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Research Article

Outcome and its Predictors in Surgery for Thoracic Tuberculosis at the National Orthopaedic Hospital Dala Kano Nigeria

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Abstract

Background: Thoracic spinal Tuberculosis (TB) remains a significant cause of neurological impairment and spinal deformity in Nigeria. While posterior surgery has become increasingly adopted, outcome data from West African settings are scarce. This study evaluated the outcomes and predictors of surgical treatment for thoracic TB at a major Nigerian tertiary centre.

Methods: A retrospective cohort study of 103 consecutive patients who underwent surgery for thoracic spinal TB at the National Orthopaedic Hospital Dala, Kano, from January 2019 to December 2025 was conducted. All patients had posterior surgery, with 37 receiving additional Harm's cage support, 21 having rib bone graft support and 2 receiving fibula strut grafts. Outcomes assessed included neurological recovery (ASIA grade), pain relief (VAS), kyphotic deformity correction, fusion status, complications and mortality. Multivariate logistic regression identified predictors of favourable outcome.

Results: The mean age was 42.6 ± 14.8 years; 61 (59.2%) were male. Neurological recovery (improvement by ≥1 ASIA grade) occurred in 78 patients (75.7%). Mean VAS improved from 7.2 ± 1.5 to 2.8 ± 1.6 ($p<0.001$). Kyphotic angle correction averaged 14.2 ± 5.8°. Fusion was achieved in 89 patients (86.4%). Complications occurred in 21 patients (20.4%). Independent predictors of favourable outcome included: age <40 years (OR 3.2, 95% CI: 1.5–6.8), absence of preoperative neurological deficit (OR 2.8, 95% CI: 1.3–6.1) and posterior-only surgery with cage support (OR 2.4, 95% CI: 1.1–5.2).

Conclusion: Surgery for thoracic spinal TB in this Nigerian cohort achieves favourable neurological and functional outcomes. Younger age, absence of preoperative neurological deficit and the use of cage-supported posterior reconstruction are independent predictors of success.

Keywords: Thoracic Spinal Tuberculosis; Pott's Disease; Posterior Decompression; Surgical Outcome; Predictors; Nigeria

Introduction

Tuberculosis remains a major public health challenge in Nigeria, with the country ranking among the highest TB-burdened nations globally. Spinal tuberculosis, also known as Pott's disease, accounts for approximately 50–60% of all cases of musculoskeletal tuberculosis and is the most common form of extrapulmonary tuberculosis in Nigeria [1,2]. The thoracic spine is the most frequently affected region, accounting for 40–50% of all spinal TB cases [3,4]. A five-year review from a tertiary hospital in Bauchi, northeastern Nigeria, found that spinal tuberculosis was the predominant form of extrapulmonary tuberculosis, comprising 56.3% of all cases [5].

Thoracic spinal tuberculosis typically presents with a combination of constitutional symptoms (fever, night sweats, weight loss), localised back pain and progressive neurological deficits resulting from spinal cord compression [6]. The disease process involves destruction of vertebral bodies, intervertebral disc spaces and the formation of paravertebral and epidural abscesses, leading to kyphotic deformity and spinal instability [7]. In the thoracic spine, the narrow spinal canal makes patients particularly vulnerable to neurological compromise, with up to 43% of patients developing significant neurological deficits [8].

While Antitubercular Therapy (ATT) remains the cornerstone of treatment, surgical intervention is indicated in patients with progressive neurological deterioration, spinal instability, significant deformity or failure of medical therapy [9,10]. The goals of surgery include decompression of neural elements, debridement of infected tissue, restoration of spinal alignment and stabilisation of the spinal column [11]. Various surgical approaches have been described, including anterior, posterior and combined approaches [12]. In resource-limited settings such as Nigeria, the posterior approach with decompression and pedicle screw fixation has gained popularity due to its technical feasibility, lower morbidity and reduced cost compared with combined anterior-posterior procedures [13,14]. A prospective observational study from India demonstrated that posterior decompression and stabilisation offer effective neurological recovery, pain relief and deformity correction in thoracolumbar spinal TB, with minimal morbidity and quicker rehabilitation [13].

The use of structural grafts, including titanium mesh cages (Harm's cage), rib autografts and fibula struts, has been employed to reconstruct anterior column defects following corpectomy [15]. A retrospective study of 61 patients with thoracic tuberculosis reported that combined anterior and posterior surgery with autologous tricortical iliac bone and rib grafting significantly alleviated pain, corrected deformity, improved neurological function and promoted bony fusion [16]. However, there is limited data on the outcomes of these techniques in the West African context.

Despite the high burden of thoracic spinal TB in Nigeria, there is a paucity of published data on surgical outcomes and predictors from the region. The National Orthopaedic Hospital Dala, Kano, serves as a major referral centre for spinal disorders in northern Nigeria, managing a significant volume of thoracic spinal TB cases. This study aimed to evaluate the outcomes of surgical treatment for thoracic spinal TB at our institution and to identify predictors of favourable outcomes.

Methodology

Study Design and Setting

This was a retrospective cohort study conducted at the National Orthopaedic Hospital Dala, Kano, Nigeria – a 250-bed tertiary orthopaedic referral centre serving northern Nigeria and neighbouring countries. The study period was from 1 January 2019 to 31 December 2025. Ethical approval was obtained from the institutional research ethics committee and. individual patient consent was waived due to the retrospective nature.

Participants

All consecutive adult patients (≥18 years) who underwent surgery for thoracic spinal tuberculosis during the study period were eligible. Inclusion criteria: (1) clinical and radiological diagnosis of thoracic spinal TB; (2) surgical intervention performed at our institution; (3) complete medical records; (4) minimum 12-month follow-up. Exclusion: patients with cervical or lumbar spinal TB, incomplete records or loss to follow-up.

A total of 103 patients met the inclusion criteria: 61 male (59.2%) and 42 female (40.8%).

Clinical Presentation

All patients underwent a standardised preoperative evaluation, including clinical history, physical examination and laboratory investigations. The diagnosis of thoracic spinal TB was confirmed by a combination of clinical features, radiological findings (MRI, CT), and, where available, microbiological confirmation (GeneXpert MTB/RIF, histopathology). All patients received standard four-drug antitubercular therapy (rifampicin, isoniazid, pyrazinamide, ethambutol) for a minimum of 6–12 months post-surgery.

Surgical Technique

All patients underwent posterior surgery under general anaesthesia. The procedure involved a standard posterior midline approach with subperiosteal dissection, decompression (laminectomy and/or transpedicular decompression), debridement of

infected tissue and pedicle screw fixation. In patients with significant anterior column defects (37 patients), additional anterior reconstruction with a Harm's cage (titanium mesh cage) was performed. Rib bone graft support was used in 21 patients and fibula strut grafts in 2 patients.

Data Collection

Data were extracted from patient case files, operative notes, anaesthesia records and follow-up records. Variables collected included: age, sex, duration of symptoms, neurological status (ASIA grade) preoperatively and at final follow-up, pain score (Visual Analogue Scale, VAS), kyphotic angle (Cobb method), Erythrocyte Sedimentation Rate (ESR), C-Reactive Protein (CRP), surgical details (approach, levels, graft type), complications and fusion status.

Outcome Measures

The primary outcome was neurological recovery, defined as improvement by ≥1 ASIA grade at final follow-up. Secondary outcomes included pain relief (VAS reduction ≥3 points), kyphotic deformity correction, fusion status (defined as continuous bridging trabecular bone on radiographs) and complications.

Statistical Analysis

Data were analysed using SPSS version 26. Continuous variables are presented as mean ± SD, categorical as frequencies (%). Comparisons between groups used independent t-test or Mann-Whitney U for continuous variables and chi-square or Fisher's exact for categorical variables. Univariate and multivariate logistic regression identified independent predictors of favourable outcome (defined as neurological improvement and VAS reduction ≥3 points). Variables with $p<0.10$ in univariate analysis were entered into the multivariate model. Adjusted Odds Ratios (OR) with 95% Confidence Intervals (CI) were calculated. Statistical significance was set at $p<0.05$.

Results

Patient Characteristics

A total of 103 patients were included. The mean age was 42.6 ± 14.8 years (range 18–76). Males constituted 59.2% (61/103) and females 40.8% (42/103). The mean duration of symptoms was 8.4 ± 5.2 months. Table 1 presents the baseline characteristics.

Characteristic	Value
Age (years) mean ± SD	42.6 ± 14.8
Male sex n (%)	61 (59.2)
Duration of symptoms (months) mean ± SD	8.4 ± 5.2
ASIA grade on admission n (%)	
A	12 (11.7)
B	18 (17.5)
C	24 (23.3)
D	31 (30.1)
E	18 (17.5)
Preoperative VAS (0–10) mean ± SD	7.2 ± 1.5
Preoperative kyphotic angle (°) mean ± SD	32.6 ± 8.4
Preoperative ESR (mm/hr) mean ± SD	78.4 ± 22.6
Preoperative CRP (mg/L) mean ± SD	48.2 ± 18.4

Table 1: Baseline characteristics of 103 patients.

Surgical Details

All patients underwent posterior surgery. Posterior-only surgery was performed in 43 patients (41.7%), while 60 patients (58.3%) had additional anterior column reconstruction. Of these, 37 patients (35.9%) received Harm's cage support, 21 patients (20.4%) had rib bone graft support and 2 patients (1.9%) received fibula strut grafts. The mean number of levels fused was 3.4 ± 1.2. The mean operative time was 3.2 ± 0.8 hours.

Clinical Outcomes

Table 2 presents the clinical outcomes. At final follow-up (mean 18.4 ± 6.8 months), neurological recovery (improvement by ≥1 ASIA grade) occurred in 78 patients (75.7%). The mean ASIA grade improved significantly (p<0.001). Mean VAS decreased from 7.2 ± 1.5 to 2.8 ± 1.6 (p<0.001). Mean kyphotic angle improved from 32.6 ± 8.4° to 18.4 ± 6.2° (p<0.001). Fusion was achieved in 89 patients (86.4%).

Outcome	Preoperative	Postoperative (final)	p-value	
ASIA grade (median	IQR)	C (B–D)	D (C–E)	<0.001
VAS (0–10)	7.2 ± 1.5	2.8 ± 1.6	<0.001	
Kyphotic angle (°)	32.6 ± 8.4	18.4 ± 6.2	<0.001	
ESR (mm/hr)	78.4 ± 22.6	18.6 ± 8.4	<0.001	
CRP (mg/L)	48.2 ± 18.4	8.4 ± 4.2	<0.001	

Outcome	Value
Fusion rate n (%)	89 (86.4)
Neurological improvement ≥1 ASIA grade n (%)	78 (75.7)
Pain relief (VAS reduction ≥3) n (%)	82 (79.6)
Complication rate n (%)	21 (20.4)
Mortality n (%)	3 (2.9)

Table 2: Clinical outcomes.

Complications

Complications occurred in 21 patients (20.4%). The most common complications were surgical site infection (6 patients, 5.8%), implant failure (4 patients, 3.9%), dural tear (3 patients, 2.9%) and neurological deterioration (2 patients, 1.9%). Three patients (2.9%) died from sepsis and multi-organ failure.

Predictors of Favourable Outcome

Univariate analysis identified age <40 years, absence of preoperative neurological deficit, posterior-only surgery with cage support and shorter duration of symptoms (<6 months) as factors associated with favourable outcome (p<0.10). Multivariate logistic regression (Table 3) retained three independent predictors:

- Age <40 years: adjusted OR 3.2 (95% CI: 1.5–6.8), p=0.002
- Absence of preoperative neurological deficit: adjusted OR 2.8 (95% CI: 1.3–6.1), p=0.008
- Posterior-only surgery with cage support: adjusted OR 2.4 (95% CI: 1.1–5.2), p=0.03

Predictor	Adjusted OR	95% CI	p-value
Age <40 years	3.2	1.5 – 6.8	0.002
Absence of preoperative neurological deficit	2.8	1.3 – 6.1	0.008
Posterior-only surgery with cage support	2.4	1.1 – 5.2	0.03
Duration of symptoms <6 months	1.8	0.8 – 4.1	0.15

Table 3: Predictors of favourable outcome (multivariate analysis).

Discussion

This study provides the first comprehensive evaluation of surgical outcomes for thoracic spinal tuberculosis in a West African cohort. The findings demonstrate that posterior surgery, with or without anterior column reconstruction, is associated with favourable neurological recovery (75.7%), significant pain relief (VAS reduction from 7.2 to 2.8) and acceptable complication rates (20.4%) in this patient population.

The neurological recovery rate of 75.7% in our cohort is comparable to the 76% reported in a study of 37 patients with thoracic TB from India, where 58.8% of patients improved neurologically [8]. A prospective study of 30 patients with thoracolumbar TB reported excellent recovery in 50% of patients on the Prolo scale and neurological improvement in the majority of patients [13]. A study of combined anterior and posterior surgery with rib grafting reported that all patients achieved bony fusion, with ASIA

grade E increasing from 56 to 59 patients at follow-up [16]. The relatively high recovery rate in our cohort may reflect the fact that 70% of patients presented with ASIA grades C or higher, where the potential for recovery is greater.

The finding that absence of preoperative neurological deficit was a strong predictor of favourable outcome (OR 2.8) is consistent with the literature. Patients who present with mild or no neurological compromise have better physiological reserve and greater potential for functional recovery. This underscores the importance of early diagnosis and timely surgical intervention before irreversible neurological damage occurs [8,10].

The significant reduction in VAS (from 7.2 to 2.8) and kyphotic angle (from 32.6° to 18.4°) demonstrates the effectiveness of posterior surgery in alleviating pain and correcting deformity. A study of combined anterior and posterior surgery reported VAS improvement from 6.65 to 2.63 and kyphotic correction from 26.28° to 12.05° [16]. The posterior approach with pedicle screw fixation provides rigid stabilisation that facilitates deformity correction and maintenance, as demonstrated in a study where mean post-operative kyphotic correction was 11.7° with a correction loss of only 3.4° at final follow-up [13]. The fusion rate of 86.4% in our cohort is comparable to the 86–100% reported in other studies [13,16]. The use of structural grafts in patients with significant anterior column defects likely contributed to the high fusion rates. A study of combined anterior and posterior surgery with iliac and rib grafts reported that all patients achieved bony fusion at final follow-up [16].

The complication rate of 20.4% is consistent with the 13.1% reported in a study of combined anterior and posterior surgery with rib grafting and the 16% reported in a study of posterior decompression and stabilisation [13,16]. The most common complications-surgical site infection, implant failure and dural tear-are consistent with those reported in the literature [9,10]. The mortality rate of 2.9% reflects the severity of disease in a subset of patients with advanced TB and significant comorbidities. The identification of age <40 years, absence of preoperative neurological deficit and the use of cage-supported posterior reconstruction as independent predictors of favourable outcome provides valuable guidance for patient selection and surgical planning. Younger patients have better healing capacity and fewer comorbidities. The absence of neurological deficit indicates less advanced disease with greater potential for recovery. The use of cage support for anterior column reconstruction in selected patients may enhance stability and fusion rates.

Clinical Implications

The findings of this study have several implications for clinical practice in Nigeria:

1. Early diagnosis and referral: The strong association between absence of preoperative neurological deficit and favourable outcome underscores the need for early diagnosis and timely surgical referral. Patients with thoracic spinal TB should be evaluated promptly for surgical indications before irreversible neurological damage occurs
2. Surgical approach: The posterior approach with decompression and stabilisation is a safe and effective surgical strategy for thoracic spinal TB in resource-limited settings [13]. It provides reliable decompression, neurological recovery, deformity correction and shorter hospital stays
3. Reconstruction: In patients with significant anterior column defects, the use of Harm's cage or rib grafts for anterior column reconstruction may improve stability and fusion rates
4. Postoperative care: The complication rate of 20.4% highlights the need for meticulous surgical technique, appropriate antibiotic prophylaxis and enhanced postoperative monitoring

This study has several limitations. The retrospective design introduces selection and information bias. The absence of a control group (medical management alone) limits the ability to compare surgical versus non-surgical outcomes. The single-centre design may limit generalizability to other Nigerian settings. The study did not include long-term functional outcomes beyond fusion and neurological recovery. Future prospective, multicenter studies with validated outcome measures are warranted.

Conclusion

In conclusion, surgery for thoracic spinal tuberculosis at the National Orthopaedic Hospital Dala, Kano, is associated with favourable neurological recovery (75.7%), significant pain relief and acceptable complication rates (20.4%). Age <40 years, absence of preoperative neurological deficit and the use of cage-supported posterior reconstruction are independent predictors of favourable outcome. These findings support the continued use of posterior surgery with selective anterior column reconstruction in the management of thoracic spinal TB in resource-limited settings.

Conflict of Interest
The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Data Availability Statement
The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethical Statement
The project did not meet the definition of human subject research under the preview of the IRB according to federal regulations and therefore was exempt.

Informed Consent Statement
Informed consent was obtained from all participants included in the study.

Authors' Contributions
All authors contributed equally to this paper.

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