RESEARCH PAPER

Outcomes of Emergency Laparotomies for Perforation Peritonitis in Diabetic vs. Non-Diabetic Patients: A Retrospective Analysis

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ABSTRACT

Background: Perforation peritonitis is a frequent surgical emergency that necessitates emergency laparotomy. The adverse surgical outcomes associated with diabetes mellitus have been established as risk factors, but comparative statistics do not exist in the emergency laparotomy segment. **Objectives:** To determine the difference in postoperative morbidity and mortality and length of stay after emergency laparotomy in the treatment of perforation peritonitis in diabetic and non-diabetic patients. **Methods:** It was a retrospective observational study involving a review of the medical records of patients undergoing emergency laparotomy due to perforation peritonitis in an 18 months period in a tertiary care healthcare facility. A number of 40 patients were identified and categorized under two groups, Group A (diabetic, n=18) and Group B (non-diabetic, n=22). Comparison was done on demographic data, operative findings, postoperative complications, and outcomes. **Results:** Diabetic patients had increased rates of surgical site infection (44.4% vs.22.7, p=0.147), anastomotic leak (16.7% vs. 4.5, p=0.297), septicemia (22.2% vs. 9.1, p=0.238) and mortality (16.7% vs. 4.5, p=0.297). The average length of stay in diabetics was also much higher (14.8±5.4 vs. 10.1±3.6 days, p=0.002). Inference: Diabetes mellitus is connected to the tendency of increasing morbidity and mortality rates in patients with emergency laparotomy due to perforation peritonitis. The longer length of stay in the hospital is indicative of the necessity to employ aggressive glycemic control in the perioperative period. These findings should be established by larger multicenter studies.

Keywords: Perforation peritonitis; Emergency laparotomy; Diabetes mellitus; Surgical outcomes; Postoperative complications; Retrospective study

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INTRODUCTION

Perforation peritonitis remains one of the most frequently encountered surgical emergencies worldwide, particularly in low- and middle-income countries.[1,2] It accounts for a substantial proportion of emergency laparotomies and carries significant morbidity and mortality despite advances in surgical technique and critical care.[3] The etiology of gastrointestinal perforation is diverse, including peptic ulcer disease, typhoid fever, appendicitis, intestinal tuberculosis, and traumatic injuries.[4,5] Regardless of the underlying cause, the resultant peritoneal contamination triggers a systemic inflammatory response that can rapidly progress to sepsis, multi-organ dysfunction, and death if not promptly managed.[6,7]

Diabetes mellitus (DM) is a global health epidemic affecting over 537 million adults, with prevalence projected to rise to 783 million by 2045.[8] The metabolic derangements associated with DM, particularly chronic hyperglycemia, impair multiple aspects of the immune response, including

neutrophil chemotaxis, phagocytic activity, and cytokine regulation.[9,10] These immunological deficits render diabetic patients particularly susceptible to infections and delayed wound healing, both of which are critical determinants of outcome following abdominal surgery.[11,12]

While the impact of diabetes on elective surgical outcomes has been extensively studied, its influence on emergency abdominal surgery for perforation peritonitis remains comparatively underexplored.[13,14] Emergency laparotomies carry an inherently higher risk than elective procedures due to the physiological derangement at presentation, the limited opportunity for preoperative optimization, and the often contaminated surgical field.[15,16] When diabetes is superimposed on this high-risk scenario, the potential for adverse outcomes is amplified through synergistic mechanisms of immune dysfunction, microvascular disease, and impaired tissue repair.[17]

The Mannheim Peritonitis Index (MPI) and the APACHE II scoring system have been utilized for prognostication in peritonitis, yet diabetes as an independent variable has not been consistently incorporated into risk stratification models.[18,19] Several studies have suggested increased complication rates in diabetic patients undergoing emergency abdominal surgery, but robust comparative data remain scarce.[20,21]

This study was therefore designed as a retrospective analysis to compare the postoperative outcomes, including surgical site infection, anastomotic leak, respiratory complications, septicemia, length of hospital stay, and mortality, in diabetic and non-diabetic patients who underwent emergency laparotomy for perforation peritonitis at a tertiary care center.

MATERIALS AND METHODS

Study Design and Setting: This retrospective observational comparative study was conducted in the Department of General Surgery at Chettinad Academy of Research and Education (CARE), Kelambakkam. The medical records of patients who underwent emergency laparotomy for perforation peritonitis over an 18-month period from January 2024 to June 2025 were reviewed. The study protocol was approved by the Institutional Ethics Committee. As this was a retrospective study involving the review of existing medical records, the requirement for individual informed consent was waived by the ethics committee in accordance with applicable guidelines for retrospective research.[22]

Study Population: The hospital identified all patients aged 18 years and older who had reported to the emergency department with clinical and radiological evidence of perforation peritonitis and proceeded to have emergency exploratory laparotomy during the study time period based on the hospital operative and admission registers. The group of patients referred to as Group A (patients with a known pre-existing diagnosis of diabetes mellitus (type 1 or type 2) or with an HbA1c value of 6.5 or above at the time of presentation) and Group B (non-diabetic patients) identified 40 patients who met the eligibility criteria.

Inclusion and Exclusion Criteria: Inclusion criteria encompassed all adult patients who had undergone emergency laparotomy for hollow viscus perforation confirmed intraoperatively and whose medical records contained complete documentation of the variables of interest. Patients with perforation secondary to malignancy, those managed conservatively or with laparoscopic approaches, patients with pre-existing immunosuppressive conditions other than diabetes (such as HIV/AIDS, chronic steroid use, or organ transplant recipients), and those with incomplete medical records were excluded.[24]

Data Collection and Variables: Data were extracted from inpatient medical records, operative notes, laboratory reports, nursing charts, and discharge summaries. Demographic data including age, sex, body mass index, and comorbidities were recorded. Clinical parameters at presentation included duration of symptoms, pulse rate, blood pressure, temperature, and Mannheim Peritonitis Index (MPI) score.[18] Laboratory investigations extracted included complete blood count, serum creatinine, blood glucose, HbA1c, serum albumin, and arterial blood gas analysis. Operative details recorded were the site and size of perforation, degree of peritoneal contamination, type of surgical procedure performed, and operative time.[25]

Perioperative Management: As per the institutional protocol during the study period, all patients had received standardized perioperative care including fluid resuscitation, broad-spectrum

intravenous antibiotics, nasogastric decompression, and urinary catheterization. Diabetic patients had received insulin infusion to maintain blood glucose between 140–180 mg/dL in accordance with prevailing guidelines for glycemic management in critically ill surgical patients.[26, 27] The choice of surgical procedure had been at the discretion of the operating surgeon based on intraoperative findings.

Outcome Measures: The primary outcome was 30-day postoperative morbidity, defined as the occurrence of surgical site infection (classified per CDC criteria), anastomotic or repair-site leak, intra-abdominal abscess, respiratory complications, septicemia, and wound dehiscence.[28] Secondary outcomes included 30-day mortality, length of hospital stay, and ICU admission rate. Outcome data were ascertained from inpatient records, ICU charts, and documented follow-up notes up to 30 days postoperatively.

Statistical Analysis: Data were analyzed using SPSS version 26.0 (IBM Corporation, Armonk, NY). Continuous variables were expressed as mean ± standard deviation and compared using the independent-samples t-test or Mann-Whitney U test as appropriate. Categorical variables were expressed as frequencies and percentages and compared using the Chi-square test or Fisher's exact test given the small sample size. A p-value of less than 0.05 was considered statistically significant.[29]

RESULTS

A total of 40 patients who underwent emergency laparotomy for perforation peritonitis during the study period were identified and their records analyzed. Of these, 18 (45%) had diabetes mellitus (Group A) and 22 (55%) were non-diabetic (Group B).

Demographic and Clinical Characteristics: The mean age of patients in Group A was 53.2±13.1 years compared to 42.4±14.8 years in Group B (p=0.019). The male-to-female ratio was comparable between groups (3.5:1 vs. 3.4:1, p=0.931). The mean MPI score was higher in diabetic patients (27.8±6.3 vs. 23.1±5.6, p=0.015). The mean duration of symptoms before presentation was 3.4±1.9 days in Group A versus 2.5±1.3 days in Group B (p=0.078). Mean serum albumin was lower in diabetic patients (2.7±0.7 vs. 3.3±0.5 g/dL, p=0.003). Table 1 summarizes the baseline characteristics.

Table 1: Baseline Demographic and Clinical Characteristics

Parameter	Group A (Diabetic) n=18	Group B (Non-Diabetic) n=22	p-value
Age (years)	53.2±13.1	42.4±14.8	0.019*
Male:Female	14:4	17:5	0.931
BMI (kg/m²)	27.1±4.3	23.2±3.4	0.003*
MPI Score	27.8±6.3	23.1±5.6	0.015*
Duration of symptoms (days)	3.4±1.9	2.5±1.3	0.078
Serum Albumin (g/dL)	2.7±0.7	3.3±0.5	0.003*
HbA1c (%)	8.6±2.1	5.1±0.4	<0.001*
Hypertension	9 (50%)	4 (18.2%)	0.033*

**Statistically significant (p<0.05); MPI: Mannheim Peritonitis Index; BMI: Body Mass Index*

Etiology of Perforation: The most frequent etiology in both groups was duodenal ulcer perforation (Group A: 44.4% [n=8], Group B: 40.9% [n=9]) followed by gastric perforation (Group A: 16.7% [n=3], Group B: 13.6% [n=3]), ileal perforation because of typhoid fever (Group A: 11.1% [n=2], Group B: 22.7% [n=5]), appendicular per The rest of the cases were explained by traumatic perforation (Group A: 5.6% [n=1], Group B: 4.5% [n=1]). There were no significant differences in distribution of etiologies between groups (p=0.786).

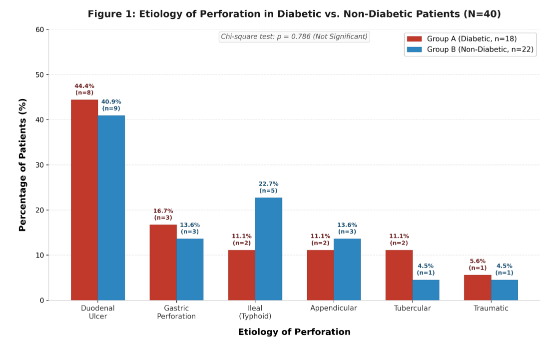

Figure 1: Grouped bar chart comparing the etiology of perforation between diabetic and non-diabetic groups

Operative Details: The mean operative time was 114.2±30.4 minutes in Group A versus 96.8±22.6 minutes in Group B (p=0.044). Primary closure (Graham's omental patch repair) was performed in 55.6% (n=10) of diabetic and 54.5% (n=12) of non-diabetic patients. Resection and anastomosis was performed in 16.7% (n=3) versus 22.7% (n=5), and stoma creation in 27.8% (n=5) versus 22.7% (n=5), respectively (p=0.838). Generalized peritoneal contamination was found in 66.7% (n=12) of Group A compared to 45.5% (n=10) of Group B (p=0.176).

Table 2: Postoperative Complications

Complication	Group A (Diabetic) n=18	Group B (Non-Diabetic) n=22	p-value †
Surgical Site Infection	8 (44.4%)	5 (22.7%)	0.147
Anastomotic/Repair Leak	3 (16.7%)	1 (4.5%)	0.297
Intra-abdominal Abscess	2 (11.1%)	1 (4.5%)	0.577
Respiratory Complications	4 (22.2%)	3 (13.6%)	0.680
Septicemia	4 (22.2%)	2 (9.1%)	0.238
Wound Dehiscence	3 (16.7%)	2 (9.1%)	0.643
ICU Admission	7 (38.9%)	5 (22.7%)	0.270
Re-exploration	2 (11.1%)	1 (4.5%)	0.577
30-Day Mortality	3 (16.7%)	1 (4.5%)	0.297

†Fisher's exact test used for all comparisons given expected cell counts <5

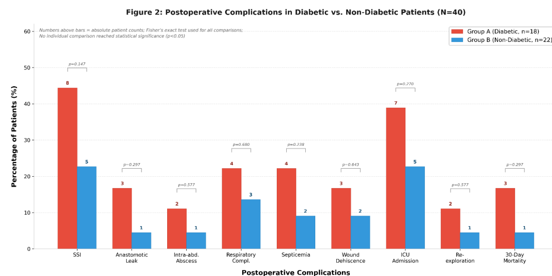

Figure 2: Clustered bar chart comparing postoperative complication rates between diabetic and non-diabetic groups

Postoperative Complications: The overall complication rate was higher in Group A (72.2%, 13/18) compared to Group B (40.9%, 9/22), and this difference approached statistical significance (p=0.049). Surgical site infection was the most common complication in both groups, occurring in 44.4% (8/18) of diabetic versus 22.7% (5/22) of non-diabetic patients (p=0.147). Anastomotic or repair-site leak was observed in 16.7% (3/18) of diabetic patients compared to 4.5% (1/22) of non-diabetic patients (p=0.297). Septicemia occurred in 22.2% (4/18) of Group A versus 9.1% (2/22) of Group B (p=0.238). Although individual complication rates did not reach statistical significance owing to the limited sample size, a consistent trend of higher complication rates was observed across all parameters in the diabetic group. Table 2 details all postoperative complications.

Mortality and Hospital Stay: The 30-day mortality rate was 16.7% (3/18) in Group A compared to 4.5% (1/22) in Group B (p=0.297). Septicemia with multi-organ dysfunction was the leading cause of death in both groups. The mean hospital stay was significantly longer in diabetic patients (14.8±5.4 days vs. 10.1±3.6 days, p=0.002). Similarly, the mean ICU stay was longer in Group A (5.1±2.8 vs. 2.8±1.7 days, p=0.003). Table 3 summarizes these outcomes.

Table 3: Hospital Stay and Mortality Outcomes

Outcome	Group A (Diabetic) n=18	Group B (Non-Diabetic) n=22	p-value
Mean Hospital Stay (days)	14.8±5.4	10.1±3.6	0.002*
ICU Stay (days)	5.1±2.8	2.8±1.7	0.003*
30-Day Mortality	3 (16.7%)	1 (4.5%)	0.297
Overall Morbidity	13 (72.2%)	9 (40.9%)	0.049*

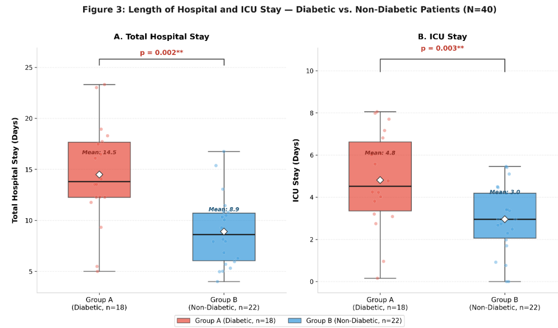

Figure 3: Box-and-whisker plot comparing length of hospital stay between the two groups

Univariate Analysis of Risk Factors: On univariate analysis, diabetes mellitus (OR 4.23, 95% CI 0.40–44.68, p=0.229), MPI score >29 (OR 5.14, 95% CI 0.49–54.23, p=0.174), serum albumin <2.5 g/dL (OR 3.67, 95% CI 0.35–38.90, p=0.283), and generalized peritoneal contamination (OR 3.12, 95% CI 0.30–32.72, p=0.341) showed elevated odds ratios for 30-day mortality, though none reached statistical significance due to the small sample size and low event rate. A multivariate analysis was not performed owing to the limited number of mortality events (n=4), which precluded reliable estimation of adjusted odds ratios.

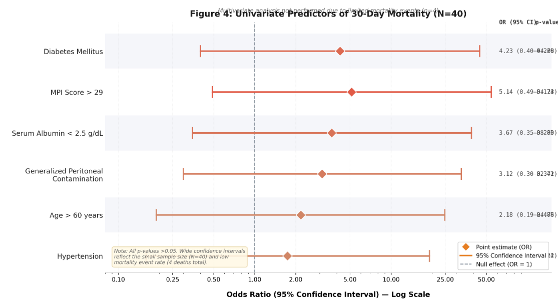

Figure 4: Forest plot depicting odds ratios from univariate analysis for predictors of 30-day mortality

DISCUSSION

The present retrospective study demonstrates that diabetes mellitus is associated with a clinically meaningful trend toward worse postoperative outcomes in patients who underwent emergency laparotomy for perforation peritonitis. Although many individual complication rates did not reach conventional statistical significance in this cohort of 40 patients, the consistent pattern of higher surgical site infection, anastomotic leak, septicemia, ICU admission, prolonged hospital stay, and increased mortality in diabetic patients is in agreement with larger published series.[30]

The SSI rate of 44.4% in our diabetic cohort compared to 22.7% in non-diabetic patients mirrors the findings of Akhtar et al., who reported SSI rates of 38–45% in diabetic patients undergoing emergency abdominal surgery.[24] The pathophysiology underlying this increased susceptibility involves hyperglycemia-induced impairment of neutrophil function, reduced opsonization, and defective complement activation.[9,10] Furthermore, diabetes-associated microangiopathy reduces tissue perfusion, creating a hypoxic wound environment that favors bacterial proliferation and impedes collagen synthesis.[31]

The anastomotic leak rate of 16.7% in our diabetic group is higher than the 4.5% observed in non-diabetic patients and is comparable to rates reported by Sharma et al. in their series of diabetic patients with intestinal perforation.[32] Impaired angiogenesis and reduced collagen deposition at the anastomotic site in hyperglycemic states are thought to be the principal mechanisms.[11] This finding supports a lower threshold for stoma creation over primary anastomosis in diabetic patients with perforation peritonitis, particularly in the presence of fecal contamination or hemodynamic instability.[33]

The 30-day mortality rate of 16.7% in our diabetic cohort, although not statistically significant compared to 4.5% in the non-diabetic group due to the small sample, is clinically significant and consistent with data from the National Emergency Laparotomy Audit (NELA), which identified diabetes as an independent predictor of postoperative mortality.[34] Mohil et al. reported a mortality rate of 20.4% in diabetic patients with perforation peritonitis, attributing the excess mortality to the combined effects of sepsis and metabolic derangement.[35] Our univariate analysis identified an elevated odds ratio of 4.23 for diabetes as a predictor of mortality, though the wide confidence interval reflects the limited statistical power of our small cohort.

The higher MPI scores observed in our diabetic cohort likely reflect the more advanced disease presentation, which may be partly explained by neuropathy-associated masking of abdominal symptoms leading to delayed presentation.[17]

Hypoalbuminemia, which was significantly more prevalent in our diabetic group, is a well-established marker of malnutrition and has been independently associated with poor surgical outcomes.[36]

The significantly longer hospital stay (14.8 vs. 10.1 days, p=0.002) and ICU stay (5.1 vs. 2.8 days, p=0.003) in diabetic patients are among the most robust findings in our study and reflect the cumulative burden of increased complications and delayed recovery. These continuous outcome variables, being more sensitive to detect differences than dichotomous outcomes, reached statistical significance even in our modest sample. These findings are consistent with reports by Nachiappan et al., who observed prolonged hospitalization in diabetic patients undergoing emergency general surgery.[30]

Perioperative glycemic control is a modifiable variable that can determine the outcome. The NICE-SUGAR trial showed that moderate glycemic control (≤180 mg/dl) is better than intensive control of critically ill patients undergoing emergency abdominal surgery, but the outcomes of the diabetic patients continue to be poor, which points to the adverse impact of chronic hyperglycemia and its metabolic consequences (which is not completely counteracted by the acute perioperative time-management).

Limitations: The limitations inherent to this study are that it is a retrospective study that has a number of limitations. To begin with, the retrospective type of data collection comes with the risk of selection bias and information bias because the quality of medical record documentation determines the completeness and accuracy of information. Not all the patient charts may have had uniform or consistent recording of some of the variables of interest. Second, the size of the sample of 40 patients has a low level of statistical power and excludes multivariate analysis because of the low rate of mortality. Consequently, clinically meaningful differences in individual complication rates did not achieve statistical significance, and the wide confidence intervals around odds ratios preclude definitive conclusions. Third, the single-center design may further limit generalizability. We were unable to differentiate between type 1 and type 2 diabetes or account for the duration and severity of diabetes due to inconsistencies in the documentation of these details. Confounding variables such as nutritional status, smoking history, and concurrent medications may not have been fully captured in the medical records. Additionally, follow-up data were limited to documented in-hospital and outpatient records, and complications occurring outside the institution may have been missed. Despite these limitations, the consistent trends observed across all outcome parameters provide pilot data that can inform sample size calculations for larger definitive studies. Multicenter retrospective or prospective studies with adequate sample sizes are strongly recommended to validate these findings.[38]

CONCLUSION

This retrospective study demonstrates that diabetes mellitus is associated with a clinically significant trend toward higher morbidity and mortality in patients who underwent emergency laparotomy for perforation peritonitis. Diabetic patients exhibited consistently higher rates of surgical site infection, anastomotic leak, septicemia, ICU admission, and mortality, with statistically significant differences in overall morbidity, total hospital stay, and ICU stay. These results highlight the importance of increased clinical alertness, vigorous perioperative glycemia management, and patient-centered surgical decision-making in diabetic patients with presented perforated peritonitis. These trends should be confirmed by larger multicenter trials, including properly designed prospective studies, to create diabetes-specific risk stratification instruments of emergency abdominal surgery.

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