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Role of Magnetic Resonance Imaging in Evaluation of Spinal Tuberculosis with Clinical Correlation- An Observational Study

Bhargava Ram Dasangam[1], Pradeep Patil[2], Sai Sree Harsha Varada[3]

[1]Department of Radiology, DY Patil Education Society, Kolhapur, Maharashtra, India
Email: *doctor.bhargavaramd[at]gmail.com*

[2]Department of Radiology, DY Patil Education Society, Kolhapur, Maharashtra, India.
Corresponding author Email: *dr.patildyp[at]gmail.com*

[3]Osmania Medical College, Hyderabad, Telangana, India
Corresponding author Email: *harshavaradagrey[at]gmail.com*

Abstract: ***A global total of about 10 million people fell ill with TB in 2020, equivalent to 127 cases per 100000 population. A total of 1.5 million people died from TB in 2020 (including 214 000 people with HIV). Worldwide, TB is the 13th leading cause of death. TB of the spine is one of the oldest demonstrated diseases of mankind and is the common extrapulmonary form of TB. The morbidity and mortality rate due to spinal TB is higher than other infections in developing countries with dense population. Conventional radiographs give a good overview; computed tomography (CT) visualizes the disco-vertebral lesions and paravertebral abscesses, while MRI is useful in determining the spread of the disease to the soft tissues and to determine the extent of spinal cord involvement. In this study75 patients with clinical suspicion of Pott's spine and diagnosed TB spine for follow up were referred to our department underwent MRI without contrast.***

Keywords: Tuberculosis, MRI Image, Pott's Spine, Indian Population, Spinal Tuberculosis

1. Introduction

Tuberculosis (TB) is one of the most ancient diseases of mankind and has co-evolved with humans for many thousands of years or perhaps for several million years[1]. Tuberculosis continues to be a huge peril disease against the human population. Tuberculosis is highly prevalent among the low socioeconomic section of the population and marginalized sections of the community.2.

A global total of about 10 million people fell ill with TB in 2020, equivalent to 127 cases per 100000 population. A total of 1.5 million people died from TB in 2020 (including 214 000 people with HIV). Worldwide, TB is the 13th leading cause of death and the second leading infectious killer (above HIV/AIDS). In 2020, an estimated 10 million people fell ill with tuberculosis (TB) worldwide.5.6 million men, 3.3 million women and 1.1 million children. TB is present in all countries and age groups. Eight countries account for two thirds of the total, with India leading the count, followed by China, Indonesia, the Philippines, Pakistan, Nigeria, Bangladesh, and South Africa[3].

Pott's spine:
Percival Pott was the first person to present the classic description of spinal tuberculosis (TB) in 1779; hence, spinal TB was called 'Pott's Disease'. TB of the spine is one of the oldest demonstrated diseases of mankind and is the common extrapulmonary form of TB. The morbidity and mortality rate due to spinal TB is higher than other infections in developing countries with dense population. Since the advent of antituberculous drugs and improved public health measures, spinal TB has become uncommon in industrialized countries, although it is still a significant cause of disease in developing countries. Spinal TB has the potential for serious morbidity, including permanent neurologic deficits and severe deformity[4]. Spinal TB accounts for 2% of all cases of TB, 15% of the cases of extrapulmonary TB and 50% of the cases of skeletal TB[5]. In the developing countries, the disease commonly afflicts children and young adults and tends to be more aggressive in extent and abscess formation. Consequently, neurologic complications and spinal deformities are seen frequently. In the developed countries, musculoskeletal tuberculosis is uncommon, but its incidence is reported to be greater in older individuals. The relative rarity and varied presentations of spinal tuberculosis pose diagnostic difficulty, warranting its inclusion in the differential diagnosis of any spinal disorder[6].

2. Literature Survey

Shashikumar M. R, et al in 2015 studied 40patients with an age range of 21to 60 years and they showed that most affected level of the spine was thoracic spine with Thoracic vertebrae were being the most common affected vertebra seen in 37.5% of the cases followed by thoracolumbar (27.5%), and lumbar vertebra (22.5%). Various clinical presentations such as fever, backache, weight loss, malaise were noted with most common being backache (77%) in 31 cases. Intervertebral disc involvement was seen in 85% of the cases with an epidural component occurring in 77% of the cases. Cord oedema was noted in 10% of the cases. They concluded that MRI is a very valuable tool in the evaluation of spinal TB. The MRI scan is highly sensitive in the detection of various pathological processes of spinal

tuberculosis and their pattern of occurrence and also provides excellent depiction of soft tissue involvement, cord involvement and nerve root integrity. It is an accurate modality in differentiating spinal TB from pyogenic spondylitis and helps in diagnosing spinal TB in early stages and Serial MRI scans can also be used to assess the disease response to treatment 18.

Arsalan Ahmad Alvi, et al in 2013 conducted cross sectional study of 119 cases and the following results are obtained. The level of spine which was most commonly found to be affected was the Dorsa lumbar (D10 to D12 or D12 with L1) (33.6%) }. In this study relationship between MRI finding and level of spine affected by T. B was observed. In cervical level classical form of T. B was present in 57.9% cases and also the highest number of patients had involvement of anterior region of vertebra in this level which was 84.2% but in upper dorsal level it was majorly involvement of all three region anterior, posterior, and lateral region.29 Cord compression was seen in 90% of people presenting with TB in their dorsa lumbar region and in all the patients with lumbar and lumbosacral had thecal compression. It was concluded that dorsa lumbar region was the mostly affected region in this disease and the female teenagers were majorly associated with it. MRI scans showed soft tissue involvement, cord compression, and disc destruction were major findings to be looked over in lumbosacral region and in lumbar spine, familiar observation was thecal compression which could be prevented by giving early decompression

G. R. Bajwa, et al in 2008 conducted a descriptive study on 60 patients with age range of 14-36 yrs and showed that most affected level of the spine was lower thoracic and upper lumber45% of cases. Only thoracic spine was involved in 14 cases (23.3%). Lumbar spine in 12 cases (20%). Cervical spine tuberculosis was found in four cases (6.6%). There was diffuse involvement in three cases (5%). MRI showed narrowing of intervertebral disc space in 95% of cases. Most common symptom was low back pain. Most common sign was local tenderness. Spinal cord compression was seen in 16 cases (26.6%). MRI scan of spine showed narrowing/ destruction of disc space in 95% of cases. Wedge collapse of body in 30%. Complete destruction of body in 20%. Paraspinal abscess in 40%, calcification in 30% and cord compression in 26.6% of cases. They concluded that MRI spine is the most valuable investigation for evaluation of spinal tuberculosis

Prateek S. Gehlot, et al in 2012 studied 70 cases of Pott's spine patients were between 21 to 40 years of age with a female predominance, Multiple vertebrae were affected in most of the cases and a majority had 2 vertebrae involved (60%), followed by the involvement of 3-4 vertebrae (25%), while a single case had a single vertebra involved. In 37 (52.8%) cases, the dorsal and in 43 (61.4%) cases, the lumbar vertebrae were involved. Among these, 12 cases 30 had both the dorsal and the lumbar vertebrae involvement. Two cases of dorsal vertebrae involvement were in association with the cervical vertebrae and 1 case of the lumbar vertebra was involved in association with the sacrum. The cervical vertebrae were involved in a total of 4 cases, out of which 3 cases were below 30 years of age. Skip lesions were noted in 2 (2.85%) cases. The vertebral body which was affected in a majority of the cases was L3 (34.2%). An alteration in the curvature, mostly a gibbus deformity which was due to the collapse of the vertebrae was noted in 19 (27.2%) cases. An intervertebral disc involvement was a common finding which was noted in 65 (92.8%) cases. A pre or paravertebral collection was seen in all cases except 1 case (98.5%), while an epidural collection was present in 58 (82.9%) cases. This epidural collection caused thecal sac indentation in 51 cases, while a cord compromise which was due to a gibbus deformity or posteriorly displaced bony fragments was noted in 16 cases. The combination of the gibbus and the epidural collections caused a neural compromise in 14 patients. The canal dimension was reduced by 75%, which was considered as severe. A neural compromise was noted in 15 (21.4%) cases. Cord edema was appreciated in 7 (10%) cases. The Psoas abscess was noted in 26 (37.4%) cases, among which a bilateral involvement was seen in 10 patients. The marrow edema or the destructive process extended into the posterior bony components in 13 (18.6%) cases, among which 11 had involvement of the pedicle. They concluded that MRI is the most valuable method for detecting spinal tuberculosis and it is the preferred technique for defining the activity and the extent of the infection. It can also act as a guide to the surgical treatment in cases of tuberculosis of the spine

Yandrapati Bala Venkata Krishna Chandrashekar, et al in 2013 studied 64 patients and the patients were divided into two groups; those with TB of the spine and those with some other conditions affecting the spine (non-TB spine) based on the final diagnosis. There was 31 no significant difference in the mean age of presentation. All patients presented with backache in either group. There was epiphyseal involvement (100%), disc height reduction (71.42%) and pedicle destruction (42.82%) in plain X-rays in the TB group. Lumbar spine was the most common affected region in their study (26.31% in non TB and 34.6% in TB group of patients). MRI features having a significant P value and Odds ratio in the study suggestive of TB spine are • T1 hypo intensity • T2 hyper intensity • Disc involvement • Epiphyseal involvement • Pedicle involvement • Anterior subligamentous extension • Paraspinal extension • No involvement of spinous process The eight parameters were tested among both the groups and it was noted that scores ≥ 6 favored a tuberculous pathology whereas ≤4 were suggestive of non tuberculous etiology. They concluded that the eight point MRI criteria of the vertebral lesions are likely to enhance the diagnostic ability of tuberculous and non-tuberculous pathologies thereby reducing the dependency on histopathological diagnosis or invasive method for early initiation of therapy

R. K Gupta, et al in 1996 conducted MRI of 60 patients presenting with extramural compressive myeloradiculopathy secondary to vertebral disease to assess the imaging features which may help in differentiating tuberculous from neoplastic disease. Spin echo T1-, proton density-and T2-weighted images were available for all patients and fast low-angle shot images with a low flip angle for 21 patients. Contrast-enhanced images were available for 28 patients. There were 41 patients with tuberculosis and 19 patients with neoplastic disease (metastases 11, lymphoma 6,

plasmacytoma 1, and giant cell tumour 1). Discovertebral disease with or without involvement of the posterior arch was a feature not only of tuberculous spondylitis (30 patients) but also of metastases (6). The remaining 11 patients with tuberculosis had "atypical" involvement (vertebral body with or without posterior arch in 8 and posterior arch alone in 3) described as typical of neoplasms. This "atypical" involvement was seen in metastases (5), lymphoma (6) and the 2 primary bone tumours. The presence of an abscess helped in differentiating tuberculosis from neoplasia in 22 of the 41 patients with tuberculosis and was absent in all with neoplasms. The presence of bone fragments in 16 patients (8 with and 8 without an abscess) was found to be specific for tuberculosis. In the absence of an abscess or bone fragments, image-guided biopsy is essential to establish the diagnosis. They concluded that MRI is the useful tool in differentiating TB spine from other neoplastic and non neoplastic lesions of spine 23.

D J Kotzé, MB ChB, et al studied 23 patients of histologically proven case of spinal tuberculosis and showed that there was complete destruction of at least one vertebral body in 14 patients (69%) (11 of 16 (69%) patients with thoracic and 3 of 7 (43%) with lumbar involvement). out of 23 patients 22 had disc involvement and 8 patients had complete destruction of disc.92%of the patients had anterior and posterior paravertebral abscess 33 formation. Signal intensities in partially affected vertebrae were predominantly hypo-intense on T1 (74%), hyper-intense on T2 (74%), hyperintense after gadolinium administration (81%), and hyper-intense on STIR sequences. In all 23 patients there was longitudinal ligament involvement, with: • Elevation anterior and elevation posterior in 12 (52%) • Elevation and destruction anterior, with only elevation posterior in 10 (44%) • Elevation and destruction posterior without anterior involvement in 1 (4%). They concluded that spinal tuberculosis can be diagnoses based on above said MRI features confirmatively without the need of interventional procedures like biopsy 24

Khalequzzaman S1, et al in 2003 had conducted cross sectional study of 42 patients of spinal tuberculosis with Plain and contrast MRI using T1, T2 and STIR sequences in saggital and axial planes. In their study, the most common age presenting with tuberculous spinal infection is between 31 to 40 years (43%), which was less than the presentation in the developed countries. Because, lot of risk factors took place for the development of tuberculosis, like, low nutrition, overcrowding, poor hygienic condition, multipariety etc. In western and developed countries, tuberculosis was a delayed presentation as because, only risk factor which play important role for the development of this disease is immucompromised states like diabetes, old age and more recently AIDS. Males suffer more than females11. More than 50% of cases involve lumbar vertebra, single vertebral body involvement found only 7% of case. Single vertebral body involvement may mimic metastatic involvement. Involvement of three or more vertebral bodies was found in 50% of cases. This reflects 34 advanced disease and the route of transmission due to haematogenous and subligamentous spread. The multiplicity of vertebral body involvement may cause confusion with metastatic disease. Skip lesions located at the cervical spine have been reported in as many as 12% of cases. There may be a need to exclude non contiguous lesions in the lower spine in those patients with cervical spondylitis, especially when low back symptoms are present. Almost all TB spondylitis will show some form of vertebral body destruction. In my studies, it is 88%. They showed that axial MR images will demonstrate cortical destruction and posterior element involvement to best advantage. There is a tendency towards pedicular and laminar involvement in tuberculous spondylitis, whereas pyogenic spondylitis has a predilection for the facet joint. The presence of posterior element involvement is a significant finding, since these patients are more likely to have neurological symptoms and require laminectomy. Bilateral pedicle involvement is infrequent. Gadolinium MRI is particularly useful for characterizing TB spondylitis. The presence of reactivation, abscesses versus cellulitis, is often diagnosed with confidence only after GdDTPA enhancement. They concluded that MRI should be considered to be the imaging modality of choice for patients with suspected TB spondylitis, because of its high specificity, sensitivity and accuracy as it provides necessary information to the surgeon for proper management.

DR. wanderi peter kioria, mbchb (uon), et al, in 2003 did cross sectional study over a 45 patients who are diagnosed to have spinal infection based on MRI features, histopathological and biochemical analysis. They did study to evaluate the differentiating MRI features of different spinal infections like tuberculosis, pyogenic and brucellosis.35 In TB spine spondylodiscitis was the main pathological lesion with 32 (84.2%) cases followed by spondylitis with 4 cases (10.5%)). TB had a thoracic region predilection while pyogenic infections and brucellosis favoured the lumbar region. Spinal deformities (kyphosis and Gibbus deformity) were only observed in TB spine. Of the vertebral body changes examined, end plate destruction considered typical of spinal infection occurred in all cases affecting the vertebral body. This observation is consistent with earlier reports indicating that end-plate destruction had good sensitivity for spinal infections particularly tuberculosis. The MRI findings interrogated for neurological deficits were those known to cause neural element compression like vertebral body collapse, epidural inflammation, paraspinal inflammation and neural foraminal stenosis. These findings occurred in various combinations with an additive effect. Of the 29 cases with neurological deficits the most common MRI findings were cord compression seen in 26 (89.7%) cases, paraspinal inflammation and epidural inflammation at 22 (75.9%) cases each. A significant number of patients without neurological problems had cord compression (68%). They concluded that MRI is the imaging modality of choice in spinal infections due its superior contrast resolution and sensitivity to soft tissues lesions. It is the only imaging modality that combines high sensitivity, specificity and accuracy in spinal infection imaging. Contrast should be administered in all cases of suspected spinal infections

MM Nagoda, et al in 2009 studied 87 patients from 2005 to 2009 over a period of d years first 2 years retrospectively and next 2 years prospectively and all the patients underwent MRI studies. Seventy five percent of the patients presented more than 2 months after the onset of the illness.

Paraplegia/paraparesis and sensory impairment over the lower limbs were the most common features (100%) followed by back pain (90.8%). In this study, the vertebral 36 levels affected mostly were lower thoracic (T6-T12) and upper lumbar (L1-L3). Some studies have also found the thoracic spine predominantly affected. Predominantly, 10 (11.5%) subjects had kissing lesion, 44 (50%) had wedge collapse, planar vertebra was in 10 (11.5%) patients, 18 (20.7%) patients had complete destruction Predominantly, 10 (11.5%) subjects had kissing lesion, 44 (50%) had wedge collapse, planar vertebra was in 10 (11.5%) patients, 18 (20.7%) patients had complete destruction. They concluded that MRI is the investigation of choice for diagnosing spinal tuberculosis 26.

DR. JULIETTE A. OREGE, et al in 2010 studied 185 patients with H/O low back pain and all the patients are subjected to MRI study with contrast to evaluate various pathologies underlying. The patterns identified on MRI included: 80% degenerative disc disease, 23.78% lumbar spondylitis, 4.86% infections, and 9.73% neoplasms. The common lumbar spine infections in their were tuberculosis seen in 66.67% (n=6) and Pyogenic infections 33.33% (n=3). The most common site was the mid lumbar vertebrae L3/L4 at 77.78% (n=7) followed by the upper lumbar vertebrae L2/L3 66.68% (n=6) and L1/l2 11.11% (n=1). The common complication of infections was spinal canal stenosis and 15.68% other anomalies. MRI shows typical findings of tuberculosis like altered signal intensity of involved vertebral bodies with disc destruction and pre and para vertebral soft tissue abscess and enhancement on contrast studies. They concluded that MRI is helpful in diagnosing spinal infections mainly tuberculosis in developing countries and thereby preventing the development of complications.

Sajid Ansari/et al in 2011 conducted study on prospective basis in 30 patients with clinical suspicion of Pott's spine. In their study dorsal vertebrae were involved in 50%, lumbar vertebrae in 43.3% and sacral vertebrae in 6.7% patients. Cervical vertebrae involvement was not found. Among dorsal vertebrae D11-D12 level were commonly involved followed by D10-D11 level, while among lumbar vertebrae 37 L3-L4 level were commonly involved. Paradiscal type of involvement was most common followed by central type. Posterior element involvement was found in 8 cases. Least common was anterior subligamentous type of involvement. Severe levels of vertebral body destruction were seen in 19 patients. Prevertebral & paravertebral abscesses seen in 80% of cases on MRI. Contrast enhanced MRI was very helpful in diagnosing paraspinal abscesses, granulation tissues and determining the level of vertebrae involved along with its signal intensities. They concluded that MRI is the gold standard for evaluating disc space infection and is most effective for demonstrating the extension of disease into soft tissues and also serial MRI can be used to assess the response to treatment and regression of the disease.

Ravindra Kumar Garg, et al in 2011reviwed retrospectively 50 cases of spinal tuberculosis and studied various diagnostic modalities available for evaluation of spinal tuberculosis like plain radiograph, bone scan, MRI and histopathological methods and described the classical MRI features of spinal infections. They described that MRI readily demonstrates involvement of the vertebral bodies, disk destruction, cold abscess, vertebral collapse, and spinal deformities. Abscess formation and collection and expansion of granulation tissue adjacent to the vertebral body are highly suggestive of spinal tuberculosis. MRI is also useful in detecting intramedullary or extra medullary tuberculoma, spinal cord cavitation, spinal cord edema, and possibly unsuspected non-contiguous lesions of the spine. The subligamentous spread of a paraspinal mass and the involvement of multiple contiguous bones and intramedullary spinal changes can be very well demonstrated by MRI. They concluded that MRI is the investigation of choice and superior to other modalities in diagnosing spinal tuberculosis

3. Problem Definition

Spinal TB is perhaps the most clinically important extrapulmonary form of tuberculosis, as it may produce serious neurological sequelae due to compression of spinal cord as a result of the disease itself, as well as the resultant deformity. Early recognition and prompt treatment are therefore necessary to minimize residual spinal deformity and/or permanent neurological deficit.7

The diagnosis of spinal TB is challenging with non-specific constitutional symptoms and late presentation. Imaging plays an important role in the diagnosis and treatment decisions in these patients. Plain radiography remains the cornerstone of diagnosis in spinal tuberculosis; however, computerized tomography (CT) and magnetic resonance imaging (MRI) have gained popularity as special investigation methods. The MRI has become the gold standard for diagnosis and preoperative planning in spinal TB[8]. CT demonstrates abnormalities earlier than plain radiography. CT is of great value in the demonstration of any calcification within the cold abscess or visualizing epidural lesions containing bone fragments. However, CT is less accurate in defining the epidural extension of the disease and its effect on neural structures. In contrast to most imaging methods, MRI has the advantages of improved contrast resolution for bone and soft tissues along with versatility of direct imaging in multiple planes. With the aid of intravenous administration of magnetic resonance contrast agents, MRI is highly accurate in distinguishing granulation tissue from cold abscess. MRI can reveal more extensive involvement than the plain films. MRI clearly demonstrated the extent of soft tissue disease and its effect on the thecal sac, cord, and foramina in cases with doubtful CT findings[9].

4. Methods and Materials

Source of Data

Patients referred to the radiology department in D. Y. Patil Medical College, Hospital& Research Center, Kolhapur, in suspicion of and diagnosed for spinal tuberculosis

Inclusion Criteria

- Patients both male and female are included
- Only patients with consent to participate in this study will be included.

- Patients referred to the radiology department for neurological
- Symptoms and found to have positive findings are included in this study.
- All patients suffering from spinal tuberculosis already diagnosed

Exclusion Criteria

- All patients with no consent will be excluded from this study
- Patients with claustrophobia for MRI
- Patients contraindicated for MRI
- Patients who are unable to cooperate for the procedure

Sample Size: 75

Duration of Study: 24 months (November 2021 to November 2022)

Study Design: Observational cross-sectional study

Methodology

- This study is conducted in Department of Radio Diagnosis
- Patients fitting into inclusion criteria are evaluated with history and physical examination. Patients with claustrophobia are contraindicated for MRI
- Data will be collected from minimum of 75 cases referred to radiology department in suspicion of spinal infection
- MRI performed with Philips Achieva 3.0T in supine position with informed consent

5. Observations and Results

Table 1: Age Group Distribution

Age group affected	No. of patients
4 to 10 yrs	7
11 to 20 yrs	13
21 to 30 yrs	22
31 to 40 yrs	15
41 to 50 yrs	4
51 to 60 yrs	10
>60yrs	4

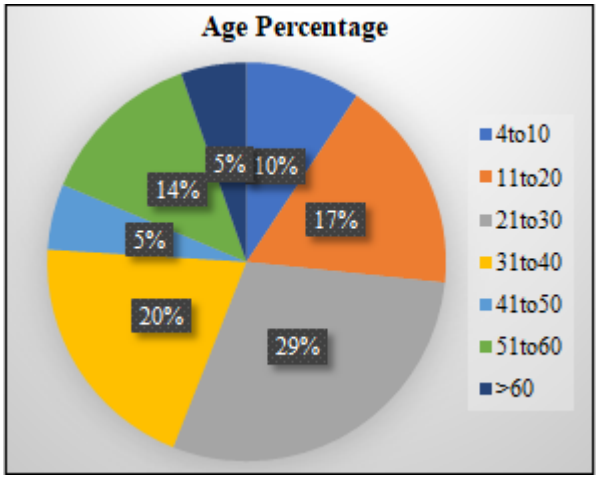


Table 2: Gender distribution

Males	35	47%
Females	40	53%
Total	75	100%

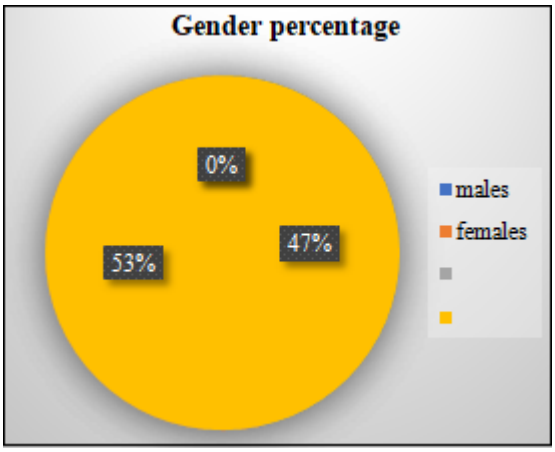


Table 3: Gender Distribution in different Age Groups

Age	*Males*	*Females*
4 to 10 yrs	4	3
11 to 20 yrs	5	8
21 to 30 yrs	9	13
31 to 40 yrs	8	7
41 to 50 yrs	2	2
51 to 60 yrs	7	3
>60	1	3
TOTAL	35	40

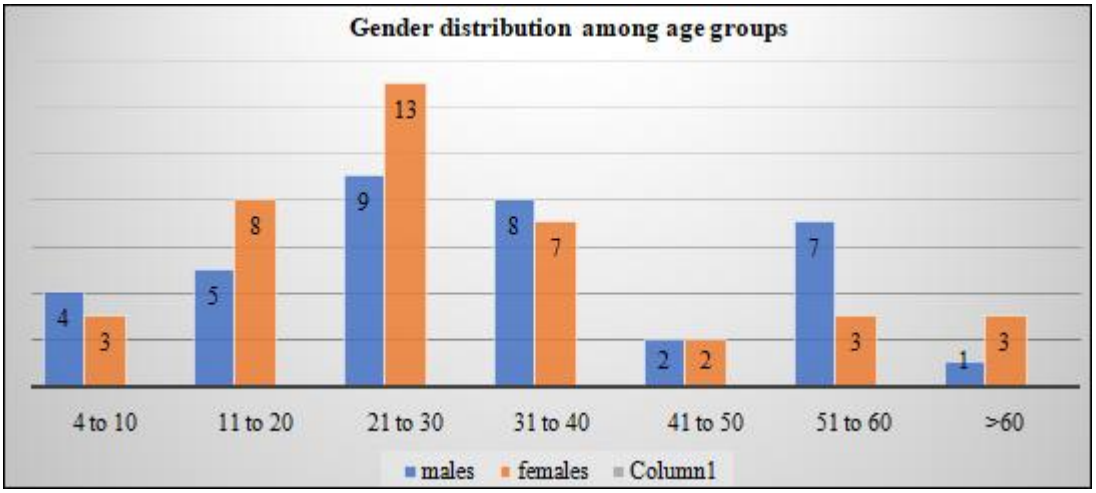


Table 4: Distribution of clinical features in study group

Clinical features	fever	Weight loss	Lymphadenopathy	Neurological Deficit	Backache	kyphosis
No. of patients	42	12	13	15	50	19

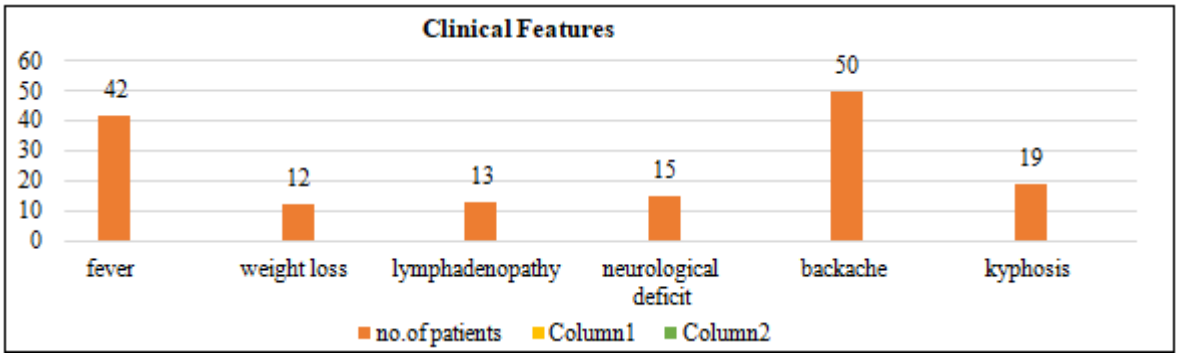


Table 5: History of TB among study group

Pulmonary tuberculosis	10
Past H/O tuberculosis	15
No present and/or past H/O TB	50

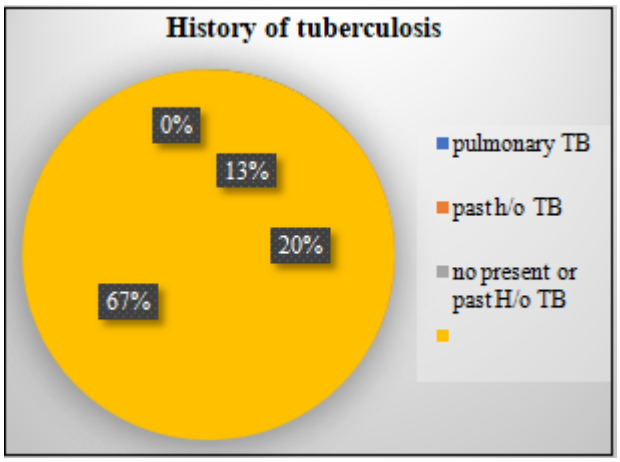


Table 6: Regional distribution of TB spine

Level of spinal involvement	No. of patients	Percentage
Cervical	3	4%
Cervico-dorsal	2	3%
Dorsal	40	51%
Dorso-lumbar	10	13%
lumbar	23	29%

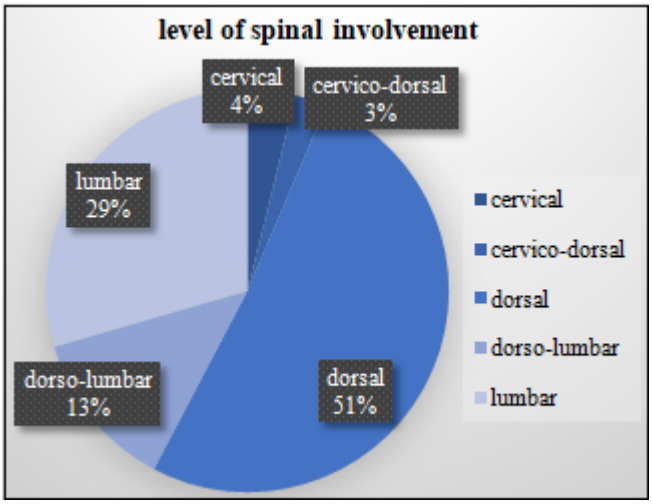


Table 7: Severity of vertebral body involvement

Imaging features	No. of cases
Altered signal intensity	74
Partial collapse	16
Complete collapse	10
Compression fracture	20

Table 8: Pattern of vertebral body involvement

Pattern of involvement	No. of cases
Contiguous vertebrae	65
Skip vertebrae	6
Single vertebra	4

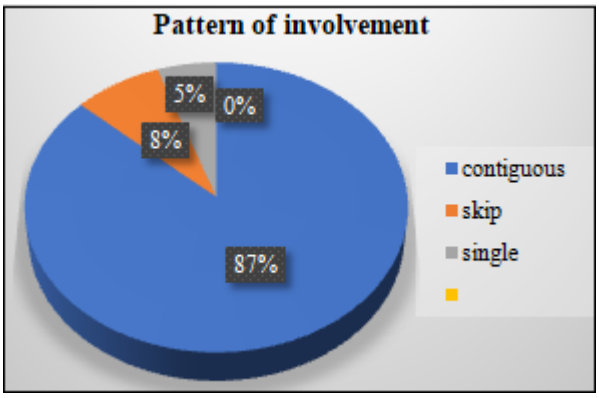


Table 9: Severity of intervertebral disc involvement

Imaging features	No. of cases	Percentage
Altered signal intensity	49	65.3%
Partial destruction	19	25.3%
Complete destruction	17	22.7%
No involvement	26	34.6%

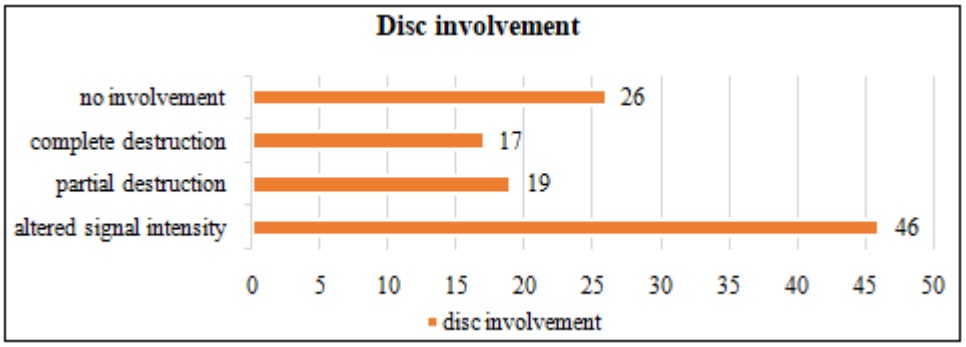
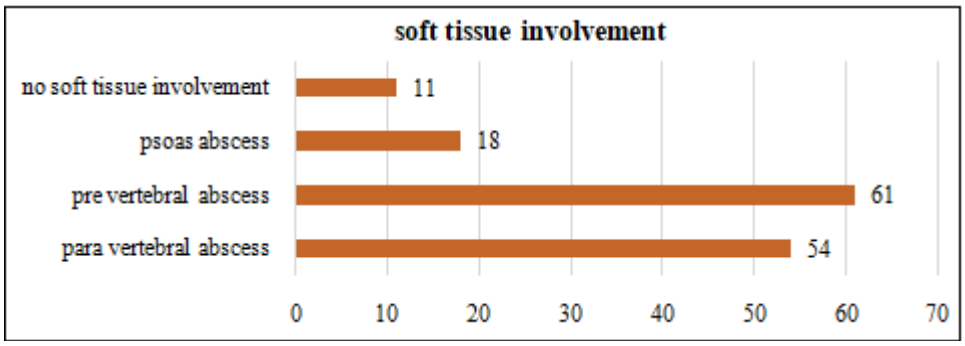


Table 10: Spinal Cord, Intradural and epidural involvement

Epidural involvement (collection)	42
Intradural involvement	3
Intramedullary involvement	2
Anterior thecal sac indentation	13
Spinal cord compression	23

Table 11: Pre and para vertebral soft tissue involvement

	No. of cases
Para vertebral abscess	61
Prevertebral abscess	54
Psoas abscess	18
No soft tissue collections	11



6. Discussion

From November 2019 to November 2021, 75 patients with clinical suspicion of Pott's spine and diagnosed TB spine for follow up were referred to our department underwent MRI without contrast.

In the present study, the maximum number of patients belonged to the age group 21-30 (29%) years and next common age group was between 31-40 (20%) years with age of patients ranging from 4yrs to 70yrs. It affects the patient in the active working group thereby causing economic impacts on the patients and its family. The findings were matching with studies done by Rajiv Kalia et al [10] and Lf Owolabi et al

Males constituted 47% of the cases and females constituted 53% of the cases. These findings correlate well with studies done by Rumeet Kukreja et al[11]. There was not much difference in male to female ratio in spinal infections and it showed that there was no significant prediliction for spinal infections to occur regarding sex of the patients

Patient's clinical profile

Present study showed that backache was the single most complaint of the patients of spinal tuberculosis which made the patients to seek clinical evaluation. In developing countries like India other symptoms like evening rise of temperature, generalized weakness, malaise and weight loss were treated symptomatically and patients/clinicians seeks specific investigations only when patients develop symptoms pertaining to the involved regions like in spinal tuberculosis back pain.

In present study backache was the presenting symptom in 67%of the cases and next common complaint was fever in 56%. neurological deficit in 20% cases. Similar results were obtained in studies from Tariq Sinan et al[7] of about 73% and Shashikumar M. R. et al[12] of about 77% of patients. Past H/O tuberculosis was present in 20% of the patients and 13% of patients had active pulmonary tuberculosis

Regional distribution of TB spine
In the present study the most common region of spinal involvement was dorsal region.51% patients were having dorsal spinal involvement and next common was 29% involving lumbar spine.13% patients had involvement of dorso-lumbar and only 4% patients had involvement of cervical spine.

The same results were obtained in the study conducted by RumeetKukreja et al[10]study showed involvement of dorsal spine in 53.8% and next common site of involvement was lumbar vertebra accounting for 37%

Severity of vertebral body involvements
In present study most common imaging feature of vertebral body involvement was altered signal intensity seen in 74 (98.6%) cases. Followed by compression fracture in 20 (26.6%) cases.10 (13.3%) cases had complete collapse 16 (21.3%) cases had partial collapse and with spinal deformity in 19 (25.3%) cases.

Similar studies done by Sajid Ansari et al[5] shows that 26.7% of patients had spinal deformity

Intervertebral disc involvement in spinal tuberculosis
In the present study 49 (65.3%) patients had Intervertebral disc involvement and all the patients showed altered signal intensities.19 (25.3%) patients had partial destruction and 17 (22.6%) patients had complete destruction of the IV disc.
In study conducted by Tariq sinan et al[7], shows involvement of IV discs in 72% of cases

As the age advances due to decreased vascularity of the IV discs involvement of disc is less common in spinal infections

Involvement of pre and para vertebral soft tissues
Formation of cold abscess and involvement of pre and para vertebral soft tissues favours the diagnosis of spinal tuberculosis. If infection is not controlled by early intervention adjacent muscle involvement occurs resulting in psoas abscess. In some cases mass effect by the pre and paravertebral collection may be the presenting clinical symptom.

In the present study 85.3% of cases had pre and paravertebral involvement and 24% cases had frank psoas abscess. In 14% of cases pre and paravertebral involvement is not seen.

In similar studies conducted by Al-Mulhim et al about 71% of patients had pre and para spinal involvement.

In studies done by Shashikumar et al[12] paraspinal involvements is seen in only 57.5% of cases.

Variations in percentage of involvement of pre and para vertebral soft tissues are due to time of presentation of patients and if the imaging is done in initial stages involvement of pre and para vertebral regions are less.

Involvement of extradural and dural region in patients
Tuberculosis is characterized by chronic granulomatous inflammation of the involved vertebral bodies and intervertebral discs and due to lack of proteolytic enzymes subligamentous spread along the anterior and posterior ligaments is common and posteriorly it can involve extradural or intradural region or may involve spinal cord.

In the present study of cases had 56% epidural involvement.30.6% of cases had spinal cord compression by either epidural collection or collapsed vertebra causing kyphotic deformity. Only 6.6% of cases had direct spinal cord involvement in the form of tuberculoma.

In study done by Bhatnagar S et al [49] 56% of patients had epidural soft tissue component

Pattern of spinal involvement
In present study 65 (86%) cases had contiguous vertebral involvement, 6 (8%) cases had skip lesions, 4 (5.3%) cases had single veretebral involvement.

7. Conclusion

Tuberculosis of spine accounts for 50 percent of all musculoskeletal tuberculosis. It can result in collapse of vertebrae and fracture of bones leading to neurological damage. Early diagnosis and prompt treatment reduces the risk of neurological complications and hence it is necessary to have a good diagnostic tool which helps in early diagnosis.

Present study showed various imaging findings which were helpful in diagnosing as well as evaluating the extent of spread of disease. MRI should be considered as the first line imaging modality for patients with suspected TB spondylitis, because of its high specificity, sensitivity and accuracy and it provides necessary information to the surgeon for proper management by providing vertebral, intra-osseous abscess, vertebral disc collapse, skip lesions, dural and intradural diseases and involvement of posterior elements and early soft tissue involvement more precisely.

Magnetic resonance imaging is also useful in the detection of the reactivation of old TB spondylitis.

Present study showed that MRI was an accurate modality in

diagnosing spinal TB in early stages and hence prompt treatment minimizes spinal deformity and permanent neurological deficits. Serial MRI scans can also be used to assess the disease response to treatment.

To conclude MRI is a noninvasive investigation of choice in diagnosing Spinal tuberculosis.

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List of Abbreviations Used

ASI-ALTERED SIGNAL INTENSITY
CS-CERVICAL SPINE
DL-DORSOLUMBAR
FLAIR-FLUID ATTENUATION INVERSION RECOVERY
IVD-INTERVERTEBRAL DISC
LS-LUMBAR SPINE
MR-MAGNETIC RESONANCE
MRI-MAGNETIC RESONANCE IMAGING
PTB-PULMONARY TUBERCULOSIS
STIR-SHORT TOU INVERSION RECOVERY
TBS-TUBERCULOSIS-SPINE
T1W-T1 WEIGHTED
T1C-T1 CONTRAST
T2W-T2 WEIGHTED
TB-TUBERCULOSIS