

FREQUENCY OF 30-DAY MORBIDITY AND MORTALITY AFTER EXPLORATORY LAPAROTOMY FOR TYPHOID ILEAL PERFORATION AT A TERTIARY-CARE HOSPITAL IN KARACHI

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ABSTRACT

Objective: To determine the frequency of 30-day morbidity and mortality among patients undergoing exploratory laparotomy for typhoid ileal perforation.

Study Design: Descriptive cross-sectional study.

Setting: Department of Surgery, Jinnah Postgraduate Medical Centre, Karachi.

Period: Four months from 5th March 2025 to 15th June 2025.

Material & Methods: 157 patients aged 30 to 80 years, undergoing laparotomy for typhoid ileal perforation, were enrolled using a non-probability consecutive sampling method. Morbidity included any of the also-ascribed postoperative morbidities, while mortality was defined as death in the first 30 days after the procedure. Descriptive statistics were used to summarize quantitative variables, while frequencies and percentages were used for categorical variables. Significance level of $p \leq 0.05$ was used for planned post-stratification chi-square or Fisher exact tests.

Results: The mean age in this study was 49 years, and 66.2% were male. The median was 49 years as well, and residents were reporting an even distribution. 70.1% of participants had a monthly income < 50,000 PKR. Of the total participants, 77 developed morbidity (49.0%; 95% CI 41.3-56.8) and 25 died (15.9%; 95% CI 11.0-22.5). Both morbidity and mortality were analysed, and the following factors were assessed and found to be associated: Age > 50 years, rural vs urban residence, duration of surgery > 3 hours, and length of stay > 10 days (all with $p < 0.001$). However, analysis revealed that there was no significant relationship found between sex and morbidity ($p = 0.310$), as was found between sex and mortality ($p = 0.260$).

Conclusion: Typhoid ileal perforation had significant morbidity and mortality at 30 days. The recognition of high-risk patients and the use of uniformly standardized peroperative pathways may produce better outcomes.

INTRODUCTION

Despite metastasis in a few decades, typhoid remains one of the significant preventable morbidity contributors in Pakistan, being complicated by delays in diagnosis, access to unsafe water, access to inadequate sanitation, and antimicrobial resistance. The infection can be either asymptomatic until the patient comes into contact with it within the hospital, and may develop into severe disease, e.g., intestinal perforation, allowing the faecal material to spread throughout the abdomen, resulting in generalized abdominal infection (peritonitis) and serious sepsis, which may need surgery of the perforation.^{1,2}

The growth of multidrug- and extensively drug-resistant *Salmonella Typhi* has drastically limited the antibiotic arsenal in South Asia.^{3,4} Even though studies done in Hyderabad and Karachi show the effectiveness of the typhoid conjugate vaccine in vaccination campaigns carried out in the midst of an outbreak, there are still extreme cases of typhoid that are sent to hospitals.^{5,7} Molecular studies of the antibiotic-resistant typhoid lineages conducted in Pakistan demonstrated the persistence of extensively drug-resistant lineages and that the inappropriate use of antibiotics and self-medication continues to delay the timely use of effective treatment.^{8,9} Once intestinal perforation occurs, the immediate surgical management of the peritoneal contamination, along with emergency resuscitation and antibiotic coverage with intensive monitoring in the postoperative period, is the most important determinant of survival.

Until now, there have been no significant studies to show the short-term outcomes of surgery on patients with typhoid-related intestinal perforations. The frequency of outcomes is associated with a number of factors, including but not limited to the complexity of the disease, surgical delays due to patient referral, and the limitations of the surgical and medical services surrounding the surgery.^{10,11} This study was conducted to measure the frequency of 30-day postoperative morbidity and mortality in patients on whom typhoid-related ileal perforation had been surgically repaired by exploratory laparotomy at a tertiary-care hospital in Karachi and to assess the impact of the stated

demographic and perioperative parameters for each case on the stated outcomes.

MATERIAL & METHODS

Study design, setting and duration: This descriptive cross-sectional study was conducted done at the Department of Surgery, Jinnah Postgraduate Medical Centre, Karachi, and was approved for a period of four months from 5th March 2025 to 15th June 2025. after approval of the synopsis and permission from the institution.

Sample size and sampling technique: Using the WHO sample size software, a total study population of 157 was calculated based on a mortality rate of 7.2% with 4% absolute precision and a 95% level of confidence. Non-probability consecutive sampling was used to select the study participants.

Inclusion criteria: For this study, inclusion criteria for participants were ages 30 years and older, with no requirement for sex. Participants had to have exploratory laparotomy and clinical presentations of an acute abdomen with abdominal pain, abdominal distention, abdominal tenderness, free air in the abdomen (on X-ray), and had to contain a perforation in the ileum which had been seen during laparotomy.

Exclusion criteria: Patients were excluded if they had a history of sepsis; a history of radiotherapy; a history of intestinal obstruction; wound dehiscence after any gynecological procedure; ileostomy due to malignancy; any other of the large chronic diseases except those provided above.

Data collection procedure: Following informed written consent, demographic and peri-operative data were noted on a structured proforma. Surgeons who have over a decade of experience have completed the operation, and the choice of operation (primary closure, resection with anastomosis, or stoma formation) depends on the size and number of perforations, contamination, and illness status of the patient. Assessment of patients was carried out daily as long as they stayed in the hospital and weekly post-discharge until day 30 postoperatively.

Data and statistical analysis: Data were analyzed using the IBM SPSS Statistics v. 27 software. Age, duration of surgery, and duration of stay were described using various methods of descriptive statistics. For all other variables, data were summarized as counts and percentages. Categorical variables were described by their frequency and percentage, and Wilson 95% confidence intervals were computed for the two main outcome proportions. Pearson chi-square and Fisher exact tests were performed as appropriate, or where applicable, and missing values were filled in where zero cell values were present. The two-tailed tests were compared, and statistical significance was set at a p-value of ≤ 0.05 . Unadjusted analyses were used since clinical covariates were not provided to create an appropriate multiple analysis, and several strata

were completely separated.

Ethical approval: This research was approved by the Jinnah Postgraduate Medical Centre institutional ethics committee (IRB# F.2-81/2024-GENL/163/JPMC). All participants gave written informed consent before enrolment.

RESULTS

Complete data on the variables used in the analysis were available for all 157 patients. Mean age was 49.0 years (SD 9.1), mean surgery duration was 2.83 hours (SD 0.55), and mean hospital stay was 9.69 days (SD 2.36). The mean population of males (66.2%), rural zone (49.7%), and less than family monthly income of PKR 50,000 (70.1%) were as in Table 1.

TABLE 1 Baseline demographic and perioperative characteristics (n=157)

Characteristic	Value
Age, years	49.0 (SD 9.1); median 48 (IQR 41-57)
Male sex	104 (66.2%)
Rural residence	78 (49.7%)
Family income $\leq$ PKR 50,000/month	110 (70.1%)
Surgery duration, hours	2.83 (SD 0.55); median 2.8 (IQR 2.3-3.3)
Hospital stay, days	9.69 (SD 2.36); median 9 (IQR 8-12)
Surgery >3 hours / hospital stay >10 days	56 (35.7%) / 56 (35.7%)

Seventy-seven patients had at least one of the defined complications; 49.0% (95% CI 41.3-56.8) of patients had at least one complication within the 30 days. Patients over 50 years old, patients who were in rural areas, and patients whose family income was at or below the

prespecified cut points, and those who had surgeries or hospital visits that crossed the prespecified cut points, were significantly more likely to be morbid (all $p < 0.001$). There was no difference between the sexes ($p = 0.310$) (Table 2).

**TABLE 2
Thirty-day morbidity by prespecified strata**

Factor	Category	Morbidity n/N (%)	p value
Age	≤ 50 years	13/91 (14.3)	$<0.001^*$
	>50 years	64/66 (97.0)	
Sex	Female	29/53 (54.7)	0.310
	Male	48/104 (46.2)	
Residence	Urban	1/79 (1.3)	$<0.001^*$

Factor	Category	Morbidity n/N (%)	p value
	Rural	76/78 (97.4)	
Monthly income	>PKR 50,000	0/47 (0.0)	<0.001*
	≤PKR 50,000	77/110 (70.0)	
Surgery duration	≤3 hours	21/101 (20.8)	<0.001*
	>3 hours	56/56 (100.0)	
Hospital stay	≤10 days	21/101 (20.8)	<0.001*
	>10 days	56/56 (100.0)	

Pearson chi-square p values unless marked *Fisher exact due to a zero or sparse observed cell. Percentages are within strata.

Mortality frequency had been 15.9% (95% CI 11.0-22.5) after 30 days, as 25 of the 157 people under observation had passed away. There were none of them without morbidity who died, compared to 32.5% (25/77) of them with morbidity who died (Fisher exact $p < 0.001$). In

the group of patients with no morbidity, 0% died (Fisher exact $p < 0.001$). The association of mortality with older age, rural residence, lower income, longer surgery, and longer stay, but not sex, was likewise shown in the data (Table 3).

TABLE 3
Thirty-day mortality by prespecified strata

Factor	Category	Mortality n/N (%)	p value
Age	≤50 years	0/91 (0.0)	<0.001*
	>50 years	25/66 (37.9)	
Sex	Female	6/53 (11.3)	0.260
	Male	19/104 (18.3)	
Residence	Urban	0/79 (0.0)	<0.001*
	Rural	25/78 (32.1)	
Monthly income	>PKR 50,000	0/47 (0.0)	<0.001*
	≤PKR 50,000	25/110 (22.7)	
Surgery duration	≤3 hours	0/101 (0.0)	<0.001*
	>3 hours	25/56 (44.6)	
Hospital stay	≤10 days	0/101 (0.0)	<0.001*
	>10 days	25/56 (44.6)	

Pearson chi-square p values unless marked *Fisher exact due to a zero observed cell. Percentages are within strata.

DISCUSSION

This study documented a large burden of complications following an exploratory laparotomy for typhoid ileal perforation. About 50% of patients developed a postoperative complication after the surgery, and about 16%

of patients died within 30 days of the surgery. Age, residence, and socioeconomic status were all strongly associated and suggest a worse outcome for older patients, those who live in a rural area, and those who come from a household with a lower income. Longer surgery

and a longer hospital stay were also strongly associated with worse morbidity and mortality. There was no association between either of the outcomes and gender.

This study calculated a 49% rate of morbidity. This is considerably higher than the 23.7% complication rate documented by Katyar et al. in a cohort of 228 patients from Pakistan, with a mortality rate of 7.2% in that study.¹² A more recent JPMC study documented wound infection in 34.1% of patients, burst abdomen in 17.1% of patients, and a mortality rate of 8.5%, with deaths concentrated in patients presenting after 48 hours.¹³ Differences in the characteristics of the study populations, definitions used for outcomes, delays in referrals, number of perforations, and critical care may all be causes for the higher morbidity and mortality in the current study cohort.

It seems clinically reasonable to associate mortality with patients aged over 50, since physiological reserve, frailty, and sepsis tolerance decline with age. In a large resource-limited cohort study, Adamou and colleagues reported a 10.5% mortality rate, where death was linked to physiological derangement, high ASA status, delayed management, and multiple perforations.¹⁴ Rural residence and low family income in the current study may indicate delayed access, transportation, and nutritional barriers, and a lack of resources to obtain early and effective treatment. Although these barriers were not specifically assessed, the associations reported herein should be considered more risk markers than true effects.

Following the same rationale, longer operations may be indicative of greater operative challenges, such as extensive contamination, multiple perforations, and difficult source control, as well as the addition of resection and stoma formation. Recent studies on Secondary Peritonitis have demonstrated that the combination of physiological and operative scoring systems has been shown to be of great value in predicting mortality.¹⁵ Hospital stays greater than 10 days may be assessed with even greater caution, since prolonged stays may be the result of complications and not be predictive in nature, and therefore create a reverse correlation. This is also the reason that surgical duration and length of stay may not be

considered independent causes based on these cross-sectional studies.

The morbidity rate correlates well with other emergency laparotomy studies. Ylimartimo et al. reported complications in 58% of 674 cases, with infections being the most common operation-related complications and with significantly compromised short-term survival of patients with complications.¹⁶ Meta-analysis also designates sarcopenia as a relevant predictor of 30-day death after emergency laparotomy,¹⁷ while other cohorts document mortality in a range, both low and high, based on physiology, comorbidity, the urgency of the operation, and critical care.¹⁸⁻²⁰ The current study did not include ASA class, nutritional scores, lab values, delay to referral, or postoperative organ support. This lack of data prevents direct risk estimation concerning those studies.

These findings justify a high-risk pathway rather than alterations to working procedures predicated on demographic variables. Emergency-laparotomy ERAS advocates for a rapid evaluation and resuscitation, combined with a timely administration of antimicrobials along with source control, and a balance of temperature and fluids, as well as a multimodal analgesic regimen, and an early return to nutrition and mobilization, coupled with focused postoperative surveillance.^{21,22} Wound complications can be particularly troublesome after a contaminated laparotomy, so incision management strategies may also provide a benefit. Closed-incision negative-pressure therapy can lead to a reduction in surgical-site infection after an emergency laparotomy, though an evaluation of local applicability and the cost or benefit ratio may be warranted.²³ A 2025 prospective study on emergency laparotomy will further support the need for active surveillance of surgical-site infection, and 2026 data on emergency small-bowel surgery will support reduced psoas muscle size (volume) and the complications of surgery, and the need for an objective measure of the assessment of the physiological reserve.²⁵

There are some limitations to this study. It was a single-center study from a tertiary-care facility with limited sampling methods, so the generalizability is limited. Complications were presented only as a composite, so individual complication rates could not be presented.

Other missing data would include presentation delay, physiological severity, lab values, antimicrobial susceptibility, the number of perforations, the surgical technique, ICU support, and the cause of death. Several explanatory variables were highly correlated, and many strata presented outcomes of zero; therefore, only the planned unadjusted analyses were reported, and the effect size is likely to be imprecise. The association with the duration of the hospital stay is likely to be affected by the reverse relationship, and the design was cross-sectional, so a cause-and-effect relationship could not be established.

CONCLUSION

The consequences of typhoid ileal perforation posed a significant threat following surgery. Postoperative morbidity was reported in almost half (49.0%) of the patient population. A total of 15.9% of the patients died within 30 days of the surgical intervention. Certain factors, such as an older population, patients who lived in rural areas, a lower socioeconomic status, and patients who had a prolonged duration of surgery and hospitalization, were considered high-risk. Early risk recognition should be utilized with standardized care for the patient in the perioperative period.

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