

A Prospective Study of Risk Factors Associated with Burst Abdomen Following Laparotomy

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Abstract

Background: Burst abdomen, also known as postoperative abdominal wound dehiscence, is a serious surgical complication associated with increased morbidity, prolonged hospital stays, and higher healthcare costs. It commonly occurs following laparotomy and is influenced by multiple patient-, disease-, and surgical-related factors. Identifying these factors is essential for implementing preventive strategies and improving postoperative outcomes.

Aims and Objectives: The primary objective of this study was to identify the etiological factors influencing the incidence of burst abdomen in hospitalized patients. The secondary objective was to evaluate the association between various clinical and surgical factors with postoperative complications and patient outcomes.

Materials and Methods: This prospective observational study was conducted in the Department of General Surgery at Gandhi Medical College and Hamidia Hospital, Bhopal, from June 2023 to November 2024. A total of 64 patients aged above 18 years who developed a burst abdomen following abdominal surgery were

included in the study. Data on demographic characteristics, clinical history, comorbid conditions, laboratory parameters, operative details, and postoperative complications were collected using a structured pro forma. Wound swab culture and serum albumin levels were evaluated.

Results: Among the 64 patients studied, the majority belonged to the 20–40-year age group (37.5%), and males constituted 73.4% of cases. Anemia (Hb 8–10.9 g/dL) was observed in 57.8% of patients, while 48.4% had severe hypoalbuminemia (<2.5 g/dL). Peritonitis was present in 85.9% of patients, and emergency surgeries accounted for 84.4% of cases. Surgical site infection was observed in 93.8% of patients. Klebsiella was the most commonly isolated pathogen (35.9%). A statistically significant association was observed between prolonged operating time (>150 minutes) and surgical site infection ($p = 0.008$). Additionally, wound size was significantly associated with serum albumin levels ($p = 0.022$).

Conclusion: Burst abdomen is a multifactorial complication influenced by both patient-related and surgical factors. Surgical site infection, peritonitis,

emergency surgery, hypoalbuminemia, anemia, prolonged operating time, and smoking were identified as major contributing factors in this study. Early identification of high-risk patients, optimization of nutritional and hematological status, strict infection control, and meticulous surgical techniques can help reduce the incidence of burst abdomen and improve postoperative outcomes.

Keywords: Burst abdomen, abdominal wound dehiscence, laparotomy, surgical site infection, hypoalbuminemia, wound healing.

Introduction

Burst abdomen, also known as abdominal wound dehiscence, is a serious postoperative complication characterized by partial or complete separation of the abdominal fascial layers following surgical closure. It typically occurs after laparotomy and represents a significant cause of postoperative morbidity and mortality in surgical practice. The reported incidence of burst abdomen ranges from 0.4% to 3.5% globally. Still, higher rates of up to 10–30% have been documented in developing countries, particularly in emergency surgical settings where patients often present with advanced disease and compromised physiological status^{1,2}.

Wound healing after abdominal surgery is a complex biological process involving inflammation, tissue proliferation, collagen synthesis, and remodeling. During the early postoperative period, the tensile strength of the abdominal fascia is relatively low, making it vulnerable to mechanical stress and infection. Any disruption in these processes can weaken the surgical wound and eventually lead to fascial separation³. Burst abdomen typically occurs between the sixth and tenth postoperative day, a period when the wound depends primarily on suture support because collagen deposition is still insufficient to provide adequate tensile strength⁴.

Several patient-related, disease-related, and surgical factors have been implicated in the development of a burst abdomen. Patient-related factors include advanced age, malnutrition, anemia, hypoalbuminemia, diabetes mellitus, malignancy, and chronic illnesses, all of which impair tissue repair and immune response⁵. Hypoalbuminemia is considered a strong predictor of poor wound healing because albumin plays a crucial role in collagen synthesis and maintenance of oncotic pressure within tissues⁶. Similarly, anemia reduces oxygen delivery to tissues, thereby impairing fibroblast activity and collagen formation required for proper wound healing⁷.

In addition to systemic conditions, local factors such as surgical site infection (SSI), intra-abdominal sepsis, and increased intra-abdominal pressure significantly contribute to fascial dehiscence. Infection disrupts collagen formation and increases proteolytic enzyme activity, leading to degradation of newly formed connective tissue⁸. Increased intra-abdominal pressure caused by coughing, vomiting, abdominal distension, or ileus can also exert excessive tension on the suture line, further increasing the risk of wound disruption⁹.

Surgical factors also play an important role in determining wound integrity. The type of surgical procedure, the emergency nature of the surgery, operative duration, suturing technique, and the type of suture material used for fascial closure can influence the likelihood of postoperative wound dehiscence. Emergency surgeries are particularly associated with higher rates of burst abdomen due to contamination, peritonitis, and poor preoperative optimization of patients¹⁰. Studies have shown that techniques such as continuous suturing with slow-absorbable monofilament sutures and the small-bite technique can reduce the

incidence of wound dehiscence by distributing tension more evenly along the fascial closure ¹¹.

Despite advances in surgical techniques and perioperative care, burst abdomen continues to be associated with significant morbidity, prolonged hospitalization, and increased healthcare costs. Furthermore, mortality rates following complete abdominal wound dehiscence have been reported to be as high as 20–30%, particularly in patients with underlying sepsis or severe systemic disease ¹².

Given the multifactorial nature of this complication, identifying modifiable risk factors is essential for improving surgical outcomes. Early recognition of high-risk patients, optimization of nutritional and metabolic status, strict infection control, and appropriate surgical techniques may help reduce the incidence of burst abdomen. Therefore, the present study was conducted to evaluate the factors influencing the incidence of burst abdomen in patients undergoing abdominal surgery and to analyze the outcomes associated with different management approaches.

Material and Methods

This study was designed as a prospective observational study and conducted in the Department of General Surgery, Gandhi Medical College and associated Hamidia Hospital, Bhopal, from June 2023 to November 2024. The study included patients of both sexes aged more than 18 years who were admitted to the general surgery wards and developed abdominal wound dehiscence (burst abdomen) following either elective or emergency abdominal surgery.

Patients were included if they had undergone routine or emergency abdominal surgery and subsequently developed postoperative wound dehiscence while admitted to the Department of General Surgery. Patients younger than 18 years and those unwilling to participate

or who did not provide consent were excluded from the study. The sample size was 64 patients, calculated based on the prevalence of burst abdomen in India, taking a 95% confidence interval and allowable error of 8%.

After obtaining approval from the Institutional Ethics Committee, written informed consent was taken from all participants. Each patient was evaluated in detail through history taking, clinical examination, and laboratory investigations. Routine biochemical investigations were performed in all cases. In addition, wound swab culture and serum albumin estimation were performed. Wound swab culture was done on postoperative day 7, and the size of the burst abdomen wound was measured using a calliper.

Initially, all patients were managed conservatively. This was followed by operative management with secondary suturing once the wound was healthy and free of purulent or serous discharge, usually during the second, third, or fourth postoperative week. Data was collected using a structured proforma that included demographic details, clinical history, examination findings, comorbidities, blood investigations, culture profile, suture material used, and suturing technique for abdominal wall closure. The collected data were entered into a master chart prepared in Microsoft Excel.

For statistical analysis, data were analyzed using Epi Info Version 6. Frequency distribution and cross-tabulation were used for tabulation. Quantitative variables were expressed as mean and standard deviation, while categorical variables were expressed as percentages and proportions. Student's t-test was used to compare means, and the Chi-square test was applied to compare categorical variables. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 64 patients with a burst abdomen were included in the study. The 20–40 years age group constituted the largest proportion, with 24 patients (37.5%), followed by the 40–60 years and more than 60

years groups, each with 15 patients (23.4%). Patients younger than 20 years accounted for 10 cases (15.6%). This shows that a burst abdomen was most seen in young and middle-aged adults in the present study.

Table 1: Baseline Demographic Characteristics of Study Population (n = 64)

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	<30	8	12.5
	31–40	14	21.9
	41–50	18	28.1
	51–60	15	23.4
	>60	9	14.1
Gender	Male	39	60.9
	Female	25	39.1
BMI (kg/m ²)	<18.5	12	18.8
	18.5–24.9	29	45.3
	≥25	23	35.9
Smoking Status	Smoker	27	42.2
	Non-smoker	37	57.8
Alcohol Consumption	Yes	21	32.8
	No	43	67.2
Diabetes Mellitus	Present	24	37.5
	Absent	40	62.5
Hypertension	Present	19	29.7
	Absent	45	70.3

There was a clear male predominance in the study population. Of 64 patients, 47 (73.4%) were male and 17 (26.6%) were female, suggesting that burst abdomen was considerably more common among male patients in this cohort.

Anaemia was highly prevalent among the study subjects. Thirty-seven patients (57.8%) had haemoglobin levels between 8–10.9 g/dL, while 8 patients (12.5%) had haemoglobin levels below 8 g/dL. Only 4 patients (6.3%) had haemoglobin values above 13 g/dL. These findings

indicate that low haemoglobin was common among patients who developed a burst abdomen.

Nutritional compromise was also evident. Serum albumin below 2.5 g/dL was found in 31 patients (48.44%), while 26 patients (40.62%) had albumin between 2.5 and 3.5 g/dL. Only 7 patients (10.94%) had serum albumin above 3.5 g/dL. This shows that most patients had hypoalbuminemia, highlighting poor nutritional status as an important associated factor.

Among the risk factors studied, peritonitis was present in 55 patients (85.9%), and smoking was noted in 20

patients (31.3%). Tuberculosis was present in 14 patients (21.9%), and malignancy in 8 patients (12.5%). These findings suggest that infective and systemic comorbid conditions were common in patients with a burst abdomen.

A large majority of cases required emergency surgery, accounting for 54 patients (84.4%), whereas only 10 patients (15.6%) had undergone planned surgery. In addition, 40 patients (62.5%) had an operating time exceeding 150 minutes. These findings indicate that emergency procedures and prolonged operations were common among cases of burst abdomen.

Regarding wound status, 61 patients (95.3%) had infected wounds, and 60 patients (93.8%) developed surgical site infections. This strongly supports the role of wound infection as a major factor associated with burst abdomen.

Regarding intra-abdominal pathology, ileal perforation was the most common finding, seen in 17 patients (26.5%), followed by small bowel obstruction in 13 patients (20.3%) and gastric perforation in 12 patients (18.7%). Overall, perforation peritonitis formed the major underlying pathology in the study population.

Among the organisms isolated on wound culture, *Klebsiella* was the most common pathogen, found in 23

patients (35.9%), followed by *E. coli* in 11 patients (17.2%) and *Staphylococcus aureus* in 8 patients (12.5%). Sterile cultures were seen in 5 patients (7.8%).

Statistically, a significant association was found between operating time and surgical site infection ($p = 0.008$), between burst wound size and serum albumin ($p = 0.022$), between burst wound size and suturing technique ($p = 0.033$), and between burst wound size and suture material ($p = 0.047$). However, the association between surgery type and SSI ($p = 0.594$) and between serum albumin and haemoglobin ($p = 0.618$) was not statistically significant.

A total of 64 patients who developed a burst abdomen following abdominal surgery were included in the study. The analysis was performed to identify demographic characteristics, clinical parameters, operative factors, and microbiological profiles associated with burst abdomen. The baseline characteristics of the study population are presented in Tables 1 and 2. Most patients were in the 41–50-year age group (28.1%), and males constituted the majority of the study population (60.9%). Emergency surgeries accounted for 68.8% of cases. Hypoalbuminemia (<2.5 g/dL) was observed in 48.4% of patients, indicating poor nutritional status among a substantial proportion of the study population.

Table 2: Baseline Clinical and Operative Characteristics of Patients (n = 64)

Variable	Category	Frequency (n)	Percentage (%)
Type of Surgery	Emergency	44	68.8
	Elective	20	31.2
Type of Incision	Midline	41	64.1
	Paramedian	13	20.3
	Transverse	10	15.6
Duration of Surgery	<150 minutes	24	37.5
	≥150 minutes	40	62.5
Serum Albumin Level	<2.5 g/dL	31	48.4
	2.5–3.5 g/dL	26	40.6

	>3.5 g/dL	7	10.9
Surgical Site Infection	Present	60	93.8
	Absent	4	6.2
Burst Wound Size	<5 cm	33	51.6
	5–10 cm	21	32.8
	11–15 cm	10	15.6

Figure 1: Distribution of operating time among patients with burst abdomen. A majority of patients (62.5%) had an operating time >150 minutes, indicating prolonged surgery as a possible risk factor.

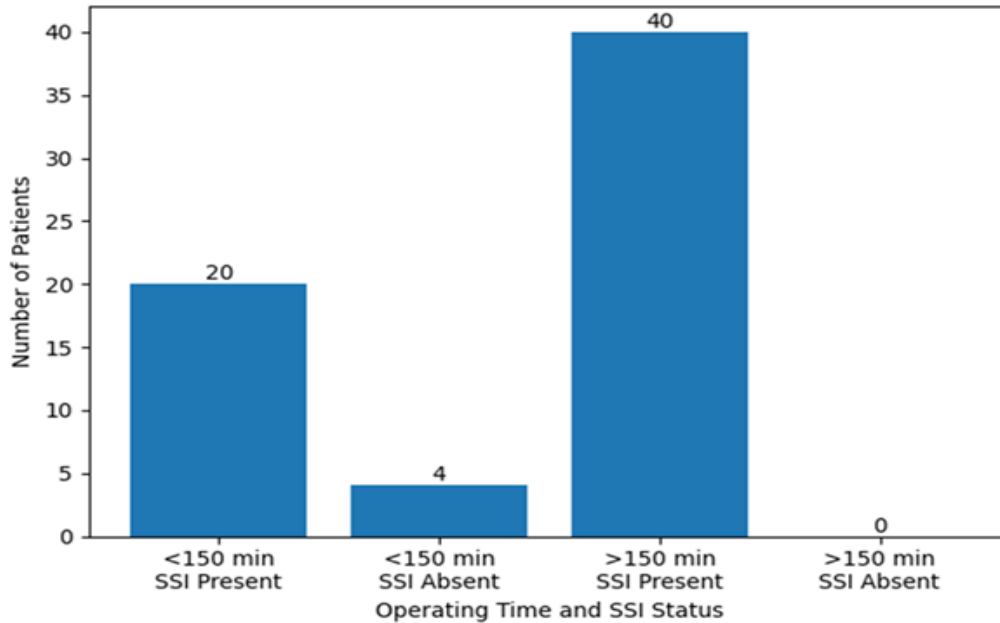
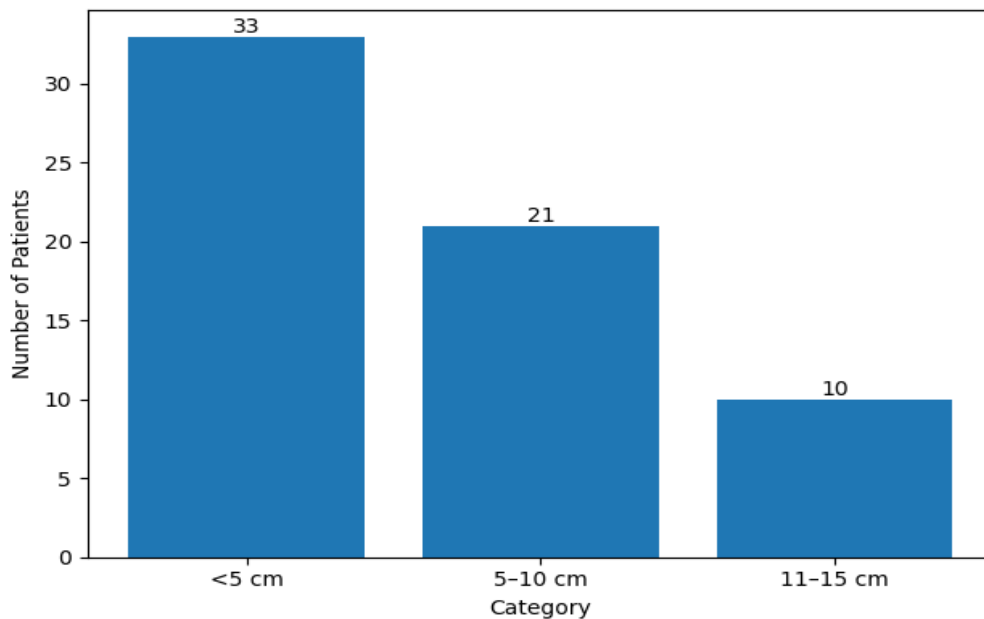


Figure 2: Distribution of burst abdomen wound size among patients. The majority (51.6%) had wound separation <5 cm.



Discussion

Burst abdomen, also known as postoperative abdominal wound dehiscence, is a serious complication following laparotomy and is associated with significant morbidity, prolonged hospital stay, and increased healthcare costs. It usually occurs within the first week after surgery and may lead to evisceration if not promptly recognized and managed. The incidence of burst abdomen reported in various studies ranges from 0.4% to 3.5% following abdominal surgeries, although higher rates have been reported in emergency laparotomies and patients with multiple comorbidities ^{1,3}.

In the present prospective study, several patient-related and surgery-related factors were found to contribute to the development of a burst abdomen. Patient-related risk factors such as advanced age, anemia, malnutrition, diabetes mellitus, and chronic pulmonary disease have been widely documented to impair wound healing and increase the risk of fascial disruption after surgery ^{2,8}. Impaired tissue oxygenation, poor collagen synthesis, and decreased immune response in these conditions delay wound healing and predispose the surgical wound to dehiscence.

Emergency laparotomy was observed to be one of the major surgical risk factors associated with a burst abdomen. Previous studies have demonstrated that emergency surgeries are frequently performed in suboptimal conditions, often in patients with peritonitis, bowel obstruction, or sepsis, which significantly compromise wound healing ¹³. The presence of intra-abdominal infection or contamination leads to increased inflammatory response and enzymatic degradation of collagen within the wound, thereby weakening the abdominal fascia ⁵.

Postoperative complications such as wound infection were also found to have a strong association with burst

abdomen. Surgical site infection significantly disrupts the normal healing process and increases the risk of wound failure. Several studies have reported that infection is among the strongest predictors of wound dehiscence, as bacterial colonization interferes with collagen deposition and increases tissue breakdown ⁹. Infected wounds also increase intra-abdominal pressure due to local inflammation and edema, further stressing the sutured fascia.

Increased intra-abdominal pressure resulting from postoperative coughing, vomiting, abdominal distension, or ileus has also been implicated in the development of a burst abdomen. Patients with chronic obstructive pulmonary disease or persistent postoperative cough are particularly vulnerable to wound disruption due to repeated stress on the abdominal wall sutures ¹¹. Similarly, postoperative ileus and abdominal distension can significantly increase tension on the surgical wound and predispose to fascial separation.

Technical factors related to surgical closure also play a critical role in preventing a burst abdomen. The type of suture material, suture technique, and surgeon experience influence wound strength and healing. Continuous mass closure with non-absorbable or slow absorbable sutures has been recommended as the standard technique for abdominal wall closure because it distributes tension evenly across the wound and reduces the risk of dehiscence ⁹. Studies have shown that inadequate suturing techniques, improper suture-to-wound length ratio, and excessive tension during closure can significantly increase the risk of burst abdomen ¹⁰.

The findings of the present study are consistent with previous research, which highlights that burst abdomen is a multifactorial complication involving both patient-related and surgical factors. Early identification of high-risk patients, optimization of nutritional and metabolic

status, meticulous surgical technique, and strict postoperative monitoring can significantly reduce the incidence of this complication.

Conclusion

Burst abdomen following laparotomy remains a serious postoperative complication with multifactorial etiology. Patient-related factors such as anemia, malnutrition, diabetes, and advanced age, along with surgical factors including emergency surgery, wound infection, and increased intra-abdominal pressure, significantly contribute to the development of wound dehiscence. Early identification and management of these risk factors, along with meticulous surgical technique and appropriate postoperative care, are essential to reduce the incidence and associated morbidity of burst abdomen.

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