AHMAR METASTASIS HEALTH JOURNAL
Available online at: http://journal.ahmareduc.or.id/index.php/AMHJ
Vol. 5. No. 4. March 2026, Page 287-295
P-ISSN: 2797-6483 E-ISSN: 2797-4952

Complete Recovery Following Intestine Perforation Caused by Tuberculosis: A Case Report

Ikhsan Budi[1]*, Rey Mas Fakhrury[2], Nahdah Lupita[2], Zahra Nurusshofa[3]

[1] Faculty of Medicine, Universitas Pembangunan Nasional Veteran Jakarta, Jakarta, DKI Jakarta, Indonesia
[2] General Practitioner, Mitra Husada Hospital, Tangerang, Banten, Indonesia
[3] Faculty of Medicine, Universitas Muhammadiyah Prof. Dr. Hamka, Jakarta, DKI Jakarta, Indonesia

ARTICLE INFO

Article Type:
Case Report

Article History:
Received: 07 February 2026
Accepted: 23 February 2026
Published: 24 February 2026

****Corresponding author***
Email: *ikhsanbudi@upnvj.ac.id*

ORIGINAL ARTICLE

ABSTRACT
Intestinal tuberculosis (ITB) can mimic common gastrointestinal disorders and is frequently diagnosed late, particularly in resource-limited settings where microbiological confirmation is unavailable. This case report aims to describe an unusual presentation of ITB as ileocaecal perforation and to highlight diagnostic and therapeutic considerations. The method used was a descriptive case report of a 25-year-old woman who presented with watery diarrhoea, vomiting, diffuse abdominal pain, fever, weight loss, and cough, and subsequently developed generalized peritonitis requiring emergency exploratory laparotomy. Intraoperative findings revealed an ileocaecal perforation requiring segmental resection with primary anastomosis. Histopathological examination of the resected bowel and regional lymph nodes demonstrated necrotising granulomatous inflammation with caseation and Langhans-type giant cells, supporting the diagnosis of ITB. Microbiological tests such as GeneXpert and culture were not performed due to resource limitations. Postoperatively, the patient received supportive care, antibiotics, and standard anti-tuberculosis therapy. The results showed a favorable clinical outcome, with no early postoperative complications, discharge on postoperative day seven, and complete symptom resolution with weight gain and radiological improvement at follow-up. This case illustrates that when microbiological confirmation is not feasible, histopathology combined with timely surgical intervention and anti-tuberculosis therapy can support diagnosis and lead to successful management of complicated ITB.

Keywords: Intestinal Tuberculosis, Ileocaecal Perforation, Pneumoperitoneum, Extrapulmonary Tuberculosis.

ABSTRAK
Tuberkulosis intestinal (ITB) dapat menyerupai gangguan gastrointestinal umum dan sering terlambat didiagnosis, terutama di fasilitas dengan keterbatasan sumber daya di mana konfirmasi mikrobiologis tidak tersedia. Laporan kasus ini bertujuan untuk menggambarkan presentasi tidak biasa ITB berupa perforasi ileosekal serta menyoroti pertimbangan diagnostik dan terapeutik. Metode yang digunakan adalah laporan kasus deskriptif pada seorang perempuan berusia 25 tahun yang datang dengan diare cair, muntah, nyeri perut difus, demam, penurunan berat badan, dan batuk, kemudian berkembang menjadi peritonitis generalisata yang memerlukan laparotomi eksplorasi darurat. Temuan intraoperatif menunjukkan adanya perforasi ileosekal yang memerlukan reseksi segmental dengan anastomosis primer. Pemeriksaan histopatologi pada usus yang direseksi dan kelenjar getah bening regional menunjukkan peradangan granulomatosa nekrotik dengan nekrosis kaseosa dan sel raksasa tipe Langhans, yang mendukung diagnosis ITB. Pemeriksaan mikrobiologis seperti GeneXpert dan kultur tidak dilakukan karena keterbatasan sumber daya. Pascaoperasi, pasien mendapatkan perawatan suportif, antibiotik, dan terapi standar anti-tuberkulosis. Hasil menunjukkan luaran klinis yang baik, tanpa komplikasi pascaoperasi dini, pasien dipulangkan pada hari ketujuh pascaoperasi, serta terjadi perbaikan gejala, peningkatan berat badan, dan perbaikan radiologis pada tindak lanjut. Kasus ini menunjukkan bahwa ketika konfirmasi mikrobiologis tidak memungkinkan, temuan histopatologi yang dikombinasikan dengan intervensi bedah yang tepat waktu dan terapi anti-tuberkulosis dapat mendukung diagnosis serta menghasilkan tata laksana yang berhasil pada ITB kompleks.

Kata Kunci: Tuberkulosis Intestinal, Perforasi Ileosekal, Pneumoperitoneum, Tuberkulosis Ekstraparu.

INTRODUCTION

Tuberculosis (TB) remains a preventable and largely curable infectious disease, yet it continues to cause substantial global morbidity and mortality (Shah et al., 2025; Tadese et al., 2025). In 2023, TB was again estimated to be the leading cause of death from a single infectious agent after being temporarily surpassed during the COVID-19 period (WHO, 2024). Caused by Mycobacterium tuberculosis, TB is primarily transmitted via inhalation of aerosolized droplets from individuals with active pulmonary disease (Ju et al., 2025).

Although the lungs are the main site of infection, M. tuberculosis can disseminate and cause extrapulmonary tuberculosis (EPTB), and gastrointestinal involvement is a recognized manifestation (Malikowski et al., 2018). Abdominal TB encompasses infection of the gastrointestinal tract, peritoneum, intra-abdominal lymph nodes, and/or solid organs. It represents a small but clinically important proportion of TB cases. It is more frequently encountered in high TB-burden settings, where delayed presentation and limited access to definitive diagnostics may worsen outcomes (Tobin & Khatri, 2025).

Intestinal tuberculosis is an important subtype of abdominal TB. The ileocecal region is the most commonly affected site, reflecting physiological stasis and abundant lymphoid tissue, while involvement of other intestinal segments may also occur (Debi et al., 2014; Rathi & Gambhire, 2016). Patients may present with nonspecific symptoms such as abdominal pain, altered bowel habits, fever, and weight loss, which overlap with inflammatory bowel disease and malignancy (Almadi et al., 2009). This clinical overlap is particularly problematic in differentiating intestinal TB from Crohn's disease, as inappropriate immunosuppression can lead to clinical deterioration.

Diagnosis remains challenging because no single test is sufficiently sensitive across all clinical contexts. Microbiological confirmation may be limited by difficulty obtaining adequate specimens, variable bacillary load, and constrained availability of molecular testing in resource-limited facilities. Consequently, clinicians often rely on a composite of clinical suspicion, imaging, endoscopic findings, and histopathology, each of which has limitations and may yield inconclusive results (Almadi et al., 2009; Debi et al., 2014). Delayed recognition can result in severe complications including obstruction, perforation, and peritonitis; which increase the need for emergency surgery and are associated with significant morbidity (Debi et al., 2014; Rathi & Gambhire, 2016).

Despite TB being endemic in many regions, including countries with a high TB burden, intestinal TB is frequently under-recognized, and the diagnosis may only become apparent after life-threatening surgical complications. In addition, reports detailing perforation as an initial manifestation of intestinal TB and describing practical diagnostic pathways when microbiological tests are not feasible remain limited. Clearer clinical narratives from high-burden, resource-constrained settings are needed to highlight warning features, support timely decision-making, and reduce diagnostic delays.

Therefore, this report aims to describe a rare presentation of intestinal TB with ileocecal perforation requiring emergency surgery, and to highlight the diagnostic approach and clinical reasoning in a setting where microbiological confirmation was not readily available.

RESEARCH METHODS

This study is a single-patient case report prepared in accordance with the CARE (Case Report) guidelines to enhance transparency and completeness of reporting. The case was selected for publication because it represents a rare initial presentation of intestinal tuberculosis (ITB) manifesting as ileocaecal perforation requiring emergency surgery. It offers educational value, particularly in settings where microbiological confirmation may be limited by resource constraints.

The patient was managed at Mitra Husada Hospital, Tangerang Regency, Indonesia, a Type C local referral hospital. The index admission occurred in January 2025, and monthly follow-up evaluations were conducted thereafter. Clinical data were collected retrospectively through a structured review of the patient's medical records. Information obtained included demographic characteristics, relevant medical and exposure history, presenting complaints, physical examination findings, diagnostic investigations, operative notes, inpatient clinical course,

treatments administered, discharge status, and follow-up outcomes. All potentially identifying information was removed to ensure patient confidentiality.

Diagnostic evaluation included routine laboratory investigations such as complete blood count, inflammatory markers, serum albumin, and other clinically indicated parameters. Laboratory results were interpreted according to the institution's reference ranges at the time of testing. Imaging studies reviewed consisted of posteroanterior chest radiography and abdominal ultrasonography performed during hospitalization and follow-up. Imaging findings were extracted from documented clinical and radiology reports available in the medical records.

The diagnosis of ITB was primarily supported by histopathological examination of intraoperative specimens, including the resected ileocaecal segment and regional lymph nodes. Histopathological assessment was conducted using standard tissue processing techniques and hematoxylin–eosin staining, as documented in the pathology report. Findings considered supportive of ITB included necrotising granulomatous inflammation with caseation and Langhans-type giant cells, interpreted in conjunction with the clinical presentation and intraoperative findings. Microbiological confirmation, such as GeneXpert testing or mycobacterial culture, was not performed due to documented local resource and specimen limitations during care.

Emergency surgery was performed for generalized peritonitis with suspected gastrointestinal perforation, in accordance with standard surgical indications. Operative management included exploratory laparotomy and segmental resection of the perforated ileocaecal segment with primary anastomosis, followed by postoperative supportive care. Perioperative management included intravenous fluids, analgesia, nutritional support, and empiric antibiotic therapy based on institutional protocols.

Postoperatively, anti-tuberculosis therapy was initiated using the standard national first-line regimen in accordance with Indonesian TB guidelines. The intensive phase consisted of rifampicin (8–12 mg/kg), isoniazid (4–6 mg/kg), pyrazinamide (20–30 mg/kg), and ethambutol (15–20 mg/kg), followed by rifampicin and isoniazid during the continuation phase. All medications were administered in weight-based doses, and the total duration of therapy was individualized according to clinical response and follow-up evaluations.

Follow-up was conducted monthly after hospital discharge. Treatment response was assessed descriptively based on resolution of gastrointestinal and systemic symptoms, weight gain and functional recovery, and improvement or resolution of abnormalities on follow-up imaging as documented in clinical and radiological records. As this was a single-case report, data were analyzed descriptively, and no statistical analysis was performed.

Written informed consent for publication of this case report and accompanying images was obtained from the patient. Patient confidentiality was maintained through appropriate de-identification procedures.

RESULTS

A 25-year-old female with no significant past medical history presented to the emergency room with complaints of diarrhea for one week, associated with vomiting, abdominal pain, and fever. The diarrhea was watery but without visible blood or mucus, and was accompanied by intermittent abdominal cramping. The vomiting had been frequent in the past 48 hours, and the patient had noticed a significant weight loss over the last 2 weeks. The patient reported a persistent unproductive cough for more than two weeks but denied any known exposure to tuberculosis (TB) or a history of previous TB treatment. The patient did not report any recent travel history, exposure to contaminated water or food, or any history of immunosuppression. There was no significant family history of gastrointestinal or pulmonary diseases.

On physical examination, the patient appeared mildly distressed, showing signs of dehydration. Upon auscultation of the respiratory system, bilateral rales were noted, suggesting a possible respiratory infection. Abdominal examination revealed diffuse tenderness throughout the abdominal region, with noticeable distension upon palpation. Increased bowel sounds were also audible, indicating potential gastrointestinal involvement. No significant findings were observed in the cardiovascular or neurological examinations.

Laboratory results showed an elevated leukocyte count (13.8×10^9/L), normal random glucose levels, and decreased total protein (5.1 g/dL), albumin (2.5 g/dL), and globulin (2.6 g/dL).

Liver and kidney functions were within normal limits, while the erythrocyte sedimentation rate (ESR) was elevated at 105 mm/h. Microbiological examination of sputum yielded no sample. Chest radiography revealed right paracardiac consolidation and left lung infiltrates (Figure 1).

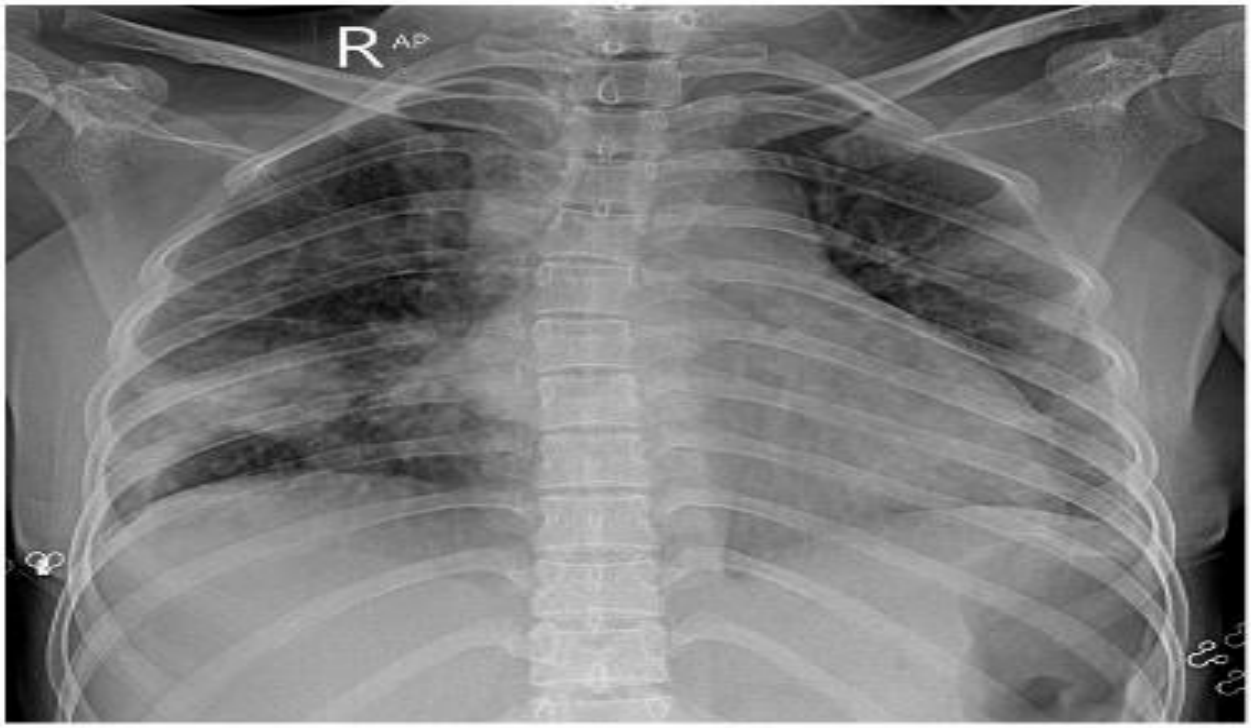

Figure 1. Chest X-ray

2-view plain abdominal radiography (Figure 2) showed signs of pneumoperitoneum, with dilation of the small intestine, particularly in the left hemiabdomen, along with multiple air-fluid levels, raising concern for a differential diagnosis of obstructive ileus at the small intestine level. Abdominal ultrasound revealed mild ascites below the liver and between the intestines, along with enlargement of multiple lymph nodes at the celiac trunk, the largest measuring 5.7 x 2.2 x 2.9 cm.

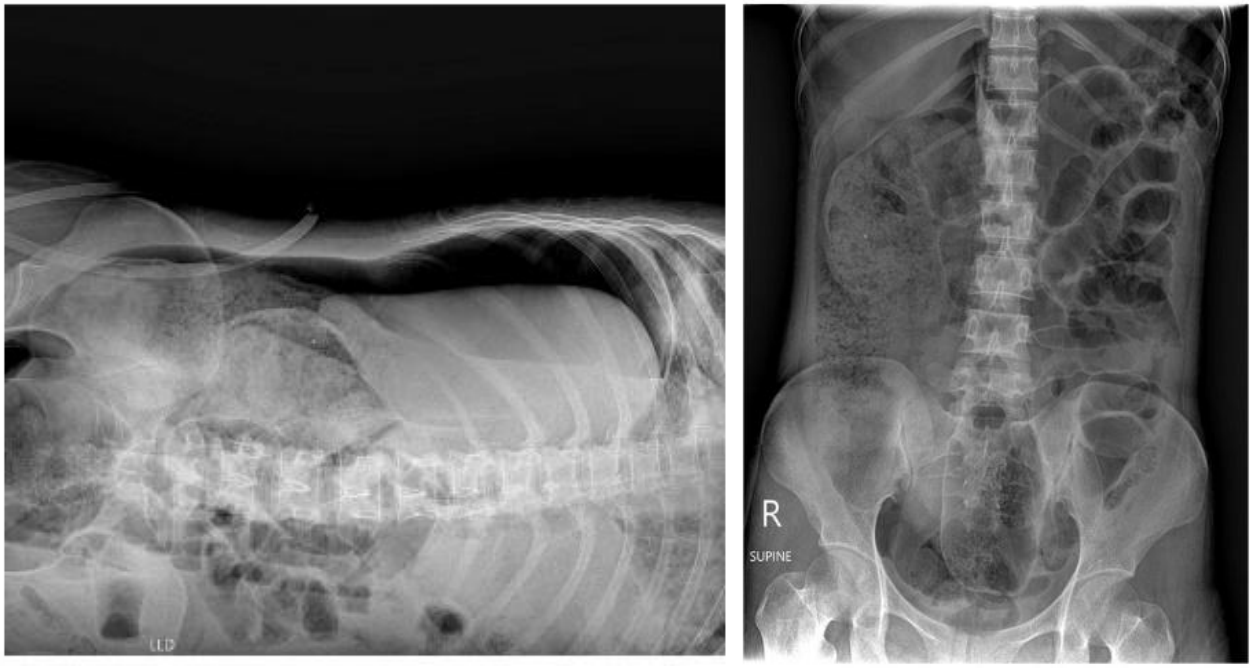

Figure 2. 2-view plain abdominal radiography.

The patient was evaluated for an acute abdomen and managed as generalized peritonitis. Following initial resuscitation, an emergency exploratory laparotomy was performed, which identified an ileocaecal perforation with diffuse peritoneal soiling. Segmental resection of the involved ileocaecal bowel was undertaken with primary intestinal anastomosis. Representative specimens from the resected intestine and regional lymph nodes were obtained intraoperatively and submitted for histopathologic examination.

Histopathology of the intestinal tissue and lymph nodes demonstrated granulomatous inflammation with well-formed tubercles, extensive central caseous necrosis, epithelioid cell proliferation, and multinucleated Langhans-type giant cells, consistent with tuberculous involvement. GeneXpert testing and mycobacterial culture for Mycobacterium tuberculosis were not performed due to resource limitations. Postoperatively, the patient received supportive care, antibiotic therapy, and standard wound management. Anti-tuberculosis treatment was initiated using the Indonesian national standard regimen: an intensive phase of 2 months with rifampicin, isoniazid, pyrazinamide, and ethambutol, followed by a continuation phase of rifampicin and isoniazid for 4–7 months. The postoperative course was uncomplicated, symptoms improved, and the patient was discharged in stable condition on postoperative day 7 with outpatient follow-up arranged for ongoing treatment and monitoring.

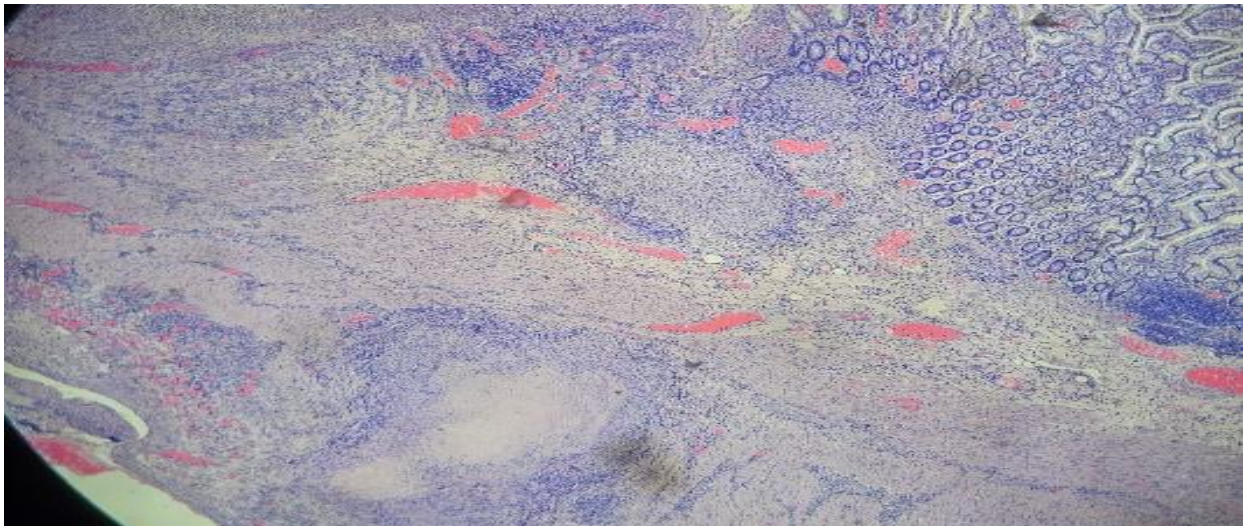

Figure 3. Ileal histopathology demonstrating caseous necrosis with epithelioid cell proliferation.

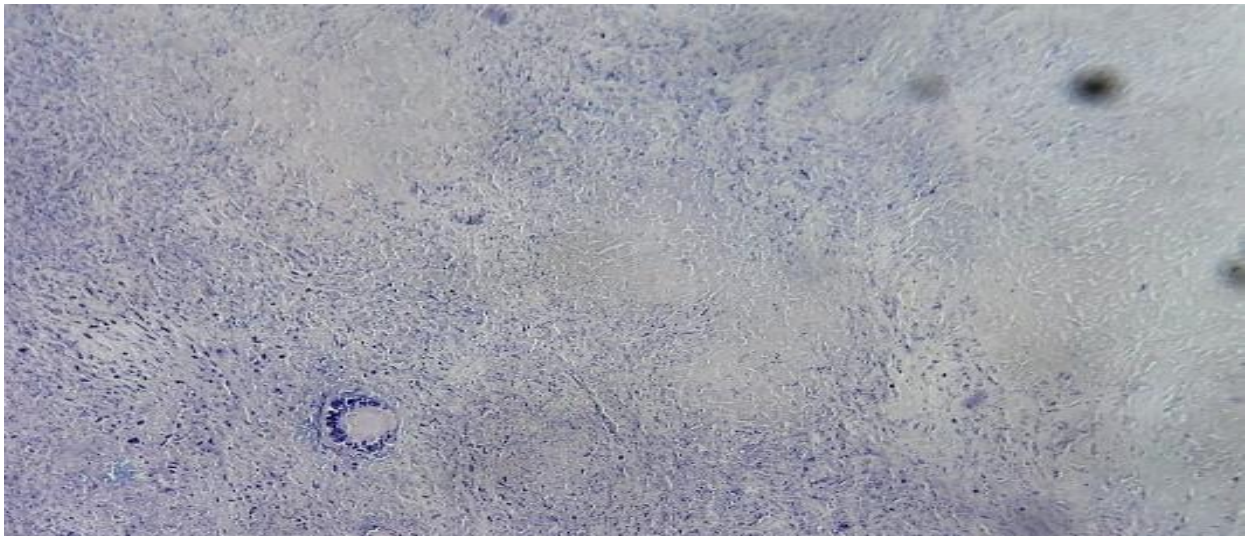

Figure 4. Lymph node histopathology showing Langhans-type multinucleated giant cells.

At the 2-month follow-up, the patient reported further clinical improvement, with resolution of systemic and abdominal symptoms and a progressive increase in body weight. A posteroanterior chest radiograph demonstrated decreased pulmonary infiltrates and consolidation compared with baseline imaging (Figure 5). Concurrent abdominal ultrasonography showed a reduction in the size of paracolic and ileocaecal lymph nodes, along with decreased ascites, indicating a favorable clinical and radiologic response to therapy.

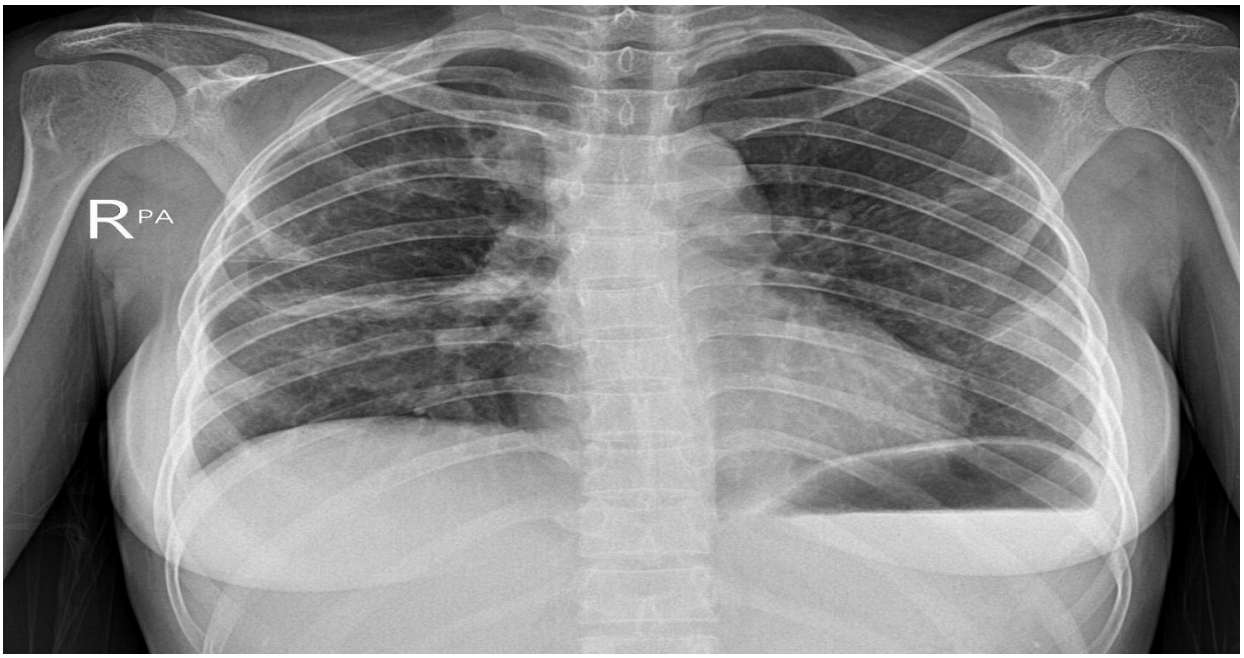

Figure 5. Posteroanterior (PA) chest radiograph at the 2-month follow-up.

At the 9-month follow-up, a posteroanterior chest radiograph (Figure 6) demonstrated complete resolution of the previously noted infiltrates and consolidation. Abdominal ultrasonography showed no residual lymphadenopathy and no detectable ascites. On the basis of sustained clinical recovery and the absence of radiologic evidence of active disease, the patient was deemed cured and anti-tuberculosis therapy was completed.

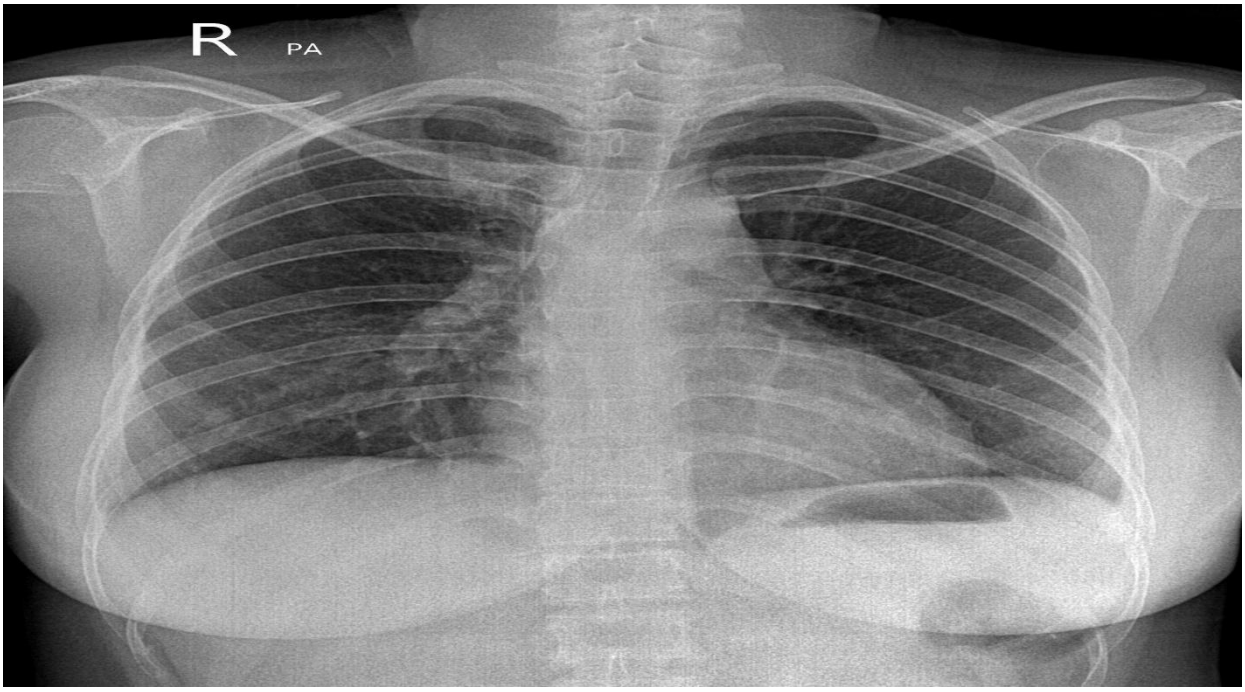

Figure 6. Posteroanterior (PA) chest radiograph at the 9-month follow-up.

DISCUSSION

In TB-endemic regions, intestinal tuberculosis (ITB) should remain an important differential diagnosis for patients with chronic abdominal complaints; however, recognition is frequently delayed because symptoms are nonspecific and overlap with inflammatory bowel disease and malignancy (Debi et al., 2014; Tahiri et al., 2021). This case is clinically instructive because ITB manifested as a rare surgical emergency ileocaecal perforation with pneumoperitoneum so management was driven by sepsis control rather than etiologic confirmation. The presentation illustrates a common real-world pathway in complicated abdominal TB: the underlying diagnosis may only become apparent after operative source control provides tissue for histopathology (Di Buono et al., 2024; Weledji & Pokam, 2017).

Although Crohn's disease is the most common clinical mimic, necrotising granulomatous inflammation is not specific for tuberculosis, and the differential diagnosis includes Crohn's disease, Yersinia infection, invasive fungal infection (e.g., histoplasmosis), sarcoidosis, and other granulomatous enteritides (Amarnath et al., 2021; Shah et al., 2017). In this patient, the combined clinical–radiological–pathological profile favored intestinal TB over Crohn's disease: residence in a TB-endemic setting, systemic symptoms (fever and weight loss), concurrent pulmonary abnormalities, and histopathology showing caseating necrotising granulomas with Langhans-type giant cells in bowel and regional lymph nodes (Kedia et al., 2019; Shah et al., 2017). However, because confirmatory ancillary testing (AFB stain and/or TB PCR) and fungal stains/cultures were not performed, alternative infectious causes cannot be fully excluded, and conclusions should be interpreted with appropriate diagnostic caution (Amarnath et al., 2021; Shah et al., 2017).

Microbiological confirmation in extrapulmonary TB is often limited by low bacillary burden and sampling constraints; even when available, molecular assays may have insufficient sensitivity, so negative results do not reliably rule out disease (Lewinsohn et al., 2017; Sharma et al., 2021). In this case, the perforation-driven emergency course appropriately prioritized resuscitation and urgent laparotomy, inherently narrowing opportunities for preoperative diagnostic work-up. With GeneXpert and culture unavailable, the diagnostic pathway necessarily relied on tissue-based inference integrated with clinicoradiological correlation an approach frequently required in resource-limited, high-burden settings where timely access to diagnostic tissue and pathology expertise becomes pivotal (Lewinsohn et al., 2017).

Surgery is unavoidable in perforated intestinal TB, but operative strategy warrants critical appraisal. Primary anastomosis after ileocaecal resection may be appropriate when hemodynamic stability is achieved after resuscitation, bowel viability is adequate, contamination is controllable, and anastomosis can be tension-free. However, in patients with severe sepsis, extensive contamination, profound malnutrition/hypoalbuminaemia, or questionable tissue perfusion, stoma formation or staged approaches may reduce anastomotic risk. In our patient, hypoalbuminaemia also served as a clinically meaningful marker of compromised nutritional reserve, supporting early nutritional optimization given its potential implications for wound healing, immune recovery, and treatment tolerance (Di Buono et al., 2024).

Once histopathology supported a tuberculous aetiology, initiation of standard first-line anti-tuberculosis therapy was appropriate (WHO, 2024). In the postoperative context, the key case-based considerations are practical rather than guideline-recitation: gastrointestinal intolerance, potential reduction in early oral intake and absorption in the setting of vomiting/diarrhoea, and monitoring for drug toxicity (particularly hepatotoxicity) alongside adherence support. Serial clinical recovery with weight gain and radiological improvement in this patient was particularly informative because bacteriological endpoints and drug-susceptibility testing were unavailable; in such contexts, objective improvement on follow-up imaging, while not a stand-alone definition of cure, can strengthen confidence in treatment response when combined with sustained symptom resolution (WHO, 2024).

Longer-term implications warrant brief attention. After ileocaecal resection, patients may develop altered bowel habits and chronic diarrhoea related to bile acid malabsorption, and should be assessed if symptoms persist (Barkun et al., 2013). Although recurrence risk cannot be quantified from a single case, post-treatment recurrence remains clinically relevant and supports symptom-based surveillance after treatment completion (Ruan et al., 2022). Ongoing monitoring

for late adverse drug effects and adherence counselling is particularly important when baseline drug-susceptibility testing is unavailable (Nahid et al., 2016).

The principal limitation of this report is the absence of microbiological confirmation and drug-susceptibility testing, which reduces diagnostic certainty and prevents bacteriological outcome assessment. In addition, tissue-based adjuncts (AFB stain, TB PCR) and fungal stains/cultures were not performed; therefore, while histopathology strongly supported TB, misclassification cannot be fully excluded and introduces potential empirical bias in attributing outcome solely to anti-tuberculosis therapy. Despite these constraints, this case highlights that ileocaecal perforation can be a rare initial manifestation of ITB and demonstrates a pragmatic diagnostic and management pathway in an emergency surgical presentation where confirmatory microbiology is not feasible.

CONCLUSION

This case illustrates that intestinal tuberculosis maypresent as an acute surgical emergency with ileocaecal perforation and generalized peritonitis, and the underlying aetiology may only become apparent after operative source control. In resource-limited settings where microbiological confirmation is not feasible, histopathology from resected bowel and regional lymph nodes may support the diagnosis and should be considered in cases of unexplained ileocaecal perforation. In this patient, prompt resuscitation and timely surgery, followed by initiation of standard anti-tuberculosis therapy and structured follow-up, were associated with favourable clinical recovery, weight gain, and radiological resolution. Clinicians in TB-endemic regions may consider intestinal tuberculosis in young patients with systemic features and intra-abdominal lymphadenopathy/ascites, even when the initial presentation resembles a more common gastrointestinal condition.

REFERENCES

Almadi, M. A., Ghosh, S., & Aljebreen, A. M. (2009). Differentiating intestinal tuberculosis from Crohn's disease: A diagnostic challenge. *American Journal of Gastroenterology,* 104(4), 1003–1012. https://doi.org/10.1038/ajg.2008.162

Amarnath, S., Deeb, L., Philipose, J., Zheng, X., & Gumaste, V. (2021). A comprehensive review of infectious granulomatous diseases of the gastrointestinal tract. *Gastroenterology Research and Practice,* 2021*,* 8167149. https://doi.org/10.1155/2021/8167149

Barkun, A. N., Love, J., Gould, M., Pluta, H., & Steinhart, H. (2013). Bile acid malabsorption in chronic diarrhea: Pathophysiology and treatment. *Canadian Journal of Gastroenterology,* 27(11), 653–659. https://doi.org/10.1155/2013/485631

Debi, U., Ravisankar, V., Prasad, K. K., Sinha, S. K., & Sharma, A. K. (2014). Abdominal tuberculosis of the gastrointestinal tract: Revisited. *World Journal of Gastroenterology,* 20(40), 14831–14840. https://doi.org/10.3748/wjg.v20.i40.14831

Di Buono, G., Romano, G., Amato, G., Barletta, G., Romano, G., Adelfio, N., Geraci, G., & Agrusa, A. (2024). Surgical management of complicated abdominal tuberculosis: The first systematic review—New treatments for an ancient disease and the state of the art. *Journal of Clinical Medicine,* 13(16), 4894. https://doi.org/10.3390/jcm13164894

Ju, J., Liu, J., Dong, W., Zhong, Y., & Chu, H. (2025). Uncommon ileal perforation due to intestinal tuberculosis: A case report and literature review. *Medicine,* 104*(*1), e41099. https://doi.org/10.1097/MD.0000000000041099

Kedia, S., Das, P., Madhusudhan, K. S., Dattagupta, S., Sharma, R., Sahni, P., Makharia, G., & Ahuja, V. (2019). Differentiating Crohn's disease from intestinal tuberculosis. *World Journal of Gastroenterology,* 25*(*4), 418–432. https://doi.org/10.3748/wjg.v25.i4.418

Lewinsohn, D. M., Leonard, M. K., LoBue, P. A., Cohn, D. L., Daley, C. L., Desmond, E., Keane, J., Lewinsohn, D. A., Loeffler, A. M., Mazurek, G. H., O'Brien, R. J., Pai, M., Richeldi, L., Salfinger, M., Shinnick, T. M., Sterling, T. R., Warshauer, D. M., & Woods, G. L. (2017). Official American Thoracic Society/Infectious Diseases Society of America/Centers for Disease Control and Prevention clinical practice guidelines: Diagnosis of tuberculosis in adults and children. *Clinical Infectious Diseases,* 64(2), 111–115. https://doi.org/10.1093/cid/ciw778

Malikowski, T., Mahmood, M., Smyrk, T., Raffals, L., & Nehra, V. (2018). Tuberculosis of the gastrointestinal tract and associated viscera. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases,* 12*,* 1–8. https://doi.org/10.1016/j.jctube.2018.04.003

Nahid, P., Dorman, S. E., Alipanah, N., Barry, P. M., Brozek, J. L., Cattamanchi, A., Chaisson, L. H., Chaisson, R. E., Daley, C. L., Grzemska, M., Higashi, J. M., Ho, C. S., Hopewell, P. C., Keshavjee, S. A., Lienhardt, C., Menzies, R., Merrifield, C., Narita, M., O'Brien, R., Peloquin, C. A., ... Vernon, A. (2016). Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of America clinical practice guidelines: Treatment of drug-susceptible tuberculosis. *Clinical Infectious Diseases,* 63(7), e147–e195. https://doi.org/10.1093/cid/ciw376

Rathi, P., & Gambhire, P. (2016). Abdominal tuberculosis. *Journal of the Association of Physicians of India,* 64(2), 38–47.

Ruan, Q. L., Yang, Q. L., Sun, F., Liu, W., Shen, Y. J., Wu, J., Jiang, N., Zhou, J. Y., Shao, L. Y., & Zhang, W. H. (2022). Recurrent pulmonary tuberculosis after treatment success: A population-based retrospective study in China. *Clinical Microbiology and Infection,* 28(5), 684–689. https://doi.org/10.1016/j.cmi.2021.09.022

Shah, H., Patel, J., Rai, S., & Sen, A. (2025). Advancing tuberculosis elimination in India: A qualitative review of current strategies and areas for improvement in tuberculosis preventive treatment. *IJID Regions,* 14*,* 1–5. https://doi.org/10.1016/j.ijregi.2024.100556

Shah, K. K., Pritt, B. S., & Alexander, M. P. (2017). Histopathologic review of granulomatous inflammation. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases,* 7*,* 1–12. https://doi.org/10.1016/j.jctube.2017.02.001

Sharma, V., Soni, H., Kumar-M, P., Dawra, S., Mishra, S., Mandavdhare, H. S., Singh, H., & Dutta, U. (2021). Diagnostic accuracy of the Xpert MTB/RIF assay for abdominal tuberculosis: A systematic review and meta-analysis. *Expert Review of Anti-Infective Therapy,* 19(2), 253–265. https://doi.org/10.1080/14787210.2020.1816169

Tadese, Z. B., Arage, F. G., Tsegaw, T. K., Alemu, E. A., Abate, T. G., & Taye, E. A. (2025). Forecasting tuberculosis in Ethiopia using deep learning: Progress toward sustainable development goal evidence from global burden of disease 1990–2021. *BMC Infectious Diseases,* 25*,* 870. https://doi.org/10.1186/s12879-025-11228-3

Tahiri, M., Goh, K. L., Abbas, Z., Epstein, D., Min-Hu, C., Mulder, C. J. J., Puri, A. S., Schultz, M., LeMair, A., & Melberg, J. (2023). Digestive tract tuberculosis guideline. *Journal of Clinical Gastroenterology,* 57(7), 643–650. https://doi.org/10.1097/MCG.0000000000001819

Tobin, E. H., & Khatri, A. M. (2025). *Abdominal tuberculosis*. Treasure Island: StatPearls Publishing.

Weledji, E. P., & Pokam, B. T. (2017). Abdominal tuberculosis: Is there a role for surgery? *World Journal of Gastrointestinal Surgery,* 9(8), 174–181. https://doi.org/10.4240/wjgs.v9.i8.174

WHO. (2024). *Global tuberculosis report 2024*. Geneva: WHO. Retrieved from https://www.who.int/teams/global-programme-on-tuberculosis-and-lung-health/tb-reports/global-tuberculosis-report-2024