



# International Journal of Orthopaedics Sciences

E-ISSN: 2395-1958  
P-ISSN: 2706-6630  
IJOS 2019; 5(4): 335-342  
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www.orthopaper.com  
Received: 22-11-2019  
Accepted: 24-12-2019

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## Radiological and clinical outcome of conservative management of thoracolumbar spinal tuberculosis in adults

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DOI: <https://doi.org/10.22271/ortho.2020.v6.i1f.1885>

### Abstract

**Introduction:** Potts disease continues to be a major health problem in developing and underdeveloped countries. Patients who exhibit both kyphotic deformity and minimal neurological impairment and can be managed conservatively which may be achieved by chemotherapy alone, surgical indications in these patients are specific and few. Since the last decade there is paucity of literature regarding the conservative management of thoraco-lumbar spinal tuberculosis with increasing trend toward more and more surgical management.

**Method:** This study was done between January 2018 and June 2019, patients with age >18 years with thoraco-lumbar spinal tuberculosis were studied. Relevant X-rays, Mri, ESR, CRP, Vas (Visual Analog Score) and ODI (Owestry Disability Index) was done. Changes in kyphotic angles pre and post op were calculated in lateral views of pain radiographs of dorsolumbar spine via Cobb's method.

**Results:** All patients judiciously completed the scheduled course of ATT. The highly significant reduction in ESR and CRP was found after 1<sup>st</sup> visit, 2<sup>nd</sup> visit and final visit relative to before treatment ( $p < 0.001$  for each visit). On the basis of ODI category changes, significant improvement was found after the treatment ( $p < 0.001$ ), before treatment 20% cases were belonging to the severe category, while only 35% were belonging to the minimal category but at post treatment, minimal proportion was increased to 85% while severe was eliminated fully. The Vas scores improved dramatically with increase in kyphotic angle.

**Conclusion:** MRI gains the role of a pivoting stone in non-invasively diagnosing spinal tuberculosis as the gold standard investigation. The old regime of 18 months of ATT is not valid nowadays and just a meticulously applied 6-12 months of ATT is sufficient to achieve cure of spinal tuberculosis. Judiciously applied conservative management may certainly give exceedingly good results.

**Keywords:** Conservative management, ATT, spinal tuberculosis, VAS, ODI, ESR, CRP, MRI, X-Rays

### 1. Introduction

Potts disease continues to be a major health problem in developing and underdeveloped countries [1, 3, 4]. Operative treatment of Pott's disease is considered for cases of severe spinal instability or progressive neurological symptoms with evidence of cord compression or spinal deformity [13, 14, 16]. It is unclear however as to when conservative management (rest/brace/ATT/physical therapy) alone is the preferred treatment of Potts disease. Patients who exhibit both kyphotic deformity and minimal neurological impairment and can be managed conservatively which may be achieved by chemotherapy (anti-tubercular therapy/ATT) alone, surgical indications in these patients are specific and few [6, 7, 12]. Since the last decade there is paucity of literature regarding the conservative management of thoracolumbar spinal tuberculosis with increasing trend toward more and more surgical management.

### 2. Materials and Methods

Present observational study was conducted in the Department of Orthopedic Surgery, Era's Lucknow Medical College and Hospital, Lucknow, during the period between January 2018 and June 2019, after getting approval from ethical committee for this. Patients were selected

according to following inclusion and exclusion criterias.

**2.1 Inclusion criteria**

1. Age >18yrs.
2. Stage 1, 2, 3 in Kumar’s Clinico-radiological classification.
3. Stage 1, 2 in Tuli’s classification.

**2.2 Exclusion criteria**

1. Patients with skip lesions.
  2. Patients already on Anti Tubercular Therapy (ATT) having side-effects like deranged Liver Function Test (LFT) to be excluded.
  3. Patients having immunodeficiency diseases like HIV and other co morbidities.
  4. Patients having active pulmonary tuberculosis or any other tuberculosis in body.
  5. Patients not showing any clinical improvement on Anti Tubercular Therapy alone after 6 weeks and those requiring definitive surgical intervention [10].
- Written and informed consent was taken from all patients before including them in the study. Before starting the treatment following scoring system was used to assess the pre treatment condition of patient.

- “Visual Analog Score” (VAS) for back pain
- “ODI (Owestry Disability) Score” for assessment of disability.
- Follow up of all patients done at 1, 6 and 12<sup>th</sup> month.
- Patients to be recruited till 1 year and the course of ATT (standard four-drug initiation phase consisting of isoniazide (H), rifampicin (R), pyrazinamide (Z), and ethambutol (E) for the first 2 months and continuation phase consisting of HRE for another 4–10 months was followed) will be 12 months [15].
- Final follow up was at 1year.
- Relevant radiological evaluations, x-rays (number of vertebral body involvement, vertebral body and plate erosions, kyphotic angle) was done.
- MRI [Magnetic Resonance Imaging] (presence of tubercular abscess, vertebral body signal intensity change+, -) was done before start of treatment and at final follow up [1, 2, 11].
- Blood investigations (Complete Blood Count, Erythrocyte Sedimentation Rate/ESR, C-Reactive Protein/CRP, Liver Function Tests) was also conducted before starting the treatment and at subsequent patient visit.

STAGE	CLINICO- RADIOLOGICAL FEATURE	DURATION
1) Pre-destructive	straightening of curvatures Spasm of perivertebral muscles MRI: marrow edema	< 2 months
2) Early destructive	decreased disc space+ paradiscal erosion MRI: marrow edema; break of osseous margin CT: marginal erosion or cavitations	2-4 months
3) Mild angular kyphosis	2-3 vertebrae involvement (K: 10-30 degree)	4-9 months
4) Moderate angular kyphosis	> 3 vertebral involvement (K: 30-60 degree)	6-24month
5) Severe kyphosis	> 3 vertebrae involvement	> 2years

Fig 1: Clinico radiological classification

Stage	Clinical features
I [Negligible]	Patient unaware of Neuro-deficit, <b>physician detects extensor planter</b> or ankle clonus
II [Mild]	Patient aware of deficit but <b>manages to walk</b> with/without support+signs of spasticity.
III [ Moderate]	<b>Non ambulatory</b> because of paralysis in extension sensory deficit less than 50%
IV [Severe]	3+paralysis in flexion sensory deficit more than 50%

Fig 2: Neurological deficit (Tuli 1985, Kumar 1988) four grades

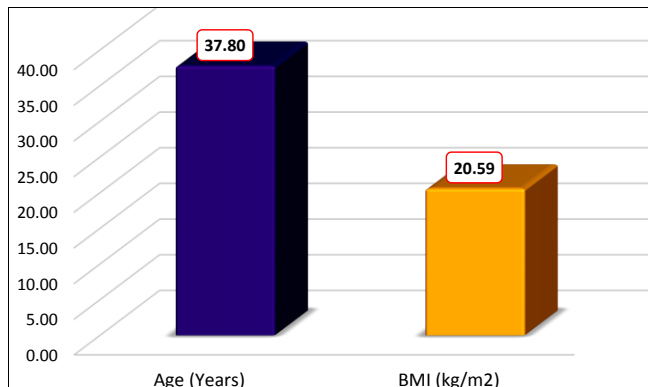
### 3. Observation and Results

Total no. of cases = 40

**Table 1:** Description of cases according to age & BMI

Physical	Mean	SD
Age (Years)	37.80	11.35
BMI (kg/m <sup>2</sup> )	20.59	2.04

The mean age of cases enrolled for the study was 37.80±11.35 years while their mean BMI was 20.59±2.04 kg/m<sup>2</sup>.

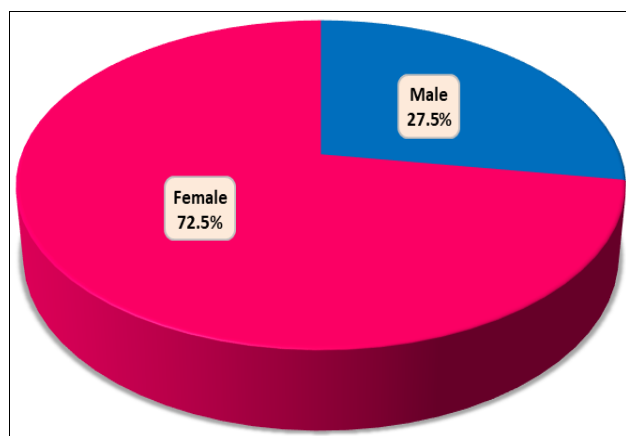


**Description of cases according to age & BMI**

**Table 2:** Sex distribution of cases

Sex (M/F)	No.	%
Male	11	27.5
Female	29	72.5
Total	40	100.0

The study contain females in majority with 29 (72.5%) cases while 11 (27.5%) males were included in the study.



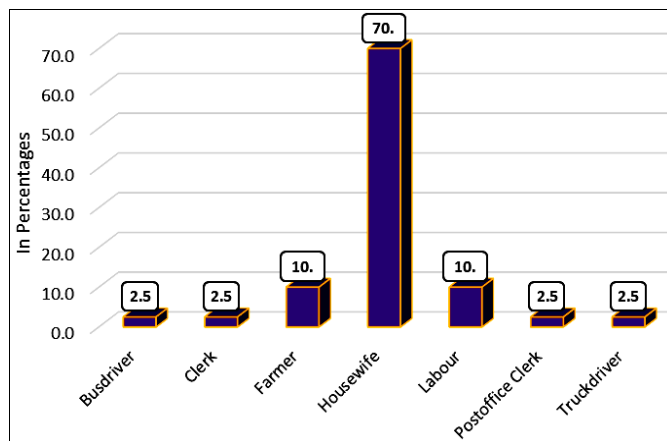
**Sex distribution of cases**

**Table 3:** Distribution of cases according to occupation

Occupation	No.	%
Busdriver	1	2.5
Clerk	1	2.5
Farmer	4	10.0
Housewife	28	70.0
Labour	4	10.0
Postoffice Clerk	1	2.5
Truckdriver	1	2.5
Total	40	100.0

The study contains housewives in majority with 28 (70.0%)

cases while among males majority were farmers and laborers (10% each).

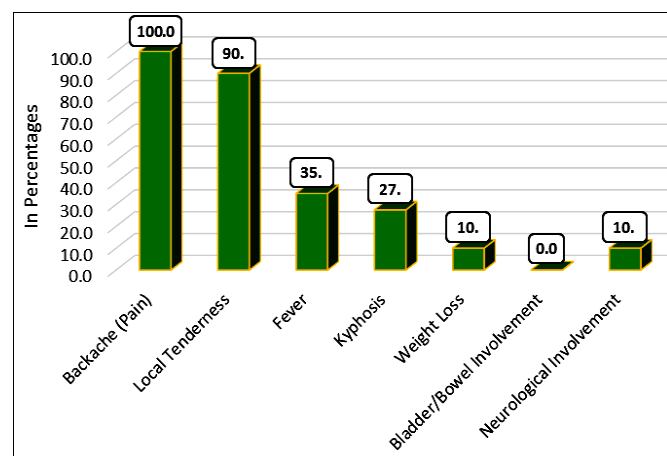


**Distribution of cases according to occupation**

**Table 4:** Distribution of cases according to clinical features

Clinical features	No.	%
Backache (Pain)	40	100.0
Local Tenderness	36	90.0
Fever	14	35.0
Kyphosis	11	27.5
Weight Loss	4	10.0
Bladder and Bowel Involvement	0	0.0
Neurological Involvement	4	10.0
Total	40	100.0

Among the study cases the most common clinical feature was local tenderness which was seen in 36 (90.0%) cases, while the next to most frequent feature was fever found in 14 (35.0%) cases.

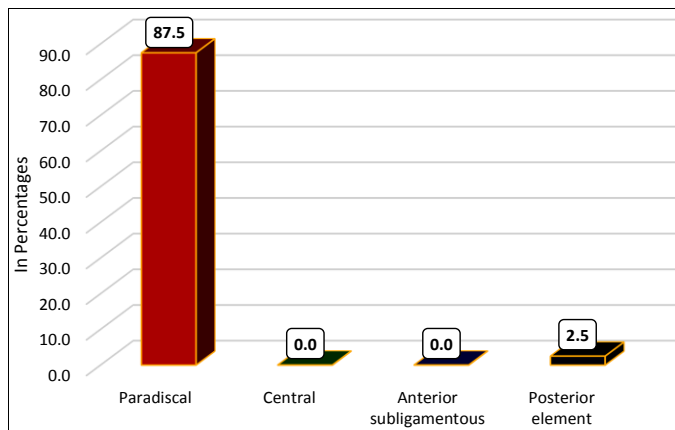


**Distribution of cases according to clinical features**

**Table 5:** Distribution of cases according to type of lesion

Type of lesion	No. (N=40)	%
Paradiscal	35	87.5
Central	0	0.0
Anterior subligamentous	0	0.0
Posterior element	1	2.5
Total	40	100.0

Among the study cases the most common lesion type was Paradiscal which was seen in 35 (87.5%) cases, while posterior element was seen in one case.

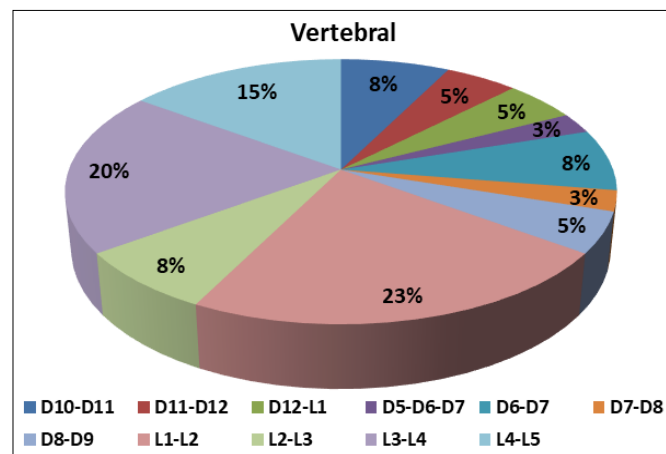


**Distribution of cases according to type of lesion**

**Table 6:** Distribution of studied patients on basis of vertebral level

Vertebral	Frequency (n=40)	Percentage
D10-D11	3	7.5%
D11-D12	2	5.0%
D12-L1	2	5.0%
D5-D6-D7	1	2.5%
D6-D7	3	7.5%
D7-D8	1	2.5%
D8-D9	2	5.0%
L1-L2	9	22.5%
L2-L3	3	7.5%
L3-L4	8	20.0%
L4-L5	6	15.0%

Following table shows majority of 9 (22.5%) were L1 – L2 followed by 8 (20.0%) L3 – L4, 6 (15.0%) L4 – L5, 3 (7.5%) D10 – D11, D6 – D7 & L2 – L3 respectively. 2 (5.0%) D11 – D12, D12 – L1 and D8 – D9 respectively. 1 (2.5%), D5-D6-D7 and D7-D8 respectively

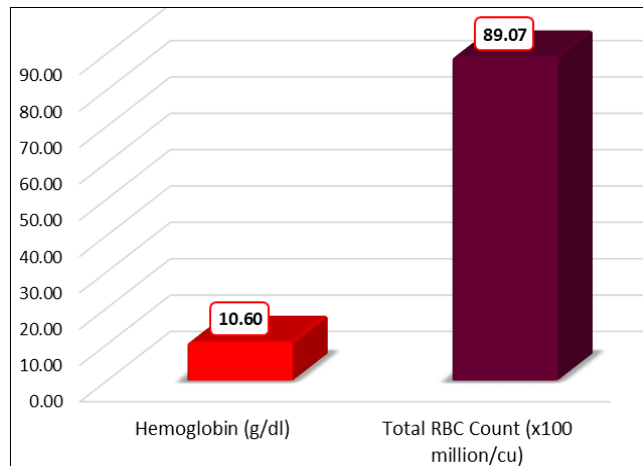


**Distribution of studied patients on basis of vertebral level**

**Table 7:** Description of Cases according to Clinical Investigations

Clinical Investigations	Mean	SD
Hemoglobin (g/dl)	10.60	1.68
Total RBC Count (million/cu)	8907.50	1789.63

The Hemoglobin of cases enrolled in the study was 10.60±1.68 g/dl while their mean Total RBC count was 8907.5±1789.63 million/cu.



**Description of Cases according to Clinical Investigations**

**Table 8:** Description of cases according to duration of symptoms

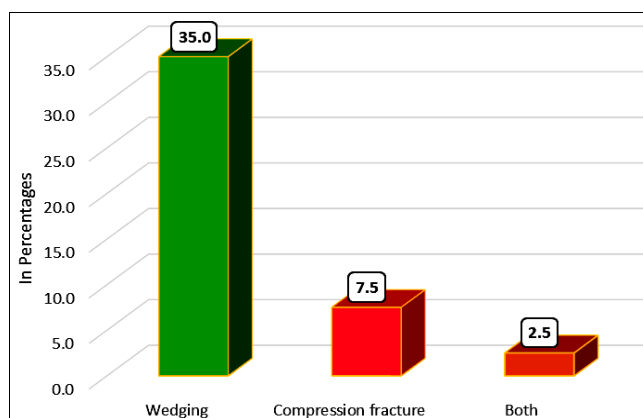
Duration of symptoms in months	Mean	SD
	3.54	2.64

The mean duration of symptoms among the cases was 3.54±2.64 months

**Table 9:** Distribution of cases according to severity of bone destruction by plain radiography

Severity of bone destruction by Plain radiography	No.	%
Wedging	14	35.0
Compression fracture	3	7.5
Both	1	2.5

Wedging was found in 14 (35%) cases, Compression fracture in 3 (7.5%) cases and both in 1 (2.5%) cases.

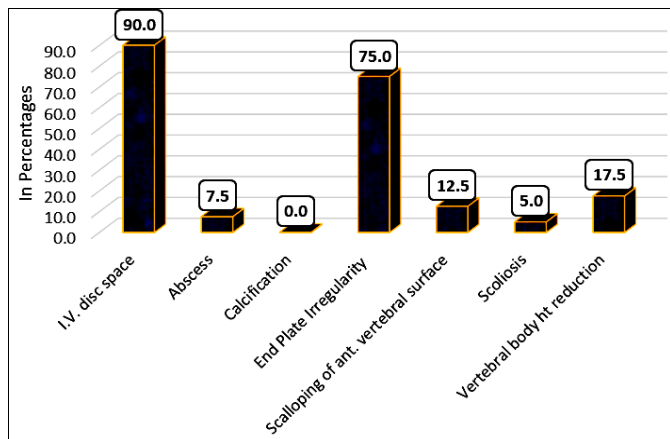


**Distribution of cases according to severity of bone destruction by plain radiography**

**Table 10:** Distribution of cases according to plain radiography findings

Plain radiography other findings	No.	%
I.V. disc space/ disc involvement	36	90.0
Abscess	3	7.5
Calcification	0	0.0
End Plate Irregularity	30	75.0
Scalloping of anterior vertebral surface	5	12.5
Scoliosis	2	5.0
Vertebral body height reduction	7	17.5

Among the study cases the most common plain radiography finding was I.V. disc space which was seen in 36 (90.0%) cases, while the next most common finding was end plate irregularity which was seen in 30 (75.0%) cases.

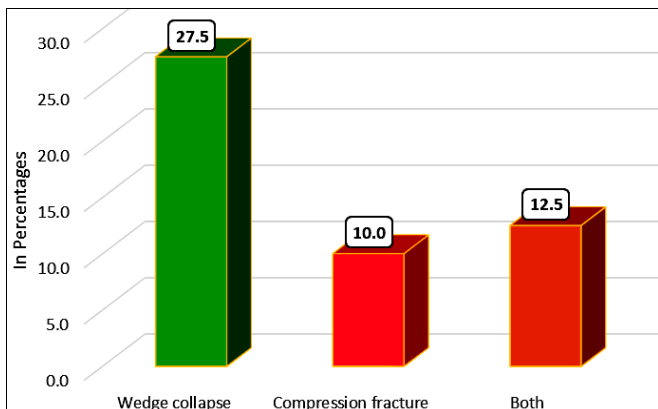


**Distribution of cases according to plain radiography findings**

**Table 11:** Distribution of cases according to severity of bone destruction (MRI findings)

MRI - Severity of bone destruction	No.	%
Wedge collapse	11	27.5
Compression fracture	4	10.0
Both	5	12.5

Wedge collapse was found in 11 (27.5%) cases, Compression fracture in 4 (10.0%) cases and both in 5 (12.5%) cases.

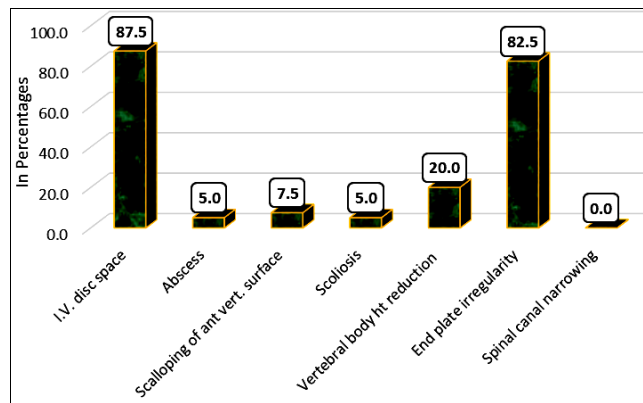


**Distribution of cases according to severity of bone destruction (MRI findings)**

**Table 12:** Distribution of cases according to MRI findings

MRI Other findings	No.	%
I.V. disc space/ disc involvement	35	87.5
Abscess	2	5.0
Scalloping of anterior vertebral surface	3	7.5
Scoliosis	2	5.0
Vertebral body height reduction	8	20.0
End plate irregularity	33	82.5
Spinal canal narrowing	0	0.0

Among the study cases the most common MRI finding was I.V. disc space which was seen in 35 (87.5%) cases, while the next most common finding was end plate irregularity which was seen in 33 (82.5%) cases.

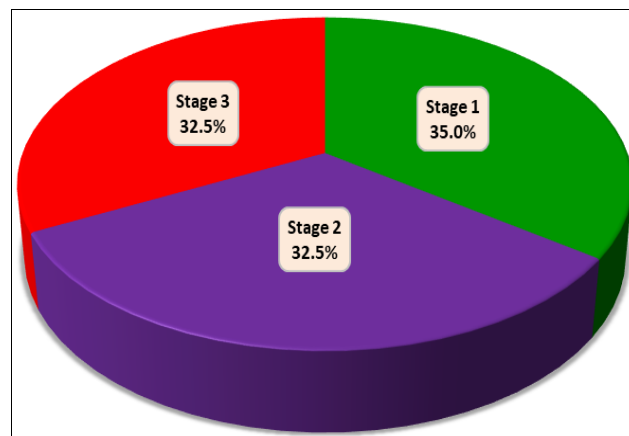


**Distribution of cases according to MRI findings**

**Table 13:** Distribution of cases according to Kumar’s Clinico-radiological classification

Kumar’s Clinico-radiological classification	No.	%
Stage 1	14	35.0
Stage 2	13	32.5
Stage 3	13	32.5
Total	40	100.0

On the basis of Kumar’s Clinico-radiological classification the stage 1 cases were 14 (35.0%), stage 2 and stage 3 cases were in same proportion (32.5%).

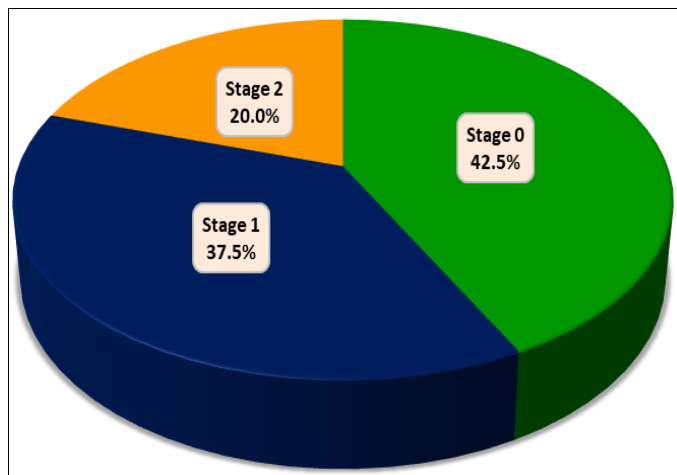


**Distribution of cases according to Kumar’s Clinico-radiological classification**

**Table 14:** Distribution of cases according to neurological assessment staging-Tuli’s classification

Neurological assessment staging - Tuli’s classification	No.	%
Stage 0	17	42.5
Stage 1	15	37.5
Stage 2	8	20.0
Total	40	100.0

On the basis of Tuli’s classification the stage 0 cases were 17 (42.5%), stage 1 cases were 15 (37.5%) and stage 2 cases were 8 (20.0%).

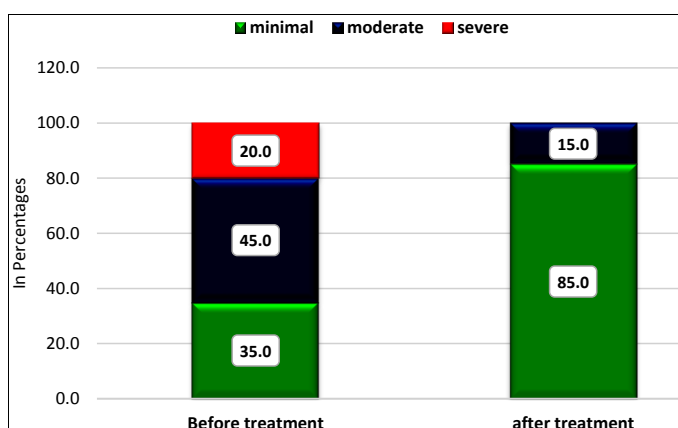


Distribution of cases according to neurological assessment staging-Tuli's classification

Table 15: The improvement status of cases on the basis of ODI category changes

ODI Category	Before treatment		After treatment		Significance	
	No.	%	No.	%	chi sq.	p-value
minimal	14	35.0	34	85.0	22.3	<0.001
moderate	18	45.0	6	15.0		
severe	8	20.0	0	0.0		
Total	40	100.0	40	100.0		

On the basis of ODI category changes, significant improvement was found after the treatment ( $p < 0.001$ ). Before treatment 20% cases were belonging to the severe category, while only 35% were belonging to the minimal category but at post treatment, minimal proportion was increased to 85% while severe was eliminated fully.



The improvement status of cases on the basis of ODI category changes

Table 18: The improvement status of cases on the basis of ODI component scores

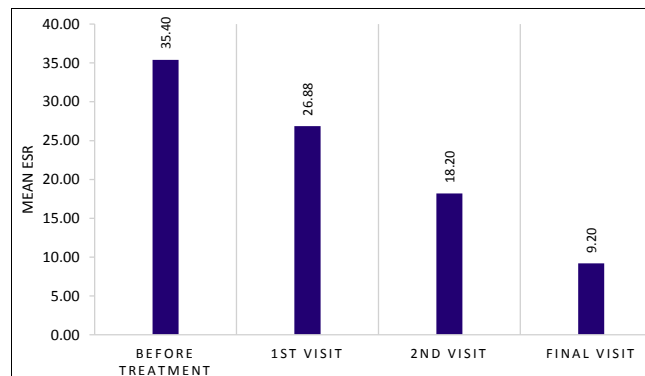
ODI Component Score	Before treatment		After treatment		Wilcoxon test	
	Mean	SD	Mean	SD	z-value	p-value
Pain intensity	2.23	1.17	1.05	0.75	-5.10	<0.001
Personal care (washing, dressing etc)	1.73	1.01	0.45	0.78	-5.55	<0.001
Lifting score	1.48	1.04	0.48	0.68	-5.03	<0.001
Walking score	1.28	0.85	0.28	0.51	-4.85	<0.001
Sitting score	1.23	0.77	0.28	0.60	-4.99	<0.001
Standing score	1.13	0.85	0.25	0.54	-5.00	<0.001
Sleeping score	1.23	0.95	0.30	0.56	-4.69	<0.001
Sex life score	1.00	0.65	0.03	0.19	-4.07	<0.001
Social life score	1.15	0.80	0.28	0.55	-5.01	<0.001
Travelling score	1.28	0.85	0.43	0.59	-4.21	<0.001

The highly significant changes (improvements) were found in each of the ODI component ( $p < 0.001$ ) which includes Pain intensity, Personal care, Lifting, Walking, Sitting, Standing, Sleeping, Sex life and travelling.

Table 16: The improvement status of cases on the basis of ESR changes

ESR (mm)	Mean	SD	Change	t-value	p-value
Before Treatment	35.40	14.80	-	-	-
1st visit	26.88	10.39	8.53	7.96	<0.001
2nd visit	18.20	6.55	17.20	10.78	<0.001
Final visit	9.20	3.55	26.20	11.58	<0.001

The highly significant reduction in ESR was found after 1<sup>st</sup> visit, 2<sup>nd</sup> visit and final visit relative to before treatment ( $p < 0.001$  for each visit)

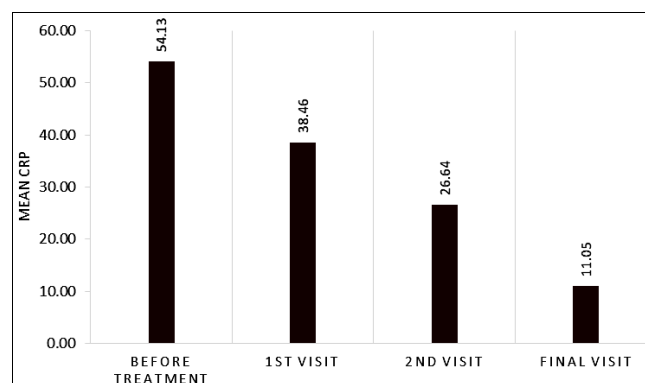


The improvement status of cases on the basis of ESR changes

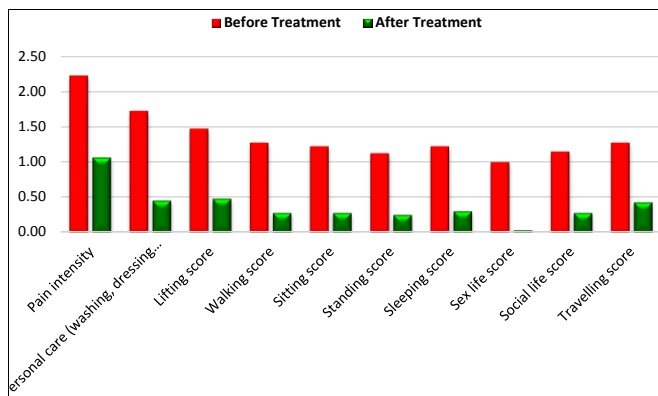
Table 17: The improvement status of cases on the basis of CRP changes

CRP (mg/dl)	Mean	SD	Change	t-value	p-value
Before Treatment	54.13	26.96	-	-	-
1st visit	38.46	16.53	15.67	7.94	<0.001
2nd visit	26.64	11.16	27.50	8.91	<0.001
Final visit	11.05	5.01	43.08	10.78	<0.001

The highly significant reduction in CRP was found after 1<sup>st</sup> visit, 2<sup>nd</sup> visit and final visit relative to before treatment ( $p < 0.001$  for each visit)



The improvement status of cases on the basis of CRP changes

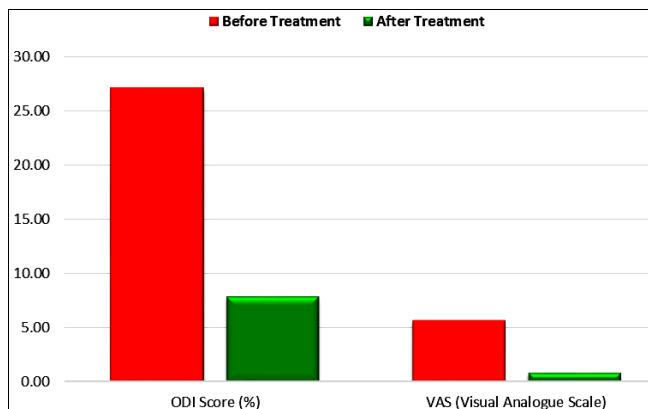


The improvement status of cases on the basis of ODI component scores

Table 19: The improvement status of cases on the basis of ODI (%) score and VAS

Variable	Before treatment		After treatment		Wilcoxon test	
	Mean	SD	Mean	SD	z-value	p-value
ODI Score (%)	27.18	13.80	7.90	8.95	-5.52	<0.001
VAS (Visual Analogue Scale)	5.70	1.71	0.90	1.72	-5.57	<0.001

The highly significant changes (improvements) were found in ODI score (%) ( $p < 0.001$ ) and VAS scores.

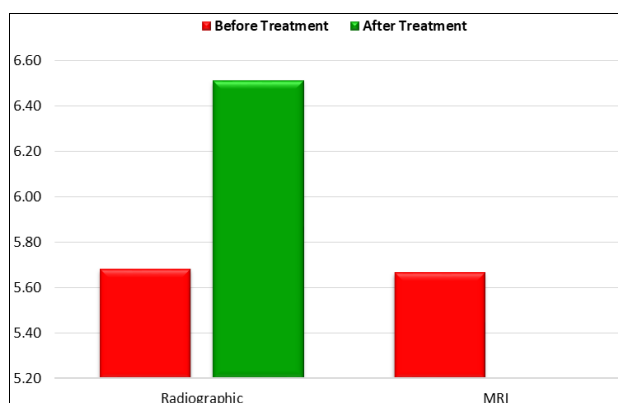


The improvement status of cases on the basis of ODI (%) score and VAS

Table 20: The improvement status of cases on the basis of kyphotic angle (Degree)

Kyphotic angle (Degree)	Before treatment		After treatment		z-value	p-value
	Mean	SD	Mean	SD		
Radiographic	5.68	8.84	6.51	9.88	3.08	0.002
MRI	5.67	8.82	-	-	-	-

The highly significant changes (increase) were found in Kyphotic angle ( $p < 0.001$ ).



The improvement status of cases on the basis of kyphotic angle (Degree)

#### 4. Limitations of the study

The study only had 40 patients. A larger study group would have been required for a more definite conclusion. During this study, the hospital had not adopted the policy for biopsy followed by culture and sensitivity testing as a routine for each patient before giving ATT. Thus, we really are in jeopardy as to how many of these patients were multi-drug-resistant and whether they would have behaved the same as mycobacterial TB (tuberculosis) following treatment. Strict follow-up is a must in this type of study because worsening of neurology can be diagnosed before hand in order for surgery to be offered at the earliest [8].



3 year followup with complete bony ankylosis

#### 5. Conclusion

MRI gains the role of a pivoting stone in non-invasively diagnosing spinal tuberculosis as the gold standard investigation [2, 4, 5]. The old regime of 18 months of ATT is not valid nowadays and just a meticulously applied 6-12 months of ATT is sufficient to achieve cure of thoraco-lumbar spinal tuberculosis<sup>15</sup>. Judiciously applied conservative management may certainly give exceedingly good results. However, the crucial step remains patient education and participation which must be given utmost significance when implementing non-operative treatment, especially in the presence of neurological deficit [6, 7, 9, 11].

#### 6. Financial support and sponsorship

Nil

#### 7. Conflicts of interest

There are no conflicts of interest

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