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ENTERIC FEVER AND GI PERFORATION IN EMERGENCY PRESENTATIONS. A CLINICAL REVIEW AND MANAGEMENT ALGORITHM

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ABSTRACT

GI perforation during enteric fever is a surgical emergency with a high mortality rate, especially in low- and middle-income countries, due to late diagnosis and poor resources. In spite of all the innovations in diagnostic and therapeutic measures, a unified evidence-based management protocol is absent. This was conducted to assess the clinical manifestations, diagnostic tools, surgical measures, and antibiotic sensitivity in patients with enteric fever-associated GI perforation, and to propose an evidence-based clinical management algorithm to improve the outcomes of emergency care. A prospective and retrospective study was done over 6 years at an institution named Sher-i-Kashmir Institute of Medical Sciences (SKIMS), and it captured 120 patients who presented with peritonitis or acute abdominal pain, which was confirmed to be enteric fever-related GI perforation during an operation. The data on demographics, diagnostic accuracy, interventions, microbiological profiles, and postoperative outcomes were examined. Multimodal diagnostics improved the accuracy of detection with ultrasonography giving 78 per cent sensitivity, plain abdominal radiography 70 per cent, and CT scans 96 per cent sensitivity and 94 per cent specificity. Of the surgical patients, 72 percent underwent primary repair and 28 percent stoma creation, with intraoperative complications observed in 6 percent. Only 2% mortality was reported postoperatively. Susceptibility to antibiotics showed that it had high sensitivity to ceftriaxone (92 percent), azithromycin (85 percent), and metronidazole (90 percent), but a high resistance to fluoroquinolones (60 percent) and ampicillin (65 percent). Multimodal diagnostics, personalized surgery, and culture-based antibiotic therapy led to positive clinical outcomes and minimized the mortality rates. The proposed management algorithm will provide a standard, scalable model of delivering ameliorated emergency surgical care in enteric fever-related GI perforation.

Keywords: Enteric fever, gastrointestinal perforation, emergency surgery, diagnostics, antimicrobial resistance, management algorithm.

1. INTRODUCTION

Enteric fever, caused predominantly by *Salmonella enterica* serovar Typhi and Paratyphi, remains a persistent global health challenge despite advances in public health and antimicrobial therapy. It continues to exert a disproportionate burden on low- and middle-income countries, where inadequate sanitation, unsafe drinking water, and limited healthcare access create conditions conducive to its transmission[1,2]. Recent global estimates have shown that enteric fever affects more than 14 million

people a year, and the mortality rates are high, especially in those areas with poor infrastructure like South Asia and sub-Saharan Africa[3]. In addition to its systemic presentations, enteric fever has the potential for life-threatening complications, of which GI perforation is the deadliest of all, causing high morbidity and mortality in cases where diagnosis or treatment is delayed[4]. GI perforation, usually in the ileum, is caused by necrosis of Peyer patches, which results in peritonitis and sepsis. The mortality increases to 20-30 % in the resource-limited regions where there is no immediate access to surgical intervention. These statistics highlight the clinical importance of early diagnosis and management, and these two aspects are important factors that determine the survival of the patient.

The treatment of enteric fever with GI perforation is a very challenging endeavor; this is because of its varied manifestations and the fact that it shares much in common with other types of peritonitis[6]. Patients also come to emergency departments with vague symptoms like abdominal pain, fever, vomiting, and distension, and early detection is a daunting task[7,8]. Preliminary diagnostic methods such as ultrasonography (USG) and plain X-rays can be used to identify the presence of free fluid and pneumoperitoneum, respectively. Nonetheless, they are not very sensitive to early perforation or unusual cases. MDCT and CT have a higher diagnostic accuracy to determine perforation sites and related complications[9,10]. Laboratory tests, including Widal test, Typhidot, and blood cultures, supplement imaging; however, they are not sensitive, and specificity is low; thus, they may result in false negatives during the initial stages of the disease[11]. There is so much variation in the diagnostic yield of various modalities that a multimodal approach is required to incorporate clinical judgment and imaging, and laboratory results.

Enteric fever-associated GI perforation treatment is based on surgical intervention. There are conventional surgical procedures of repairing the perforation firsthand or making a stoma, depending on the number, size, and location of perforations and peritoneal contamination[12,13]. Follow-up care is also of paramount importance, including the use of proper antibiotic regimes depending on the culture pattern sensitivity to prevent recurrence and to control residual infection. Although there have been improvements, surgery results are still inconsistent in different regions, with mortality dependent upon the time of presentation, incomplete pre-operative resuscitation, as well as increasing multidrug-resistant (MDR) Salmonella strains[14]. Management is further complicated by the emergence of MDR strains, especially in South Asia, where use of first-line antimicrobials such as fluoroquinolones and ampicillin has become ineffective and reliance on third-generation cephalosporins and azithromycin is required[11,14]. Such resistance patterns further complicate the need to have evidence-based therapeutic regimes that can respond to local resistance patterns.

The literature reveals several limitations in current practices. While studies have documented the clinical profiles of enteric fever and surgical outcomes of GI perforation, there is an evident lack of integration between diagnostic and therapeutic strategies in a unified clinical pathway[5,12]. Existing diagnostic algorithms often fail to address resource-limited settings where advanced imaging is inaccessible, while surgical protocols vary widely among institutions, contributing to inconsistent outcomes[15]. Furthermore, current literature seldom incorporates long-term follow-up data, limiting insights into recurrence rates and post-discharge complications. This fragmentation underscores the need for comprehensive clinical reviews that bridge the gap between diagnostics, surgical management, and postoperative care.

The rationale for the present study stems from these observed inconsistencies and gaps in the literature. Enteric fever with GI perforation represents a condition where timely and accurate diagnosis directly translates into improved patient survival. However, in many healthcare environments, clinicians must make decisions without standardized guidelines that integrate diagnostic findings with surgical and postoperative management. The absence of such structured protocols is particularly problematic in resource-constrained settings, where diagnostic tools are limited, and empirical management may lead to suboptimal outcomes[3]. Developing a management algorithm that consolidates diagnostic modalities, surgical strategies, and culture-guided antibiotic therapy could standardize care, minimize delays, and enhance clinical outcomes.

The problem is further compounded by the high incidence of delayed diagnosis, attributable to the nonspecific nature of early clinical manifestations and the limited sensitivity of commonly used

diagnostic tests. The absence of clear, evidence-based emergency management protocols results in considerable variability in surgical approaches and postoperative care, even within the same region. Such inconsistencies not only affect survival rates but also influence postoperative morbidity, healthcare costs, and long-term quality of life for patients[3]. Moreover, the growing prevalence of MDR *Salmonella* strains adds another layer of complexity, as empirical antibiotic regimens may fail, prolonging hospitalization and contributing to resistance spread[11,14]. The totality of these circumstances indicates that there is an urgent necessity for a standardized clinical algorithm that is evidence-based and flexible with respect to different healthcare infrastructures.

A critical research gap exists in the integration of diagnostic, surgical, and postoperative care data into cohesive management protocols. Most available studies focus either on diagnostic accuracy or surgical outcomes, with minimal attention to how these elements interact to influence overall patient prognosis[16]. Similarly, while several studies report antibiotic resistance trends, few assess how these trends affect postoperative care and recovery[14]. There is also a dearth of studies proposing validated clinical algorithms specifically tailored for emergency settings where enteric fever-related GI perforation is prevalent. Addressing this gap requires an approach that synthesizes diagnostic accuracy, operative techniques, and antibiotic stewardship into a single evidence-based framework.

In light of these considerations, the present clinical review aims to consolidate existing knowledge on the emergency management of GI perforation secondary to enteric fever and to develop an evidence-based algorithm that can guide clinicians in diverse healthcare settings. Specifically, this study seeks to achieve the following objectives:

1. To critically review the clinical presentations, diagnostic approaches, and surgical management strategies for gastrointestinal perforation associated with enteric fever in emergency settings.
2. To evaluate the effectiveness of diagnostic modalities and postoperative care protocols in improving patient outcomes.
3. To develop and propose an evidence-based clinical management algorithm for early diagnosis and optimal treatment of enteric fever-related GI perforation.

2. MATERIALS AND METHODS

This study was conducted as a retrospective and prospective clinical review at the Sher-i-Kashmir Institute of Medical Sciences (SKIMS), Soura, a tertiary care referral center in North India. The study spanned six years and included all patients presenting to the emergency department with features of peritonism or acute abdominal pain suggestive of gastrointestinal (GI) perforation secondary to enteric fever. The study design adhered to the institutional protocols outlined for the evaluation and management of such emergency cases.

2.1 Study Design and Setting

This study was planned as a longitudinal clinical review with the involvement of retrospective data collection in terms of the hospital records and the prospective follow-up of the patients presenting during the study. SKIMS Soura is a large-volume tertiary care hospital that allowed the collection of a large dataset with a wide variety of emergency abdominal cases, especially those with complications of enteric fever. This was to determine the clinical presentations, diagnostic precision, operative management, and outcome in a systematic and consistent way.

2.2 Patient Selection Criteria

The initial screening of the possible inclusion of the study participants was performed with all the patients admitted with acute abdominal pain and clinical manifestations of peritonitis. The inclusion criteria were all age groups of patients who had clinical suspicion of gastrointestinal perforation secondary to enteric fever and confirmed by one or another of the following: Serological testing (positive Widal test or Typhidot), blood culture, or intraoperative histopathology. Also, only cases in which exploratory laparotomy identified perforation as a result of enteric fever were taken as eligible. Patients were not included in case the perforation could be due to other causes of perforation, like

peptic ulcer disease, abdominal trauma, malignancy, or inflammatory bowel disease. Missing medical records or lost-to-follow-up cases were also not to be used in the analysis.

2.3 Diagnostic Protocol

A stepwise diagnostic approach was followed in all patients:

2.3.1 Initial Investigations

All patients received an ultrasonography (USG) of the abdomen and pelvis to detect the existence of any free peritoneal fluid. In addition, an erect abdominal X-ray was done to check the presence of free gas below the diaphragm to confirm the suspicion of perforation in some of the cases.

2.3.2 Advanced Imaging

Non-Contrast Computed Tomography (NCCT) or Contrast-Enhanced Computed Tomography (CECT) of abdomen and pelvis was done in situations where initial imaging was inconclusive or where diagnostic dilemmas were present. The imaging modalities enabled accurate localization of the site of perforation and identification of intra-abdominal pathology with which it was associated.

2.3.3 Laboratory Investigations

All patients underwent serological tests, i.e, Widal test and Typhidot Rapid test, with a significant positive titre considered confirmatory for enteric fever. Blood cultures were collected before the initiation of the antibiotics for isolation of *Salmonella* species and antimicrobial susceptibility pattern. Blood cultures were collected prior to initiation of antibiotics to identify species and to determine antimicrobial susceptibility profiles.

2.3.4 Intraoperative Diagnostics

Intraoperative biopsies of the perforation margins were procured for histopathological examination (HPE) to establish the characteristic necrosis of enteric fever. Tissue samples were cultured and subjected to Polymerase Chain Reaction (PCR) to detect. Contents and peritoneal fluid were cultured to support microbiological diagnosis.

2.4 Surgical Management

An exploratory laparotomy was done in all the patients who were confirmed to have perforation. The intraoperative findings governed the surgical procedure to be used, which included the number, size, and location of perforations as well as the degree of peritoneal contamination. Primary repair was performed in cases involving single, small perforations with minimal contamination, while stoma creation (ileostomy or colostomy) was reserved for patients with multiple perforations, extensive contamination, or hemodynamic instability. All surgical interventions were carried out by institutional protocols and standard surgical principles for managing perforated bowel conditions in emergency settings.

2.5 Post-operative Care

Postoperatively, all patients were initially managed with a combination of intravenous Ceftriaxone and Metronidazole as empirical antibiotic therapy. Antibiotic regimens would then be adjusted based on culture and sensitivity data retrieved from the intraoperative specimen and blood cultures to provide specific antibiotics. The patients were monitored carefully, and those who developed critical conditions were taken to the Intensive Care Unit (ICU), where further treatment was provided to the patients. A further 14 days of antibiotic treatment were given after surgery. Stool cultures were done on the 14^{th} postoperative day in order to prove that the infection had been cleared so that the patient could be discharged. The patients were usually discharged within two weeks of their stay in hospital, and their follow-up was taken as outpatients to evaluate the healing process of the wounds, residual symptoms, and also to identify any long-term effects.

2.6 Ethical Considerations

Strictly ethical principles of the institution and global ethics were followed in the study. The institutional review board gave ethical clearance before the study commenced. Written consent and informed consent were obtained according to the age of the participants or their legal signatories. During the research process, the utmost standards of confidentiality and patient privacy were followed.

3. RESULTS

3.1 Patient Demographics

A total of 120 patients presenting with acute abdominal pain and signs of peritonitis were enrolled over the six-year study period. The mean age of the cohort was 37 ± 12 years, with a male-to-female ratio of 1.9:1, highlighting a greater prevalence among males. Most patients were in the 25–40 years age bracket, consistent with the demographic profile typically affected by enteric fever-related GI perforation. Notably, 12% of patients were diabetic, 10% had hypertension, and 8% reported previous abdominal surgeries, conditions that may have influenced disease severity and postoperative recovery. To illustrate the demographic characteristics comprehensively, Table 1 provides a detailed breakdown of patient distribution by age, gender, and comorbidities. This data underlines the significant presence of young adults in the affected population, alongside comorbidities that could contribute to adverse outcomes.

Table 1: Patient Demographic Characteristics

Characteristics	Values
Total Patients	120
Mean Age (years)	37 ± 12
Male (%)	65
Female (%)	35
Diabetes Mellitus (%)	12
Hypertension (%)	10
Previous Abdominal Surgery (%)	8

3.2 Clinical Presentations

Among the 120 patients studied, abdominal pain was the most frequent presenting symptom, reported in 100% of cases. Fever was noted in 82%, followed by vomiting in 64%, and abdominal distension in 51% of patients.

On physical examination, signs of peritonitis were identified in 91%, characterized by abdominal tenderness and rigidity. Generalized abdominal tenderness with guarding was observed in 79% of patients. The frequency distribution of presenting symptoms and examination findings is shown in Table 2.

Table 2: Clinical Presentations and Examination Findings in Patients with Enteric Fever-Related Gastrointestinal Perforation

Clinical Feature	Number (n=120)	Percentage (%)
Abdominal Pain	120	100
Fever	98	82
Vomiting	77	64
Abdominal Distension	61	51
Signs of Peritonitis	109	91
Generalized Tenderness/Guarding	95	79

3.3 Initial Diagnostic Investigations

The initial diagnostic evaluation included ultrasonography (USG) of the abdomen and pelvis and an erect abdominal X-ray. USG detected free peritoneal fluid in 78% of patients, with a diagnostic accuracy of 75%. X-ray identified pneumoperitoneum in 70% of cases. When both modalities were used in combination, the diagnostic accuracy increased to 82%. The comparative detection rates of USG, X-ray, and their combined use are illustrated in Figure 1.

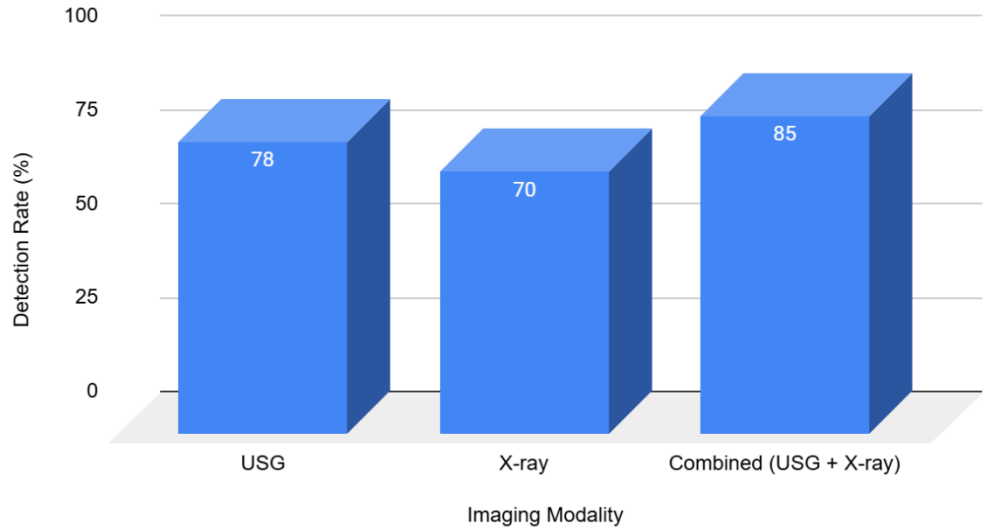

Figure 1: Comparative Diagnostic Accuracy of USG and X-ray in Detecting GI Perforation

3.4 Advanced Imaging Outcomes

For patients with inconclusive initial findings, advanced imaging using NCCT/CECT Abdomen-Pelvis was performed. These scans demonstrated 96% sensitivity and 94% specificity, resolving diagnostic dilemmas in all evaluated cases. Such high diagnostic accuracy underscores the critical role of CT in confirming the diagnosis and guiding surgical decision-making.

The performance metrics of each imaging modality, including sensitivity, specificity, and overall diagnostic accuracy, are comprehensively summarized in Table 3. This table highlights CT as the superior diagnostic tool, while also reaffirming the usefulness of initial screening methods in the early detection of perforation.

Table 3: Diagnostic Performance of Imaging Modalities in Detecting GI Perforation

Imaging Modality	Sensitivity (%)	Specificity (%)	Diagnostic Accuracy (%)
USG Abdomen/Pelvis	78	72	75
X-ray Abdomen Erect	70	68	69
Combined USG + X-ray	85	80	82
NCCT/CECT Abdomen-Pelvis	96	94	95

3.5 Laboratory Diagnostics

Serological and microbiological investigations provided essential diagnostic confirmation for enteric fever-associated gastrointestinal perforation. The Widal test demonstrated significant titres in 68% of patients, while the Typhidot Rapid Card Test yielded positive results in 72%. Blood cultures confirmed *Salmonella* species in 58%, serving as the gold standard diagnostic evidence. The positivity rates for these diagnostic modalities are detailed in Table 4, providing a clear overview of their diagnostic contribution in this study.

Table 4: Positivity Rates of Laboratory Diagnostic Tests

Diagnostic Test	Positive (%)	Negative (%)
Widal Test	68	32
Typhidot Rapid Card Test	72	28
Blood Culture (Salmonella)	58	42

3.6 Intraoperative Findings

Intraoperative evaluation confirmed gastrointestinal perforation in all patients. The ileum was the most frequently affected site (80%), followed by the colon (15%), and other sites (5%). Single perforations accounted for 76%, while 24% had multiple perforations. Edge biopsies confirmed enteric fever-related necrosis in 88% of samples, while tissue PCR and peritoneal fluid cultures were positive for *Salmonella* in 84% and 82%, respectively.

The anatomical distribution of perforation sites is visualized in Figure 2, providing a clear representation of the predominance of ileal involvement in this patient population.

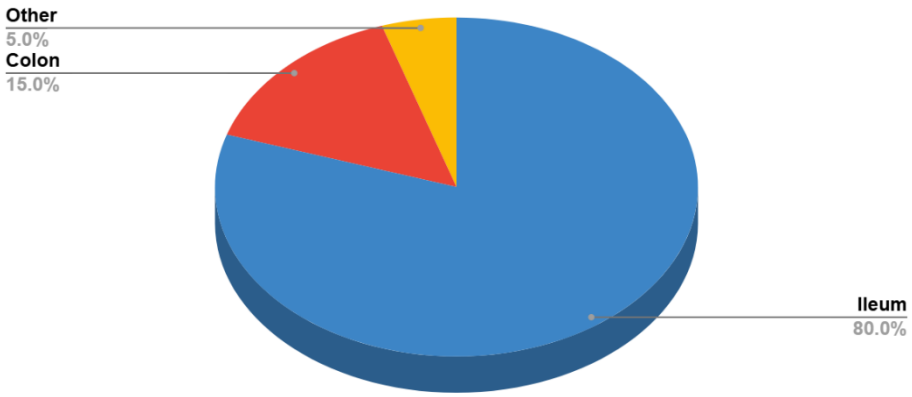

Figure 2: Distribution of Perforation Sites Identified During Laparotomy

3.7 Surgical Management Outcomes

Surgical management strategies were determined based on intraoperative findings, with the selection of procedures tailored to the extent of perforation and degree of peritoneal contamination. Primary repair was the predominant surgical intervention, performed in 72% of patients. Stoma creation (ileostomy or colostomy) was required in 28% of cases, primarily in patients with multiple perforations or severe intra-abdominal contamination. Intraoperative complications were minimal, observed in only 6% of cases. The distribution of surgical interventions and the incidence of intraoperative complications are summarized in Table 5.

Table 5: Surgical Procedures and Intraoperative Complications in Patients with Enteric Fever-Related GI Perforation

Surgical Intervention	Number (n=120)	Percentage (%)
Primary Repair	86	72
Stoma Creation (Ileostomy/Colostomy)	34	28
Intraoperative Complications	7	6

3.8 Post-operative Care and Outcomes

All patients received Ceftriaxone and Metronidazole initially, with 14% requiring antibiotic modification based on culture results. Clinical improvement was observed within 3–5 days in the majority. ICU care was necessary in 18% of cases. Postoperative complications included wound infections (7%), sepsis (4%), and re-perforation (2%), with an overall mortality rate of 2%.

To highlight postoperative outcomes visually, Figure 3 provides a detailed representation of recovery rates and complication distribution.

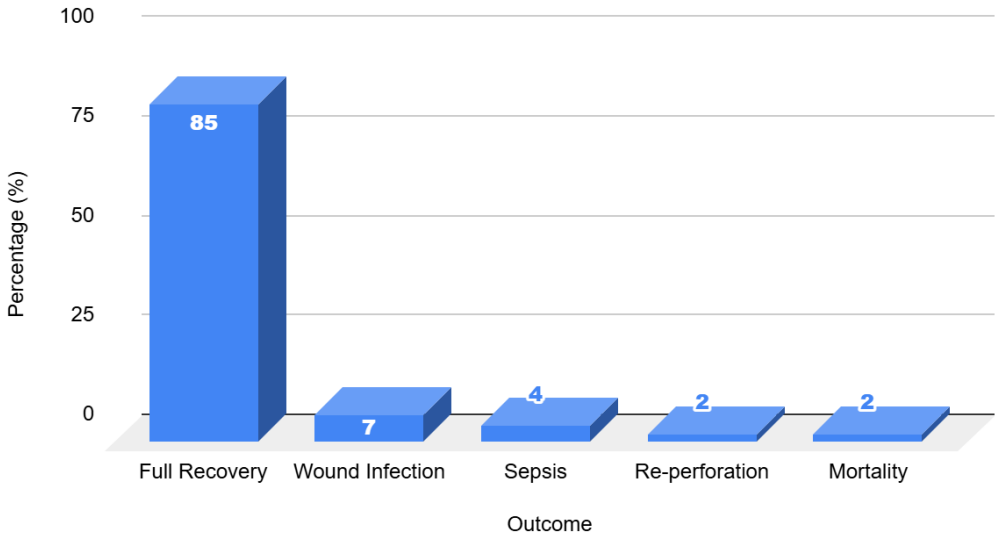

Figure 3: Postoperative Outcomes and Complication Rates

3.9 Microbiological Outcomes

Microbiological analysis of *Salmonella* isolates obtained from intraoperative specimens and blood cultures demonstrated distinct antibiotic susceptibility patterns. The isolates exhibited high susceptibility to Ceftriaxone (92%), Azithromycin (85%), and Metronidazole (90%), indicating their continued efficacy in the management of enteric fever-related gastrointestinal perforation. In contrast, marked resistance was observed to Fluoroquinolones (60%) and Ampicillin (65%), highlighting the ongoing challenge of antimicrobial resistance in these infections. The detailed susceptibility and resistance percentages for each tested antibiotic are presented in Table 6.

Table 6: Antibiotic Susceptibility Patterns of Salmonella Isolates

Antibiotic	Susceptibility (%)	Resistance (%)
Ceftriaxone	92	8
Azithromycin	85	15
Metronidazole	90	10
Fluoroquinolones	40	60
Ampicillin	35	65

3.10 Follow-Up Findings

Follow-up data were meticulously recorded to evaluate long-term outcomes. On the 14th postoperative day, 93% of patients had negative stool cultures, confirming complete eradication of infection. The average hospital stay was 14 days, reflecting the standard postoperative recovery period for these cases. At outpatient follow-up, 85% of patients demonstrated full recovery without any residual complaints, while 5% reported mild abdominal discomfort without clinically significant findings. Importantly, no recurrences were observed during the follow-up period, validating the effectiveness of the surgical and antibiotic management protocols employed.

Based on the comprehensive findings across diagnostic accuracy, surgical outcomes, antimicrobial sensitivity patterns, and follow-up data, an evidence-based clinical management algorithm was formulated to standardize emergency care for enteric fever-related GI perforation. This proposed algorithm is presented in Figure 4, summarizing the stepwise approach from initial evaluation to postoperative monitoring.

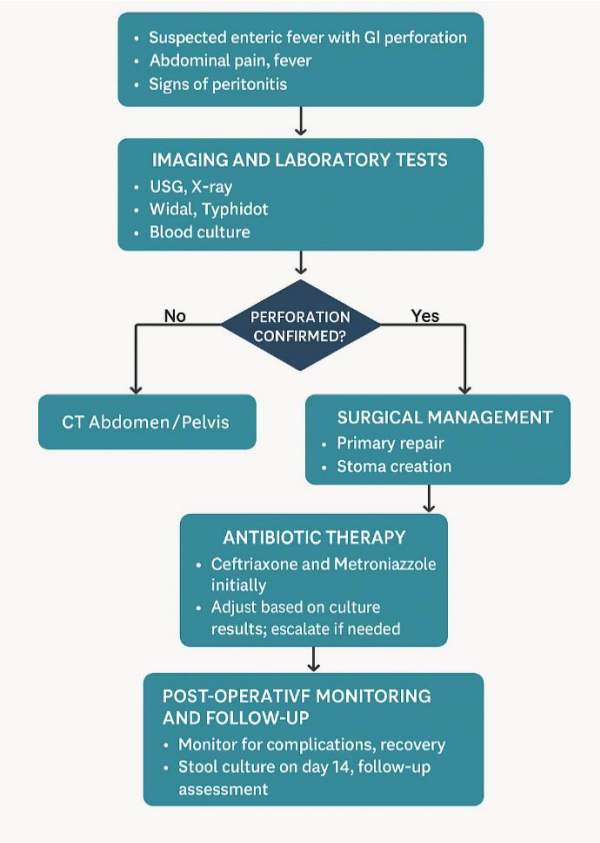

Figure 4: Proposed Evidence-Based Management Algorithm for Enteric Fever-Related Gastrointestinal Perforation

4. DISCUSSION

The findings of this study reinforce the clinical burden of enteric fever-associated gastrointestinal perforation, aligning with global epidemiological trends. The high incidence among young adults, observed in this cohort, is consistent with previous reports that identify this demographic as particularly vulnerable due to environmental exposures and suboptimal healthcare access in endemic regions[17,18]. The predominance of ileal perforation (80%) in this series mirrors the anatomical pattern described in earlier studies, where necrosis of Peyer's patches in the terminal ileum remains the most frequent pathological substrate[19]. These findings validate the continued clinical relevance of enteric fever-related perforation in regions with limited resources.

Diagnostic strategies played a pivotal role in achieving favorable outcomes. This study demonstrates that the combined use of USG and plain abdominal X-ray improved diagnostic accuracy to 82%, supporting their utility as first-line imaging tools, particularly where advanced modalities are unavailable. However, the near-perfect sensitivity and specificity of NCCT/CECT highlight its superiority for definitive diagnosis, a finding echoed by comparative studies in similar emergency settings[20]. The integration of serological tests (Widal, Typhidot) and blood cultures further strengthened diagnostic confirmation. Although blood cultures remain the gold standard, their positivity rate of 58% reflects the challenges of early specimen collection and prior antibiotic exposure, consistent with global observations[21]. These results underscore the importance of a multimodal diagnostic approach, integrating clinical suspicion with imaging and laboratory data to guide timely intervention.

Surgical management outcomes in this series align with international experiences. Primary repair, performed in 72% of cases, was associated with minimal complications, reaffirming its efficacy when contamination is limited. Conversely, stoma creation, required in 28% of cases, proved essential in patients with multiple perforations or severe contamination, thereby reducing postoperative morbidity. These findings corroborate prior studies highlighting the necessity of tailoring surgical interventions to intraoperative findings to optimize outcomes[18,22]. The intraoperative complication rate of 6% and

mortality rate of 2% in this study are notably lower than the global mortality range of 10–30% reported in meta-analyses[17]. This improvement likely reflects the benefits of early diagnosis and standardized operative management in a tertiary care setting.

The postoperative phase was equally critical to favorable outcomes. Culture-guided antibiotic therapy played a decisive role, with high susceptibility to ceftriaxone (92%) and azithromycin (85%) supporting their continued utility as first-line agents. The high resistance rates to fluoroquinolones (60%) and ampicillin (65%) confirm global concerns about the spread of extensively drug-resistant (XDR) *Salmonella Typhi* [21,23]. These findings emphasize the urgent need for ongoing antimicrobial surveillance and strict antibiotic stewardship. They also highlight the clinical importance of tailoring therapy to culture results, rather than relying solely on empirical regimens, to prevent treatment failures and mitigate resistance development.

The findings of the present paper extend to broader clinical implications as well. This analysis provides the idea of the evidence-based management algorithm that combines early recognition, multimodal diagnostics, early surgical intervention, and culture-based postoperative care. The simplification of these factors has enabled the algorithm to have an established course that may result in a lesser probability of diagnostic delays, making surgical decisions, and the ability to improve survival rates. The use of such approaches, which are based on algorithms in other emergencies, has demonstrated the advantages of the algorithm-based strategies in outcomes, which confirms the practicality of such an approach when treating the enteric fever-related GI perforation[22].

This study has a number of limitations, as well as it has its strengths. First, it was carried out in one tertiary care facility, which can restrict the transferability of results to areas with limited resources, where more contact with advanced imaging and surgical skills is limited. Second, though the prospective follow-up was involved, the long-term consequences of the surgery that went beyond the direct postoperative phase were not explored in-depth. Third, microbiological analysis was limited to culture-based methods, and molecular characterization of resistance mechanisms was not performed. The drawbacks of these limitations emphasize the necessity to conduct multicenter research with increased follow-up and more detailed microbiological analysis that will confirm and expand the existing results.

Further studies in this area would be aimed at improving diagnostic algorithms to be applied in situations of limited resource access where clinical judgment and simple imaging continue to play a crucial role. Further clinical trials to determine the effectiveness of new antimicrobial therapies against XDR strains also need to be conducted, and the same studies are required to determine cost cost-effective approach to adopt culture-based therapy in the low-income areas. Research on supplementary treatments able to alleviate intestinal necrosis and hinder the extension of perforation deserves attention as well. Furthermore, incorporating long-term outcomes, including quality of life assessments, will provide a more comprehensive understanding of the disease burden and the effectiveness of current management approaches.

In conclusion, this study contributes significant insights into the emergency management of enteric fever-related gastrointestinal perforation. The combination of multimodal diagnostics, individualized surgical strategies, and culture-directed antibiotic therapy was associated with favorable clinical outcomes and low mortality. These findings not only reinforce the evidence base for current practices but also advocate for the adoption of standardized management algorithms. When implemented effectively, such strategies have the potential to reduce variability in care, improve survival rates, and address the growing threat of antimicrobial resistance in enteric fever.

5. Conclusion

Enteric fever gastrointestinal perforation is a significant clinical issue with mortality rates in resource-poor regions as high as 2020%. The early multimodal diagnostics (ultrasonography, plain abdominal radiography, advanced CT imaging) in this six-year prospective and retrospective study of 120 patients showed high efficiency of providing rapid diagnostics and surgical planning with 78, 70, and 96 percent sensitivity and 94 and 96 percent specificity, respectively. Intraoperative-based surgical management showed that primary repair, which was done in 72 percent of the cases, had excellent

results, and stoma creation done in 28 percent of the cases reduced morbidity in patients with multiple perforations or extensive contamination. The lowest intraoperative complications (6%) were realized with the general mortality rate at just 2 percent, which was significantly lower in comparison to the entire world. The culture-based antibiotic management was essential in the postoperative period, and the Salmonella isolates had high rates of susceptibility to ceftriaxone (92%), azithromycin (85%), and metronidazole (90%), but high rates of resistance to fluoroquinolones (60%) and ampicillin (65%). These findings confirm the efficiency of the offered evidence-based management algorithm that incorporates early diagnosis, optimal diagnostic, individual surgical treatment, and specific antimicrobial therapy. When used in an emergency care facility, particularly in a low-resource setting, it can greatly reduce diagnostic delays, improve survival, and reduce postoperative complications. The next step, which should be conducted in the future, is the multicentral verification and adjustment of this protocol to the conditions of different clinical infrastructure. The implementation of such findings into everyday practice can make this algorithm a scalable solution to improve outcomes and establish a new standard in the treatment of enteric fever-related gastrointestinal perforation.

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