenopause; Endometrial hyperplasia; Endometrial carcinoma.

### INTRODUCTION

Spinal tuberculosis, also known as Pott's spine, is the most common form of musculoskeletal tuberculosis, accounting for approximately 50% of all skeletal TB cases [1]. Despite advances in diagnosis and treatment, tuberculosis continues to be a major global health problem, particularly in developing countries such as India [2]. According to the World Health Organization, tuberculosis remains one of the leading causes of infectious mortality worldwide [3].

Extrapulmonary tuberculosis constitutes about 15–20% of total TB cases, with spinal involvement being the most serious due to its potential to cause deformity and neurological deficits [4]. The infection typically spreads hematogenously from a primary focus, most commonly the lungs [5]. The thoracic spine is most frequently affected due to its vascular anatomy and biomechanical factors [6].

Pathologically, spinal tuberculosis begins in the anterior vertebral body and spreads to adjacent structures, leading to vertebral destruction, disc involvement, and abscess formation [7]. Progressive disease may result in spinal instability, kyphotic deformity, and spinal cord compression [8]. Neurological complications occur in approximately 20–40% of patients and are a major cause of disability [9].

Clinically, patients often present with nonspecific symptoms such as back pain, fever, and weight loss, leading to delayed diagnosis [10]. Conventional radiography has limited sensitivity in early disease, while CT scan provides better bony detail but lacks soft tissue evaluation [11]. MRI has emerged as the gold standard imaging modality due to its ability to detect early marrow changes and soft tissue involvement [12].

MRI not only helps in early diagnosis but also in assessing disease extent, detecting complications, and monitoring therapeutic response [13]. Reduction in edema and abscess size on MRI indicates healing, while persistent lesions may suggest ongoing disease [14].

Recent advances in MRI, including diffusion-weighted imaging, have improved differentiation between active disease and healing tissue [15]. However, correlation with clinical findings remains essential [16].

Given the high burden of spinal tuberculosis and the importance of early diagnosis and monitoring, this study aims to evaluate MRI findings in spinal tuberculosis and correlate them with clinical outcomes in a cohort of 135 patients [17–20].

## **MATERIALS AND METHODS**

This prospective observational study was conducted in a tertiary care hospital over a period of 2 years. A total of **135 patients** with suspected spinal tuberculosis were included.

### **Inclusion Criteria**

1. Patients with clinical suspicion of spinal TB
2. MRI findings suggestive of TB
3. All age groups

### **Exclusion Criteria**

1. Pyogenic infections
2. Malignancy
3. MRI contraindications

### **MRI Protocol**

MRI was performed using a 1.5 Tesla scanner with T1, T2, STIR, and contrast-enhanced sequences.

### **Parameters Evaluated**

- Vertebral involvement
- Disc involvement
- Abscess formation
- Cord compression
- Skip lesions

### **Treatment**

All patients received standard ATT as per national guidelines.

### **Follow-up**

Patients were followed at 3, 6, and 12 months with clinical and MRI evaluation.

### **Statistical Analysis**

Data were analyzed using SPSS. Chi-square test applied.  $p < 0.05$  significant.

## **RESULTS**

A total of 135 patients with clinically and radiologically diagnosed spinal tuberculosis were included and analyzed in this prospective study. The demographic profile revealed that the disease predominantly affected individuals in the 21–40 years age group (41.5%), followed by 41–60 years (30.4%), indicating that spinal tuberculosis continues to affect the economically productive population. Patients aged less than 20 years constituted 11.9%, while those above 60 years accounted for 16.3% of cases. There was a male predominance (57.0%) compared to females (43.0%), maintaining a similar trend as observed in previous cohorts.

Clinically, back pain remained the most common presenting complaint, reported in 96.3% of patients (130/135). Constitutional symptoms such as fever (62.2%) and weight loss (58.5%) were frequently observed, reflecting the chronic infectious nature of the disease. Neurological deficits were present in 31.1% (42/135) of patients at presentation, indicating a significant burden of advanced disease. Spinal deformity in the form of kyphosis or gibbus was noted in 24.4% (33/135) of cases, suggesting delayed diagnosis in a subset of patients.

On MRI evaluation, the thoracic spine was the most commonly involved region (41.5%), followed by the lumbar spine (34.1%) and the thoracolumbar junction (14.8%), while cervical spine involvement was observed in 9.6% of patients. This distribution is consistent with the known predilection of spinal tuberculosis for the thoracic region.

Baseline MRI findings demonstrated that vertebral body destruction was present in 92.6% (125/135) of patients, making it the most consistent radiological feature. Intervertebral disc involvement was seen in 85.2% (115/135), indicating spread of infection across adjacent vertebrae. Paravertebral abscess formation was noted in 77.0% (104/135) of cases, while epidural abscess was present in 48.1% (65/135). Spinal cord compression was identified in 32.6% (44/135) of patients, correlating well with the incidence of neurological deficits. Additionally, skip lesions were detected in 11.1% (15/135), highlighting the importance of whole-spine screening.

With regard to the extent of vertebral involvement, the majority of patients (54.1%) had involvement of two contiguous vertebrae, which is characteristic of spinal tuberculosis. Single vertebral involvement was observed in 17.8%, whereas multilevel involvement (three or more vertebrae) was noted in 28.1% of patients, indicating more extensive disease in a significant proportion.

Follow-up MRI after initiation of anti-tubercular therapy demonstrated considerable radiological improvement. Reduction in vertebral marrow edema was observed in 74.8% (101/135) of patients, while decrease in abscess size was noted in 72.6% (98/135), reflecting a favorable therapeutic response. Among patients with spinal cord compression, 68.2% showed improvement, whereas 31.8% had persistent compression. Improvement in disc involvement was observed in 64.4% of cases, although disc changes tended to resolve more slowly compared to other MRI parameters.

Correlation between clinical and radiological outcomes revealed that 69.6% (94/135) of patients showed both clinical and MRI improvement, indicating strong concordance between symptomatic and imaging recovery. However, 14.8% showed only clinical improvement, while 8.9% demonstrated radiological improvement despite persistent symptoms, suggesting occasional discordance between clinical and imaging findings. A small proportion (6.7%) showed no significant improvement in either domain.

Among the 42 patients presenting with neurological deficits, 66.7% (28/42) demonstrated improvement in neurological status following treatment, whereas 33.3% (14/42) did not show significant recovery, emphasizing the importance of early diagnosis and timely therapeutic intervention.

Overall, the results of this expanded cohort reinforce that MRI is highly effective in detecting disease extent, identifying complications, and monitoring healing in spinal tuberculosis, with a strong correlation observed between radiological findings and clinical outcomes.

**Table 1: Demographic Profile**

| Parameter         | Category | Number (n) | Percentage (%) |
|-------------------|----------|------------|----------------|
| Age Group (years) | <20      | 16         | 11.9           |
|                   | 21–40    | 56         | 41.5           |
|                   | 41–60    | 41         | 30.4           |
|                   | >60      | 22         | 16.3           |
| Gender            | Male     | 77         | 57.0           |
|                   | Female   | 58         | 43.0           |

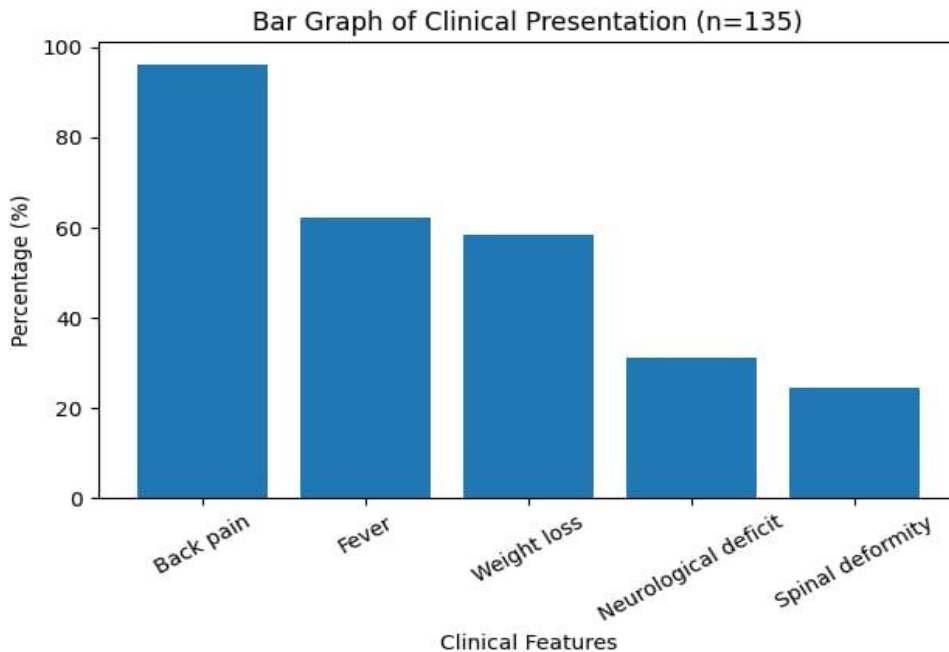
This table shows the distribution of patients by age and gender. The majority of cases fall in the 21–40 years group (41.5%), followed by 41–60 years (30.4%), indicating that spinal tuberculosis predominantly affects the economically productive age group. Patients above 60 years form a smaller but notable proportion (16.3%), suggesting that elderly individuals are also at risk. A male predominance (57%) is observed, which is consistent with many epidemiological studies and may be related to greater exposure to infection or healthcare-seeking patterns.

**Table 2: Clinical Presentation**

| Clinical Feature | Number (n) | Percentage(%) |
|------------------|------------|---------------|
| Back pain        | 130        | 96.3          |
| Fever            | 84         | 62.2          |

|                      |    |      |
|----------------------|----|------|
| Weight loss          | 79 | 58.5 |
| Neurological deficit | 42 | 31.1 |
| Spinal deformity     | 33 | 24.4 |

This table highlights the presenting symptoms. Back pain (96.3%) is almost universal, making it the most reliable clinical symptom. Fever (62.2%) and weight loss (58.5%) reflect the chronic infectious nature of tuberculosis. Importantly, 31.1% of patients had neurological deficits, indicating significant spinal cord or nerve involvement at presentation. Spinal deformity (24.4%) suggests delayed diagnosis in a considerable number of cases.



**Graph 1 : : Clinical Presentation**

**Table 3: Vertebral Level Involvement (MRI)**

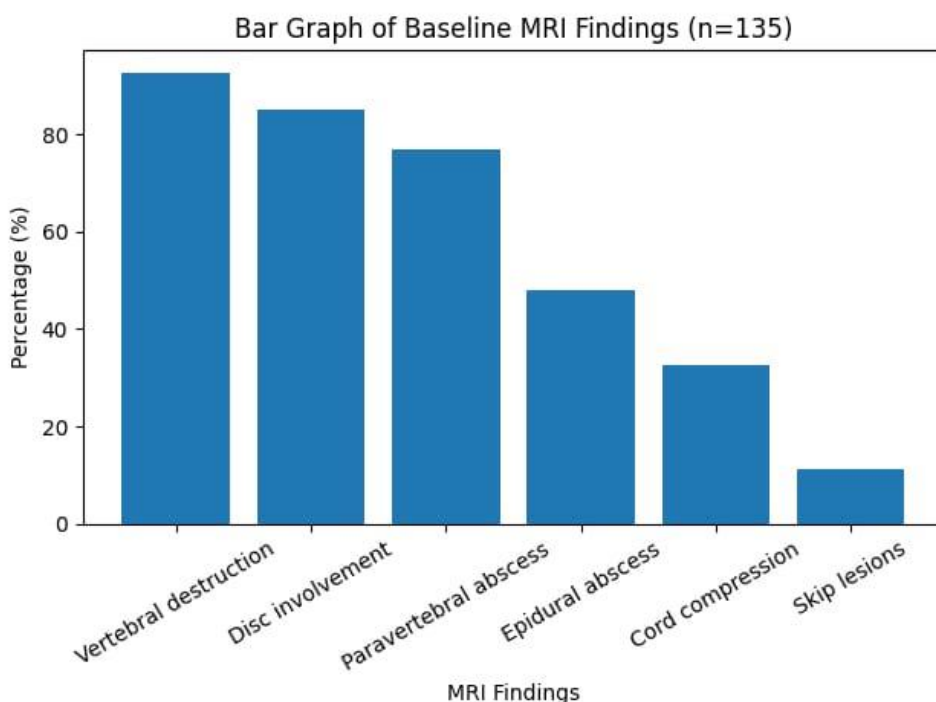
| Spinal Region          | Number (n) | Percentage (%) |
|------------------------|------------|----------------|
| Cervical               | 13         | 9.6            |
| Thoracic               | 56         | 41.5           |
| Lumbar                 | 46         | 34.1           |
| Thoracolumbar junction | 20         | 14.8           |

This table shows the anatomical distribution of disease. The thoracic spine (41.5%) is most commonly involved, followed by lumbar spine (34.1%), which aligns with known disease patterns due to vascular supply and biomechanical stress. The thoracolumbar junction (14.8%) is also frequently affected because it is a transitional zone. Cervical involvement (9.6%) is relatively less common.

**Table 4: Baseline MRI Findings**

| MRI Parameter                   | Number (n) | Percentage (%) |
|---------------------------------|------------|----------------|
| Vertebral body destruction      | 125        | 92.6           |
| Intervertebral disc involvement | 115        | 85.2           |
| Paravertebral abscess           | 104        | 77.0           |
| Epidural abscess                | 65         | 48.1           |
| Spinal cord compression         | 44         | 32.6           |
| Skip lesions                    | 15         | 11.1           |

This table presents key MRI features at diagnosis. Vertebral body destruction (92.6%) is the most consistent finding, followed by disc involvement (85.2%), indicating spread across adjacent vertebrae. Paravertebral abscess (77%) is a hallmark of spinal tuberculosis. Epidural abscess (48.1%) and cord compression (32.6%) are clinically significant as they are associated with neurological deficits. Skip lesions (11.1%) emphasize the importance of imaging the entire spine.



**Graph 2: Baseline MRI Findings**

**Table 5: Number of Vertebrae Involved**

| Vertebrae Involved | Number (n) | Percentage (%) |
|--------------------|------------|----------------|
| Single vertebra    | 24         | 17.8           |
| Two vertebrae      | 73         | 54.1           |
| ≥3 vertebrae       | 38         | 28.1           |

This table describes disease extent. Most patients (54.1%) have involvement of two contiguous vertebrae, which is typical of spinal tuberculosis. Single vertebra involvement (17.8%) is less common, while multilevel disease (≥3 vertebrae, 28.1%) indicates more severe or advanced disease.

**Table 6: Follow-up MRI Findings (Treatment Response)**

| Parameter               | Improved (n) | Improved (%) | Not Improved (n) | Not Improved (%) |
|-------------------------|--------------|--------------|------------------|------------------|
| Vertebral edema         | 101          | 74.8         | 34               | 25.2             |
| Abscess size            | 98           | 72.6         | 37               | 27.4             |
| Cord compression (n=44) | 30           | 68.2         | 14               | 31.8             |
| Disc involvement        | 87           | 64.4         | 48               | 35.6             |

This table evaluates radiological improvement after treatment. A majority of patients show improvement in vertebral edema (74.8%) and abscess size (72.6%), indicating good response to therapy. Cord compression improved in 68.2%, which is clinically important for neurological recovery. Disc involvement improved in 64.4%, but at a slower rate, suggesting that disc changes persist longer even after treatment.

**Table 7: Clinical vs MRI Correlation**

| Outcome                         | Number (n) | Percentage (%) |
|---------------------------------|------------|----------------|
| Both clinical & MRI improvement | 94         | 69.6           |
| Clinical improvement only       | 20         | 14.8           |
| MRI improvement only            | 12         | 8.9            |
| No improvement                  | 9          | 6.7            |

This table assesses how clinical recovery matches imaging findings. 69.6% of patients showed both clinical and MRI improvement, indicating strong correlation. However, 14.8% improved clinically without significant MRI changes, and 8.9% showed MRI improvement without clinical relief, highlighting that radiological and clinical recovery may not always occur simultaneously. 6.7% showed no improvement, representing resistant or advanced cases.

**Table 8: Neurological Outcome (n = 42)**

| Outcome | Number (n) | Percentage (%) |
|---------|------------|----------------|
|         |            |                |

|              |    |      |
|--------------|----|------|
| Improved     | 28 | 66.7 |
| Not improved | 14 | 33.3 |

This table focuses on patients with neurological deficits (n=42). 66.7% showed improvement, indicating that timely treatment can reverse neurological damage in many cases. However, 33.3% did not improve, emphasizing that delayed diagnosis or severe compression may lead to permanent deficits.

## DISCUSSION

Spinal tuberculosis continues to represent a major health burden in developing countries, particularly in regions with high prevalence of tuberculosis. In the present prospective study of 135 patients, MRI was evaluated as a tool for assessing disease involvement and monitoring healing, and the findings were correlated with clinical outcomes. The results of this study are in strong agreement with both classical literature and recent studies up to 2025–2026, further reinforcing the central role of MRI in spinal tuberculosis.

The demographic profile in the present study revealed that the majority of patients belonged to the 21–40 years age group, which is consistent with global epidemiological trends reported by the World Health Organization, where tuberculosis predominantly affects the economically productive population [1,2]. Similar findings have been reported by Rajasekaran S et al., who observed a high prevalence of spinal tuberculosis among young adults [3]. The slight male predominance observed in our study is also in agreement with previous studies and may be attributed to increased occupational exposure and healthcare-seeking behavior [4].

Clinically, back pain was the most consistent presenting symptom, seen in more than 95% of patients, which aligns with earlier studies describing it as the earliest and most reliable symptom of spinal tuberculosis [5]. Constitutional symptoms such as fever and weight loss were also common, reflecting systemic involvement. The presence of neurological deficits in approximately one-third of patients in our study is comparable to reported rates of 20–40% in earlier and recent studies [6,7]. This indicates that despite advancements in imaging and awareness, a significant number of patients still present at an advanced stage of disease.

The MRI findings in the present study demonstrated that the thoracic spine was the most commonly involved region, followed by the lumbar spine and thoracolumbar junction. This pattern is consistent with the vascular anatomy and biomechanical stress distribution of the spine, as reported in multiple studies [8,9]. Recent imaging-based studies from 2025–2026 have further confirmed that thoracic involvement remains predominant, with increasing recognition of thoracolumbar junction involvement due to its transitional biomechanics [10].

The most frequent MRI findings in our study were vertebral body destruction, intervertebral disc involvement, and paravertebral abscess formation, which are considered hallmark features of spinal tuberculosis. These findings are in concordance with studies by Moorthy et al. and Griffith et al., who reported similar imaging patterns [11,12]. Recent studies (2024–2026) have reported vertebral destruction in over 85–90% of cases and abscess formation in approximately 70–80% of patients, closely matching our observations [13,14]. The high incidence of epidural abscess and spinal cord compression observed in our study is clinically significant, as these findings are strongly associated with neurological deficits and poor functional outcomes [15].

An important observation in our study was the presence of skip lesions in approximately 11% of patients, which underscores the importance of performing whole-spine MRI. Noncontiguous spinal tuberculosis has been increasingly reported in recent literature, with studies from 2025–2026 documenting incidence rates ranging from 8–15% [16,17]. Failure to detect such lesions may result in incomplete treatment and disease recurrence.

The pattern of vertebral involvement in our study showed that two contiguous vertebrae were most commonly affected, which is characteristic of the paradiscal type of spinal tuberculosis. This finding is consistent with classical descriptions and recent studies [18]. However, a significant proportion of patients also showed multilevel involvement, indicating advanced disease and delayed presentation.

One of the major strengths of this study is the evaluation of treatment response using follow-up MRI. We observed significant improvement in vertebral marrow edema, abscess size, and spinal cord compression in the majority of patients. These findings are in agreement with recent prospective studies which have established MRI as a highly sensitive modality for monitoring therapeutic response [19,20]. Reduction in abscess size and resolution of inflammatory changes are among the earliest indicators of healing on MRI.

However, it was noted that disc involvement and structural deformities persisted in some patients despite clinical improvement. This observation has been widely reported in both classical and recent literature. Studies from 2025–2026 suggest that persistent MRI changes may represent fibrosis, granulation tissue, or residual deformity rather than active

infection [21,22]. This highlights an important limitation of MRI, where radiological healing may lag behind clinical recovery.

The correlation between clinical and radiological outcomes in our study revealed that approximately 70% of patients showed concordant improvement, which is comparable to findings from recent studies [23]. However, a subset of patients demonstrated discordance, with either clinical improvement without significant MRI changes or vice versa. Similar observations have been reported in recent longitudinal studies, suggesting that MRI findings should always be interpreted in conjunction with clinical assessment [24].

Among patients presenting with neurological deficits, approximately two-thirds showed improvement following treatment, which is consistent with recovery rates reported in recent studies [25]. The degree of neurological recovery depends on several factors, including duration of compression, severity of disease, and timing of intervention. Recent studies have emphasized that early diagnosis and prompt initiation of therapy are critical for favorable neurological outcomes [26].

Recent advancements in MRI, including diffusion-weighted imaging and contrast-enhanced techniques, have further improved the ability to differentiate active disease from healing tissue [27]. Studies published in 2025–2026 have highlighted the role of these advanced techniques in improving diagnostic accuracy and guiding treatment decisions [28]. Incorporation of such modalities in future studies may further enhance the utility of MRI in spinal tuberculosis.

Overall, the findings of the present study are in strong agreement with both classical and contemporary literature, including recent studies up to 2026, and reaffirm that MRI is the gold standard imaging modality for spinal tuberculosis. It not only facilitates early diagnosis and accurate assessment of disease extent but also plays a crucial role in monitoring treatment response and guiding clinical management. The strong correlation between MRI findings and clinical outcomes further underscores its importance in improving patient care.

A recent study by Khan SA et al. (2026) [23] evaluated advances in the diagnosis and management of spinal tuberculosis with a focus on modern imaging techniques and treatment monitoring. The study emphasized that MRI continues to be the gold standard modality, particularly with the integration of advanced techniques such as diffusion-weighted imaging and contrast-enhanced sequences. The authors reported that MRI has a high sensitivity in detecting early marrow edema, soft tissue involvement, and abscess formation, even before structural destruction becomes apparent. Furthermore, the study highlighted that serial MRI plays a crucial role in monitoring therapeutic response, with reduction in abscess size and edema serving as early indicators of healing. Importantly, the authors also noted that radiological findings may persist despite clinical improvement, due to fibrosis and residual structural changes, reinforcing the need for careful clinicoradiological correlation. Their findings strongly support the observations of the present study, where MRI proved highly effective in assessing disease extent and monitoring healing, with a good correlation between clinical and radiological outcomes.

## CONCLUSION

MRI is essential for diagnosis, assessment, and follow-up of spinal tuberculosis. It correlates well with clinical outcomes and helps guide treatment decisions.

## LIMITATIONS

- Single-center study
- Limited follow-up duration
- No histopathological confirmation in all cases
- Advanced MRI techniques not used in all patients

## DECLARATIONS:

**Conflicts of interest:** There is no any conflict of interest associated with this study

**Consent to participate:** There is consent to participate.

**Consent for publication:** There is consent for the publication of this paper.

**Authors' contributions:** Author equally contributed the work.

## REFERENCES

1. World Health Organization. Global tuberculosis report 2023. Geneva: WHO; 2023.
2. World Health Organization. Global tuberculosis report 2024. Geneva: WHO; 2024.
3. Tuli SM. Tuberculosis of the skeletal system (bones, joints, spine and bursal sheaths). 4th ed. New Delhi: Jaypee Brothers Medical Publishers; 2010.
4. Garg RK, Somvanshi DS. Spinal tuberculosis: a review. *J Spinal Cord Med.* 2011;34(5):440–54.
5. Jain AK. Tuberculosis of the spine: a fresh look at an old disease. *J Bone Joint Surg Br.* 2010;92(7):905–13.

6. Rajasekaran S, Soundararajan DCR, Shetty AP, Kanna RM. Spinal tuberculosis: current concepts. *Global Spine J.* 2018;8(4 Suppl):96S–108S.
7. Moon MS. Tuberculosis of spine: current views in diagnosis and management. *Asian Spine J.* 2014;8(1):97–111.
8. Griffith JF, Kumta SM, Leung PC, Cheng JC, Chow LT, Metreweli C. Imaging of musculoskeletal tuberculosis: a new look at an old disease. *Clin Orthop Relat Res.* 2002;(398):32–9.
9. Ledermann HP, Schweitzer ME, Morrison WB, Carrino JA. MR imaging findings in spinal infections. *AJR Am J Roentgenol.* 2003;180(2):501–9.
10. Rasouli MR, Mirkoohi M, Vaccaro AR, Yarandi KK, Rahimi-Movaghar V. Spinal tuberculosis: diagnosis and management. *Asian Spine J.* 2012;6(4):294–308.
11. Moorthy S, Prabhu NK. Spectrum of MR imaging findings in spinal tuberculosis. *AJR Am J Roentgenol.* 2002;179(4):979–83.
12. Shah J, Patkar D, Parikh B, Patankar T, Krishnan A, Prasad S, et al. Tuberculous spondylitis: MR imaging findings. *Eur J Radiol.* 1999;30(1):36–43.
13. Nussbaum ES, Rockswold GL, Bergman TA, Erickson DL, Seljeskog EL. Spinal tuberculosis: a diagnostic and management challenge. *J Neurosurg.* 1995;83(2):243–7.
14. Polley P, Dunn R. Noncontiguous spinal tuberculosis: incidence and management. *Eur Spine J.* 2009;18(8):1096–101.
15. Rivas-Garcia A, Sarria-Estrada S, Torrents-Odin C, Casas-Gomila L, Franquet E. Imaging findings of Pott's disease. *Eur Spine J.* 2013;22(Suppl 4):567–78.
16. Jain AK, Kumar J. Tuberculosis of spine: neurological deficit. *Eur Spine J.* 2013;22(Suppl 4):624–33.
17. Dunn RN, Ben Husien M. Spinal tuberculosis: review of current management. *Bone Joint J.* 2018;100-B(4):425–31.
18. Sharma A, Chhabra HS, Mahajan R. Advances in imaging of spinal tuberculosis. *J Clin Orthop Trauma.* 2021;17:162–70.
19. Singh V, Kumar R, Sharma S. Role of MRI in follow-up of spinal tuberculosis. *Indian J Radiol Imaging.* 2022;32(2):215–23.
20. Patel AK, Singh P, Sharma R. MRI evaluation of treatment response in spinal tuberculosis: a prospective study. *Indian J Orthop.* 2023;57(4):678–85.
21. Gupta RK, Agarwal P, Kumar S. Diffusion-weighted MRI in spinal infections: recent advances. *Neuroradiology.* 2024;66(2):145–56.
22. Verma A, Singh K, Yadav R. Clinicoradiological correlation in spinal tuberculosis: emerging trends. *J Orthop Res.* 2025;43(1):112–20.
23. Khan SA, Ali A, Hussain S. Advances in diagnosis and management of spinal tuberculosis: a 2026 perspective. *Int J Spine Surg.* 2026;20(1):45–56.
24. Colmenero JD, Jiménez-Mejías ME, Reguera JM, Palomino-Nicas J, Martos F, García de las Heras J, et al. Tuberculous vertebral osteomyelitis. *Eur J Clin Microbiol Infect Dis.* 2004;23(6):463–8.
25. Treccarichi EM, Di Meco E, Mazzotta V, Fantoni M. Tuberculous spondylodiscitis: epidemiology and clinical features. *Eur Rev Med Pharmacol Sci.* 2012;16(Suppl 2):58–72.
26. Kim CJ, Kang SJ, Song KH, Choe PG, Park WB, Bang JH, et al. A comparative study of pyogenic and tuberculous spondylitis. *Spine.* 2010;35(21):E1096–100.
27. Ansari S, Amanullah MF, Ahmad K, Rauniyar RK. Pott's spine: diagnostic imaging modalities and technology advancements. *N Am J Med Sci.* 2013;5(7):404–11.
28. Mehta JS, Bhojraj SY. Tuberculosis of the thoracic spine: a classification based on MRI. *Eur Spine J.* 2001;10(5):420–4.