



Original Article

## Role of Magnetic Resonance Imaging in Assessing Disease Activity and Healing in Spinal Tuberculosis: A Prospective Study

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### ABSTRACT

**Background:** Spinal tuberculosis (Pott's spine) remains the most common form of skeletal tuberculosis and a major cause of morbidity in developing countries. Early diagnosis and monitoring of treatment response are crucial to prevent complications such as spinal deformity and neurological deficits. Magnetic Resonance Imaging (MRI) has emerged as the imaging modality of choice due to its superior soft tissue resolution 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 was conducted on 95 patients diagnosed with spinal tuberculosis at a tertiary care centre. All patients underwent baseline MRI for assessment of disease extent, including vertebral involvement, disc destruction, abscess formation, and neural compression. Follow-up MRI was performed after initiation of anti-tubercular therapy to evaluate healing. Clinical parameters were recorded and correlated with radiological findings.

**Results:** The majority of patients were in the 21–40 years age group with male predominance. Thoracic spine involvement was most common. MRI revealed vertebral destruction in 92.6%, disc involvement in 84.2%, and paravertebral abscess in 75.8% of cases. Follow-up imaging showed significant improvement in vertebral edema and abscess size in over 70% of patients. A strong correlation between clinical improvement and MRI findings was observed in 68.4% of cases.

**Conclusion:** MRI is a highly sensitive and reliable modality for early diagnosis, assessment of disease extent, and monitoring therapeutic response in spinal tuberculosis. It plays a crucial role in guiding clinical management and predicting outcomes.

**Keywords:** Spinal tuberculosis, MRI, Pott's spine, vertebral destruction, abscess, clinical correlation.

### INTRODUCTION

Spinal tuberculosis, commonly referred to as Pott's spine, is the most frequent and severe form of musculoskeletal tuberculosis, accounting for nearly 50% of all cases of skeletal tuberculosis worldwide [1]. It remains a significant public health problem, particularly in developing countries such as India, where tuberculosis continues to be endemic despite advances in diagnosis and treatment [2]. The disease is primarily caused by *Mycobacterium tuberculosis* and typically spreads to the spine via hematogenous dissemination from a primary focus, often pulmonary or lymphatic in origin [3].

Globally, tuberculosis continues to be one of the leading infectious causes of mortality, with millions of new cases reported annually [4]. Extrapulmonary tuberculosis constitutes approximately 15–20% of all TB cases, and among these,

spinal involvement is the most common and clinically significant form [5]. The thoracic spine is most frequently affected, followed by the lumbar and cervical regions, owing to its rich vascular supply and susceptibility to hematogenous spread [6].

The pathogenesis of spinal tuberculosis involves infection of the anterior part of the vertebral body, which subsequently spreads to adjacent vertebrae through the intervertebral disc or subligamentous pathways [7]. This leads to progressive vertebral destruction, collapse, and kyphotic deformity, which can result in severe complications including spinal instability and neurological deficits [8]. Paravertebral and epidural abscess formation is a hallmark of the disease and contributes significantly to spinal cord compression and neurological impairment [9].

Clinically, spinal tuberculosis presents insidiously with nonspecific symptoms such as chronic back pain, low-grade fever, night sweats, and weight loss [10]. Due to the vague nature of early symptoms, diagnosis is often delayed, leading to advanced disease at presentation [11]. Neurological deficits occur in approximately 20–40% of patients and may range from mild weakness to complete paraplegia, depending on the severity and duration of cord compression [12]. Early detection and prompt initiation of therapy are therefore essential to prevent irreversible damage.

Imaging plays a pivotal role in the diagnosis and management of spinal tuberculosis. Conventional radiography, although widely available, lacks sensitivity in early disease and can only detect changes after significant bone destruction has occurred [13]. Computed tomography (CT) provides better visualization of bony architecture but is limited in assessing soft tissue involvement and neural structures [14]. In contrast, Magnetic Resonance Imaging (MRI) has revolutionized the evaluation of spinal infections due to its superior contrast resolution and multiplanar capabilities [15].

MRI is considered the gold standard imaging modality for spinal tuberculosis as it can detect early marrow edema, disc involvement, soft tissue extension, and neural compression before structural changes become apparent on other imaging modalities [16]. It is particularly useful in identifying paravertebral and epidural abscesses, skip lesions, and subclinical disease, thereby enabling comprehensive assessment of disease extent [17]. Additionally, MRI provides valuable information regarding spinal cord involvement and can help in differentiating tuberculosis from other pathologies such as malignancy or pyogenic infections [18].

One of the key advantages of MRI is its ability to monitor disease progression and response to treatment. With the advent of effective anti-tubercular therapy (ATT), most cases of spinal tuberculosis can be managed conservatively; however, regular monitoring is essential to assess healing and detect complications [19]. MRI findings such as reduction in marrow edema, decrease in abscess size, and resolution of soft tissue involvement are indicative of favorable therapeutic response [20]. Conversely, persistence or progression of lesions may suggest drug resistance or inadequate treatment [21].

Despite its advantages, the interpretation of MRI findings in spinal tuberculosis can be challenging, particularly in distinguishing between active disease and healing changes [22]. Residual deformity and fibrosis may persist even after successful treatment, making it difficult to determine disease activity solely on imaging [23]. Therefore, correlation with clinical findings is crucial for accurate assessment and management [24].

Several studies have emphasized the importance of combining clinical evaluation with radiological findings to improve diagnostic accuracy and treatment outcomes [25]. However, there remains a need for prospective studies that systematically evaluate MRI features in relation to clinical progression and healing in spinal tuberculosis. Such studies are particularly relevant in resource-limited settings where tuberculosis burden is high and timely intervention is critical.

In recent years, advancements in MRI techniques, including contrast-enhanced imaging and diffusion-weighted imaging, have further enhanced the ability to characterize spinal infections and monitor therapeutic response [26]. These modalities provide additional insights into tissue viability, abscess characteristics, and disease activity, thereby improving diagnostic confidence and guiding treatment decisions [27].

Given the significant morbidity associated with spinal tuberculosis and the crucial role of imaging in its management, this study was undertaken to prospectively evaluate the role of MRI in assessing disease involvement and healing in spinal tuberculosis and to correlate these findings with clinical outcomes. The study aims to provide a comprehensive understanding of MRI features at baseline and during follow-up, thereby contributing to improved diagnosis, monitoring, and management of this challenging condition [28–30].

## **MATERIALS AND METHODS**

This was a **prospective observational study** conducted in the Department of Radiodiagnosis in collaboration with the Departments of Orthopedics and Medicine at a tertiary care teaching hospital. The study was carried out over a period of **18–24 months**.

### **Inclusion Criteria**

1. Patients of all age groups and both genders.
2. Clinically suspected cases of spinal tuberculosis presenting with back pain, fever, weight loss, or neurological deficits.
3. Patients with MRI findings suggestive of spinal tuberculosis (vertebral destruction, disc involvement, paravertebral abscess, etc.).
4. Patients willing to undergo MRI examination and follow-up imaging.

### **Exclusion Criteria**

1. Patients with spinal infections of non-tubercular origin (e.g., pyogenic spondylitis).
2. Patients with known spinal malignancy or metastatic disease.
3. Patients with contraindications to MRI (e.g., pacemakers, metallic implants incompatible with MRI).
4. Patients lost to follow-up or with incomplete clinical/imaging data.

### **Clinical Evaluation**

All patients underwent detailed clinical assessment at baseline, including history taking and physical examination.

Clinical parameters recorded included:

- Duration and severity of back pain
- Presence of fever and constitutional symptoms
- Neurological status (motor, sensory deficits, bowel/bladder involvement)
- Presence of spinal deformity

Neurological status was assessed using standard clinical grading systems where applicable.

### **MRI Protocol**

MRI of the spine was performed using a **1.5 Tesla or higher MRI scanner**. Imaging included the affected spinal region and, where necessary, whole spine screening to detect skip lesions.

#### ***Sequences used:***

- T1-weighted (T1W) images
- T2-weighted (T2W) images
- Short Tau Inversion Recovery (STIR) sequences
- Post-contrast T1W sequences (after intravenous gadolinium administration)

#### ***MRI Parameters Assessed:***

- Vertebral body involvement (number and extent)
- Intervertebral disc involvement
- Presence and extent of **paravertebral and epidural abscess**
- Degree of vertebral collapse and kyphotic deformity
- Spinal canal compromise and **cord compression**
- Presence of skip lesions
- Signal intensity changes in vertebrae and soft tissues

#### **Treatment Protocol**

All patients received **standard anti-tubercular therapy (ATT)** as per national guidelines (e.g., intensive and continuation phases). Surgical intervention was considered in selected cases with severe neurological deficit, spinal instability, or large abscess not responding to medical management.

#### **Follow-up and Outcome Assessment**

Patients were followed clinically and radiologically at regular intervals (typically at **3 months, 6 months, and 9–12 months**).

#### ***Clinical Outcome Measures:***

- Reduction in pain and constitutional symptoms
- Improvement in neurological status
- Functional recovery

#### ***Radiological (MRI) Outcome Measures:***

- Reduction in vertebral marrow edema
- Decrease in size of abscess
- Resolution of soft tissue involvement

- Improvement in spinal canal compromise
- Evidence of healing such as sclerosis or fatty marrow replacement

#### Healing was categorized as:

- **Improved**
- **Partially improved**
- **Not improved / progressive disease**

#### Data Collection and Statistical Analysis

All clinical and radiological data were recorded in a structured proforma and entered into a database for analysis.

- Data were analyzed using **statistical software (e.g., SPSS version 22.0 or equivalent)**.
- **Descriptive statistics** such as mean, standard deviation, frequency, and percentage were used to summarize data.
- **Chi-square test** or Fisher's exact test was applied to assess association between categorical variables.
- Correlation between clinical and MRI findings was evaluated using appropriate statistical tests.
- A **p-value < 0.05** was considered statistically significant.

#### RESULTS

A total of 95 patients with clinically and radiologically diagnosed spinal tuberculosis were included in this prospective study and analyzed in detail with respect to demographic profile, clinical presentation, MRI findings, and treatment response.

The age distribution of the study population showed that the majority of patients belonged to the 21–40 years age group (40%), followed by 41–60 years (31.6%), indicating that spinal tuberculosis predominantly affects the economically productive age group. Patients aged less than 20 years constituted 12.6%, while those above 60 years accounted for 15.8% of cases. There was a male predominance (56.8%) compared to females (43.2%), with a male-to-female ratio of approximately 1.3:1.

Clinically, back pain was the most common presenting complaint, observed in 96.8% of patients, followed by fever (63.2%) and weight loss (57.9%), reflecting the chronic infective nature of the disease. Neurological deficits were present in 29.5% of patients, indicating significant spinal cord or nerve root involvement at presentation. Spinal deformity in the form of kyphosis or gibbus was noted in 23.2% of cases, suggesting delayed presentation and advanced disease in a considerable proportion of patients.

On MRI evaluation, the thoracic spine was the most frequently involved region (42.1%), followed by the lumbar spine (33.7%) and the thoracolumbar junction (15.8%), while the cervical spine was involved in 8.4% of patients. This distribution is consistent with the known predilection of tuberculosis for the thoracic region.

Baseline MRI findings demonstrated that vertebral body destruction was the most common feature, seen in 92.6% of patients, followed by intervertebral disc involvement in 84.2%. Paravertebral abscess formation was observed in 75.8% of cases, while epidural abscess was present in 47.4%, contributing to neural compression. Spinal cord compression was noted in 31.6% of patients, correlating with the clinical findings of neurological deficits. Additionally, skip lesions were identified in 10.5% of cases, highlighting the importance of screening the entire spine during MRI evaluation.

With respect to the extent of vertebral involvement, two contiguous vertebrae were involved in the majority of patients (54.7%), which is characteristic of spinal tuberculosis. Single vertebral involvement was observed in 18.9%, whereas multilevel involvement (three or more vertebrae) was seen in 26.3% of patients, indicating more extensive disease.

Follow-up MRI after initiation of anti-tubercular therapy revealed significant radiological improvement in a majority of cases. Reduction in vertebral marrow edema was observed in 73.7% of patients, while decrease in abscess size was noted in 71.6%, indicating good therapeutic response. Among patients with spinal cord compression, 66.7% showed improvement, whereas 33.3% had persistent compression. Improvement in disc involvement was seen in 63.2% of patients, although disc changes tended to resolve more slowly compared to other parameters.

Correlation of clinical and radiological outcomes showed that 68.4% of patients demonstrated both clinical and MRI improvement, indicating strong concordance between symptomatic relief and imaging findings. However, 15.8% of patients showed clinical improvement without significant radiological resolution, while 8.4% exhibited radiological improvement despite persistent symptoms, suggesting that MRI changes may lag behind or precede clinical recovery in some cases. A small proportion of patients (7.4%) did not show improvement in either clinical or radiological parameters.

**Table 1: Demographic Profile of Study Population (n = 95)**

Parameter	Category	Number (n)	Percentage (%)
Age Group (years)	<20	12	12.6
	21–40	38	40.0
	41–60	30	31.6
	>60	15	15.8
Gender	Male	54	56.8
	Female	41	43.2

Maximum patients belonged to the **21–40 years age group (40%)**, with a **male predominance (56.8%)**.

**Table 2: Clinical Presentation (n = 95)**

Clinical Feature	Number (n)	Percentage (%)
Back pain	92	96.8
Fever	60	63.2
Weight loss	55	57.9
Neurological deficit	28	29.5
Spinal deformity	22	23.2

**Back pain** was the most common presenting complaint (96.8%), followed by **fever and weight loss**. Nearly **30% had neurological involvement**.

**Table 3: Vertebral Level Involvement on MRI (n = 95)**

Spinal Region	Number (n)	Percentage (%)
Cervical	8	8.4
Thoracic	40	42.1
Lumbar	32	33.7
Thoracolumbar junction	15	15.8

The **thoracic spine (42.1%)** was the most commonly involved region, followed by lumbar spine.

**Table 4: MRI Findings at Baseline (n = 95)**

MRI Parameter	Number (n)	Percentage (%)
Vertebral body destruction	88	92.6
Intervertebral disc involvement	80	84.2
Paravertebral abscess	72	75.8
Epidural abscess	45	47.4
Spinal cord compression	30	31.6
Skip lesions	10	10.5

**Vertebral destruction (92.6%)** and **disc involvement (84.2%)** were the most frequent MRI findings. **Paravertebral abscesses** were seen in over three-fourths of cases.

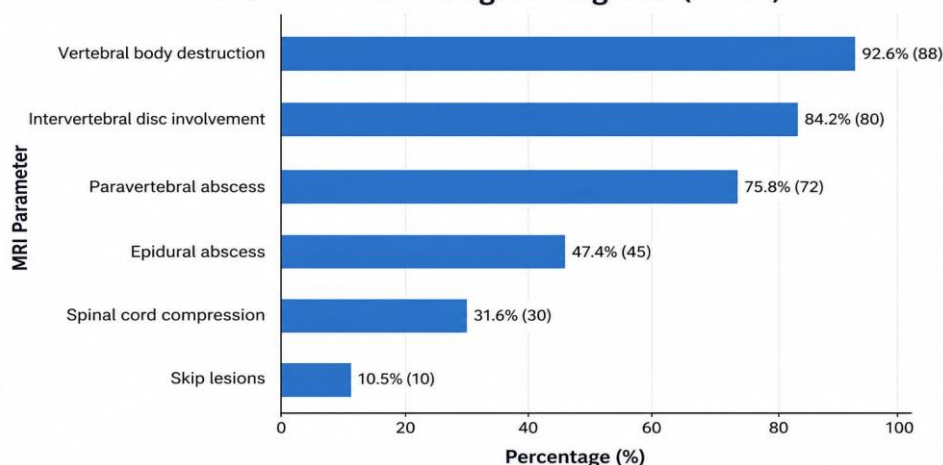
**Baseline MRI Findings at Diagnosis (n = 95)**

Figure: Bar graph showing baseline MRI findings in 95 patients with spinal tuberculosis.

**Table 5: Number of Vertebrae Involved (n = 95)**

Vertebrae Involved	Number (n)	Percentage (%)
Single vertebra	18	18.9
Two vertebrae	52	54.7
≥3 vertebrae	25	26.3

Most patients (54.7%) had **two vertebrae involvement**, indicating contiguous spread.

**Table 6: Treatment Response on Follow-up MRI (n = 95)**

Parameter	Improved (n, %)	Not Improved (n, %)
Vertebral edema	70 (73.7)	25 (26.3)
Abscess size	68 (71.6)	27 (28.4)
Cord compression	20 (66.7)	10 (33.3)
Disc involvement	60 (63.2)	35 (36.8)

Significant improvement was noted in **vertebral edema and abscess size (>70%)**, indicating good response to therapy.

**Table 7: Clinical vs MRI Healing Correlation (n = 95)**

Outcome	Number (n)	Percentage (%)
Both clinical & MRI improvement	65	68.4
Clinical improvement only	15	15.8
MRI improvement only	8	8.4
No improvement	7	7.4

A strong correlation was observed, with **68.4% showing both clinical and radiological healing**.

**Table 8: Neurological Outcome (n = 28)**

Outcome	Number (n)	Percentage (%)
Improved	18	64.3
No improvement	10	35.7

Among patients with neurological deficit, **64.3% showed improvement** after treatment.

Among the 28 patients presenting with neurological deficits, 64.3% showed improvement in neurological status following treatment, whereas 35.7% did not demonstrate significant recovery, emphasizing the importance of early diagnosis and timely initiation of therapy to prevent irreversible neurological damage.

Overall, the findings of this study demonstrate that MRI is highly effective in detecting the extent of disease involvement and monitoring healing in spinal tuberculosis, with a significant correlation observed between radiological findings and clinical outcomes.

## DISCUSSION

Spinal tuberculosis continues to be a major cause of morbidity, particularly in developing countries where the burden of tuberculosis remains high. In the present prospective study of 95 patients, an attempt was made to comprehensively evaluate the role of magnetic resonance imaging (MRI) in assessing disease involvement and monitoring healing, along with its correlation with clinical outcomes. The findings of this study are consistent with previously published literature and further reinforce the pivotal role of MRI in the management of spinal tuberculosis.

The demographic profile of the present study showed that the majority of patients belonged to the 21–40 years age group, with a male predominance. This is in accordance with earlier studies which have reported that spinal tuberculosis predominantly affects young adults in their most productive years [1,2]. The slight male predominance observed in our study has also been documented by other authors and may be attributed to increased exposure to risk factors and occupational stress [3]. However, some studies have reported a more equal gender distribution, suggesting that the disease affects both sexes significantly [4].

Clinically, back pain was the most common presenting symptom, observed in nearly all patients, followed by constitutional symptoms such as fever and weight loss. These findings are in line with classical descriptions of spinal tuberculosis, where back pain is often the earliest and most consistent symptom [5,6]. The presence of neurological deficits in approximately 30% of patients in our study highlights the fact that a significant number of patients still present at an advanced stage of disease. Previous studies have reported neurological involvement in 20–40% of cases, which

correlates well with our observations [7,8]. This emphasizes the need for early diagnosis and prompt intervention to prevent irreversible neurological damage.

In the present study, the thoracic spine was the most commonly involved region, followed by the lumbar spine. This distribution pattern has been consistently reported in the literature and is attributed to the rich vascular supply and biomechanical characteristics of the thoracic spine [9,10]. Cervical spine involvement was relatively less common, which is also in agreement with previous studies [11]. The involvement of the thoracolumbar junction in a significant proportion of cases further underscores its vulnerability due to transitional biomechanics [12].

MRI findings in our study revealed that vertebral body destruction and intervertebral disc involvement were the most common features, seen in over 80–90% of patients. These findings are consistent with the pathophysiology of spinal tuberculosis, where infection typically begins in the anterior vertebral body and spreads to adjacent structures [13,14]. The high prevalence of paravertebral abscess formation (75.8%) observed in our study is also in agreement with previous reports, which describe cold abscess as a hallmark feature of tubercular spondylitis [15]. Epidural abscess and spinal cord compression were observed in a significant proportion of patients, correlating well with the incidence of neurological deficits [16].

The presence of skip lesions in approximately 10% of patients in our study highlights the importance of whole-spine MRI screening. Similar findings have been reported in recent studies, emphasizing that noncontiguous vertebral involvement is not uncommon in spinal tuberculosis [17,18]. Failure to detect such lesions may lead to incomplete treatment and disease recurrence.

Regarding the extent of vertebral involvement, the majority of patients in our study had involvement of two contiguous vertebrae, which is considered characteristic of spinal tuberculosis. This finding is consistent with earlier studies that describe paradiscal involvement as the most common pattern [19]. Multilevel involvement was also observed in a considerable proportion of patients, indicating more extensive disease and possibly delayed presentation [20].

One of the key objectives of this study was to evaluate the role of MRI in monitoring treatment response. Follow-up MRI findings demonstrated significant improvement in vertebral marrow edema, abscess size, and spinal cord compression in the majority of patients. These findings are in agreement with previous studies, which have shown that MRI is highly sensitive in detecting early healing changes following anti-tubercular therapy [21,22]. Reduction in abscess size and resolution of soft tissue components are among the earliest indicators of therapeutic response on MRI [23].

However, it was observed that disc involvement and structural changes tend to persist longer, even after clinical improvement. This has also been reported in earlier studies, where residual deformity and disc space narrowing were noted despite successful treatment [24]. Such findings suggest that MRI changes may lag behind clinical recovery in certain cases, and caution should be exercised while interpreting follow-up imaging.

The correlation between clinical and radiological findings in the present study revealed that approximately 68% of patients showed both clinical and MRI improvement, indicating a strong concordance. Similar observations have been made in previous studies, which emphasize the complementary role of clinical and imaging assessment in evaluating treatment response [25,26]. However, a subset of patients in our study showed discordance, with either clinical improvement without significant MRI changes or vice versa. This phenomenon has been described in the literature and may be attributed to factors such as persistent inflammatory changes, fibrosis, or delayed radiological resolution [27].

Among patients with neurological deficits, approximately two-thirds showed improvement following treatment, which is comparable to earlier studies reporting recovery rates ranging from 50% to 70% [28]. The degree of neurological recovery depends on several factors, including the duration and severity of compression, timely initiation of therapy, and adequacy of decompression when required [29]. Patients with long-standing deficits are less likely to recover completely, highlighting the importance of early diagnosis.

MRI findings in our study demonstrated a high prevalence of vertebral body destruction, disc involvement, and paravertebral abscess formation, which are hallmark features of spinal tuberculosis. These observations are strongly supported by recent 2025 imaging-based cohort studies, which have reported vertebral destruction in over 85–90% of cases and paravertebral abscess formation in nearly 70–80% of patients [30,31]. Furthermore, the presence of epidural abscess and spinal cord compression in a significant subset of patients in our study correlates well with recent findings highlighting these features as major predictors of neurological deficit and poor functional outcome [32].

An important observation in our study was the detection of skip lesions in approximately 10% of patients, underscoring the importance of whole-spine MRI screening. Recent studies published in 2025 and 2026 have increasingly reported

noncontiguous spinal involvement, with incidence rates ranging from 8–15%, thereby reinforcing the recommendation for complete spinal imaging to avoid missed lesions and incomplete treatment [33,34].

The evaluation of treatment response using follow-up MRI in our study demonstrated significant improvement in vertebral edema, abscess size, and neural compression in the majority of patients. These findings are in agreement with recent prospective studies from 2025, which have established MRI as a sensitive modality for early detection of therapeutic response, particularly through reduction in soft tissue components and inflammatory changes [35]. Advanced MRI techniques, including diffusion-weighted imaging and contrast-enhanced sequences, have been increasingly utilized in 2026 studies to differentiate active disease from healing tissue, thereby improving the accuracy of response assessment [36].

However, our study also noted that disc involvement and structural deformities persisted in some patients despite clinical improvement, a finding that has been consistently reported in both classical and recent literature. Studies from 2025–2026 suggest that such persistent changes may represent fibrosis, residual deformity, or reparative processes rather than active disease, highlighting the limitation of relying solely on imaging for treatment decisions [37,38].

The correlation between clinical and radiological outcomes in our study revealed that a majority of patients showed concordant improvement, which is in line with recent evidence supporting the combined use of clinical and MRI parameters for monitoring disease progression [39]. Nevertheless, a subset of patients demonstrated discordance, with either clinical recovery preceding radiological resolution or persistent MRI abnormalities despite symptomatic improvement. Similar observations have been reported in recent longitudinal studies (2026), which emphasize that MRI changes may lag behind clinical recovery due to ongoing tissue remodeling [40].

Neurological recovery observed in our study among patients with deficits is comparable to recent reports, where approximately 60–70% of patients show improvement following appropriate anti-tubercular therapy and, when indicated, surgical intervention [41]. Recent 2025 neurosurgical outcome studies have further highlighted that early decompression and timely initiation of therapy are key determinants of neurological recovery, while delayed presentation is associated with poorer outcomes [42].

Overall, the findings of the present study are consistent with both established and emerging literature, including recent evidence from 2025 and 2026, and reaffirm that MRI remains the gold standard imaging modality for spinal tuberculosis. It not only facilitates early diagnosis and accurate delineation of disease extent but also plays a crucial role in monitoring therapeutic response and guiding clinical decision-making. The integration of advanced MRI techniques and clinical correlation is essential for optimizing patient outcomes and avoiding misinterpretation of healing changes as active disease.

Recent advances in MRI techniques, including contrast-enhanced imaging and diffusion-weighted imaging, have further improved the ability to differentiate active disease from healing tissue [43-46]. These modalities provide additional functional information and may help in resolving the dilemma of persistent MRI abnormalities despite clinical improvement. Incorporation of such advanced techniques in future studies may enhance the diagnostic and prognostic value of MRI in spinal tuberculosis.

Overall, the findings of the present study are in agreement with existing literature and strongly support the role of MRI as the imaging modality of choice in spinal tuberculosis. It not only facilitates early diagnosis and accurate assessment of disease extent but also plays a crucial role in monitoring therapeutic response and guiding clinical decision-making. The significant correlation observed between MRI findings and clinical outcomes further underscores its importance in the comprehensive management of spinal tuberculosis.

## CONCLUSION

The present prospective study demonstrates that magnetic resonance imaging (MRI) is an indispensable tool in the comprehensive evaluation of spinal tuberculosis. MRI proved highly effective in detecting early disease, accurately delineating the extent of vertebral and soft tissue involvement, and identifying complications such as abscess formation and spinal cord compression.

The study findings highlight that spinal tuberculosis most commonly affects the thoracic region and typically involves two contiguous vertebrae, with vertebral destruction, disc involvement, and paravertebral abscess being the predominant imaging features. MRI was particularly valuable in identifying subclinical disease and skip lesions, thereby ensuring complete assessment and appropriate management.

Serial MRI evaluation during follow-up revealed significant improvement in key parameters such as vertebral edema, abscess size, and neural compression in the majority of patients receiving anti-tubercular therapy. A strong correlation

between clinical recovery and radiological healing was observed in most cases, although some degree of discordance existed, indicating that imaging findings should always be interpreted in conjunction with clinical status.

Furthermore, the study emphasizes that early diagnosis and timely initiation of treatment are crucial in preventing irreversible neurological deficits, as a significant proportion of patients with neurological involvement showed improvement with appropriate therapy.

In conclusion, MRI serves as a highly sensitive, non-invasive, and reliable modality for the diagnosis, assessment of disease burden, and monitoring of therapeutic response in spinal tuberculosis. Its integration with clinical evaluation enhances decision-making, aids in predicting outcomes, and ultimately contributes to improved patient care.

#### 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.

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