International Surgery Journal
Dela DJ et al. Int Surg J. 2026 Dec;13(12):2421-2427
https://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: https://dx.doi.org/10.18203/2349-2902.isj20264346

Original Research Article

Extrapulmonary tuberculosis in surgical practice: a prospective study of clinical profile, diagnostic work-up and outcome in 20 patients

Dilshad J. Dela, Alimamad O. Noyda*

Department of General Surgery, Shri M. P. Shah Government Medical College and Guru Gobind Singh Government Hospital, Jamnagar, Gujarat, India

Received: 08 October 2026
Accepted: 05 November 2026

***Correspondence:**
Dr. Alimamad O. Noyda,
E-mail: draonoyda@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Extrapulmonary tuberculosis often reaches the surgeon as pain, obstruction, perforation, a mass or an abscess, and its nonspecific presentation delays diagnosis. This study has described its profile, diagnostic work-up and outcome in a surgical department.
Methods: This prospective observational study included 20 adults with extrapulmonary tuberculosis requiring surgical evaluation or intervention at a tertiary care hospital in Jamnagar, Gujarat, between April 2025 and January 2026. Patients with pulmonary tuberculosis or HIV infection were excluded. All received anti-tubercular therapy, with surgery as indicated.
Results: Mean age was 40.4±16.7 years and the sexes were equally represented. Most patients were rural (80.00%) and underweight (90.00%). The abdomen was the commonest site (65.00%), followed by pleura (15.00%) and bone or spine (10.00%). Nausea and vomiting (40.00%), pain (35.00%) and diarrhea (30.00%) were the leading symptoms, and 70.00% presented within two months. CBNAAT was performed in all patients and acid-fast bacilli staining in 90.00%; histopathology showed granulomatous inflammation in six of 10 specimens. Mean ESR and CRP were 64.8±8.2 mm/hour and 34.8±6.8 mg/l. Two patients (10.00%) developed postoperative complications. Mean hospital stay was 11.5±1.9 days. Eighteen patients (90.00%) were cured, one completed treatment and one had treatment failure with recurrence; none died.
Conclusions: Surgical extrapulmonary tuberculosis was mainly abdominal and affected undernourished young and middle-aged rural adults. Combined surgical and anti-tubercular treatment achieved favorable outcomes. A high index of suspicion, tissue diagnosis and nutritional support are essential.

Keywords: Abdominal tuberculosis, Anti-tubercular therapy, CBNAAT, Extrapulmonary tuberculosis, Surgical tuberculosis, Undernutrition

INTRODUCTION

India carries the largest share of the global tuberculosis burden, and extrapulmonary tuberculosis accounts for about 15% to 20% of all cases in immunocompetent patients.[1,2] Extrapulmonary disease can involve virtually any organ, most often the lymph nodes, pleura, abdomen, bones and joints, genitourinary tract and central nervous system.[3,4] Its paucibacillary nature and nonspecific presentation make diagnosis difficult, and imaging findings frequently mimic malignancy, Crohn's disease or other infections.[5,6]

Surgeons see extrapulmonary tuberculosis in two settings: when tissue is needed for diagnosis, and when complications such as intestinal obstruction, perforation, abscess, empyema or spinal compression require operation.[7,8] Abdominal tuberculosis is the commonest surgical form in India, and a large proportion of patients still need laparoscopy or laparotomy for diagnosis or

treatment despite modern imaging.[9-11] The national Index-TB guidelines recommend tissue diagnosis with histopathology and molecular testing, followed by standard anti-tubercular therapy, with surgery reserved for specific indications.[12]

Data on the profile and outcome of extrapulmonary tuberculosis managed in surgical units of western India are limited. This study described the clinical profile, diagnostic work-up, management and outcome of patients with extrapulmonary tuberculosis treated in a department of general surgery.

METHODS

Study design and setting

This prospective observational study was conducted in the department of general surgery, Shri M. P. Shah Government Medical College and Guru Gobind Singh Government Hospital, Jamnagar, Gujarat, India, over 10 months from April 2025 to January 2026.

Participants

Patients aged above 18 years with suspected or confirmed extrapulmonary tuberculosis requiring surgical evaluation or intervention were enrolled after written informed consent, which included consent for intraoperative photography. Patients with pulmonary tuberculosis, HIV infection, current chemotherapy, pregnancy or severe comorbidity precluding surgery were excluded. All patients were evaluated with chest radiography to exclude concomitant pulmonary disease.

Sample size

The sample size was estimated with the formula $n=Z^2pq/d^2$, assuming a proportion of 10% of tuberculosis requiring surgical management, a Z value of 1.96 and an absolute precision of 13%, which gave approximately 20 patients.

Data collection

A predesigned case record form was used to record age, sex, occupation, residence, body mass index, smoking and alcohol use, presenting complaints and their duration, site of involvement, previous treatment and its response, past history of tuberculosis and comorbidities. Vital signs, hemoglobin, total leukocyte count, erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were recorded at admission.

Diagnostic work-up

Imaging was chosen according to the site of disease and included ultrasonography, contrast-enhanced computed tomography and magnetic resonance imaging. Diagnostic confirmation was attempted with cartridge-based nucleic acid amplification testing (CBNAAT, GeneXpert), Ziehl-Neelsen staining for acid-fast bacilli, mycobacterial culture where feasible, fine needle aspiration cytology or biopsy, histopathology of operative specimens, and adenosine deaminase (ADA) estimation in ascitic or pleural fluid in selected patients.

Management

All patients received standard anti-tubercular therapy according to the National Tuberculosis Elimination Programme guidelines in consultation with the department of respiratory medicine.[12] Surgical intervention was performed when clinically indicated, and the procedure depended on the site of disease, its severity and associated complications. Postoperative care included continuation of anti-tubercular therapy, wound and drain care, and nutritional support.

Outcomes

Outcomes were postoperative complications, duration of hospital stay, treatment outcome recorded according to programme definitions (cure, treatment completed, treatment failure), recurrence during follow-up and mortality.

Statistical analysis

Data were entered in Microsoft Excel and analyzed descriptively. Continuous variables were expressed as mean±standard deviation and categorical variables as frequency and percentage.

RESULTS

The mean age of the 20 patients was 40.4±16.7 years (range 19 to 70 years), and 35.00% were aged 25 to 34 years. There were 10 men and 10 women. Labourers (35.00%) and housewives (30.00%) were the largest occupational groups, and 80.00% lived in rural areas. Eighteen patients (90.00%) were underweight. Eight (40.00%) smoked and three (15.00%) consumed alcohol (Table 1).

The abdomen was the most common site (65.00%): 11 patients had abdominal tuberculosis, one had terminal ileal perforation from a tubercular ulcer and one had tubercular peritonitis with liver parenchymal disease. Pleural tuberculosis was present in three patients (15.00%), bone and spinal tuberculosis in one each, disseminated disease with tubercular lymphadenitis in one, and tubercular meningitis in one. Nausea and vomiting (40.00%), pain (35.00%), diarrhea (30.00%), abdominal lump (25.00%) and bleeding per rectum (25.00%) were the leading symptoms. Fourteen patients (70.00%) presented within two months of symptom onset. Nine patients (45.00%) had received earlier treatment, most often drainage (20.00%), and nine (45.00%) had a past history of tuberculosis,

extrapulmonary in six and pulmonary in three. Diabetes mellitus and hypertension were each present in 15.00% (Table 2, Figure 1). Representative intraoperative findings at laparotomy and laparoscopy in patients with abdominal tuberculosis are shown in Figures 2 and 3.

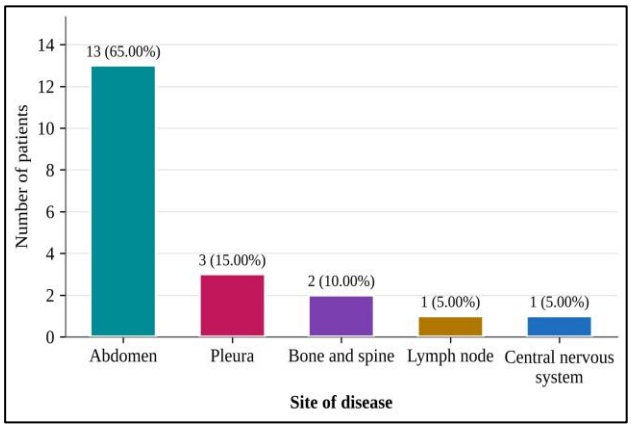

Figure 1: Site of extrapulmonary tuberculosis in the study participants (n=20).

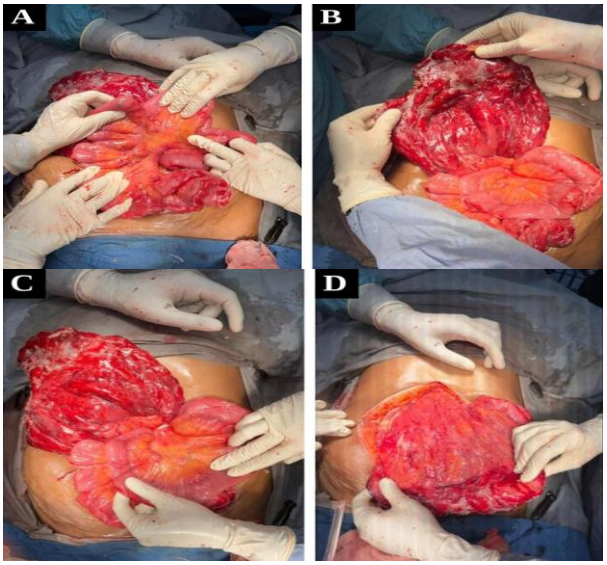

Figure 2: Intraoperative findings at laparotomy in abdominal tuberculosis (A-D): thickened, inflamed omentum adherent to congested, matted small-bowel loops with dense interloop adhesions.

Table 1: Demographic profile and risk factors of the study participants (n=20).

Variables	Number of patients (%)
Age group (years)	
18-24	3 (15.00)
25-34	7 (35.00)
35-44	3 (15.00)
45-54	2 (10.00)
55-64	2 (10.00)
65-74	3 (15.00)
Mean±SD (years)	40.4±16.7
Sex	
Male	10 (50.00)
Female	10 (50.00)
Occupation	
Labourer	7 (35.00)
Housewife	6 (30.00)
Farmer	4 (20.00)
Factory worker	3 (15.00)
Residence	
Rural	16 (80.00)
Urban	4 (20.00)
Body mass index	
Underweight	18 (90.00)
Normal	2 (10.00)
Habits*	
Smoking	8 (40.00)
Alcohol	3 (15.00)

*Two patients both smoked and consumed alcohol. SD: standard deviation.

Table 2: Site of disease, presenting complaints and past history (n=20).

Variables	Number of patients (%)
Site of involvement	
Abdomen	13 (65.00)
Pleura	3 (15.00)
Bone and spine	2 (10.00)
Lymph node (disseminated disease)	1 (5.00)
Central nervous system	1 (5.00)
Presenting complaints*	
Nausea and vomiting	8 (40.00)
Pain	7 (35.00)
Diarrhea	6 (30.00)
Abdominal lump	5 (25.00)
Bleeding per rectum	5 (25.00)
Swelling	4 (20.00)
Constipation	4 (20.00)
Fever	4 (20.00)
Sinus or discharging ulcer	1 (5.00)
Duration of symptoms	
Up to 2 months	14 (70.00)
More than 2 to 4 months	6 (30.00)
Previous treatment	
None	11 (55.00)
Drainage	4 (20.00)
Anti-tubercular therapy	3 (15.00)
Surgery	2 (10.00)
Past history of tuberculosis	
Extrapulmonary	6 (30.00)
Pulmonary	3 (15.0)
None	11 (55.00)
Comorbidities*	
Tuberculosis at another site	5 (25.00)
Diabetes mellitus	3 (15.00)
Hypertension	3 (15.00)
None	10 (50.00)

*More than one complaint or comorbidity was present in some patients.

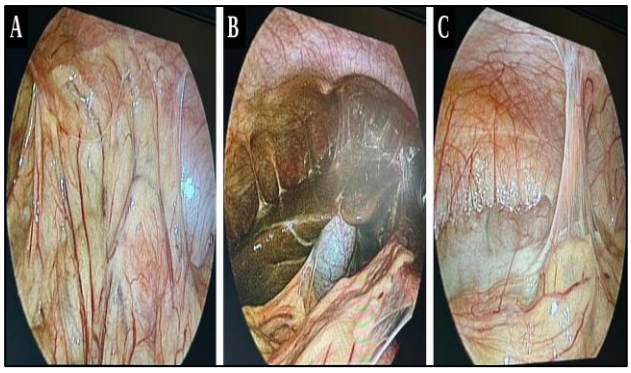

Figure 3: Laparoscopic findings in abdominal tuberculosis: A) thickened, hyperemic parietal peritoneum with fibrinous strands; B) bowel loops bound by filmy adhesions; C) fine whitish peritoneal nodules with an adhesive band.

CBNAAT was performed in all patients, acid-fast bacilli staining in 18 (90.00%), mycobacterial culture in five (25.00%) and fine needle aspiration cytology or biopsy in two (10.00%). Histopathology was available for 10 specimens and showed granulomatous inflammation in six (caseating in one), chronic nonspecific inflammation in two, reactive lymphadenitis in one and a normal bone fragment in one. Ascitic fluid ADA, measured in four patients, ranged from 42.4 to 107.0 U/l, and pleural fluid ADA in one patient was 83.3 U/l. Mean hemoglobin was 12.1±1.6 gm/dl, total leukocyte count 10,439±1,434/µl, ESR 64.8±8.2 mm/hour and CRP 34.8±6.8 mg/l (Table 3).

Eighteen patients (90.00%) had no postoperative complication; one developed empyema and one an intra-abdominal abscess. The mean hospital stay was 11.5±1.9 days (range 8 to 15 days). Eighteen patients (90.00%)

were cured, one completed treatment and one had treatment failure; the same patient, who had developed an intra-abdominal abscess, had a recurrence during follow-up. No patient died (Table 4).

Table 3: Diagnostic investigations and laboratory parameters (n=20).

Investigations	Result (%)
Tests performed*	
CBNAAT (GeneXpert)	20 (100.00)
Acid-fast bacilli staining	18 (90.00)
Mycobacterial culture	5 (25.00)
Histopathology report available	10 (50.00)
Fine needle aspiration cytology or biopsy	2 (10.00)
Histopathology (n=10 specimens)	
Granulomatous inflammation	6 (60.00)
Chronic nonspecific inflammation	2 (20.00)
Reactive lymphadenitis	1 (10.00)
Normal bone fragment	1 (10.00)
Fluid adenosine deaminase	
Ascitic fluid (n=4), range	42.4-107.0 U/l
Pleural fluid (n=1)	83.3 U/l
Admission parameters, mean±SD	
Pulse rate (per minute)	84.1±10.9
Systolic blood pressure (mmHg)	123.9±11.5
Diastolic blood pressure (mmHg)	80.8±5.8
Hemoglobin (gm/dl)	12.1±1.6
Total leukocyte count (/µl)	10,439±1,434
ESR (mm/hour)	64.8±8.2
CRP (mg/l)	34.8±6.8

*More than one test was performed in most patients. CBNAAT: cartridge-based nucleic acid amplification test; CRP: C-reactive protein; ESR: erythrocyte sedimentation rate; SD: standard deviation.

Table 4: Postoperative complications, hospital stay and treatment outcome (n=20).

Variables	Number of patients (%)
Postoperative complications	
None	18 (90.00)
Empyema	1 (5.00)
Intra-abdominal abscess	1 (5.00)
Hospital stay (days)	
8-9	3 (15.00)
10-11	6 (30.00)
12-13	9 (45.00)
14-15	2 (10.00)
Mean±SD	11.5±1.9
Treatment outcome	
Cure	18 (90.00)
Treatment completed	1 (5.00)
Treatment failure	1 (5.00)
Recurrence	
Yes	1 (5.00)
No	19 (95.00)
Mortality	
Death	0 (0.00)

DISCUSSION

This study describes extrapulmonary tuberculosis managed in a general surgical unit of a public teaching hospital in Gujarat. Abdominal disease predominated, patients were mostly young or middle-aged, rural and undernourished, and combined surgical and medical treatment produced cure in 90.00% with a low complication rate.

The mean age of 40 years and the peak in the third and fourth decades are consistent with Indian surgical series. Charokar et al reported a median age of 30 years among 72 operated patients with abdominal tuberculosis, and Singh et al a median age of 24 years.[10,11] In contrast, abdominal tuberculosis in high-income countries affects either young immigrants or elderly, debilitated native-born patients.[13] The equal sex distribution differs from the male predominance reported in several Indian surgical series.[10,11]

Nine of every 10 patients were underweight. Undernutrition is a major risk factor for tuberculosis in India and impairs cell-mediated immunity; in a multicenter prospective Indian cohort, severe undernutrition at the start of treatment was associated with about twice the rate of unfavorable treatment outcomes.[14] Nutritional assessment and support should therefore be part of perioperative care in every patient. Smoking (40.00%) and diabetes (15.00%) are other recognized risk factors: smoking roughly doubles the risk of active tuberculosis, and diabetes increases it about threefold.[15,16] Coexisting conditions also influence treatment outcome in extrapulmonary disease.[17]

The abdomen was involved in 65.00% of patients. In large general series of extrapulmonary tuberculosis, lymph node and pleural disease are the most common forms, but surgical series are dominated by abdominal tuberculosis because obstruction, perforation and diagnostic uncertainty bring these patients to surgeons.[4,6,8] The gastrointestinal symptoms in our patients reflect this. Most patients presented within two months of symptom onset, possibly because acute complications prompted surgical referral. Nearly half had received earlier treatment, often drainage, and nine had a past history of tuberculosis, which underlines the risk of relapse and the importance of adherence and follow-up.

Diagnosis of extrapulmonary tuberculosis requires tissue or fluid for microbiological and histopathological confirmation, because clinical and imaging findings are nonspecific.[5,12] All our patients underwent CBNAAT. Automated molecular assays rapidly detect *Mycobacterium tuberculosis* and rifampicin resistance in extrapulmonary specimens, but their sensitivity varies by specimen type and a negative result does not exclude disease.[18] Histopathology, available for half the patients, showed granulomatous inflammation in most specimens, but two showed only nonspecific inflammation, a known limitation of small or partial samples. Ascitic fluid ADA is a useful adjunct for tuberculous peritonitis, with high sensitivity and specificity at cut-off values of about 36 to 40 U/l.[19] The markedly raised ESR and CRP are typical of active tuberculosis but are not specific.

Surgery in extrapulmonary tuberculosis is indicated for diagnosis and for complications. In abdominal tuberculosis, diagnostic laparoscopy or laparotomy is still required in a considerable proportion of patients, and complications such as stricture, obstruction and perforation require resection, stricturoplasty, adhesiolysis or perforation repair.[9,11,20] Pleural, spinal and central nervous system disease are primarily treated medically, with surgery reserved for empyema, trapped lung, neurological deficit, instability or mass effect.[21-23] Anti-tubercular therapy remains the definitive treatment, and surgery is an adjunct rather than a substitute.[7,12]

The postoperative complication rate of 10.00% compares favorably with the 33.3% reported by Charokar et al, whose patients were all operated for abdominal tuberculosis and 58% underwent emergency surgery.[10] The mean hospital stay of 11.5 days was shorter than the median of 14 days in that series.[10] The cure rate of 90.00% is consistent with the favorable response of extrapulmonary disease to standard therapy when diagnosis is established and treatment completed.[2,12] The single treatment failure, associated with an intra-abdominal abscess and recurrence, highlights the need for close follow-up and evaluation for drug resistance in patients who do not respond.[12]

This study has limitations. The sample was small and heterogeneous, drawn from a single surgical unit, which limits generalizability. The specific surgical procedures and the results of molecular tests and cultures were not analyzed separately, so the rate of bacteriological confirmation could not be determined. Follow-up was limited to the study period.

CONCLUSION

Extrapulmonary tuberculosis presenting to the surgeon in this series was predominantly abdominal and affected undernourished young and middle-aged adults from rural backgrounds, with nonspecific gastrointestinal symptoms. Tissue diagnosis supported by CBNAAT, histopathology and ADA, combined with standard anti-tubercular therapy and surgery when indicated, achieved cure in 90.00% of patients with few complications. Surgeons should maintain a high index of suspicion, obtain tissue for diagnosis whenever possible, and include nutritional support and close follow-up in the management of these patients.

ACKNOWLEDGEMENTS

The authors thank the faculty and residents of the department of general surgery, the departments of

respiratory medicine, microbiology and pathology, the nursing staff of Guru Gobind Singh Government Hospital, Jamnagar, and the patients who participated in this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Sharma SK, Mohan A. Extrapulmonary tuberculosis. Indian J Med Res. 2004;120(4):316-53.
2. Sharma SK, Mohan A, Kohli M. Extrapulmonary tuberculosis. Expert Rev Respir Med. 2021;15(7):931-48.
3. Golden MP, Vikram HR. Extrapulmonary tuberculosis: an overview. Am Fam Phys. 2005;72(9):1761-8.
4. Ilgazli A, Boyaci H, Basyigit I, Yildiz F. Extrapulmonary tuberculosis: clinical and epidemiologic spectrum of 636 cases. Arch Med Res. 2004;35(5):435-41.
5. Rodriguez-Takeuchi SY, Renjifo ME, Medina FJ. Extrapulmonary tuberculosis: pathophysiology and imaging findings. Radiographics. 2019;39(7):2023-37.
6. Debi U, Ravisankar V, Prasad KK, Sinha SK, Sharma AK. Abdominal tuberculosis of the gastrointestinal tract: revisited. World J Gastroenterol. 2014;20(40):14831-40.
7. Fry DE. Extra-pulmonary tuberculosis and its surgical treatment. Surg Infect. 2016;17(4):394-401.
8. Pattanayak S, Behuria S. Is abdominal tuberculosis a surgical problem? Ann R Coll Surg Engl. 2015;97(6):414-9.
9. Swaminathan S, Naidu CS, Rao PP. Surgical management of abdominal tuberculosis in a tertiary care referral center. Int Surg J. 2020;7(3):842-8.
10. Charokar K, Garg N, Jain AK. Surgical management of abdominal tuberculosis: a retrospective study from Central India. Int Surg J. 2016;3(1):23-31.
11. Singh H, Krishnamurthy G, Rajendran J, Sharma V, Mandavdhare H, Kumar H, et al. Surgery for abdominal tuberculosis in the present era: experience from a tertiary-care center. Surg Infect. 2018;19(6):640-5.
12. Sharma SK, Ryan H, Khaparde S, Sachdeva KS, Singh AD, Mohan A, et al. Index-TB guidelines: guidelines on extrapulmonary tuberculosis for India. Indian J Med Res. 2017;145(4):448-63.
13. Hassan I, Brilakis ES, Thompson RL, Que FG. Surgical management of abdominal tuberculosis. J Gastrointest Surg. 2002;6(6):862-7.
14. Sinha P, Ponnuraja C, Gupte N, Prakash Babu S, Cox SR, Sarkar S, et al. Impact of undernutrition on tuberculosis treatment outcomes in India: a multicenter, prospective, cohort analysis. Clin Infect Dis. 2023;76(8):1483-91.
15. Bates MN, Khalakdina A, Pai M, Chang L, Lessa F, Smith KR. Risk of tuberculosis from exposure to tobacco smoke: a systematic review and meta-analysis. Arch Intern Med. 2007;167(4):335-42.
16. Jeon CY, Murray MB. Diabetes mellitus increases the risk of active tuberculosis: a systematic review of 13 observational studies. PLoS Med. 2008;5(7):e152.
17. Khan AH, Sulaiman SAS, Laghari M, Hassali MA, Muttalif AR, Bhatti Z, et al. Treatment outcomes and risk factors of extra-pulmonary tuberculosis in patients with co-morbidities. BMC Infect Dis. 2019;19(1):691.
18. Kohli M, Inbaraj LR, Salomon A, Scandrett K, Korobitsyn A, Ismail N, et al. Low-complexity automated nucleic acid amplification tests for extrapulmonary tuberculosis and rifampicin resistance in adults and adolescents. Cochrane Database Syst Rev. 2025;8(8):CD012768.
19. Riquelme A, Calvo M, Salech F, Valderrama S, Pattillo A, Arellano M, et al. Value of adenosine deaminase (ADA) in ascitic fluid for the diagnosis of tuberculous peritonitis: a meta-analysis. J Clin Gastroenterol. 2006;40(8):705-10.
20. Jha DK, Pathiyil MM, Sharma V. Evidence-based approach to diagnosis and management of abdominal tuberculosis. Indian J Gastroenterol. 2023;42(1):17-31.
21. Shaw JA, Irusen EM, Diacon AH, Koegelenberg CF. Pleural tuberculosis: a concise clinical review. Clin Respir J. 2018;12(5):1779-86.
22. Dunn RN, Ben Husien M. Spinal tuberculosis: review of current management. Bone Joint J. 2018;100-B(4):425-31.
23. Rajshekhar V. Surgery for brain tuberculosis: a review. Acta Neurochir. 2015;157(10):1665-78.

Cite this article as: Dela DJ, Noyda AO. Extrapulmonary tuberculosis in surgical practice: a prospective study of clinical profile, diagnostic work-up and outcome in 20 patients. Int Surg J 2026;13:2421-7.