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Abdominal Tuberculosis: Diagnostic Challenges and Outcomes in a Nigerian Tertiary Hospital

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ABSTRACT

Abdominal tuberculosis (TB) remains a diagnostic dilemma in many low-resource settings due to its nonspecific clinical presentation and its overlap with other intra-abdominal conditions. This study aimed to describe the clinical, diagnostic, and treatment profiles of patients with abdominal TB at a tertiary hospital in northern Nigeria. We conducted a 10-year retrospective review of patients with histopathologically confirmed abdominal TB at Usmanu Danfodiyo University Teaching Hospital, Sokoto. Data on demographics, clinical presentation, diagnostic methods, treatment modalities, and outcomes were analyzed using descriptive and inferential statistics. Sixty-four patients were included, with a median age of 35 years (IQR: 25–50); most were male (59.4%). Common symptoms included abdominal pain, weight loss, fever, and altered bowel habits. Only 22% of cases were diagnosed preoperatively, underscoring the limitations in non-invasive diagnostic tools. All patients received anti-TB chemotherapy, and 19% underwent surgery for complications. The majority (64%) had favorable outcomes, but a significant proportion (31%) were lost to follow-up. HIV co-infection was noted in 19% of patients and was associated with higher complication and mortality rates. Abdominal TB primarily affects young, economically active individuals and remains underdiagnosed preoperatively in resource-constrained environments. Improved access to advanced diagnostics such as laparoscopy and GeneXpert, combined with structured follow-up and early referral systems, is essential to improve outcomes.

Keywords: Abdominal tuberculosis, Nigeria, Histopathology, Diagnosis, Anti-TB therapy, HIV, Low-resource settings.

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1. Introduction

Tuberculosis (TB) remains one of the most important infectious diseases worldwide, ranking among the top ten causes of death and as the leading cause of death from a single infectious agent. In 2023, the World Health Organization (WHO) estimated 10.8 million new TB cases and 1.25 million deaths globally, with sub-Saharan Africa bearing a disproportionate share of the burden (WHO, 2023) (Tuberculosis (TB), n.d.). Nigeria continues to rank sixth among high-burden countries, contributing an estimated 590,000 new cases annually, of which approximately 140,000 are co-infected with HIV, and nearly 245,000 deaths occur (Olaleye et al., 2023).

The emergence of the COVID-19 pandemic further complicated TB control efforts. During 2020–2022, disruptions in healthcare delivery led to reduced TB notifications, diagnostic delays, and treatment interruptions worldwide (Gulumbe et al., 2025; Jeong & Min, 2023). This abdominal TB setback reversed years of progress, with TB regaining its position as the leading cause of death from an infectious agent once the initial wave of COVID-19 subsided. In Nigeria, the pandemic strained already fragile diagnostic and surveillance systems, exacerbating challenges for extrapulmonary TB (EPTB), which already suffers from under-recognition and misdiagnosis.

Globally, EPTB constitutes between 8% and 24% of all TB cases, with an average of 15%, though prevalence varies by region. In Africa, a meta-analysis reported a pooled EPTB prevalence of 26%, with the highest rate in Eastern Africa (32%) and the lowest in Western Africa (16%). Peritoneal TB makes up about 12% of EPTB cases (Hailu et al., 2024). Among EPTB forms, abdominal TB is one of the most diagnostically elusive. It can involve the gastrointestinal tract, peritoneum, lymph nodes, or solid organs, and often presents with nonspecific features such as abdominal pain, weight loss, fever, or changes in bowel habits (Al-Zanbagi & Shariff, 2021; Cho et al., 2018). These symptoms mimic conditions, such as malignancy, inflammatory bowel disease, or typhoid perforation, leading to misclassification and late diagnosis. Even in well-resourced settings, abdominal TB is frequently confirmed only after surgical intervention. In Nigeria, diagnosis is hampered by limited access to CT, laparoscopy, and molecular tools such as GeneXpert, with many cases confirmed only histopathological following laparotomy.

Existing Nigerian studies (Akinkuolie et al., 2008; Dauda et al., 2010; Ihekwaba, 1993; Ohanaka & Egbagbe, 2004) provide useful insights but are limited by small sample sizes, older data, or partial diagnostic criteria. In the post-COVID-19 era, there is an urgent need to update the epidemiology and clinical outcomes of abdominal TB, as delayed diagnosis and loss to follow-up may have worsened.

The objective of this study is to provide a 10-year retrospective review (2015–2024) of histopathological confirmed cases of abdominal TB at Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto. We aim to describe the demographic distribution, clinical features, diagnostic challenges, and outcomes, thereby generating contemporary evidence to inform earlier recognition, improved diagnostic pathways, and better patient follow-up in low-resource settings.

2. Research Hypothesis

- Primary Hypothesis (H1):

Patients with abdominal tuberculosis in low-resource settings are more likely to experience delayed diagnosis, higher complication rates, and increased loss to follow-up compared with patients diagnosed with pulmonary TB or abdominal TB in well-resourced settings.

- Null Hypothesis (H0):

There is no significant difference in diagnostic delay, complication rates, or loss to follow-up between patients with abdominal tuberculosis in low-resource settings and those with pulmonary TB or abdominal TB in well-resourced settings.

3. Patients and Methods

3. 1. Study Design and Setting

This was a retrospective descriptive study conducted over a 10-year period, from January 1, 2015, to December 31, 2024, at the Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, a major tertiary health facility serving the Northwestern region of Nigeria and neighboring Niger and the Benin Republic. The hospital provides specialized medical and surgical services, including gastroenterology and infectious disease care, making it a referral center for complicated tuberculosis (TB) cases, including extrapulmonary and abdominal TB.

3. 2. Study Population

The study population comprised all patients who underwent surgery for abdominal tuberculosis at UDUTH Sokoto during the study period. Inclusion criteria were:

- Patients of all ages and both sexes.
- Patients with histologically or microbiologically confirmed abdominal TB, regardless of whether they underwent surgery.
- Patients with sufficient clinical, laboratory, and operative data retrievable from hospital records.

Exclusion criteria included:

- Patients with incomplete or missing case records.
- Cases where the diagnosis of abdominal TB was uncertain or not confirmed.3

3. 3. Data collection

Data were obtained from patient case files, ward admission registers, operative records, histopathology reports, and radiology department archives. A structured data extraction form was used to collect relevant information, including:

- Demographic data: age, sex, occupation, and residence.
- Clinical presentation: presenting symptoms (e.g., abdominal pain, distension, weight loss, fever, night sweats), duration of symptoms, and nutritional status.
- Diagnostic work-up: results of laboratory investigations (e.g., full blood count, erythrocyte sedimentation rate, HIV status), imaging studies (abdominal ultrasound, plain X-rays, CT scans), tuberculin skin test results, GeneXpert MTB/RIF assay, and findings from diagnostic laparotomy.
- Diagnostic Tools and Equipment
  - ✓ Histopathology: All cases included in the study were confirmed by histopathological examination of intraoperative or biopsy specimens, processed in the UDUTH pathology laboratory using standard hematoxylin and eosin staining.
  - ✓ GeneXpert MTB/RIF: This molecular test was used in selected cases where tissue or ascitic fluid samples were sufficient, and the equipment was functional. For molecular confirmation, we used the GeneXpert MTB/RIF Assay (Cepheid) on GeneXpert Instrument Systems. The system employs single-use disposable cartridges containing all required reagents, including sample processing chemicals (e.g., NaOH and isopropanol), primers/probes targeting the rpoB gene region, and internal controls (Sample Processing Control and Probe-Check Control) to ensure valid amplification.
  - ✓ Radiologic Evaluation: Ultrasound and computed tomography (CT) scans were used. No specific machine was used, as reports came from different laboratories.

- ✓ Surgical Decision-Making Protocol: Surgery was performed in cases of acute or subacute intestinal obstruction; suspicion of intra-abdominal abscess or mass requiring drainage; inconclusive non-invasive diagnostics requiring laparotomy for definitive diagnosis (diagnostic dilemma); or when laparotomy specimens were prioritized for histological analysis.

- Site and type of abdominal TB: classification into luminal, peritoneal, nodal, and visceral types.
- Treatment modality: whether medical (anti-TB therapy alone) or combined medical and surgical.
- Surgical details: type of surgery performed, intraoperative findings, complications, and duration of hospital stay.
- Outcomes: postoperative morbidity and mortality, response to therapy, recurrence, and follow-up status.
- Missing data: Patients with incomplete essential data were excluded from the study. For variables with partial missing information (e.g., HIV status), available-case analysis was performed, and the limitation was noted in the discussion.

3. 4. Definitions

Table 1. Operational Definitions Used in the Study.

Term	Definition
Abdominal TB	Tuberculosis infection affecting any component of the abdominal cavity, including the gastrointestinal tract, peritoneum, mesenteric lymph nodes, or solid abdominal organs. Although radiological features may suggest abdominal TB, only **histopathological confirmation** was used as the definitive diagnostic criterion in this study.
Treatment success	Complete clinical resolution of symptoms and radiologic improvement following completion of a full course of anti-TB treatment.
Complications	Categorized as minor or major, including surgical site infection, intestinal obstruction, perforation, and need for reoperation.
Recurrence	Reappearance of clinical features with confirmation of abdominal TB after completion of treatment.
Lost to follow-up	Patients who discontinued therapy or became untraceable before completing the prescribed treatment.
Mortality	Death occurring during the index admission or follow-up, attributable to TB or its complications.

3. 5. Ethical Considerations

Approval for this study was obtained from the Ethical Review Committee of Usmanu Danfodiyo University Teaching Hospital, Sokoto. Due to the retrospective nature of the study, individual informed consent was waived, but confidentiality of patient data was strictly maintained. All collected data were anonymized and used solely for the purpose of research.
Intraoperative photos were de-identified and used strictly for educational purposes. Patient consent was waived due to retrospective design and data anonymization, as approved by the hospital's ethics committee.

3. 6. Data Analysis

The data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 25 (IBM Corp., Armonk, NY, USA). Descriptive statistics such as frequencies, means, medians, and standard deviations were used to summarize patient characteristics. Associations between categorical variables were assessed using Chi-square or Fisher's exact tests, as appropriate. A p-value < 0.05 was considered statistically significant

4. Results

4. 1. Demographic Characteristics

A total of 72 patients were retrieved; however, 8 cases were excluded due to incomplete data. Sixty-four patients diagnosed with and operated on for abdominal tuberculosis were analyzed over a 10-year period from 2015 to 2024. Patient ages ranged from the second to the eighth decade, with a peak incidence in the third and fourth decades. The median age was 35 years (IQR: 25–50 years). The highest burden was observed in the third decade (28.1%), followed by the fourth (18.8%) and second (15.6%) decades. Only 6.3% of patients were below 20 years, while 6.3% were aged 70 years and above (**Table 2**). There was a male predominance, with 38 males (59.4%) and 26 females (40.6%), yielding a male-to-female ratio of approximately 1.5:1.

Table 2. Age Distribution of Patients Operated for Abdominal Tuberculosis at UDUTH Sokoto.

Age Group (Decade)	Frequency (n)	Percentage (%)
0–9	0	0.0%
10–19	4	6.3%
20–29	10	15.6%
30–39	18	28.1%
40–49	12	18.8%
50–59	10	15.6%
60–69	6	9.4%
≥70	4	6.3%
Total	**64**	**100%**

4. 2. HIV Status

Among the cohort, 12 patients (18.8%) were HIV-positive, while 40 (62.5%) tested negative. The HIV status of 12 patients (18.8%) was unknown or not documented.

4. 3. Duration of Symptoms Before Presentation

The majority of patients presented more than 3 months after symptom onset. Specifically, 27 patients (42.2%) had symptoms lasting more than 3 months, 22 (34.4%) presented within 1–3 months, and 15 (23.4%) presented within 1 month. This indicates a generally delayed pattern of health-seeking among the patients.

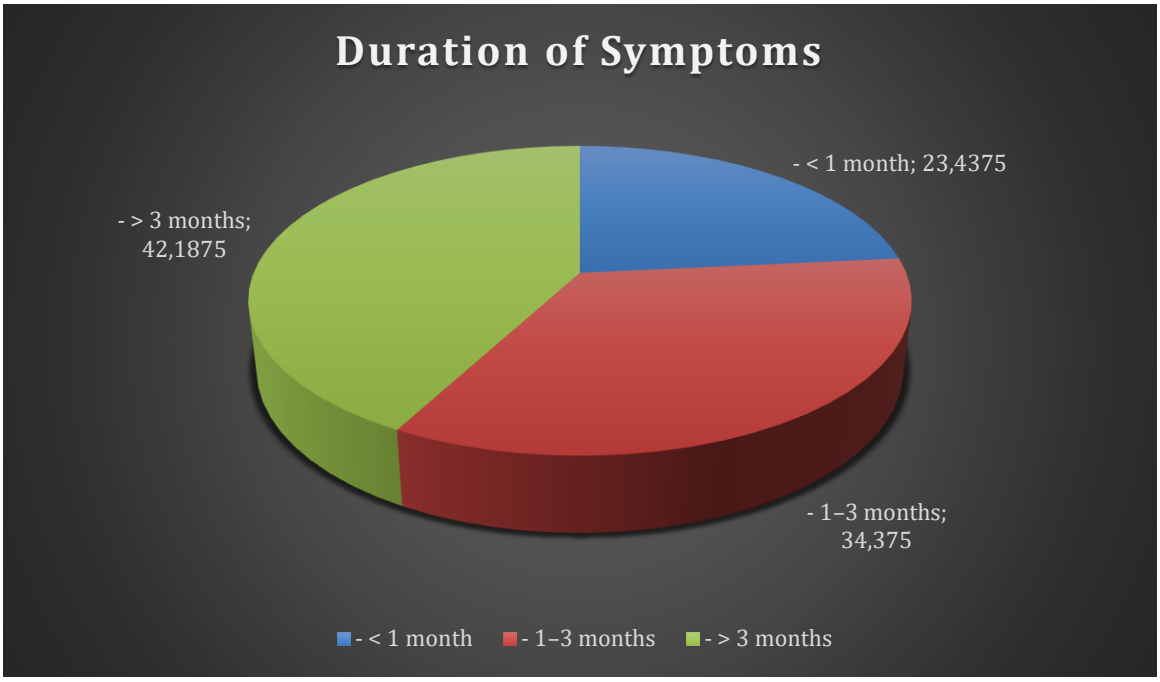

Figure 1. Duration of Symptoms before Presentation of Abdominal Tuberculosis at UDUTH Sokoto.

4. 4. Clinical Presentation

The most common symptom was weight loss, reported in 62 patients (96.9%), followed closely by abdominal pain in 60 (93.8%) and fever and altered bowel habits in 58 (90.6%) each. Abdominal distension was observed in 41 patients (64.1%), while night sweats were present in 30 (46.9%). These findings highlight the non-specific and systemic nature of abdominal tuberculosis.

- **Types of Abdominal Tuberculosis**

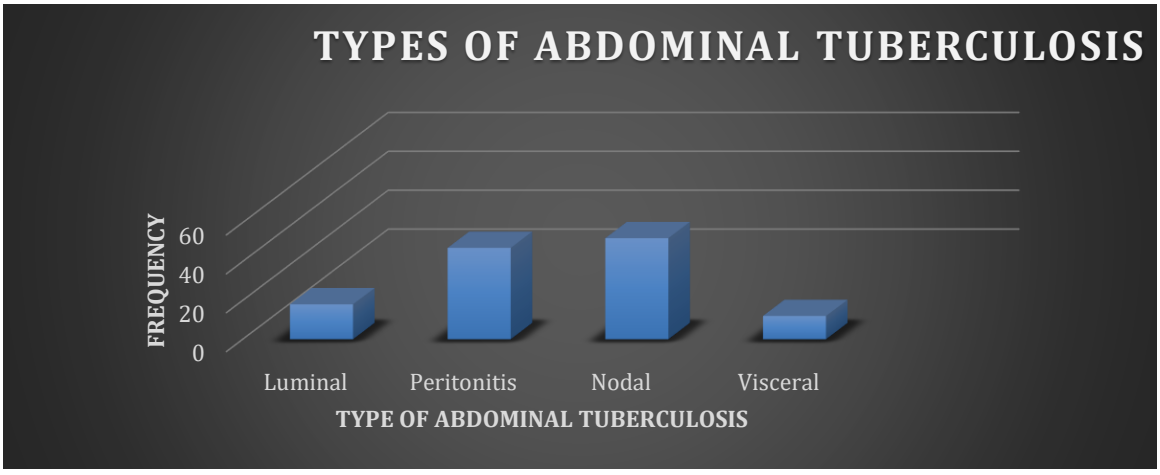

Figure 2. Frequency of Types of Abdominal Tuberculosis in Sokoto.

Abdominal TB was categorized into four types based on anatomical location and presentation:

- Nodal TB was the most frequent, found in 52 patients (81.3%).
- Peritoneal involvement occurred in 47 cases (73.4%).
- Luminal TB was seen in 18 patients (28.1%).
- Visceral TB was documented in 12 patients (18.8%).

It is important to note that multiple anatomical sites were often involved in the same patient, leading to overlaps in classification.

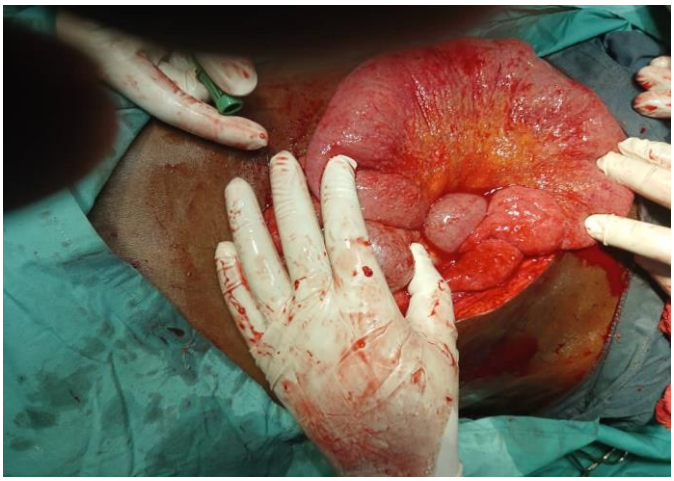

Figure 3. Intraoperative Pictures of a Young Man Operated on at UDUTH Sokoto Depicting Widespread Peritoneal Nodules in Peritoneal TB.

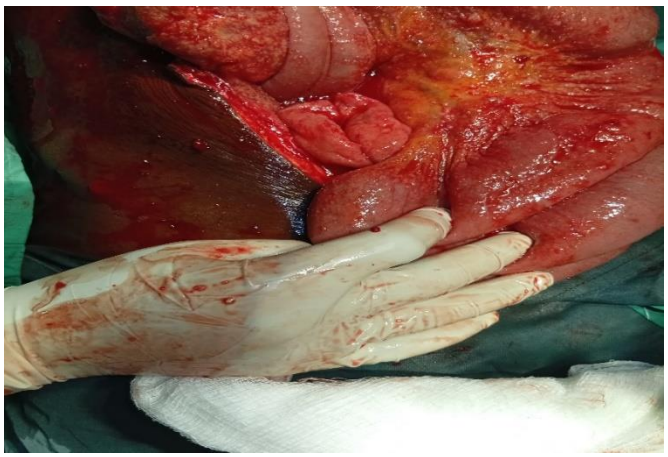

Figure 4. Intraoperative Pictures of a Young Man Operated on at UDUTH Sokoto Depicting Mesenteric Lymph Nodes Enlargement, Black Arrow, and Widespread Peritoneal Nodules, Blue Thick Arrow.

4. 5. Time of Diagnosis

Diagnosis was established postoperatively in the majority of cases (50 patients, 78.1%), indicating that definitive diagnosis often followed surgical intervention. Only 14 patients (21.9%) were diagnosed preoperatively, suggesting a limitation in non-invasive diagnostic capabilities.

4. 6. Diagnostic Modalities Utilized

All 64 patients had histopathological confirmation (100%). In addition:

- Laparotomy/laparoscopy findings contributed to the diagnosis in 28 cases (43.8%).
- GeneXpert MTB/RIF assay was utilized in 10 patients (15.6%).
- Imaging (Ultrasound/CT scan) was helpful in only 5 patients (7.8%).

These findings reflect the critical role of surgical and histopathological evaluation in confirming abdominal TB in this setting.

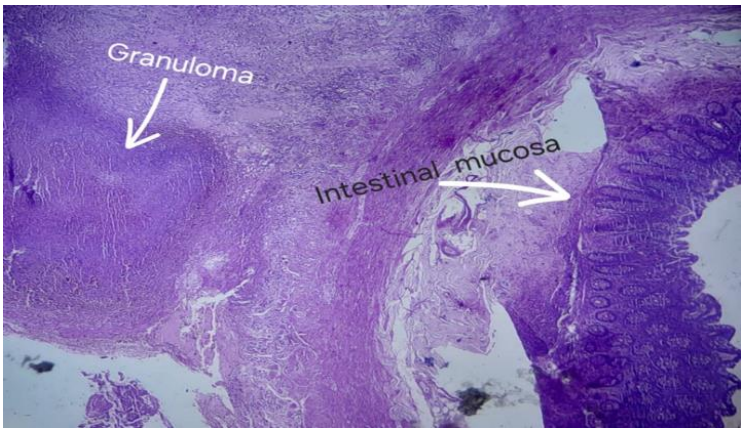

Figure 5. Section from the Intestine Shows Granulomata within the Serosa. Other Areas Show Intestinal Mucosa.H&Ex200.

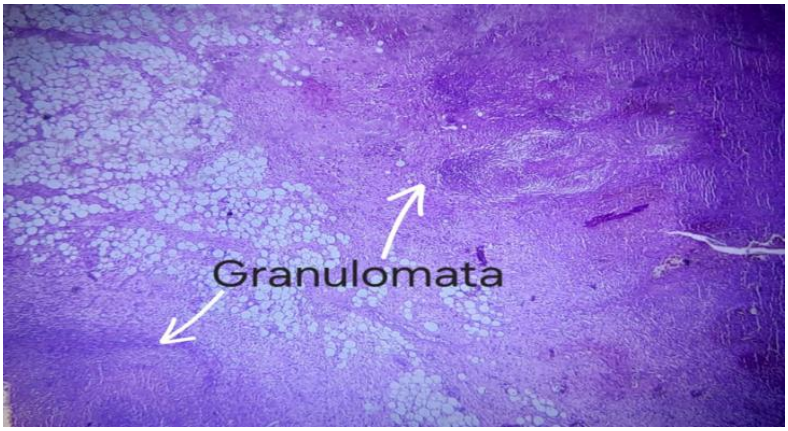

Figure 6. Section from the Intestinal Serosa Shows Granulomata with Caseous Necrosis. H&E X 200.

4. 7. Treatment Modalities

All patients received anti-TB chemotherapy as the mainstay of treatment. Additionally, 12 patients (18.8%) underwent surgical interventions beyond diagnostic laparotomy, in conjunction with medical therapy. These were typically indicated for complications such as obstruction or therapeutic decompression and abscess drainage.

4. 8. Surgical Interventions Performed

- Peritoneal biopsy alone was the most common procedure (32 cases, 50%).
- Drainage of intra-abdominal abscesses was performed in 20 cases (31.3%).
- Adhesiolysis was carried out in 8 patients (12.5%).

- Bowel resection and anastomosis were necessary in 4 cases (6.3%) due to obstructive complications.

4. 9. Postoperative Complications

A majority of patients had uneventful postoperative courses. However:

- Wound infections occurred in 15 patients (23.4%).
- Reoperation was required in 2 cases (3.1%).
- No cases of enterocutaneous fistula formation were recorded.
- 47 patients (73.4%) had no complications.

4. 10. Treatment Outcomes

Outcomes were favourable in most cases:

- Complete recovery was achieved in 41 patients (64.1%).
- Mortality occurred in 3 patients (4.7%), likely due to late presentation and/or comorbidities.
- No recurrences were recorded during the follow-up period.
- 20 patients (31.3%) were lost to follow-up, reflecting a significant challenge in continuity of care.

4. 11. Associations between Clinical Parameters and Outcome

HIV Status and Clinical Outcomes

- Among the 12 patients who were HIV-positive:
- ✓ Complication rate: 50% (6 patients) had post-treatment complications such as wound infection and prolonged hospital stay, compared to 20.8% among HIV-negative patients, p value 0.0868. Though clinically important, it was not statistically significant.
- ✓ Mortality rate: 2 out of the 3 total deaths (66.7%) occurred in HIV-positive patients, despite them comprising only 18.8% of the cohort, p=0.0041.

Type of Abdominal TB vs. Need for Surgery

- Luminal TB was more frequently associated with bowel obstruction and required bowel resection and adhesiolysis in 75% of such cases.
- Peritoneal and nodal TB were mostly managed with biopsy or abscess drainage.
- Luminal disease subtype showed a stronger association with surgical intervention compared to peritoneal or nodal involvement.

Time of Diagnosis vs. Treatment Outcome

- Preoperative diagnoses (21.9%) had a higher rate of complete recovery (85.7%) and fewer complications.
- Postoperative diagnoses (78.1%) were more likely to require emergency interventions and had a greater proportion of patients lost to follow-up.

Duration of Symptoms Before Presentation vs. Complications

- Patients presenting after >3 months of symptoms had a complication rate of 33%, compared to only 13% in those presenting within 1 month. Although the difference was clinically significant, it was not statistically significant, p= 0.792.

5. Discussion

Abdominal tuberculosis (TB) continues to pose a formidable challenge to diagnosis and treatment, especially in low-resource settings. This 10-year retrospective study at Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria, offers valuable insights into the demographic, clinical, and therapeutic profiles of patients with abdominal TB. The findings are examined in light of previous Nigerian studies and international experiences.

The study identified 64 confirmed abdominal TB (ATB) cases over a decade, which is consistent with the burden reported from similar tertiary institutions in Nigeria. For instance, Akinkuolie et al. (2008) documented 47 cases over 20 years at Wesley Guild Hospital, Ile-Ife, while Ohanaka and Egbagbe (2004) reported five cases in six years in Benin City (Akinkuolie et al., 2008; Ohanaka & Egbagbe, 2004).

Globally, abdominal TB comprises about 10–12% of extrapulmonary TB, with regional variation. Dhali et al. (2021) in India reported 317 cases over five years, noting a rising trend (Dhali et al., 2021). Calin et al. (2021) in Paris described 80 cases over 12 years, predominantly in African and Asian immigrants, reflecting the disease's persistence in high-risk groups even in low-incidence countries (Calin et al., 2021).

These parallels support the assertion that abdominal TB, though an important clinical entity, remains underdiagnosed, under-reported, and often misclassified due to its nonspecific presentation and overlap with other abdominal conditions.

Our findings demonstrate that abdominal tuberculosis predominantly affects young and middle-aged adults, with nearly two-thirds of cases (61%) occurring between the ages of 20 and 49 years. The peak incidence was in the third decade (28.1%), followed by the fourth (18.8%) and second (15.6%) decades. This pattern mirrors prior Nigerian and international studies. For example, Dauda et al. (2010) and Cho et al. (2018) documented clustering in early to middle adulthood, while Ihekwaba (1993), in his 30-year Ibadan series, reported that 78% of patients were under 40 years, with a peak incidence in the second decade (Cho et al., 2018; Dauda et al., 2010; Ihekwaba, 1993). Notably, while female predominance was described in Ibadan and Ile-Ife (Akinkuolie et al., 2008; Ihekwaba, 1993), our cohort showed a male predominance (59.4%). Such differences may reflect variations in socio-cultural roles, occupational exposures, and healthcare-seeking behaviour across populations and over time.

Abdominal tuberculosis is a great mimicker, with patients commonly presenting with weight loss (96.9%), abdominal pain (93.8%), fever (90.6%), and altered bowel habits (90.6%), in line with the non-specific but classical symptomatology of abdominal TB. These symptoms are consistent with findings from Benin (Ohanaka & Egbagbe, 2004), Zaria (Dauda et al., 2010), Ile-Ife (Akinkuolie et al., 2008), and Korea (Cho et al., 2018).

Diagnostic delay remains a major challenge. Only 21.9% of patients in our study were diagnosed preoperatively, reflecting the low yield of imaging and laboratory studies in resource-limited settings. Histopathological confirmation remains the gold standard. Similar challenges were described by Akinkuolie et al. (Akinkuolie et al., 2008), where only 29% of ascitic fluid analyses were diagnostic. Similarly, Abu-Zidan and Sheek-Hussein (2019) emphasized that delays in diagnosis often lead to increased morbidity due to misclassification as malignancy or inflammatory bowel disease (Abu-Zidan & Sheek-Hussein, 2019).

GeneXpert MTB/RIF was used in only 15.6% of cases in our setting. This under utilization is worrisome, as nucleic acid amplification tests (NAATs) like GeneXpert have demonstrated high specificity, albeit variable sensitivity, in extrapulmonary TB. Maulahela et al. (2022) reported GeneXpert sensitivities ranging from 81 to 95% in intestinal TB, outperforming conventional acid-fast bacilli staining and even histology in some cases (Maulahela et al., 2022). However, performance depends on sample type; for example, Abu Talib et al. (2019) found only 39% sensitivity for stool-based GeneXpert (Talib et al., 2019).

Imaging, particularly CT and laparoscopy, plays a pivotal role in diagnosis. Jha et al. (2023) and Abu-Zidan et al. (2019) stress the value of targeted imaging to guide biopsy (Abu-Zidan & Sheek-Hussein, 2019; Jha et al., 2025). Laparoscopy, in particular, has diagnostic yields exceeding 90% and provides visual confirmation of peritoneal involvement (Muroni et al., 2015; Safarpor et al., 2007). Unfortunately, the utilization of these diagnostic modalities is often limited in our setting.

In our cohort, only about one-fifth of cases were diagnosed preoperatively, with most confirmations made on postoperative histopathology. While this aligns with many resource-limited series as noted above, it contrasts with reports from centers that routinely employ CT enterography, colonoscopy with targeted biopsy, or diagnostic laparoscopy (Di Buono et al., 2024; Ep & Bt, 2017), where preoperative diagnosis rates are appreciably higher and operative confirmations less frequent. The divergence likely reflects diagnostic capacity and pathway design: where imaging access and endoscopic biopsy are standard, fewer patients proceed to laparotomy for diagnosis; where these are constrained (stock-outs, equipment downtime, or cost barriers), tissue diagnosis is deferred to surgery. Our data, therefore, underscore the real-world gap between recommended algorithms and what is feasible in tertiary hospitals serving large catchment areas with intermittent access to advanced diagnostics.

All patients in our cohort received anti-TB chemotherapy. As reported in global literature, the response was favorable, with 64.1% achieving full recovery and mortality remaining low (4.7%). These figures align with outcomes reported by Cho et al. (2018) (84.2% cure, 1.4% mortality) and Dhali et al. (2021) (~82% cure, 2.2% mortality) (Cho et al., 2018; Dhali et al., 2021; Ohanaka & Egbagbe, 2004). These studies reinforce that, when appropriately treated, abdominal TB has excellent outcomes.

Surgical intervention was necessary in 18.8% of our cases, primarily for complications such as obstruction or abscess. This is consistent with findings by Dhali et al. (2021) and Calin et al. (2021), who reported surgery in 15–20% of patients (Dhali et al., 2021; Calin et al., 2021). Most surgeries were diagnostic or for adhesiolysis and abscess drainage, emphasizing that operative management is adjunctive to medical therapy. This stands in contrast to surgical series from West and East Africa, where emergency obstruction predominates, and bowel resection is frequently necessary, and to some South African emergency laparotomy cohorts with high stoma rates (Chalya et al., 2013; Islam et al., 2014; Ohene-Yeboah, 2006). On the other end of the spectrum, large Indian cohorts report even lower operative rates, reflecting stronger preoperative case ascertainment and medical management (Keena et al., 2022). Together, these contrasts suggest that Sokoto sits mid-spectrum: not as resection-heavy as obstruction-dominant surgical cohorts, yet still constrained enough diagnostically that a meaningful minority require operative intervention. Strengthening preoperative laparoscopy and image-guided biopsy could further shift our case mix toward non-operative confirmation.

However, 31.3% of our patients were lost to follow-up, raising concerns about treatment completion, recurrence, and community-level surveillance. Sharma and Bhatia (2004) and Abu-Zidan et al. (2019) similarly note that poor follow-up is a major hurdle in extrapulmonary TB care, especially in resource-limited regions (Abu-Zidan & Sheek-Hussein, 2019; Sharma & Bhatia, 2004). Factors likely contributing to this include patient poverty, lack of structured follow-up infrastructure (e.g., call-back systems, DOTS-based community care), internal migration patterns, and the societal stigma associated with TB. Improving retention would require integrated follow-up systems, enhanced TB education, and possibly incentivized patient engagement models.

In contrast, a recent meta-analysis across Nigeria and other countries reported a pooled treatment success rate of ~75.5%, a mortality rate of ~6.8%, and a loss-to-follow-up rate of ~11.4% (Ukoaka et al., 2024). Similarly, in Meru County, Kenya, deaths and loss to follow-up were 5.1% and 6.3% (Ngari et al., 2025). A South African study reported favorable outcomes but still observed loss to follow-up in 23.9% of cases and a mortality rate of 4.4% (Vita et al., 2024).

These contrasts suggest that while effective medical therapy can keep mortality low, retention in care remains the major limiting factor in our setting. Our findings, therefore, emphasize the need for strengthening patient tracking through SMS or community health workers and building decentralized DOTS linkages into surgical TB care pathways to reduce defaulting. The interplay between tuberculosis (TB) and human immunodeficiency virus (HIV) remains a major public health concern, particularly in sub-Saharan Africa, where co-infection rates are among the highest globally. In our cohort, 18.8% of patients with abdominal TB were HIV-positive, underscoring the critical role of HIV as both a risk factor and a complicating element in the diagnosis and management of extrapulmonary TB.

In a comprehensive review, Borkar et al. highlighted that abdominal TB is significantly more prevalent among HIV-positive individuals, especially in resource-limited settings, where diagnostic infrastructure is poor (Borkar et al., 2016). Similarly, Heller

et al. observed that HIV co-infected patients frequently presented with diffuse peritoneal involvement, lymphadenopathy, and minimal pulmonary findings, making diagnosis particularly difficult without high clinical suspicion and access to advanced diagnostic modalities (Heller et al., 2010).

The Focused Assessment with Sonography for HIV/TB (FASH) protocol, as described by Heller et al. (2016) and later by Van Hoving and colleagues, has emerged as a practical point-of-care tool to detect features such as ascites, lymphadenopathy, and splenic lesions that support the diagnosis of abdominal TB in HIV-positive individuals. Unfortunately, such imaging algorithms are not yet standard in most Nigerian centers, including ours, due to a lack of trained personnel and ultrasound availability in emergency units (Heller et al., 2010; Van Hoving et al., 2020).

In our cohort, patients who were HIV-positive had higher rates of complications (41.7% vs. 30.0%) and mortality (16.7% vs. 2.5%) compared to their HIV-negative counterparts. However, the association between HIV status and complications was not statistically significant ($p = 0.686$). This aligns with previous studies (Calin et al., 2021; Cho et al., 2018; Sharma & Bhatia, 2004), suggesting that while HIV co-infection may contribute to delayed healing and increased susceptibility to sepsis, small sample sizes often limit statistical power.

HIV co-infection was present in ~19% of our patients. Although we observed higher rates of complications and mortality among HIV-positive individuals, these differences did not reach statistical significance in our sample, as noted above. This contrasts with several high-HIV-burden African surgical series that document markedly higher mortality concentrated among HIV-positive patients, often with advanced immunosuppression (Chalya et al., 2013; Islam et al., 2014). Two factors may explain this discrepancy: first, the sample size and power of our HIV-positive subgroup were small; second, differences in case mix and care pathways—many patients in those high-mortality cohorts underwent emergency laparotomy for perforation or obstruction, whereas a smaller fraction of our patients required major resections. The implication is that integrated TB/HIV services and stabilising patients before surgery may attenuate the excess risk otherwise attributed to HIV (Keena et al., 2022; Ohene-Yeboah, 2006).

Patients with luminal or visceral TB had a higher frequency of requiring surgery (e.g., resection or abscess drainage) compared to those with purely nodal or peritoneal TB. Although this difference was not statistically significant ($p = 0.428$), this observation is consistent with pathophysiological expectations and prior reports (Cho et al., 2018). Luminal TB often results in strictures, adhesions, or perforations, necessitating operative intervention, whereas nodal TB tends to follow a more indolent course.

This underscores the importance of early subtype differentiation, ideally using imaging and diagnostic laparoscopy where feasible, to anticipate surgical needs and guide early referral. Only 21.9% of patients in this study were diagnosed pre-operatively. A comparison between pre-operative and post-operative diagnosis groups revealed no significant difference in treatment outcomes ($p = 0.738$). Despite this, early diagnosis is desirable, as it reduces exposure to surgical risk and facilitates the timely initiation of chemotherapy.

The lack of a significant difference may reflect the universal use of anti-TB therapy post-confirmation, regardless of the route of diagnosis. However, as highlighted by Akinkuolie et al. (Akinkuolie et al., 2008), early diagnosis could reduce hospital stay, complication rates, and the need for surgery. Investments in access to GeneXpert, laparoscopy, and ultrasound-guided biopsy are thus justified.

Patients who presented after more than three months of symptoms experienced a higher proportion of complications (37.0%) than those presenting within 1 month (26.7%). Despite this gross numerical difference, the association was not statistically significant ($p = 0.401$). This may be due to insufficient statistical power, especially within subgroups, or misclassification bias in recording symptom onset. In contrast, late presentation was a statistically significant predictor of mortality in the Tanzanian cohort (Chalya et al., 2013).

Nonetheless, the clinical relevance of delayed presentation is undeniable. Prolonged symptom duration has been linked to advanced disease, adhesions, bowel obstruction, and peritoneal sepsis, all of which increase the likelihood of operative intervention and postoperative morbidity (Ihekwaba, 1993; Sharma & Bhatia, 2004). Community education and primary care awareness campaigns may help mitigate these delays.

6. Conclusion

Abdominal tuberculosis remains a significant diagnostic and therapeutic challenge in our setting, despite the declining overall TB burden. This 10-year retrospective study at Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, highlights the continuing relevance of abdominal TB as a cause of chronic abdominal symptoms, particularly in young adults. Delayed presentation, low preoperative diagnostic yield, and a reliance on postoperative histological confirmation underscore gaps in early detection capabilities. While most patients responded favorably to anti-TB therapy, the substantial proportion requiring surgical intervention and the high rate of loss to follow-up reflect persistent health system and societal barriers.

Importantly, our findings reinforce that abdominal TB often mimics malignancy or other chronic abdominal diseases and may go unrecognized in the absence of high clinical suspicion, especially in resource-constrained environments. Male predominance in our cohort contrasts with earlier regional studies and may reflect shifting epidemiological patterns. HIV co-infection, present in nearly one-fifth of our cases, adds further complexity to diagnosis and management.

Despite the low mortality, the observed delays, diagnostic limitations, and follow-up attrition represent critical challenges that must be addressed to improve outcomes.

These findings underscore the need for heightened clinical suspicion, improved diagnostic access (particularly to laparoscopy and GeneXpert), and strengthened patient tracking systems to enhance early diagnosis, reduce complications, and optimise treatment outcomes in abdominal tuberculosis, particularly within low-resource settings.

These findings provide respected insights into the complexities of diagnosing and managing abdominal tuberculosis and offer practical implications for improving early detection, diagnostic approaches, and patient follow-up in clinical practice.

7. Recommendations

Based on our study and a review of current evidence, the following measures are recommended to strengthen abdominal TB management in similar low-resource settings:

1. Early Diagnosis and Diagnostic Capacity Building
   - Expand access to GeneXpert MTB/RIF, especially in surgical and emergency units, to facilitate preoperative diagnosis.
   - Promote routine ultrasound with the FASH protocol in high TB/HIV burden settings.
   - Establish laparoscopy services to allow for minimally invasive diagnosis and therapeutic interventions.
2. Integrated TB-HIV Services
   - Ensure routine TB screening for all HIV-positive patients and vice versa.
   - Incorporate abdominal TB in clinical algorithms for persistent abdominal complaints in HIV patients.
3. Health Education and Community Awareness
   - Launch community-based education programmes to promote early presentation and reduce stigma surrounding TB and HIV.
   - Emphasise the importance of treatment adherence and long-term follow-up to prevent relapse and complications.
4. Surveillance and Follow-up Mechanisms

- Establish structured follow-up systems (SMS reminders, community health worker tracking) to reduce loss to follow-up.
- Integrate patient navigation tools to improve linkage to care post-discharge.

5. Multicentre Collaboration and Research

- Encourage multicentre studies to better characterise the national burden, improve generalisability, and guide policy.
- Advocate for government and donor investment in TB diagnostic infrastructure and research funding.

8. Limitations

- Single-centre study: The findings may not be fully generalisable to other parts of Nigeria or sub-Saharan Africa, where healthcare-seeking behaviour, diagnostic access, and patient demographics may differ.
- Retrospective design: Dependence on clinical records introduces risks of missing data and underreporting of certain variables, such as HIV status or long-term follow-up outcomes.
- Small sample size: Although comparable to other Nigerian studies, the relatively modest sample size limited the power of inferential analysis; most findings are descriptive rather than predictive.
- Loss to follow-up: A significant proportion of patients (31.3%) were lost to follow-up, limiting the ability to fully evaluate long-term treatment outcomes and recurrence rates.
- Limited diagnostics: Access to molecular diagnostics (GeneXpert) and advanced imaging was restricted during much of the study period, which may have delayed preoperative diagnosis and influenced management pathways.

COVID-19 impact: The study period included the COVID-19 pandemic years, during which disruptions in TB services likely contributed to delayed presentation, diagnostic backlogs, and possible underestimation of true incidence.

Data Availability

The research data are stored in completed proformas and on the personal computer of the corresponding author. The data is available on request.

Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

Abu-Zidan, F. M., & Sheek-Hussein, M. (2019). Diagnosis of abdominal tuberculosis: Lessons learned over 30 years: pectoral assay. World Journal of Emergency Surgery : WJES, 14, 33. https://doi.org/10.1186/s13017-019-0252-3.

Akinkuolie, A. A., Adisa, A. O., Agbakwuru, E. A., Egharevba, P. A., & Adesunkanmi, A. R. K. (2008). Abdominal tuberculosis in a Nigerian teaching hospital. African Journal of Medicine and Medical Sciences, 37(3), 225–229.

Al-Zanbagi, A. B., & Shariff, M. K. (2021). Gastrointestinal tuberculosis: A systematic review of epidemiology, presentation, diagnosis and treatment. Saudi Journal of Gastroenterology: Official Journal of the Saudi Gastroenterology Association, 27(5), 261–274. https://doi.org/10.4103/sjg.sjg_148_21.

Borkar, M. S., Joshi, A. S., Kashid, A. A., Gawale, C. G., Kakade, R. D., & Chimote, H. N. (2016). Clinical profile of 128 HIV positive cases with abdominal tuberculosis. International Journal of Scientific Reports, 2(1), 18. https://doi.org/10.18203/issn.2454-2156.IntJSciRep20160089.

Calin, R., Belkacem, A., Caraux-Paz, P., Wagner, M., Guillot, H., Veziris, N., Jaureguiberry, S., Caumes, E., Patey, O., & Pourcher, V. (2021). Abdominal Tuberculosis: Experience from Two Tertiary-Care Hospitals in the Paris Region. The American Journal of Tropical Medicine and Hygiene, 104(1), 223–228. https://doi.org/10.4269/ajtmh.20-0023.

Chalya, P. L., Mchembe, M. D., Mshana, S. E., & ... (2013). Tuberculous bowel obstruction at a university teaching hospital in Northwestern Tanzania: A surgical experience with 118 cases. In World Journal of …. Springer. https://doi.org/10.1186/1749-7922-8-12.

Cho, J.-K., Choi, Y. M., Lee, S. S., Park, H. K., Cha, R. R., Kim, W. S., Kim, J. J., Lee, J. M., Kim, H. J., Ha, C. Y., Kim, H. J., Kim, T. H., Jung, W. T., & Lee, O. J. (2018). Clinical features and outcomes of abdominal tuberculosis in southeastern Korea: 12 years of experience. BMC Infectious Diseases, 18(1), 699. https://doi.org/10.1186/s12879-018-3635-2.

Dauda, M. M., Ahmed, A., Okpapi, J. U., Ahmed, S. A., Randawa, A. J., & Mukhtar, H. M. (2010). Abdominal tuberculosis in surgical practice in northern Nigeria. Nigerian Journal of Medicine : Journal of the National Association of Resident Doctors of Nigeria, 19(4), 415–418. https://doi.org/10.4314/njm.v19i4.61966.

Dhali, A., Das, K., Dhali, G. K., Ghosh, R., Sarkar, A., & Misra, D. (2021). Abdominal Tuberculosis: Clinical Profile and Outcome. The International Journal of Mycobacteriology, 10(4), 414. https://doi.org/10.4103/ijmy.ijmy_195_21.

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.

Ep, W., & Bt, P. (2017). Abdominal tuberculosis: Is there a role for surgery? World Journal of Gastrointestinal Surgery, 9(8). https://doi.org/10.4240/wjgs.v9.i8.174.

Gulumbe, B. H., Abdulrahim, A., Ahmad, S. K., Lawan, K. A., & Danlami, M. B. (2025). WHO report signals tuberculosis resurgence: Addressing systemic failures and revamping control strategies. Decoding Infection and Transmission, 3, 100044. https://doi.org/10.1016/j.dcit.2025.100044.

Hailu, S., Hurst, C., Cyphers, G., Thottunkal, S., Harley, D., Viney, K., Irwin, A., Dean, J., & Nourse, C. (2024). Prevalence of extra-pulmonary tuberculosis in Africa: A systematic review and meta-analysis. Tropical Medicine & International Health: TM & IH, 29(4), 257–265. https://doi.org/10.1111/tmi.13970.

Heller, T., Goblirsch, S., Wallrauch, C., Lessells, R., & Brunetti, E. (2010). Abdominal tuberculosis: Sonographic diagnosis and treatment response in HIV-positive adults in rural South Africa. International Journal of Infectious Diseases, 14, e108–e112. https://doi.org/10.1016/j.ijid.2009.11.030.

Ihekwaba, F. N. (1993). Abdominal tuberculosis: A study of 881 cases. Journal of the Royal College of Surgeons of Edinburgh, 38(5), 293–295.

Islam, J., Clarke, D. L., & Thomson, S. R. (2014). Lessons from emergency laparotomy for abdominal tuberculosis in the HIV/AIDS era. South African Journal of Surgery, 52(1), 10–12.

Jeong, Y., & Min, J. (2023). Impact of COVID-19 Pandemic on Tuberculosis Preventive Services and Their Post-Pandemic Recovery Strategies: A Rapid Review of Literature. Journal of Korean Medical Science, 38(5), e43. https://doi.org/10.3346/jkms.2023.38.e43.

Jha, S., Verma, S., & Bhatnagar, S. (2025). Understanding Bowel Habits and Stool Form Among Indian Adolescents: A Descriptive Study. In Cureus. cureus.com. https://www.cureus.com/articles/341132-understanding-bowel-habits-and-stool-form-among-indian-adolescents-a-descriptive-study.pdf.

Keena, M., Chawla, G., Sonika, U., Abrol, N., Hiremath, S., & Meena, V. K. (2022). Indian tubercular belly: A prospective study of 140 patients of abdominal tuberculosis and their outcomes. Journal of Family Medicine and Primary Care, 11(6), 2423. https://doi.org/10.4103/jfmpc.jfmpc_1198_21.

Maulahela, H., Simadibrata, M., Nelwan, E. J., Rahadiani, N., Renesteen, E., Suwarti, S. W. T., & Anggraini, Y. W. (2022). Recent advances in the diagnosis of intestinal tuberculosis. BMC Gastroenterology, 22(1), 89. https://doi.org/10.1186/s12876-022-02171-7.

Muroni, M., Rouet, A., Brocheriou, I., & Houry, S. (2015). Abdominal Tuberculosis: Utility of Laparoscopy in the Correct Diagnosis. Journal of Gastrointestinal Surgery, 19(5), 981–983. https://doi.org/10.1007/s11605-015-2753-z.

Ngari, M. M., Mberia, J. K., Kanana, E., Sanga, D., Ngari, M. K., Nyagah, D. N., & Abdullahi, O. A. (2025). Mortality and loss to follow-up among Tuberculosis patients on treatment in Meru County, Kenya: A retrospective cohort study. PLOS Global Public Health, 5(3), e0003896. https://doi.org/10.1371/journal.pgph.0003896.

Ohanaka, C. E., & Egbagbe, E. E. (2004). ADULT ABDOMINAL TUBERCULOSIS IN BENIN CITY, NIGERIA. Sahel Medical Journal. https://journals.lww.com/shmj/abstract/2004/07040/adult_abdominal_tuberculosis_in_benin_city,.5.aspx.

Ohene-Yeboah, M. (2006). Case series of acute presentation of abdominal TB in Ghana. Tropical Doctor. https://doi.org/10.1258/004947506778604643.

Olaleye, S. A., Balogun, O. S., & Adusei-Mensah, F. (2023). Bibliometric structured review of tuberculosis in Nigeria. African Health Sciences, 23(2), 139–160. https://doi.org/10.4314/ahs.v23i2.16.

Safarpor, F., Aghajanzade, M., Kohsari, M. R. R., Hoda, S., Sarshad, A., & Safarpor, D. (2007). Role of Laparoscopy in the Diagnosis of Abdominal Tuberculosis. Saudi Journal of Gastroenterology, 13(3), 133. https://doi.org/10.4103/1319-3767.33465.

Sharma, M. P., & Bhatia, V. (2004). Abdominal tuberculosis. The Indian Journal of Medical Research, 120(4), 305–315.

Talib, A., Bhatty, S., Mehmood, K., Naim, H., Haider, I., Lal, H., Ali, G., & Nashit, M. (2019). GeneXpert in stool: Diagnostic yield in Intestinal Tuberculosis. Journal of Clinical Tuberculosis and Other Mycobacterial Diseases, 17, 100131. https://doi.org/10.1016/j.jctube.2019.100131.

Tuberculosis (TB). (n.d.). Retrieved May 13, 2025, from https://www.who.int/news-room/fact-sheets/detail/tuberculosis.

Ukoaka, B. M., Daniel, F. M., Wagwula, P. M., Ahmed, M. M., Udam, N. G., Okesanya, O. J., Babalola, A., Wali, T. A., Afolabi, S., Udoh, R. A., Peter, I. G., & Maaji, L. A. (2024). Prevalence, clinical characteristics, and treatment outcomes of childhood tuberculosis in Nigeria: A systematic review and meta-analysis. BMC Infectious Diseases, 24(1), 1447. https://doi.org/10.1186/s12879-024-10321-3.

Van Hoving, D. J., Kenge, A. P., Maartens, G., & Meintjes, G. (2020). Point-of-Care Ultrasound Predictors for the Diagnosis of Tuberculosis in HIV-Positive Patients Presenting to an Emergency Center. JAIDS Journal of Acquired Immune Deficiency Syndromes, 83(4), 415. https://doi.org/10.1097/QAI.0000000000002279.

Vita, D., Aznar, M. L., Martínez-Campreciós, J., Kansietoko, D. C. M. S., & Molina, I. (2024). Risk Factors Associated with Loss to Follow-Up during Tuberculosis Treatment in the Sanatorium Hospital of Luanda, Angola. Tropical Medicine and Infectious Disease, 9(6), 131. https://doi.org/10.3390/tropicalmed9060131.