

# Survey of spinal tuberculosis in Basrah

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## ABSTRACT

**Background.** Tuberculous spondylitis (TS) or spinal tuberculosis is secondary either to pulmonary or intestinal tuberculosis and may be the initial manifestation of tuberculosis (TB). Spinal TB also called Pott's disease is by definition, an advanced severe disease, requiring accurate evaluation and aggressive systemic therapy.

**Objective.** This study was conducted to demonstrate the prevalence and clinical, laboratory, and management characteristics of patients with spinal tuberculosis in Basrah governorate.

**Methods.** A cross-sectional descriptive retrospective and prospective study was conducted from March 2020 to December 2021. All cases registered at the tuberculous center, Basrah Health Directorate, were viewed either by phone calling (or recall) or newly diagnosed with spinal tuberculosis which attended to Basrah Teaching Hospital. Those patients were followed after diagnosis and treatment initiation for any clinical improvement, worsening or no improvement after diagnosis.

**Results.** Among 51 enrolled patients with spinal tuberculosis in this study, the age distribution was 20-39 years old (45.09%). Most of the patients (32) were males with rates of 62.74%. The most common site of vertebral involvement was the dorsal segment 29 (56.86%). The most common presenting complaints were: back pain, in 49 patients (96.07%). Regarding the examination findings, 2 (13.33%) presented with deformity either kyphotic or gibbous. Most of the examined patients had a power grade 1-3/5 (93.33%) in the lower limbs. All of the 4 cases of cervical tuberculosis had been managed conservatively, while 6 out of 16 cases diagnosed with lumbar lesions (37.5%) were managed conservatively, and 10 cases (62.5%) were managed surgically.

**Conclusion.** The prevalence and characteristics of patients with spinal TB follow the global trend, although some differences were recorded, but it was not that significant. The surgical approach is still superior to the conservative one in the improvement of neurological deficits.

**Keywords:** spinal TB, tuberculosis, extra-pulmonary TB, skeletal TB, TB management

## INTRODUCTION

Tuberculous spondylitis (TS), also known as spinal tuberculosis or Pott's disease, is a severe form of tuberculosis (TB) that primarily affects the spine, secondary to either pulmonary or intestinal TB, and can sometimes be the initial manifestation of TB [1]. Accurate evaluation and aggressive systemic therapy are crucial in managing this advanced disease [1]. While systemic therapy is the mainstay of treatment, surgical intervention is often required for diagnostic purposes, addressing neurological complications, and preventing or managing kyphosis [2].

TS is one of the most serious forms of TB infection. Delays in diagnosis and treatment can lead to spinal cord compression and skeletal abnormalities [3]. Given the scarcity of data on TS in Iraq, particularly in Basrah, this study aims to elucidate the prevalence of spinal tuberculosis in the Basrah governorate.

TB remains a significant global public health issue, with about one-third of the world's population infected with *Mycobacterium tuberculosis*, the causative agent of TB. Annually, there are approximately 9 million new TB cases and 1.5 million TB-related deaths [4]. In Iraq, the Ministry of Health reported

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an incidence rate of 41 TB cases per 100,000 people in 2019 [5].

Skeletal TB constitutes 10-20% of all extrapulmonary TB (EPTB) cases and 1-2% of all TB cases [6]. Spinal TB, the most dangerous form of bone and joint TB due to its potential to cause bone destruction, deformity, and paraplegia, represents 50% of all skeletal TB cases [7]. Neurological complications, ranging from 23% to 76% of cases, can lead to complete paraplegia or tetraplegia if untreated [8].

The rise in multi-drug resistant TB, higher infection rates in immunocompromised individuals, improved imaging technologies, and advancements in spinal reconstruction surgery have significantly impacted the management of Pott's disease [9]. Early diagnosis through advanced imaging techniques like magnetic resonance imaging (MRI) has improved the management and outcomes of spinal TB patients [10].

Spinal TB results from the hematogenous spread of *Mycobacterium tuberculosis* to the vascular vertebral bodies, primarily via arterial or venous routes [1,2,11]. The disease typically begins in the anterior inferior part of the vertebral body and can spread to the central part or discs, leading to vertebral collapse and deformities such as kyphosis. In young patients, the vascularized discs are more affected, whereas in older patients, the avascular nature of the discs leads to different disease patterns [12,13].

The clinical features of spinal TB include local pain, tenderness, muscle spasm, stiffness, cold abscess formation, and obvious spinal deformity [14]. The disease progresses slowly, with symptoms ranging from mild dull pain to severe disability over several months to years [15,16]. Neurological manifestations depend on the level of spinal involvement, with cervical TB causing tetraplegia and thoracic or lumbar TB causing paraplegia [17]. Cold abscesses, a hallmark of spinal TB, can cause significant complications depending on their location [11,18].

This study aims to shed light on the prevalence, clinical presentation, laboratory findings, and management characteristics of spinal TB in Basrah governorate, addressing the gaps in local epidemiological data and informing better healthcare strategies.

## PATIENTS AND METHODS

This study employed a cross-sectional observational design, incorporating both retrospective and prospective elements. Conducted at the Orthopaedic Department of Basrah Teaching Hospital, the study spanned from March 2020 to December 2021.

The study included all patients diagnosed with spinal tuberculosis (TB) through two primary recruitment methods. First, patients who were registered at the TB center had their records reviewed via phone calls or direct access to recorded information. Sec-

ond, newly diagnosed patients who attended Basrah Teaching Hospital were included. Participants encompassed individuals of all ages and genders to accurately determine the prevalence of spinal TB in Basrah.

Patients attending Basrah Teaching Hospital underwent comprehensive clinical assessments, which included a detailed medical history focusing on comorbidities and a thorough clinical examination. Diagnostic tools such as patient history, physical examinations, imaging studies, and laboratory investigations were also reviewed.

After diagnosis and initiation of medical treatment, patients were monitored for clinical improvement, indicated by subsiding pain and fever, regained appetite, restored normal hemoglobin levels, and normalized inflammatory markers. Any deterioration in these features was considered a sign of worsening.

Data were collected using a specially designed questionnaire comprising socio-demographic characteristics, clinical assessment, laboratory assessment, imaging, and patient follow-up. The socio-demographic section included the patient's name, age, sex, occupation, address, phone number, and financial status. The clinical assessment documented symptoms, chief complaints, duration, lesion site, and complete clinical, laboratory, and radiological evaluations. Laboratory assessments included hematological tests such as Complete Blood Count (CBC) and Erythrocyte Sedimentation Rate (ESR), biochemical tests like Random Blood Sugar (RBS), Blood Urea (B.urea), and C-Reactive Protein (CRP), blood culture for some patients, and histopathological examination. Imaging studies included X-Ray and MRI evaluations. Follow-up data encompassed details of medical treatment, surgical management, disease progression, and complications.

Neurological injury severity was classified using the Frankel grading system, which includes five grades: Grade A (complete neurological injury with no motor or sensory function below the lesion level), Grade B (preserved sensation only with no motor function below the lesion level), Grade C (preserved motor function, able to walk), Grade D (preserved useful motor function, able to work), and Grade E (normal motor and sensory function below the lesion level, with abnormal reflexes possibly persisting).

## RESULTS

Among 51 enrolled patients with spinal tuberculosis in this study, the age distribution was: 23 aged 20-39 years (45.09%), 11 aged 40-59 years (21.56%), 9 aged  $\geq 60$  years (17.64%), and 8 aged  $< 20$  years (15.68%). Most of the patients were males (32) with

62.74% rates. The majority (58.82%) of the patients were unemployed. Regarding the family history, none of the patients had family history of TB. The financial status ranged from low class (64.7%) to middle class (25.49%), and upper class (9.80%) (Table 1).

**TABLE 1.** Different types of JIA

	Variables	Frequency (No. 51)	%
<b>Age (years)</b>	<20 years	8	15.68
	20-39	23	45.09
	40-59	11	21.56
	≥60	9	17.64
<b>Gender</b>	Male	32	62.74
	Female	19	37.25
<b>Occupation</b>	Employed	21	41.17
	Unemployed	30	58.82
<b>Family history</b>	Positive	0	0.0
	Negative	51	100
<b>Financial status</b>	Low	33	64.7
	Middle	13	25.49
	Upper	5	9.80

The clinical parameters analysis of the enrolled patients showed that the most common site of vertebral involvement was dorsal segments - 29 (56.86%), followed by the lumbar - 16 (31.37%), cervical vertebra - 4 (7.84%), and the dorso-lumbar - 2 (3.92%). Moreover, the most common presenting complaints recorded in this study were back-pain - 49 (96.07%), loss of appetite - 35 (68.62%), and fever - 22 (43.13%), radicular pain - 19 (37.25%), paraplegia - 18 (35.29%), weight loss - 14 (27.45%), and night sweating - 12 (23.52%). Most of the enrolled patients had a long period between the onset of the symptoms and diagnosis, reaching up to months and even years. Immuno-compromised patients were including diabetic - 11 (21.56%), those with malignancy - 2 (3.92%) (a male patient with colonic cancer, and a female with breast cancer)-, and on steroids therapy - 3 (5.88%)-, one of them previously diagnosed with ulcerative colitis, another one diagnosed with COVID-19 infection, and the last one diagnosed with spinal TB (Table 2).

A total of 15 patients who attended Basrah Teaching Hospital had been examined and re-evaluated. Regarding the examination findings, 13.33% were observed with deformity either kyphotic or gibbous. Tenderness felt in 80% of the patients, while mass was palpated in 13.33%. Most of the examined patients (93.33%) had a power grade 1-3/5 (Table 3).

All the 15 patients who underwent surgical intervention had been evaluated for neurological deficit before and after the surgery (one month only after surgery). One patient was recorded as grade A and another as grade B, the first one did not show any

**TABLE 2.** Clinical parameters distribution of the enrolled patients

	Variables	Frequency (No. 51)	%
<b>Site of lesion</b>	Cervical	4	7.84
	Dorsal	29	31.37
	Lumbar	16	56.86
	Dorso-lumbar	2	3.92
<b>Presenting complaint</b>	Back pain	49	96.07
	Paraplegia / paraparesis	18	35.29
	Weight loss	14	27.45
	Sphincter uncontrol	5	9.80
	Radicular pain	19	37.25
	Subjective loss of sensation	6	11.76
	Cough	3	5.88
	Fever	22	43.13
	Back swelling	4	7.84
	Night sweating	12	23.52
	Loss of appetite	35	68.62
<b>Duration of symptoms</b>	Weeks (3-4)	12	23.52
	Months (3-6)	36	70.58
	Years (up to 2 year)	3	5.88
<b>Associated pathology</b>	Diabetes mellitus	11	21.56
	Malignancy	2	3.92
	Steroid user	3	5.88

**TABLE 3.** Different types of JIA

	Variables	Frequency (No. 51)	%
<b>Look</b>	Deformity (Kyphosis, gibbous deformity)	2	13.33
	Cachexia	4	26.67
	Mass	2	13.33
	Sinus	2	13.33
<b>Feel</b>	Tenderness	12	80.00
	Mass	2	13.33
<b>Power of lower limb</b>	Grade 0/5	1	6.67
	Grade 1-3 /5	14	93.33

improvement after surgery while the next improved and recoded as grade C. Three patients had registered as grade C preoperatively, and all of them were transitioned to grade D. Seven patients observed as grade D preoperatively, 3 of them showed a dramatic response and reserved normal motor and sensory functions (Tables 4, 5).

**TABLE 4.** Frankel grading of patients who underwent surgical intervention

Variables	Preoperative	Postoperative (15)				
		A	B	C	D	E
Grade A:	1	1				
Grade B:	1			1		
Grade C:	3				3	
Grade D:	7				4	3
Grade E:	3					3

**TABLE 5.** Frankel grading in regard to the site of lesion

Grade	No. of patients	Site of lesions
Grade A:	1 (6.67%)	1Dorsal
Grade B:	1 (6.67%)	1Dorsal
Grade C:	3 (20%)	2 Dorsal 1 Lumbar
Grade D:	7 (46.67%)	4 Dorsal 3 Lumbar
Grade E:	3 (20%)	3Dorsal

The blood laboratory parameters revealed that hemoglobin levels presented with a mean of 7.46 + 1.95), while lymphocyte count, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) recorded a means of 80.024 + 5.26, 80.36 + 15.74, and 101.57 + 26.89, respectively (Table 6).

**TABLE 6.** Laboratory-related parameters distribution of the enrolled patients

Variables	Means + SD
Hemoglobin (g/dl)	7.46+1.95
Erythrocyte sedimentation rate (mm/hour)	80.36+15.74
C-reactive protein (mg/L)	101.57+26.89
Lymphocyte count (cell/ microliter)	80.024+5.26

Out of the 51 patients enrolled in this study 18 (35.29%) had been managed conservatively using anti-TB chemotherapy, 33 (64.69%) had been managed surgically by the following approaches:

- Posterior drainage ± fixation -14 (27.45%),
- Anterolateral thoracotomy drainage ± fixation, and rib graft -16 (31.37%),
- Ilioinguinal drainage of abscess - 2 (3.92%)
- Direct Posterior drainage of large paraspinal abscess -1 (1.96%).

Among those patients, 54.90% had been improved, 9.80% had been deteriorated and their condition worsening as the sequences of the complications, while 35.29% were still as the same condition (Table 7).

All of those 4 cases of cervical TB had been managed conservatively, while 6 out of 16 cases (37.5%) diagnosed with lumbar lesions were managed conservatively, and 10 cases (62.5%) were managed sur-

**TABLE 7.** Management and follow-up related parameters distribution of the enrolled patients

Variables	Frequency (No. 51)	%
<b>Surgical management</b>		
Posterior ± drainage ± fixation	14	27.45
<b>33 patients</b>		
Anterolateral thoracotomy drainage ± fixation and rib graft	16	31.37
Ilioinguinal drainage of abscess	2	3.92
Direct Posterior drainage	1	1.96
<b>Conservative</b>	18	35.29
<b>Follow-up</b>		
Improved (28)	Surgical 22	
	Conservative 6	
Not-improved (18)	Surgical 9	
	Conservative 9	
Worsening (5)	Surgical 2	
	Conservative 3	

gically. Regarding the dorsal Tb (29 cases), 7 cases (24.14%) had been managed conservatively, and 22 cases (75.86%) had been managed surgically. Moreover, from those 2 cases of dorso-lumbar lesion, one (50.0%) had been managed conservatively and the other one (50.0%) surgically (Table 8).

**TABLE 8.** Site of lesion distribution regarding the management option

Management	Cervical (4 cases)	Lumbar (16 cases)	Dorsal (29 cases)	Dorso-lumbar (2 cases)
<b>Conservative No. 18</b>	4 (100.0%)	6 (37.5%)	7 (24.14%)	1 (50.0%)
<b>Surgical No. 33</b>	0 (0.0%)	10 (62.5%)	22 (75.86%)	1 (50.0%)

## DISCUSSION

Spinal Tuberculosis (TB), one of the oldest known diseases, has significantly impacted humanity. First described by Percival Pott in 1782 [19], evidence of spinal TB dates back to 3400 BC among Egyptian mummies [20]. It remains a major public health issue in developing countries, accounting for 50% of skeletal TB cases and being a leading cause of non-traumatic paraplegia, with significant morbidity and socioeconomic repercussions [21].

Out of 51 cases studied, the majority of patients were young adults (20-39 years old) representing 45.09%, followed by the 40-59 age group at 21.56%. Males predominated (62.74%), with most patients being non-employed (58.82%) and of poor financial status (68.08%). A similar study by Peng Wang et al. on 597 spinal TB cases found a majority in the 20-39

age group (37.6%) with males at 52.43% [22]. Mohammad Khan's study of 305 patients noted 55.1% in the 20-45 age group and a high rate of non-employment (37.2%) [23]. Zheng Liu's retrospective study in China on 1378 patients also found a predominance in the 18-45 age group (40.7%) and males (58.4%), with a significant portion being non-employed (>65%) [24].

Young people are more vulnerable to spinal TB due to greater mobility, harsh living conditions, and poor health awareness as interpreted by Wang [22]. Hao Zeng hypothesizes that young patients performing long periods of physical labor increase spinal load, leading to chronic spinal injury and susceptibility to Mycobacterium tuberculosis infection [25]. A national TB survey in 2010 indicated a rise in older patients with bone and joint TB [26], attributed to aging populations, longer lifespans, poor immunological status, and higher vulnerability to comorbidities [27]. In older patients, spinal TB is characterized by disease complexity, slow recovery, treatment resistance, and atypical symptoms [28].

Clinically, the most affected segments were dorsal (59.86%), followed by lumbar (31.37%), dorso-lumbar (3.92%), and cervical (7.84%). Thoracic and lumbar spine involvement is common, leading to spinal deformity and paralysis [29]. However, Obisesan's and Lagundoye's studies found lumbar vertebrae more vulnerable than thoracic segments [30]. Common presenting symptoms were back pain, loss of appetite, and fever. Severe symptoms like paraplegia, weight loss, and night sweats were also noted. The chronic, progressive nature of spinal TB and its prevalence among immunocompromised individuals often delays diagnosis for months or even years [31].

In this study, immunocompromised cases included patients with diabetes mellitus, malignancies, and those on steroids. Delayed diagnosis and misdiagnosis were challenges, as illustrated by cases of non-tuberculous vertebral osteomyelitis misdiagnosed as TB [32, 33]. Back pain is the most common symptom, often followed by night sweats, weight loss, and low-grade fever. Studies by Garg RK and Turgut M confirm that pain is typically localized to the site of infection [31,34]. Chronic back pain was the only presenting complaint in 61% of UK patients with spinal TB [35]. Owolabi's study of 87 patients found paraplegia (100%) and back pain (90.8%) as common presentations, linking high paraplegia rates to delayed healthcare seeking [36]. Pain mechanisms include vertebral body destruction and inflammatory stimuli leading to neuropathic pain [24].

Neurological injury and disability rates among spinal TB patients vary from 23% to 76% [37]. Spinal deformity, notably kyphosis, is a hallmark of spinal TB, commonly resulting from thoracic involvement.

Deformity severity depends on the number of affected vertebrae, with kyphotic deformity increasing by over 10° in up to 20% of cases post-treatment [36, 38]. This study observed deformity in 13.33% of patients, with 80% developing tenderness upon palpation. A study in Guizhou Province found deformity and tenderness in 30.65% and 77.89% of 542 spinal TB patients, respectively [22]. Roop Singh confirmed kyphotic deformity's correlation with vertebral involvement and disease duration [39].

Erythrocyte sedimentation rate (ESR) and C-reactive proteins (CRP) are sensitive parameters for monitoring disease activity. This study observed ESR ( $80.36 \pm 15.74$ ) and CRP ( $101.57 \pm 26.89$ ), consistent with some studies [22], while contrasting with others like Fam A.G.'s [40]. Mulleman et al. found CRP levels ranging from 6 to 197 mg/l in 23 spinal TB patients [41]. Sudprasert et al. noted a mean CRP level of 80.4 mg/L in patients with neurological deficits, with significant postoperative CRP decline correlating with neurological recovery [42].

Hemoglobin (Hb) level reflects nutritional status, with malnutrition being a key cause of spinal TB development [43]. This study recorded a mean Hb value of  $7.46 \pm 1.95$ . Spinal TB, a wasting disease, necessitates nutritional support [44]. The World Health Organization recommends enhancing nutritional status alongside anti-TB treatment [45]. Immunotherapies can improve bacterial replication control, treatment duration, and therapeutic effects in latent or active TB cases [46].

Lymphocyte-predominant exudates with high adenosine deaminase (ADA) are indicative of tuberculous infections [47]. However, diagnosing TB via fluid analysis remains challenging. Lymphocytes constitute up to 90% of cells in TB-infected fluids [48]. This study recorded a mean lymphocyte count of  $80.024 \pm 5.26$ . Francisco Gambo's study on lymphocyte populations in TB infection found doubled lymphocyte counts in recent infections compared to controls [49].

Spinal TB management is challenging and depends on disease severity and presentation. Treatment generally involves supportive care, anti-TB chemotherapy, and surgical interventions. Anti-TB chemotherapy, the primary treatment, is used for 6-9 months [46]. In this study, 35.29% of patients were managed conservatively with anti-TB drugs, while 64.69% underwent various surgical procedures [50]. Surgical factors include poor drug compliance due to treatment duration and adverse effects, high multi-drug resistance rates, and the inability of anti-TB drugs to correct vertebral destruction [51]. Advanced surgical techniques have improved spinal alignment and function [52,53].

A 2018 study in Iran on 229 skeletal TB patients found 21.4% underwent surgery and anti-TB chemo-

therapy, while 78.6% used anti-TB chemotherapy alone, achieving an 86% success rate [54]. Lionelson Norbert Yong et al.'s 2021 meta-analysis of 19 articles concluded that surgical intervention is more common than conservative management, likely due to neurological consequences [55-57]. Studies on surgical techniques recorded many patients with compromised preoperative neurological status. However, fewer studies evaluated outcomes of conservative management, with those patients less likely to have initial neurological deficits [58,59].

This study was limited by the pandemic of coronavirus and the transition of Basrah Teaching Hospital to an isolation Hospital for infected patients, which limited the registration of new cases and surgical interventions of the patients also, skipped lesions not

assess because most of the patient not do whole spine MRI, additionally, it was too difficult to call the patients and ask them to attend the hospital for research purpose as they have poorly cooperated. Moreover, patients were poorly understanding the full medical information that can tell the doctor about the details.

## CONCLUSION

The prevalence and characteristics of patients with spinal TB follow the global trend, although some differences were recorded but it was not that significant. The surgical approach is still superior to the conservative one in the improvement of neurological deficit.

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