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Original Research Article

Disability in Patients Presenting With Spinal Tuberculosis

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Abstract: *Spinal tuberculosis (TB) is the most common form of skeletal TB and a major contributor to neurological morbidity in endemic regions. While clinical severity and radiological extent are often used to estimate outcomes, functional disability remains a complex and underexplored consequence of spinal TB, especially in resource-constrained settings. Understanding the incidence and correlates of disability is critical for guiding prognostication and management strategies.* ***Objective:*** *To assess the incidence of disability in patients presenting with spinal tuberculosis.* ***Methods:*** *In this prospective, cross-sectional study, we enrolled consecutive patients presenting to the Department of Neurosurgery outpatient clinic at CHK over a six-month period November 2024 till April 2025. Eligible participants were adults aged 18–55 years with radiological evidence of spinal tuberculosis on MRI. Patients were excluded if they had a prior history of cerebrovascular accident, any previous spinal, thoracic, or lower limb surgery, congenital musculoskeletal anomalies (e.g., cerebral palsy, limb amelia), poliomyelitis, or any other neurological disorder unrelated to spinal tuberculosis* ***Results:*** *Among the 13 patients with lumbar lesions, 4 were disabled versus 15 non-disabled; thoracic involvement saw 4 disabled and 9 non-disabled, and cervical disease 5 versus 8 (p = 0.593). Disability similarly did not correlate with the number of vertebrae involved (p = 0.369): 4 of 15 single-level cases were disabled versus 11 non-disabled; 4/10 two-level; 1/9 three-level; and 5/11 four-level. Motor deficit severity also showed no significant effect (p = 0.330): 5 of 12 mild, 3 of 11 moderate, 5 of 12 severe, and only 1 of 10 with no motor deficit were classified as disabled. Finally, sensory deficits were present in 8 disabled versus 14 non-disabled patients with no significant difference (p = 0.337). Overall, although nearly half the cohort exhibited some functional impairment, lesion location, extent of vertebral involvement, and neurological deficit at presentation did not predict disability in this sample.* ***Conclusion:*** *Early presentation and prompt management in our cohort resulted in minimal disability, suggesting that timely intervention may outweigh anatomical disease burden in predicting functional outcomes.*

Keywords: Spinal tuberculosis, Prevalence, disability, incidence

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Introduction

Spinal tuberculosis (TB) – first described by Sir Percivall Pott in the 18th century – remains the commonest form of osteo-articular TB, accounting for roughly half of all skeletal cases and up to one-third of extrapulmonary disease worldwide (1). The burden is heaviest in high-incidence regions where Mycobacterium tuberculosis infection is ubiquitous; an estimated 2 billion people harbour latent bacilli and 1.7 million die of TB annually (2). Because the thoracic and lumbar segments house the spinal cord and cauda equina, vertebral collapse, abscess formation, and kyphosis can quickly translate into neurological compromise and long-term disability, making functional outcome a key treatment benchmark (3).

Neurological deficit is reported in 10–43 % of patients at first contact, rising to almost 50 % in tertiary referral cohorts. Risk-stratification studies highlight modifiable anatomical factors: kyphosis >30°, canal encroachment >50 % and overt cord oedema carry odds ratios of 7–52 for paralysis, while systemic factors such as body-mass index >25 further amplify risk (4). Functionally, baseline Oswestry Disability Index (ODI) scores frequently lie in the "severe" range (>40), and three-quarters of conservatively managed cervical cases begin with a Modified Barthel Index (MBI) ≤ 12, indicating dependence for activities of daily living (5). Standard care combines multi-drug anti-TB chemotherapy for 6–18 months with judicious decompression and stabilisation when progressive deficit, deformity or abscess mandates surgery (6). Early surgery can halt deterioration and "reset the clock" for neurological recovery, especially in dorsal lesions (7). Across modern series, functional gains are substantial: In a multicentre Chinese cohort of non-contiguous spinal TB treated surgically, the mean ODI fell from 52.5 ± 9.2 pre-operatively to 25.3 ± 4.8 at final review, a 52 % relative improvement (8). A large Indian registry showed 64 % of 200 neurologically impaired patients achieved complete motor recovery with combined medical-surgical treatment; bladder-bowel function also normalised in most (9). Among 38 conservatively managed cervical cases, 81.6 % converted to an MBI > 12 (independent or minimally assisted) after 18 months of chemotherapy and bracing, despite only 23 % meeting that threshold at baseline (10).

Despite encouraging aggregate outcomes, heterogeneity in lesion location, disease chronicity and resource availability complicates direct comparison of studies. Standardised disability metrics such as ODI and MBI are not universally applied, and few prospective series extend beyond two years, leaving the durability of functional gains uncertain. Contemporary research priorities therefore include (i) validating early prognostic imaging markers, (ii) integrating patient-reported outcome measures into routine follow-up, and (iii) refining indications for minimally invasive versus open decompression in resource-limited settings.

In summary, disability in spinal TB is common but far from inevitable; with timely diagnosis, targeted surgery and prolonged chemotherapy, most patients can expect meaningful, and often complete, restoration of independence. The aim of this study was to assess the incidence of disability in patients presenting with spinal tuberculosis.

Methodology

In this prospective, cross-sectional study, we enrolled consecutive patients presenting to the Department of Neurosurgery outpatient clinic at CHK over a six-month period November 2024 till April 2025 until a target sample size of forty-five was reached. Eligible participants were adults aged 18–55 years with radiological evidence of spinal tuberculosis on magnetic resonance imaging. Patients were excluded if they had a prior history of cerebrovascular accident, any previous spinal, thoracic, or lower limb surgery, congenital musculoskeletal anomalies (e.g., cerebral palsy, limb amelia), poliomyelitis, or any other neurological disorder unrelated to spinal tuberculosis. A non-probability consecutive sampling technique was chosen to minimize selection bias and facilitate rapid recruitment within the study timeframe.

After obtaining informed consent, each subject underwent a standardized evaluation using a pre–piloted questionnaire hosted on Google Forms. Demographic data (age, sex) and clinical history—including symptom duration, constitutional features, and previous anti-tubercular therapy—were recorded directly by the principal investigator via a mobile device. A comprehensive neurological examination was performed to assess motor strength (graded using the Medical Research Council scale), sensory deficits, reflex status, and sphincter function. Radiological parameters were documented, including level and number of vertebrae involved, degree of vertebral body destruction, presence of paravertebral and epidural abscesses, kyphotic angle measured on lateral radiographs, and percentage of spinal canal encroachment calculated on axial imaging. Functional disability was quantified using validated instruments: the Modified Barthel Index (MBI) for activities of daily living. The MBI consists of ten domains (e.g., feeding, bathing, ambulation), yielding a maximum score of 20; a score of 15 or below was pre-specified to indicate significant functional dependency.All collected data were exported from Google Forms into Microsoft Excel, then imported into SPSS version 23. Continuous variables (age, symptom duration MBI scores, kyphotic angle) were summarized as means with standard deviations or medians with interquartile ranges, depending on distribution assessed via the Shapiro–Wilk test. Categorical variables (gender, lesion level, presence of motor or sensory deficits) were reported as frequencies and percentages. Associations between clinical or radiological predictors and disability outcomes were explored using independent-samples t-tests or Mann–Whitney U tests for continuous data, and chi-square or Fisher's exact tests for categorical data, with a significance threshold set at $p < 0.05$. Data quality checks and range validation were performed before analysis to minimize entry errors and ensure the integrity of statistical inferences.

Results

The study cohort comprised 45 patients with a mean age of 35.4 ± 10.3 years and a female predominance (32/45, 71%). The average duration of symptoms at presentation was 9.68 ± 7.2 months. Spinal involvement was most often lumbar (19/45, 42%), followed equally by thoracic and cervical levels (13/45 each, 29%). Single-vertebra disease accounted for one-third of cases (15/45, 33%), two-level involvement in 10 (22%), three levels in 9 (20%), and four levels in 11 (24%). At baseline, motor deficits were distributed as mild in 12 patients, moderate in 11 (24%), severe in 12 (27%), and absent in 10 (22%). Sensory impairment was present in 22 patients (49%). Functional disability, as measured by the Oswestry Disability Index, averaged 11.13 ± 6.05.

When stratified by the presence or absence of clinically significant disability, no variable demonstrated a statistically significant association. Among the 13 patients with lumbar lesions, 4 were disabled versus 15 non-disabled; thoracic involvement saw 4 disabled and 9 non-disabled, and cervical disease 5 versus 8 ($p = 0.593$). Disability similarly did not correlate with the number of vertebrae involved ($p = 0.369$): 4 of 15 single-level cases were disabled versus 11 non-disabled; 4/10 two-level; 1/9 three-level; and 5/11 four-level. Motor deficit severity also showed no significant effect ($p = 0.330$): 5 of 12 mild, 3 of 11 moderate, 5 of 12 severe, and only 1 of 10 with no motor deficit were classified as disabled. Finally, sensory deficits were present in 8 disabled versus 14 non-disabled patients with no significant difference ($p = 0.337$). Overall, although nearly half the cohort exhibited some functional impairment, lesion location, extent of vertebral involvement, and neurological deficit at presentation did not predict disability in this sample.

Table 1: Demographic and clinical parameters

Variables	Mean and Frequency
Age (years)	35.4±10.3
Gender	
Male	13 (29%)
Female	32 (71%)
Duration of symptoms (months)	9.68±7.2
Lesion level	
Lumbar	19 (42%)
Thoracic	13 (29%)
Cervical	13 (29%)
Vertebrae Involved	
1	15 (33%)
2	10 (22%)
3	9 (20%)
4	11 (24%)
Motor deficit	
Mild	12
Moderate	11 (24%)
Severe	12 (27%)
None	10 (22%)
Sensory Deficit	22 (49%)
Disability Score (MBI)	11.13±6.05

Table 2: Stratification of outcomes

Variables	Disability		P Value
Lesion level	Yes	No	0.593
Lumbar	4	15	
Thoracic	4	9	
Cervical	5	8	
Vertebrae Involved			0.369
1	4	11	
2	4	6	
3	1	8	
4	5	6	
Motor deficit			0.33
Mild	5	7	
Moderate	3	8	
Severe	5	7	
None	1	9	
Sensory Deficit			0.337
Yes	8	14	
No	5	18	

Discussion

Our data set revealed a predominantly young (mean 35 years) and female (71 %) cohort, whereas most large spinal-TB registries still show a modest male excess. For example, a five-year Indian cross-sectional study of 286

patients reported only 55 % women, a difference the authors linked to better health-seeking among local females yet persistent cultural barriers for men (11). Globally, the World Health Organization continues to document higher notification rates for all forms of TB in men (≈62 % in 2023), underscoring that our centre may be attracting a demographically distinct subset—perhaps because women with disabling back pain are referred earlier for neurosurgical review.

Anatomically, lumbar disease dominated in our series (42 %), mirroring the pattern Rajasekaran's 2023 narrative review described for lower thoracic/thoracolumbar junctions (12), yet contrasting with the SICOT-J risk-factor study in which the thoracic spine accounted for 35 % and carried the highest odds of neurological deficits (13). Multi-level involvement was common (67 %), but—contrary to reports that three or more diseased vertebrae independently predict spinal-cord injury or prolonged rehabilitation—the number of levels did not influence disability in our sample ($p = 0.369$). The discrepancy probably reflects limited statistical power ($n = 45$) and the fact that our patients presented earlier (median symptom duration ≈ 10 months) than cohorts in which delayed diagnosis drives extensive destruction.

Neurological findings also behaved differently. Neither motor-deficit severity nor sensory loss correlated with MBI status, whereas multiple contemporary studies identify cord oedema, canal encroachment > 50 %, and kyphosis > 30° as strong functional prognosticators. A plausible explanation is that mean MBI at entry was only 11 (minimal disability), far lower than the moderate-to-severe scores (30–60) reported in surgical case series synthesised by Yong et al. (14). Early referral and aggressive medical therapy at our institution may therefore blunt the impact of anatomical risk factors that dominate in more disabled populations.

Finally, although almost half the cohort displayed some neurological compromise, only 13 patients met our threshold for clinically significant disability. This proportion is smaller than the 34–50 % Barthel-dependence rates documented at six months in longitudinal African and Asian studies (15). It again supports the hypothesis that timely diagnosis—together with a predominantly lumbar pattern that spares long segments of cord—yields better short-term functional preservation.

Conclusion

In summary, our single-centre experience confirms familiar epidemiological features of spinal TB but challenges the generalizability of established disability predictors. The low baseline MBI and lack of radiological correlates suggest that early presentation may outweigh anatomic disease burden in determining immediate function. Larger prospective cohorts with uniform imaging metrics and serial patient-reported outcomes will be required to validate whether these encouraging findings persist beyond initial assessment.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-MMU-24)

Consent for publication
Approved

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The authors declared the absence of a conflict of interest.

Author Contribution

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Conception of Study, Development of Research Methodology Design,
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All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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