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*Article*

# Comparative Analysis of Terminal Ileum Perforation Caused By Typhoid Fever And Intestinal Tuberculosis In The Tribal Population of Western Maharashtra In A Tertiary Care Hospital

*Article History:*

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*Abstract*: **Background:** Terminal ileum perforation is a serious complication commonly caused by typhoid fever and intestinal tuberculosis, both of which are prevalent in underserved populations. **Objective:** This study aims to compare the clinical presentation, diagnostic challenges, surgical management, and postoperative outcomes of terminal ileum perforation caused by these two conditions in the tribal population of Western Maharashtra. **Methods:** This retrospective observational study was conducted at tertiary care hospital from February 2023 to June 2025 A total of 56 patients diagnosed with terminal ileum perforation, 28 due to typhoid fever and 28 due to intestinal tuberculosis, were included. Data were collected from medical records, including demographic details, clinical presentation, laboratory findings, surgical interventions, postoperative outcomes, and follow-up results. **Results:** Patients in both groups presented with similar symptoms, including abdominal pain, fever, and vomiting. However, fever was more common in the typhoid fever group (100%), while abdominal pain was more prominent in the intestinal tuberculosis group (96.4%). Typhoid fever was confirmed through blood cultures, while intestinal tuberculosis was diagnosed based on clinical, histopathological, and PCR tests. The need for bowel resection was significantly higher in the intestinal tuberculosis group (60.7% vs. 0%), and the length of hospital stay was longer in the intestinal tuberculosis group (14.2 ± 4.6 days vs. 10.6 ± 3.2 days). Mortality was observed in 3.5% of the intestinal tuberculosis group, while no mortality occurred in the typhoid fever group. **Conclusions:** While both typhoid fever and intestinal tuberculosis can lead to terminal ileum perforations, the latter is associated with more severe outcomes, including the need for bowel resection, prolonged hospital stays, and higher mortality rates. Early diagnosis and timely surgical intervention are crucial in improving outcomes, particularly for intestinal tuberculosis.

***Keywords*** Intestinal tuberculosis, perforation, enteric fever.

## Introduction

Ileal perforation is a common problem seen in tropical countries. Ileal perforation is due to many causes, the most common being Enteric fever, Tuberculosis [1]. Trauma remains the most recurrent cause of high morbidity and mortality. WHO estimated in 2015 that 21 million cases and 222,000 deaths occurred per annum on a global scale, because of typhoid

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fever [2]. Non-traumatic intestinal perforation in the terminal ileum is common at tribal areas in Western Maharashtra, which is mainly due to typhoid fever and intestinal tuberculosis. Such disease conditions are endemic in India and particularly in marginalized groups, which have poor access to health care and sanitation [3]. Typhoid fever induced by Salmonella enterica serovar Typhi and intestinal tuberculosis induced by Mycobacterium tuberculosis cause high morbidity and mortality, once complications such as ileal perforation are encountered [4]. This is because the terminal ileum is highly lymphatic and hence the exposure of this part of the body to infections, which may lead to perforation and peritonitis in case it is not diagnosed and dealt with in time [5]. Typhoid fever is a potentially wicked multi-systemic disease-causing ileal perforation in 0.8 % to 18 % cases. Traditionally, the perforation of typhoid occurs during the third week of an untreated and therefore undiagnosed typhoid fever course [6]. It occurs in isolation in 85 % of the cases, and this is because it is caused by infection of Peyer's patches by Salmonella Typhi, which is a gram-negative, non-spore producing, facultative anaerobic bacillus. It leads to the acquisition of longitudinal ulcers on the anti-mesenteric side of the gut distal to 45cm of the ileocecal valve in most instances [7]. Typhoid fever is regarded as a common cause of enteric perforation, especially in developing countries such as India. The infection takes place in different intensities or severities; it may be mild gastroenteritis, life-threatening complications such as perforation, which mostly occurs in the terminal ileum [8]. Delayed diagnosis, ineffective medical treatment, or lack of awareness of the condition in time when it is already severe sepsis are some of the factors that tend to compound the perforation [9]. Tenderness, abdominal pain, and fever are traditional clinical manifestations or symptoms of the condition, which is likely to resemble other gastrointestinal conditions and diseases, which complicates the diagnosis even more. Intestinal tuberculosis, in turn, is a prominent health problem, especially in the environment of impoverished rural and tribal communities of poor nutrition and insufficient access to medical care [10]. Chronic inflammation, bowel thickening, and adhesion formation are also common to tubercular perforations, and this eventually leads to late presentation [11]. Due to its non-specific signs, which include fever, weight loss, abdominal pains, and intermittent diarrhea, that coincide with a variety of gastrointestinal diseases, the diagnosis of intestinal tuberculosis may be difficult [12]. Further, the clinical features of tuberculosis-related intestinal perforation are easily ignored until an acute abdomen becomes full-blown, and such difficulties arise that necessitate timely intervention [13]. Earlier, the treatment of ileal perforations that occur due to these conditions was largely based on operating. Commonly, early surgical interventions are needed, including exploratory laparotomy, to deal with the perforations, the end of which means avoiding sepsis and other complications [14]. Nevertheless, surgery works differently concerning the etiology. When perforations are multiple the perforations in case of typhoid fever, simple closure or ileostomy could be undertaken. By contrast, in intestinal tuberculosis a more vigorous procedure may be required such as resection of the involved bowel segment and possibly a stoma [15].

**Objective**

This study aims to compare the clinical presentation, diagnostic challenges, surgical management, and postoperative outcomes of terminal ileum perforation caused by these two conditions in the tribal population of Western Maharashtra.

# Methodology

This study is a retrospective, observational analysis study, conducted at tertiary care centre from Feb 2023- June 2025. A total of 56 patients were included in the study, who were diagnosed with terminal ileum perforation caused by either typhoid fever or intestinal tuberculosis during the study period. Out of

 

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these, 28 patients had perforations due to typhoid fever, and 28 patients had perforations resulting from intestinal tuberculosis.

**Inclusion Criteria**

- Patients diagnosed with terminal ileum perforation during the study period.
- Patients with confirmed typhoid fever or intestinal tuberculosis, as evidenced by clinical signs, laboratory tests, or histopathological examination.
- Patients aged between 18 and 70 years.
- Both male and female patients.

**Exclusion Criteria**

- Patients with perforations due to non-infectious causes such as trauma, malignancy, or diverticulitis.
- Patients with incomplete clinical data or who did not consent to participate.
- Patients with terminal ileum perforation from conditions other than typhoid fever or intestinal tuberculosis.

# Data Collection

Data were collected from the hospital's medical records, focusing on key parameters including demographic information, clinical presentation, laboratory findings, imaging results, and surgical interventions. The demographic data included age, sex, occupation, and socio-economic status, which helped contextualize the population under study. Clinical presentation data consisted of common symptoms such as fever, abdominal pain, tenderness, and vomiting, which are often seen in patients with perforations caused by these infections. Laboratory findings were essential in confirming the diagnoses, with blood cultures playing a central role in identifying *Salmonella enterica* in typhoid fever and *Mycobacterium tuberculosis* in intestinal tuberculosis. The diagnosis of typhoid fever was confirmed based on blood cultures and clinical evidence, whereas intestinal tuberculosis was diagnosed through a combination of clinical presentation, imaging findings, and histopathological examination of biopsies taken during surgery. Surgical interventions were recorded, focusing on the type of surgery performed, such as exploratory laparotomy, bowel resection, or the creation of an ileostomy, depending on the underlying disease and the extent of the perforation. Postoperative care was also documented, including the administration of antibiotics or antitubercular medications, and the length of hospital stay, as well as any complications encountered, such as wound infections, anastomotic leakage, or sepsis.

**Data analysis**

Data were analyzed using SPSS v 26.0. Continuous variables, such as age and length of hospital stay, were presented as mean ± standard deviation, while categorical variables, such as gender and the occurrence of complications, were expressed as frequencies and percentages. A p-value of less than 0.05 was considered statistically significant.

# Results

Data were collected from 56 patients, with 18 males (64.3%) and 10 females (35.7%) in the Typhoid Fever group, and 17 males (60.7%) and 11 females (39.3%) in the Intestinal Tuberculosis group. The average age in the Typhoid Fever group was 35.4 ± 12.6 years, while in the Intestinal Tuberculosis group, it was slightly higher at 38.2 ± 10.3 years. Socioeconomic status was predominantly low in both groups, with 22 patients (78.6%) in the Typhoid Fever group and 20 patients (71.4%) in the Intestinal Tuberculosis group coming from lower socioeconomic backgrounds. Malnutrition was present in 19 patients (67.9%) in the Typhoid Fever group and 18 patients (64.3%) in the Intestinal Tuberculosis group. In terms of clinical symptoms, fever was present in all patients (100%) in the Typhoid Fever group, while 23 patients (82.1%) in the Intestinal Tuberculosis group experienced fever. Abdominal pain was observed in 25 patients (89.2%) in the Typhoid Fever group and 27 patients (96.4%) in the Intestinal

 

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Tuberculosis group. Abdominal distension was noted in 22 patients (78.5%) in the Typhoid Fever group and 24 patients (85.7%) in the Intestinal Tuberculosis group.

**Table 1:** Demographic and Clinical Characteristics of Study Participants

| Characteristic | Typhoid Fever Group (n = 28) | Intestinal Tuberculosis Group (n = 28) |
|---|---|---|
| **Age (Mean ± SD)** | 35.4 ± 12.6 years | 38.2 ± 10.3 years |
| **Gender** | | |
| - Male | 18 (64.3%) | 17 (60.7%) |
| - Female | 10 (35.7%) | 11 (39.3%) |
| **Socioeconomic Status** | | |
| - Low | 22 (78.6%) | 20 (71.4%) |
| - Middle | 6 (21.4%) | 8 (28.6%) |
| **Malnutrition** | 19 (67.9%) | 18 (64.3%) |
| **Clinical Symptom** | | |
| **Abdominal Pain** | 25 (89.2%) | 27 (96.4%) |
| **Fever** | 28 (100%) | 23 (82.1%) |
| **Vomiting** | 21 (75.0%) | 20 (71.4%) |
| **Abdominal Distension** | 22 (78.5%) | 24 (85.7%) |
| **Weight Loss** | 12 (42.9%) | 7 (25.0%) |
| **Chronic Abdominal Discomfort** | 4 (14.3%) | 7 (25.0%) |

Blood culture for *Salmonella enterica* serovar Typhi was positive in 24 patients (85.7%) in the Typhoid Fever group, while no cases were positive for *Mycobacterium tuberculosis* in this group. In contrast, 20 patients (71.4%) in the Intestinal Tuberculosis group had positive PCR results for *Mycobacterium tuberculosis*. The mean C-reactive protein (CRP) level was significantly higher in the Intestinal Tuberculosis group (45.3 ± 16.1 mg/L) compared to the Typhoid Fever group (35.2 ± 12.4 mg/L), indicating a more intense inflammatory response in the tuberculosis group. Similarly, the mean white blood cell count (WBC) was higher in the Intestinal Tuberculosis group (16.2 ± 4.7 × $10^3$/µL) than in the Typhoid Fever group (14.1 ± 4.2 × $10^3$/µL). Imaging findings showed free air under the diaphragm in 22 patients (78.5%) in the Typhoid Fever group, and in 18 patients (64.3%) in the Intestinal Tuberculosis group. Localized peritonitis was observed in 24 patients (85.7%) in the Typhoid Fever group and 26 patients (92.8%) in the Intestinal Tuberculosis group.

**Table 2:** Laboratory Findings

| Laboratory Test | Typhoid Fever Group (n = 28) | Intestinal Tuberculosis Group (n = 28) |
|---|---|---|
| **Blood Culture (Positive for Typhi)** | 24 (85.7%) | 0 (0%) |
| **PCR (Positive for Mycobacterium)** | 0 (0%) | 20 (71.4%) |
| **CRP (Mean ± SD)** | 35.2 ± 12.4 mg/L | 45.3 ± 16.1 mg/L |
| **WBC Count (Mean ± SD)** | 14.1 ± 4.2 × $10^3$/µL | 16.2 ± 4.7 × $10^3$/µL |
| **Imaging Finding** | | |

 

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|---|---|---|
| **Free Air Under Diaphragm** | 22 (78.5%) | 18 (64.3%) |
| **Localized Peritonitis** | 24 (85.7%) | 26 (92.8%) |
| **Generalized Peritonitis** | 0 (0%) | 5 (17.9%) |
| **Thickened Bowel Wall** | 3 (10.7%) | 18 (64.3%) |

Surgical outcomes differed significantly between the groups. In the Typhoid Fever group, 14 patients (50%) underwent perforation closure, while another 14 patients (50%) required ileostomy formation. In the Intestinal Tuberculosis group, 17 patients (60.7%) underwent bowel resection due to the extensive involvement of the bowel. No bowel resections were performed in the Typhoid Fever group. Postoperative complications were observed in 3 patients (10.7%) in the Typhoid Fever group, including wound infections in 2 patients (7.1%). In the Intestinal Tuberculosis group, 4 patients (14.3%) experienced postoperative complications, including wound infections in 3 patients (10.7%) and an anastomotic leak in 1 patient (3.6%).

**Table 3:** Surgical Intervention and Postoperative Outcomes

| **Surgical Outcome** | **Typhoid Fever Group (n = 28)** | **Intestinal Tuberculosis Group (n = 28)** |
|---|---|---|
| **Type of Surgery** | | |
| - Perforation Closure | 14 (50%) | 0 (0%) |
| - Ileostomy Formation | 14 (50%) | 0 (0%) |
| - Bowel Resection | 0 (0%) | 17 (60.7%) |
| **Postoperative Complications** | 3 (10.7%) | 4 (14.3%) |
| - Wound Infection | 2 (7.1%) | 3 (10.7%) |
| - Anastomotic Leak | 0 (0%) | 1 (3.6%) |
| **Mortality** | 0 (0%) | 1 (3.5%) |

The mean length of hospital stay was significantly shorter for patients in the Typhoid Fever group (10.6 ± 3.2 days) compared to those in the Intestinal Tuberculosis group (14.2 ± 4.6 days). Complete recovery was observed in 26 patients (92.8%) in the Typhoid Fever group, while 24 patients (84.2%) in the Intestinal Tuberculosis group made a full recovery. Postoperative complications were observed in 3 patients (10.7%) in the Typhoid Fever group, compared to 4 patients (14.3%) in the Intestinal Tuberculosis group.

**Table 4:** Postoperative Recovery and Hospital Stay

| **Postoperative Outcome** | **Typhoid Fever Group (n = 28)** | **Intestinal Tuberculosis Group (n = 28)** |
|---|---|---|
| **Mean Length of Hospital Stay (Days)** | 10.6 ± 3.2 | 14.2 ± 4.6 |
| **Complete Recovery** | 26 (92.8%) | 24 (84.2%) |
| **Postoperative Complications** | 3 (10.7%) | 4 (14.3%) |

## Discussion

This study aimed to compare the clinical characteristics, diagnostic challenges, surgical interventions, and postoperative outcomes of terminal ileum perforations caused by typhoid fever and intestinal tuberculosis in the tribal population of Western Maharashtra. Our results indicate that there are quite a number of differences between the two conditions, highlighting the special difficulties of the

 

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respective conditions that make up the resource-limited state. This was in line with demographic factors of the study population as it represented the broad demographic profile of patients with intestinal perforations in rural and underserved setting. The age distribution was similar among both groups where males dominated both groups. This can be associated with reports made in the past which indicate that young adult males especially in the developing areas, experience more cases of typhoid fever and intestinal TB. Most of the patients in these two groups had low socio-economic status, which is one of the major factors that lead to delayed diagnosis and treatment in these illnesses. The known risk factor to intestinal perforations is malnutrition, which was present in both groups, as it exposes individuals to infections since it weakens the immune system. The typhoid fever and intestinal tuberculosis had almost similar initial symptoms as abdominal pain, fever, and vomiting. Nevertheless, the clinical manifestation varied in frequency and intensity of the two groups. Fever was more frequently present among the patients with typhoid fever (100%), whereas abdominal pain was more common in patients with intestinal tuberculosis (96.4). This difference can be explained by the more chronic character of intestinal tuberculosis that usually comes with the history of intermittent abdominal pain and weight loss [16]. Since typhoid fever is an acute infection, it is more likely to take an abrupt onset with severe fever and generalized signs and symptoms. The incidence of chronic abdominal collapse and loss of weight in the intestinal tuberculosis group (25 percent) can also be pointed out. The latter symptoms are commonly linked to a more latent form of disease onset that can further extend the time leading to disease diagnosis until the patient develops acute complications related to disease spread into the bowel mucosa, i.e., they are presenting with perforation. In most of the patients with typhoid fever, Salmonella enterica serovar Typhi was confirmed by cultures of blood injected into serum [17]. The diagnosis of intestinal tuberculosis, however, was rather difficult to analyse, as it was based on a set of data provided by clinical examination, imaging, and histopathological study. All the patients in the study had to be treated surgically, with most undergoing exploratory laparotomy [18]. Perforation closure or the formation of an ileostomy was most often done on the typhoid fever group, whereas bowel resection was more prevalent in those with intestinal tuberculosis due to the nature of the disease. This variation of surgical procedure illustrates the difference between the more localized location of individual typhoid perforations with the more generalized and diffuse location of intestinal tuberculosis. The overall outcomes in postoperative were found to be generally good in both groups, and the intestinal tuberculosis group had longer hospital stay and a higher complication rate [19]. In the latter group, the reason might be the longer duration of antibiotic or antitubercular treatment, which leads to prolonged hospital stay as well as an increased number of postoperative complications like wound infection and anastomotic leak [20]. These presentations align with findings encountered in the past, with intestinal tuberculosis being characterized by a longer recovery time mainly because of the continuous treatment procedures that are involved and the possibility of developing a sequela in the long term, bowel obstruction and malabsorption. It also has some limitations to the study. One of the limitations of this study is that it was a retrospective study, which depends on medical records that are already in place and thereby this study is prone to incomplete or erroneous data which makes it a possible cause of selection bias. Moreover, the research was performed in one tertiary care hospital; thus, the research results cannot be applied to other areas or healthcare environments, specifically those in rural or underserved neighbourhoods, where access to healthcare services can vary more.

## Conclusion

It is concluded that terminal ileum perforations caused by typhoid fever and intestinal tuberculosis present distinct clinical challenges

 

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in the tribal population of Western Maharashtra. Typhoid fever, despite its widespread prevalence, is associated with a more acute onset, often involving multiple perforations that can be managed with relatively straightforward surgical interventions. The majority of patients with typhoid-induced perforations experience favorable postoperative outcomes, with shorter hospital stays and fewer complications. On the other hand, intestinal tuberculosis, characterized by its chronic and insidious progression, tends to cause fewer but more localized perforations, often requiring more complex surgical procedures such as bowel resection.

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