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ORIGINAL ARTICLE

Demographic Profile, Clinical Characteristics, and Short-Term Outcomes of Tuberculous Spondylitis in a Tertiary Medical Center in Southern Philippines: A 10-year Retrospective Review

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ABSTRACT

Background. Tuberculous spondylitis remains a significant cause of morbidity in the Philippines, with limited local outcome data.

Objective. To describe the demographic profile, clinical characteristics, management, and outcomes of patients with tuberculous spondylitis treated at a tertiary-level medical center from 2015 to 2024.

Methodology. This was a 10-year retrospective chart review of patients diagnosed with tuberculous spondylitis. Demographic, clinical, radiographic, and management data were collected and analyzed.

Results. A total of 69 patients were included. Most patients were male (63.6%) and unemployed (63.6%). The mean age was 40 years (range, 19–59). Thoracic involvement was reported in 59% of cases. Back pain was reported at 48.5%, and neurologic deficits were reported at 27.3%. On neurologic assessment at presentation, 50% had incomplete neurologic deficits and 10.6 % had complete deficits. Management consisted of anti-tuberculous therapy alone in 59.1% and anti-tuberculous therapy with bracing in 21.2%. Thirteen patients (19.7%) underwent surgery, performed via a posterior approach. In the surgical cohort, the mean preoperative kyphosis angle was 47.7 degrees (range, 39–79 degrees), and the mean postoperative kyphosis angle was 40.8 degrees (range, 27–55 degrees). Neurologic recovery was documented among patients with incomplete deficits. The mean interval from surgery to discharge was 51 days. At two years, more than 90% of patients were lost to follow-up.

Conclusion. Tuberculous spondylitis in this cohort was observed predominantly among unemployed young to middle-aged males, involving the thoracic spine, with a substantial proportion presenting with neurologic compromise. Among surgically treated patients, posterior surgery was associated with modest deformity correction and neurologic improvement during the early postoperative period. Long-term outcomes could not be reliably assessed due to > 90% loss to follow-up at two years. Strengthened early detection, improved continuity of care, and inclusion of functional outcomes in future studies are recommended.

Keywords. tuberculous spondylitis, Pott's disease, spinal tuberculosis, neurologic deficits, retrospective study, developing country, Philippines

INTRODUCTION

Tuberculosis (TB) remains a major global health burden, with a large proportion of cases occurring in the WHO South-East Asia Region. The Philippines continues to struggle with a high TB burden.[1]

Skeletal tuberculosis contributes to around 10% of extrapulmonary tuberculosis, and tuberculous spondylitis is the most common site (50%).[2,3] Locally, there are few studies on Pott's disease, particularly describing patient presentations, management patterns, and outcomes. If left untreated, tuberculous spondylitis results in kyphotic

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deformity, sinus formation, subluxations, contractures, and neural complications. These patients' defense mechanisms are markedly decreased, which could lead to tuberculous dissemination and eventually death in nearly 1 out of 3 patients.[4] Anti-Koch therapy is the mainstay of treatment for TB spondylitis. Bosworth et al. found a 72.5% reduction in mortality with antitubercular drug use.[5] Pharmacotherapy also prevents sinus formation, one of the dreaded complications of spinal tuberculosis.[4]

Advancements in diagnostics are being made at the frontier of research, but early detection of spinal tuberculosis is still difficult. Spinal tuberculosis, if caught and treated in its earliest stage (inflammatory stage), can heal with a near-normal spine.[6] Doctors still rely on a constellation of characteristic clinical and radiographic findings for diagnosis. Hayes et al. found that nine out of 10 patients presented with back pain, while seven out of 10 presented with constitutional symptoms of malaise, evening rise of temperature, and night sweats.[7]

Spinal tuberculosis only manifests on radiographs after three to four months, or when there is approximately 30% bone loss.[6,8] Other than vertebral changes, pulmonary lesions are found in 60 to 70% of chest radiographs.[9] Jain et al. noted that initial magnetic resonance imaging can forecast patients' prognosis. Patients experiencing paraplegia without indications of instability in their imaging tend to demonstrate favorable neural recovery. Conversely, patients with a combination of extradural compression and a thick dura-arachnoid complex, with diseased tissue surrounding the spinal cord, are more likely to exhibit poor neural outcomes.[6]

A meta-analysis of the top 250 cited articles on spinal tuberculosis found that most studies were focused on surgical techniques. There was also a low citation rate from countries with high disease burdens, including the Philippines.[10] There is a need for Philippine data on clinical presentation and outcomes, and institution-based descriptive studies. Thus, this study aimed to describe our cases in terms of demographic profile, clinical presentation, affected spinal level, treatment approaches, and early outcomes, to help identify local care gaps and inform quality improvement in patient management.

METHODOLOGY

Research design

This was a descriptive retrospective study that reviewed medical records of all patients with tuberculous spondylitis seen and treated at a tertiary-level medical center from January 1, 2015, to December 31, 2024. This study described demographic, clinical, radiographic, management, and outcome variables based on available chart documentation.

Setting

The study was conducted via review of inpatient and outpatient charts at the medical records section at a tertiary-level medical center. Spine radiographs were retrieved digitally via the Synapse PACS Diagnostic Viewer when available.

Definition of terms

Tuberculous spondylitis – a vertebral disease caused by *Mycobacterium tuberculosis.* It was diagnosed via history, clinical examination, and radiographs by a medical officer. In this study, it was equivalent to ICD code A18.0, A18.01 Tuberculosis of the bone and joints, and ICD code M49.0, M49.5, or M48.5 Tuberculosis of the spine. Diagnosis was based on the treating team's charted assessment supported by clinical and radiographic findings, with histologic confirmation when available; this approach was consistent with routine practice and locally used guidance (e.g., PhilCAT CPG/DOH-NTP Manual of procedures). Diagnostic uncertainty due to limited confirmation was acknowledged.[11]

Affected spinal level – level of the vertebrae affected by Pott's disease based on radiographs.

Kyphotic deformity – a radiographic measurement using the sagittal plane of the cervical, thoracolumbar, or lumbosacral area. It was measured using the angle between the superior and inferior end plates of both the upper and lower unaffected vertebrae adjacent to the lesion. This was measured using an established Cobb angle technique; a subset of radiographs was re-measured to ensure consistency of measurements.

Neurologic status – a descriptor of the patient's neurologic deficit. This was categorized as "no deficits," "incomplete deficits," or "complete deficit," based on physical examination findings. Standardized grading systems (e.g., ASIA/Frankel) were not consistently documented in the charts; hence, simplified categories were used.

- "No deficits" – absence of sensory or motor deficit below the affected spinal level
- "Incomplete deficits" – presence of either sensory or motor deficit below the affected spinal level
- "Complete deficit" – absence of sensory (0/2) and skeletal motor activity below the affected spinal level

Participants

All patients with tuberculous spondylitis (ICD codes: ICD code A18.0, A18.01, M49.0, M49.5, M48.4, M48.5) seen and treated at a tertiary-level medical center from January 1, 2015, to December 31, 2024.

Inclusion and exclusion criteria

We included patients who were diagnosed with tuberculous spondylitis upon admission or outpatient consult. We excluded patients with incomplete charts, patients who absconded, patients with other concomitant spine diseases, or who were subsequently determined to have non-tuberculosis spinal pathology (based on final chart diagnosis).

Sampling procedure

The study employed total enumeration of all available charts from January 1, 2015, to December 31, 2024. Based on the average monthly census, an estimated 120 patients were expected to be included in the study. Cases were identified through ICD codes, charts were retrieved and screened against inclusion/exclusion criteria, and eligible cases were included in the final analysis.

Data gathering

Independent variables

- *Demographic profile:* age, sex, civil status, occupation, residence, type of admission, duration of symptoms, treatment, and discharge
- *Clinical profile:* chief complaint, affected spinal level, kyphotic deformity, neurologic status, history of pulmonary tuberculosis, histologic confirmation status
- *Management:* pharmacologic, bracing, surgery
- *Pharmacologic (Anti-TB medications):* regimen components (e.g., isoniazid, rifampicin, pyrazinamide, ethambutol) and duration/schedule when specified in the chart, generally reflecting DOH-NTP-based practice
- *Bracing:* Brace use and, when available, brace type and advised duration
- *Surgery:* Operative notes were reviewed to classify posterior procedures, including posterior decompression (e.g., laminectomy/transpedicular decompression), costotransversectomy (thoracic), debridement/abscess drainage, posterior instrumentation (levels), and fusion. If operative detail was insufficient, cases were coded as "posterior approach-procedure unspecified" and acknowledged as a limitation.

Main outcome measures and other dependent variables

- Correction of deformity
- Neurologic status upon admission, discharge, and at six-month, one-year, and two-year follow-up. Loss to follow-up at each time point was recorded, and outcomes were summarized based on available follow-up data.

Sample size computation

This study employed total enumeration; thus, sampling was not required.

Data handling and analysis

Data were collected and recorded by the investigator and a research assistant from the medical charts. Spine x-rays were retrieved digitally via the Synapse PACS Diagnostic Viewer, and kyphotic deformity was measured by the principal investigator upon the approval of the Department of Diagnostic and Imaging Science. Histologic results were retrieved by the principal investigator upon the approval of the Department of Pathology. The data were tabulated and validated by a statistician. Data were analyzed for measures of central tendency (mean), and other descriptive statistics such as standard deviation and frequency distribution (percentage). Data analysis was done using Strata. Missing variables were treated as "no data" and excluded from denominator-specific summaries. No imputation was performed. Loss to follow-up was reported explicitly at each follow-up interval to contextualize outcome interpretation.

RESULTS

Patient demographics

A total of 142 patient charts with ICD-10 codes of A18.0, A18.01, M49.0, M49.5, M48.4, or M48.5, were reviewed from 2015 to 2024. Of these, 69 charts met the inclusion criteria and were analyzed. Sixty-five charts were excluded because the diagnosis was extrapulmonary tuberculosis but not TB spondylitis; eight charts were incomplete (Figure 1.) Unless otherwise stated, denominators refer to patients (n = 69).

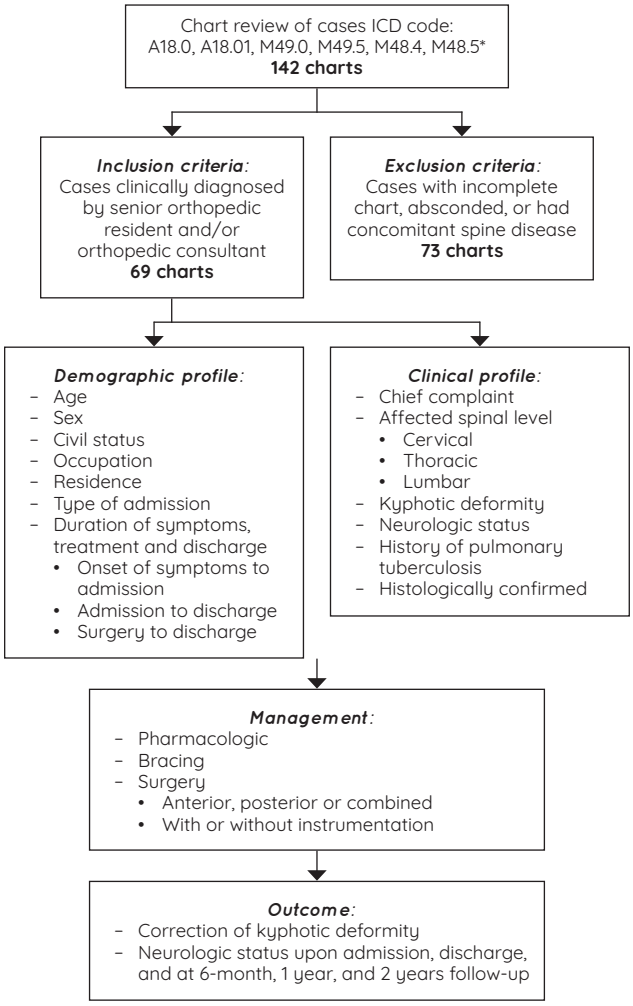

Figure 1. Workflow diagram.

*A18.0 – Tuberculosis of bones and joints; A18.01 – Tuberculosis of spine; M49.0 – Tuberculosis of spine (under Spondylopathies in diseases classified elsewhere); M49.5 – Collapsed vertebra in diseases classified elsewhere; M48.4 – Fatigue fracture of vertebra; M48.5 – Collapse vertebra, not elsewhere classified

Table 1A. Categorical demographics

	N	%
Age (years)		
0–18	12	17.39
19–59	48	69.57
≥ 60	9	13.04
Sex		
Female	24	34.78
Male	45	65.22
Civil status		
Single	33	47.83
Married	35	50.72
Widow	1	1.45
Separated	0	0
Occupation		
Employed	24	34.78
Unemployed	45	65.22
Residence (Region)		
XI	55	79.71
XII	7	10.61
XIII	6	9.09
BARMM	1	1.52
Type of admission/consults		
OPD consult	38	57.58
OPD admission	6	9.09
ER admission	22	33.33
Others	0	0
Total	69	

Table 1B. Continuous variables

	Mean (range), days
Symptom onset (days)[b]	219 (7–1095)
Neurologic deficit	24 (7–60)
Back pain	281 (30–1095)
Constitutional symptoms	302 (30–730)
Thoracic kyphosis	383 (120–300)
Length of hospital stay (days)[c]	
Non-surgical group	
Admission to discharge	21.4 (2–51)
Surgical group	
Admission to discharge	57.33 (9–149)
Admission to surgery	51.11 (4–139)
Surgery to discharge	6.22 (5–11)

[a] Categorical variables are presented by frequency (proportion) while continuous variables are presented in mean (stdev).

[b] Based on available data and on the duration of the first symptom from the first consult to the institution.

[c] Applicable to OPD admission and ER admission groups. The non-surgical group were cases treated with Anti-Koch therapy only, since all cases that underwent bracing were OPD consults.

Most of the 69 patients were male (65.2%) and aged 19 to 59 years old (69.6%), highlighting the disease's impact on the working-age population. Only 17.4% were children or adolescents, while 13.0% were elderly (≥ 60 years). Most patients were unemployed (65.2%) (Table 1).

Regarding healthcare access, most were first seen as outpatient consultations (57.6%), whereas a third presented through the emergency department (33.3%), which may reflect presentation during more severe or disabling symptoms.

The mean duration from symptom onset to diagnosis was 219 days (range, 7–1095 days), underscoring the insidious progression of the disease. Among cases with documented symptom timing, neurologic deficits manifested earliest with a mean onset of 24 days (7–60 days), followed by back pain at 281 days (30–1095 days), constitutional symptoms at 302 days (30–730 days), and thoracic kyphosis, typically the latest to appear, at a mean onset of 383 days (120–300 days).

Hospitalization data revealed that patients managed non-surgically had a mean length of stay of 21.4 days (2–51 days). Notably, all nine cases of the bracing group were OPD consults. In contrast, the surgical cohort demonstrated a substantially longer hospital course, averaging 57.33 days (9–149 days) from admission to discharge. Distinctly, the mean waiting period from admission to surgery was 51.11 days (4–139 days), whereas the postoperative stay from surgery to discharge was relatively short, with a mean of 6.22 days (5–11 days). These findings highlight both the protracted pre-operative optimization and evaluation period, as well as the efficiency of postoperative recovery once surgical management was undertaken (Table 1).

Clinical profile

Back pain was the most common presenting symptom, reported in 50% of patients, followed by neurologic deficits (27.3%). Fewer patients presented with thoracic kyphosis (13.6%) or constitutional symptoms (7.6%) (Table 2). The thoracic spine was the most frequently affected region (59.1%), followed by the lumbar spine (43.9%), while cervical involvement was uncommon (4.6%). Because some patients had multilevel involvement, spinal-region percentages may sum to > 100%. Multilevel vertebral lesions were identified

Table 2. Chief complaint* (*N* = 69)

	Back pain, *N* (%)	Neurologic deficit, *N* (%)	Thoracic kyphosis, *N* (%)	Constitutional symptoms, *N* (%)	Other symptoms, *N* (%)	No data, *N* (%)	Total
Age (years)							
0–18	4 (12. 12)	4 (22.22)	3 (33.33)	0 (0)	0 (0)	1 (50)	12
19–59	25 (75.76)	12 (66.67)	5 (55.56)	3 (60)	2 (100)	1 (50)	48
≥ 60	4 (12.12)	2 (11.11)	1 (11.11)	2 (40)	0 (0)	0 (0)	9
Total	33 (50)	18 (27.27)	9 (13.64)	5 (7.58)	2 (3.03)	2 (3.03)	**69**
Sex							
Female	13 (39.39)	4 (22.22)	4 (44.44)	2 (40)	0 (3)	1 (50)	24
Male	20 (60.61)	14 (77.78)	5 (55.56)	3 (60)	2 (100)	1 (50)	45
Total	33 (50)	18 (27.27)	9 (13.64)	5 (7.58)	2 (3.03)	2 (3.03)	**69**

*Chief complaint reflects the primary presenting complaint recorded at first consult; one category per patient

in eight patients, comprising one case at the cervicothoracic junction and seven at the thoracolumbar junction. Notably, there were eight cases where the spinal level was not mentioned in the charts (Table 3).

Thoracic kyphosis

Among the 40 patients with thoracic involvement, 85% (n = 34) presented with a kyphotic deformity of ≤ 60°, while 15% (n = 6) presented with severe deformity (> 61°) (Table 4).

Neurologic involvement

At presentation, neurologic deficits were identified in 42 patients, of whom half demonstrated incomplete deficits, and 10.6% exhibited complete deficits. Percentages for neurologic categories are based on a population of 69 patients unless otherwise stated. Neurologic impairment was most prevalent among adults aged 19–59 years, whereas no complete deficits were documented in the pediatric population (Table 5).

Pulmonary tuberculosis history

A documented history of pulmonary tuberculosis (PTB) was present in 19.7% of patients, absent in 71.2%, and not available in 9.1%. Across age groups, age- and sex-stratified PTB history is presented in Table 6.

Histopathology

Among the 69 cases of clinically diagnosed tuberculous spondylosis, 13 underwent surgery, and there were only nine retrievable histopathologic results. Seven cases had samples taken during the surgical instrumentation, while two cases' samples were taken using transpedicular biopsy. Five out of nine cases were histologically confirmed to be tuberculous spondylitis. Thus, histologic confirmation was available in a subset of surgical patients, and most cases were diagnosed clinically.

Treatment and outcomes

A total of 69 patients with tuberculous spondylitis were included in this series. The majority (63.6%) were managed with Anti-Koch therapy alone, 13.6% received Anti-Koch therapy with bracing, and 19.7% underwent surgery in addition to medical treatment. Treatment-group distributions and baseline characteristics (spinal level, kyphosis category, neurologic status) are summarized in Table 7.

Among the 69 patients, treatment data were unavailable for five individuals. Neurologic improvement was observed predominantly within the first 12 months across the three treatment groups. In the Anti-Koch group, most patients presented with incomplete deficits and demonstrated gradual recovery, with the earliest recovery occurring six months post-treatment; however, follow-up attrition exceeded 90% by 18 months, limited long-term evaluation. The bracing

Table 3. Affected spinal level

	Cervical, *N* (%)	Thoracic, *N* (%)	Lumbar, *N* (%)	Total
Age (years)				
0–18	0 (0)	8 (20)	3 (10.34)	11
19–59	3 (100)	24 (60)	23 (79.31)	50
≥ 60	0 (0)	8 (20)	3 (10.34)	11
Total	3	40	29	**72***
Sex				
Female	0 (0)	14 (35)	10 (34.48)	24
Male	3 (100)	26 (65)	19 (65.52)	48
Total	3 (4.55)	40 (59.09)	29 (43.93)	**72***

*Patients with multilevel disease spanning more than one spinal region are counted in each involved region; their totals may exceed N=69.

Table 4. Radiographic parameters: Kyphotic deformity upon admission. Thoracic cases with documented kyphosis measurement (*N* = 40)

	≤ 60 degrees, *N* (%)	> 61 degrees, *N* (%)	Total, *N* (%)
Age (years)			
0–18	7 (20.59)	1 (16.67)	8 (20)
19–59	20 (58.82)	5 (83.33)	25 (62.5)
≥ 60	7 (20.59)	0 (0)	7 (17.5)
Total	34 (85)	6 (15)	**40**
Sex			
Female	11 (32.35)	4 (66.67)	13 (32.5)
Male	23 (67.65)	2 (33.33)	25 (62.5)
Total	34 (85)	6 (15)	**40**

Table 5. Neurologic status* (*N* = 69)

	Normal, *N* (%)	Incomplete deficits, *N* (%)	Complete deficits, *N* (%)	No data, *N* (%)	Total, *N* (%)
Age (years)					
0–18	5 (20.83)	6 (17.14)	0 (0)	1 (33.33)	12 (17.39)
19–59	17 (70.83)	24 (68.57)	5 (71.43)	2 (66.67)	48 (69.57)
≥ 60	2 (8.33)	5 (14.29)	2 (28.57)	0 (0)	9 (13.04)
Total	24 (36.36)	35 (50.72)	7 (10.61)	3 (4.55)	**69**
Sex					
Female	8 (34.78)	12 (34.29)	3 (42.86)	1 (33.33)	24 (36.36)
Male	16 (66.67)	23 (65.71)	4 (57.14)	2 (66.67)	45 (65.21)
Total	24 (36.36)	35 (50.72)	7 (10.61)	3 (4.55)	**69**

*Neurologic category derived from chart documentation; standardized grading (e.g., ASIA/Frankel) not consistently recorded.

Table 6. History of pulmonary tuberculosis* (*N* = 69)

	With PTB, *N* (%)	Without PTB, *N* (%)	No data, *N* (%)	Total, *N* (%)
Age (years)				
0–18	2 (15.38)	7 (14.89)	3 (33.33)	12 (17.39)
19–59	9 (69.23)	34 (72.34)	5 (55.56)	48 (69.56)
≥ 60	2 (15.38)	6 (12.77)	1 (11.11)	9 (13.04)
Total	13 (18.84)	47 (68.11)	9 (13.04)	**69**
Sex				
Female	5 (38.46)	17 (36.17)	2 (22.22)	24 (34.78)
Male	8 (61.54)	30 (63.83)	7 (77.78)	45 (65.21)
Total	13 (19.7)	47 (71.21)	9 (9.09)	**69**

*PTB history based on charted history/diagnosis; may be under-reported in retrospective records

Table 7. Management (*N* = 69)

	Anti-Koch only, *N* (%)	Anti-Koch with bracing, *N* (%)	Anti-Koch with surgery		No data, *N* (%)	Total, *N* (%)
			Anterior approach, *N* (%)	Posterior approach, *N* (%)		
Spinal level						
Cervical	1 (2.56)	1 (11.11)	0	0	1 (20)	3 (4.16)
Thoracic	22 (52.38)	5 (55.56)	0	12 (92.31)	1 (20)	40 (55.56)
Lumbar	22 (52.38)	3 (33.33)	0	2 (15.38)	2 (40)	29 (40.27)
Total	45	9	0	14	6	**72***
Kyphosis category						
≤ 60 degrees	20 (50)	4 (9)	0	10 (25)	0	34 (85)
> 61 degrees	2 (5)	1 (1.45)	0	2 (5)	1 (2.45)	6 (15)
Total	22 (55)	9 (22.5)	0	13 (18.84)	5 (12.5)	**40**
Neurologic status						
No deficits	18 (42.86)	5 (55.56)	0	0	1 (20)	24 (34.78)
Incomplete deficits	20 (47.62)	2 (22.25)	0	11 (84.62)	2 (40)	35 (50.72)
Complete deficit	2 (4.76)	2 (22.25)	0	2 (15.38)	1 (20)	7 (10.14)
No data	2 (4.76)	0	0	0	1 (20)	3 (4.34)
Total	42 (63.64)	9 (13.64)	0	13 (19.7)	5 (7.58)	**69**

*Eight charts had multiple lesions (Cervicothoracic – 1, Thoracolumbar – 8)

group exhibited comparable early recovery with better follow-up adherence, permitting documentation of sustained improvement up to 24 months. Given non-random treatment allocation and baseline severity differences, between-group differences are presented descriptively and should not be interpreted as comparative effectiveness. Overall, neurologic recovery was documented across groups, while high attrition in the Anti-Koch group limited long-term interpretation (Table 8).

Of the 69 patients, only 13 underwent surgery. Indications for surgery were the presence of kyphotic deformity (> 30 degrees) and neurologic deficits, with 12 having incomplete deficits. Among patients who underwent posterior surgical correction, the mean pre-operative thoracic kyphotic angle was 47.7° (range, 39–79°), which improved to 40.8° (range, 27–55°) post-operatively, yielding a mean correction of 6.9°. By age group, the greatest correction was achieved in pediatric patients (0–18 years), with a mean reduction of 28° (Table 8). Kyphosis correction values are reported for patients with available pre- and postoperative measurements.

DISCUSSION

This study highlights the profile of patients with tuberculous spondylitis in a high TB-burden region. Globally, tuberculosis remains a major public health concern, with an estimated 9.9 million new cases annually, disproportionately affecting Southeast Asia and Africa.[1] The Philippines is one of the WHO high-burden countries, accounting for 6% of global incident cases.[11] Consistent with worldwide epidemiology, skeletal TB contributes roughly 10% of extrapulmonary tuberculosis, with spinal TB comprising up to 50% of musculoskeletal involvement.[2,3] The predominance of young to middle-aged, unemployed males in this cohort parallels findings in other endemic areas, reflecting the socioeconomic burden of the disease.

Thoracic spine involvement was most frequent, consistent with the rich vascular supply of the vertebrae and the known hematogenous spread of Mycobacterium tuberculosis through the Batson venous plexus.[8,12] The paradiscal pattern of involvement—owing to segmental arteries supplying both endplates—is well-described in the literature.[12] The high rate of neurologic deficits in our cohort (51.28%) indicates delayed presentation, similar to other studies.[13] Neurologic deficit results from both mechanical and inflammatory mechanisms, including internal gibbus deformity, canal compromise, cord edema, and granulation tissue.[4] Because histopathologic confirmation was available in only a minority of cases, diagnostic misclassification remains possible, which may affect our estimates of presentation patterns and outcomes.

Management patterns showed reliance on medical therapy (anti-TB medications) as first-line treatment, consistent with WHO and National Tuberculosis Program recommendations.[13] The "middle-path" approach of Tuli—reserving surgery for non-responders, progressive deformity, or neurologic deterioration—remains consistent with practice in resource-limited settings.[4,14] Unlike international literature, where anterior, posterior, and combined approaches are options, this cohort predominantly underwent posterior-only surgery, likely due to institutional preference, surgeon expertise, and financial constraints, given that PhilHealth case rates for spinal TB exclude implants and many hospitalization costs.[15]

Posterior-only surgery was associated with kyphosis correction and neurologic recovery in this study. The mean kyphosis correction (6.9 degrees) represents modest radiographic change in adults and should be interpreted in the context of surgical goals in this series (primary decompression and stabilization rather than major deformity correction). The clinical relevance of small angular changes may vary by baseline deformity level involved and symptoms. This is supported by evidence showing posterior decompression and instrumentation as a safe and effective option in many cases.[16] Posterior

approaches allow broad exposure, multilevel fixation, and deformity correction while avoiding morbidity associated with anterior thoracotomy or retroperitoneal access.[17,18] However, anterior or combined approaches remain essential in cases with severe anterior column destruction, large paravertebral abscesses, multilevel vertebral body involvement, or kyphosis > 60°, where posterior-only correction may risk further neurologic injury.[19-21]

Table 8.0. Correction of thoracic kyphotic deformity (*N* = 13)

Posterior Approach	Mean Pre-operative kyphotic deformity (range), degrees	Mean Post-operative kyphotic deformity (range), degrees	Mean Deformity correction [Pre – Post], degrees
	47.68 (39–79)	40.8 (27–55)	6.88
Age (years)			
0–18	55	27	28
19–59	46.6 (39–79)	40.6 (35–53)	6
≥ 60	53.5 (52–55)	41.5 (28–55)	12

Table 8.1. Clinical outcomes of Anti-Koch Group (*N* = 42)*

Neurologic status	Admission, *N* (%)	6 mos, *N* (%)	12 mos, *N* (%)	18 mos, *N* (%)	24 mos, *N* (%)
Complete deficit	2 (5.13)	2 (4.76)	2 (4.76)	0	0
Incomplete deficits	20 (46.15)	15 (35.71)	2 (4.76)	0	0
No deficits	18 (42.86)	19 (45.24)	8 (19.05)	0	0
Lost to follow up	2 (4.76)	4 (9.52)	30 (71.43)	42 (100)	42 (100)
Total	42 (100)	42 (100)	42 (100)	42 (100)	42 (100)

Table 8.2. Clinical outcomes of Bracing Group (*N* = 9)*

Neurologic status	Admission, *N* (%)	6 mos, *N* (%)	12 mos, *N* (%)	18 mos, *N* (%)	24 mos, *N* (%)
Complete deficit	2 (22.22)	1 (11.11)	1 (11.11)	0	0
Incomplete deficits	2 (22.22)	3 (33.33)	1 (11.11)	0	0
No deficits	5 (55.56)	5 (55.56)	0	0	0
Lost to follow up	0	0	7 (77.78)	9 (100)	9 (100)
Total	9 (100)	9 (100)	9 (100)	9 (100)	9 (100)

Table 8.3. Clinical outcomes of Surgery Group (*N* = 13)*

Neurologic status	Admission, *N* (%)	6 mos, *N* (%)	12 mos, *N* (%)	18 mos, *N* (%)	24 mos, *N* (%)
Complete deficit	2 (15.38)	1 (7.69)	0	0	0
Incomplete deficits	11 (84.62)	10 (76.92)	6 (46.15)	0	0
No deficits	0	1 (7.69)	5 (38.46)	1 (7.69)	0
Lost to follow up	0	1 (7.69)	2 (15.38)	12 (92.31)	13 (100)
Total	13 (100)	13 (100)	13 (100)	13 (100)	13 (100)

*Percentages at each follow-up time point were calculated using the number of patients with documented neurologic status at that time point (available-case denominator). Lost to follow-up is cumulative from baseline. Missing neurologic documentation at a given time point was coded as no follow-up data

The average hospital stay of 52 days underscores inefficiencies in care delivery—an issue commonly seen in low-resource settings where diagnostic delays and prolonged preoperative evaluation are prevalent.[9] Moreover, the high attrition rate in follow-up (> 90% by two years) severely limits assessment of long-term outcomes. This reflects systemic barriers, including financial constraints, geographic inaccessibility, and limited continuity of care.[22,23] Therefore, this attrition level may bias outcome estimates toward more favorable results, as patients with persistent symptoms, complications, or progression may be less likely to return, while those who improve may not seek further follow-up. Thus, the observed recovery and deformity outcomes should be interpreted cautiously and primarily reflect patients with available follow-up data. Such limitations are clinically significant because 3–5% of patients globally may progress to severe kyphosis despite adequate chemotherapy.[24,25]

Overall, this study reinforces persistent challenges in the Philippine setting: late presentation, high neurologic deficit rates, predominant reliance on posterior-only surgery due to resource constraints, and poor long-term follow-up. These findings parallel global patterns but highlight the urgent need for earlier detection, improved access to imaging and surgical care, and strengthened follow-up systems. In practical terms for Philippine orthopaedic practice, these findings support: (1) early referral pathways from primary care and TB clinics for back pain with neurologic symptoms or deformity; (2) standardized baseline documentation (including neurologic grading and kyphosis measurement) to improve longitudinal assessment; and (3) pragmatic follow-up systems (e.g., scheduled TB-spine clinics, coordination with DOH-NTP treatment hubs, and low-cost SMS/telemedicine check-ins) to reduce attrition and better capture late deformity progression and neurologic outcomes. Finally, given institutional and financial constraints, treatment decisions should remain individualized—balancing disease severity (neurologic compromise, deformity, instability, abscess burden) against access to implants, surgical capacity, and the feasibility of sustained follow-up.

CONCLUSION

Tuberculous spondylitis predominantly affects unemployed young to middle-aged males**,** most commonly involving the thoracic spine and frequently presenting with neurologic deficits. While most patients were managed successfully with anti-Koch therapy alone, those who required surgery, performed exclusively through the posterior approach, achieved modest correction of deformity and documented short-term neurologic recovery.

Despite these observed short-term outcomes, the study highlights persistent challenges, particularly prolonged hospitalization and poor long-term follow-up, which restrict the ability to fully evaluate sustained outcomes. Given the high attrition rate, longer-term treatment success may be overestimated, as outcomes primarily reflect patients who

returned for follow-up. Addressing these gaps through earlier diagnosis, standardized care pathways, and improved patient follow-up systems is essential to optimize outcomes for spinal tuberculosis in high-burden settings.

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STATEMENT OF AUTHORSHIP

All authors certified fulfillment of ICMJE authorship criteria.

CREDIT AUTHOR STATEMENT

RDVD and MRRD: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data Curation, Writing – original draft preparation, Writing – review and editing, Visualization, Supervision, Project administration, Funding acquisition.

DATA AVAILABILITY STATEMENT

The datasets generated and analyzed in this study are included in the published article.

AUTHOR DISCLOSURE

The authors declared no conflict of interest.

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