

Risk Profiling and Clinical Outcomes of Abdominal Wound Dehiscence Following Open Abdominal Surgery: A Tertiary Care Hospital Study

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Abstract

Background: Abdominal wound dehiscence (AWD) is a severe post-operative complication occurring following open abdominal surgery with increased morbidity, prolonged hospitalization, multiple interventions, and mortality. It occurs due to various factors that include patient-specific, disease-specific, operative, and post-operative risk factors. **Objective:** To evaluate the incidence, demographical and clinical risk profile, perioperative features, microbiological profile, management, and outcome of AWD following open abdominal surgery at a tertiary care hospital. **Materials and Methods:** This prospective observational clinical study was conducted over a period of 18 months from November 2023 to May 2024 at Departments of General Surgery, Surgical Oncology and Surgical Gastroenterology, Geetanjali Medical College and Hospital, Udaipur. Patients of age above 18 years who developed abdominal wound dehiscence following open abdominal surgeries were included in the study consecutively. The demographical profile, comorbidities, nutritional and laboratory parameters, post-operative complication, surgical features, microbiological findings, management, duration of hospitalization and final outcome were analyzed. **Results:** Among 762 open abdominal operations, 88 patients developed AWD, giving an incidence of 11.54%. Mean age was 50.02 ± 14.52 years and 70.46% were male. Smoking (50%), alcohol use (34.09%), diabetes (31.82%), hypertension (30.68%), malignancy (30.68%), anemia (25%), intra-abdominal infection (23.86%), and malnutrition (19.32%) were commonly observed. Hypoproteinemia occurred in 50% and hypoalbuminemia in 40.91%. Emergency procedures accounted for 61.36%, midline incision for 80.68%, and operations lasting more than two hours for 56.82%. Wound infection was present in 90.90%, respiratory complications in 60.23%, and mechanical ventilation was required in 46.59%. AWD most often appeared on the sixth postoperative day. *Staphylococcus aureus* was the most frequent isolate (43.18%). Partial dehiscence occurred in 82.95% and complete dehiscence in 17.05%. Average hospital stay was 11.45 days. Overall, 96.60% recovered and 3.40% died. **Conclusion:** AWD occurred predominantly in patients with multiple adverse host and perioperative characteristics. Prevention should emphasize preoperative optimization, infection control, nutritional correction, meticulous operative technique, respiratory care, and close postoperative wound surveillance.

Keywords: abdominal wound dehiscence; open abdominal surgery; wound infection; burst abdomen; surgical site infection; postoperative complications; risk profile.

1. Introduction

Abdominal wound dehiscence is the partial or complete separation of the layers of a surgically created abdominal wound before satisfactory healing has occurred. It develops when the healing wound fails to acquire sufficient tensile strength to withstand the mechanical forces acting across the abdominal wall. Dehiscence may remain limited to superficial or deeper layers or may progress to complete fascial disruption with exposure or evisceration of abdominal viscera. Despite advances in perioperative care, it remains a feared complication because of its association with infection, repeated wound care, reoperation, prolonged hospitalization, increased treatment cost, and mortality.

The normal wound healing process consists of a coordinated inflammatory response followed by proliferation and remodeling. Derangements of this cascade by systemic illness, nutritional deficiency, impaired oxygen delivery, infection, tissue ischemia, or excessive tissue trauma are capable of resulting in decreased collagen synthesis and wound tensile strength contributing to abdominal wound dehiscence. This is often multifactorial in origin because patient-related factors such as the patient's age, anemia, diabetes mellitus, smoking, jaundice, pulmonary disease, renal insufficiency, obesity, malignancy, and malnutrition may be associated with surgical factors such as emergency surgery, contaminated wounds, prolonged operative time, incision type, tissue trauma, and postoperative surgical site infection.

The symptoms can include postoperative fever, pain, serous-purulent discharge, suture dehiscence, or separation of the wound edges. Complete dehiscence is an emergency, but management of partial dehiscence depends on the depth, the presence of contamination, tissue viability, and the patient's condition. The early healing period is critical because the incision has obtained only moderate mechanical strength.

Reported rates of abdominal wound dehiscence vary between institutions and populations. Differences arise due to the case mix, volume of emergencies, nutritional status, wound contamination, comorbid disease, operative technique and post-operative infection. Tertiary care hospitals see patients with advanced intra-abdominal disease, sepsis, perforation, and obstruction, as well as malignancy, fluid and electrolyte disturbances, and delayed presentation, all of which can complicate the clinical picture.

The current study was conducted to characterize abdominal wound dehiscence following an open abdominal operation in a tertiary care hospital with respect to its incidence, demographic and clinical profile, peri-operative features, microbiological features, management, hospital stay, and clinical outcome.

2. Aim and Objectives

The aim of the study was to determine the incidence and clinical risk profile of abdominal wound dehiscence following open abdominal surgery and to describe the outcomes of affected patients.

1. To determine the frequency of abdominal wound dehiscence after open abdominal surgery.
2. To describe the sociodemographic and clinical characteristics of patients who developed wound dehiscence.
3. To evaluate commonly observed preoperative, operative, and postoperative factors in affected patients.
4. To assess the timing, microbiological profile, management, hospital stay, recovery, and mortality associated with abdominal wound dehiscence.

3. Materials and Methods

3.1 Study Design and Setting

This was a prospective, observational clinical study conducted in the Departments of General Surgery, Surgical Oncology, and Surgical Gastroenterology at Geetanjali Medical College and Hospital, Udaipur, Rajasthan. The study was carried out over an 18-month period from November 2018 to May 2020, with follow-up as defined in the original protocol.

3.2 Study Population

Consecutive adult patients who developed abdominal wound dehiscence following open abdominal surgery were enrolled. Eligible patients were older than 18 years and had provided written informed consent. Patients who had undergone minimally invasive surgery, urological surgery, gynaecological surgery, thoraco-abdominal surgery, or previous open abdominal surgery, were excluded.

3.3 Clinical Evaluation and Data Collection

Patients were prospectively evaluated from admission until hospital discharge. The following variables were considered: age, sex, place of residence, socioeconomic level, personal hygiene, smoking, alcohol ingestion, presence of anemia, malnutrition, obesity, diabetes, hypertension, underlying malignancy, pulmonary disease, renal failure, jaundice, intra-abdominal infection or coexistent disease, type of operation, incision, length of operation, intra-abdominal pathology, operative procedure, wound class, post-operative complications, the day on which dehiscence was detected, wound discharge, microbiological results, type of dehiscence, management performed, length of hospital stay and outcome.

Laboratory investigations comprised complete hemogram, random blood glucose, renal and liver function tests, coagulation profile and appropriate viral screening. Radiological examinations were performed as and when required. Histopathological evaluation of resection or biopsy specimens and pus culture and sensitivity tests were carried out if indicated.

3.4 Sample Size and Statistical Analysis

The original study had estimated a minimum sample size of 83 patients with abdominal wound dehiscence based on a 95% confidence level, 80% power, 10% margin of error, and 12% incidence in the Indian population. Overall, 88 patients with AWD were included in the final analysis. The statistical analysis was descriptive and included mean, standard deviation, ratios, proportions, and percentages. Due to the lack of detailed comparator patient data for most variables, the current article describes the risk profiles among the AWD cases rather than independent risk estimates.

4. Results

4.1 Incidence and Demographic Profile

During the study period, 762 open abdominal surgeries were performed. Abdominal wound dehiscence developed in 88 patients, giving an incidence of 11.54%. The mean age of affected patients was 50.02 ± 14.52 years, ranging from 20 to 81 years. Most patients were aged between 41 and 70 years old. Among the AWD patients, 70.46% were male and 29.54% were female. Thus, the male-to-female ratio was 2.4:1. Also, most patients came from rural regions (65.90%), and 75% of them were from low socioeconomic households with poor personal hygiene.

Table 1. Demographic and preoperative clinical profile of patients with abdominal wound dehiscence (n = 88)

Characteristic	n	%
Male sex	62	70.46
Female sex	26	29.54
Rural residence	58	65.90
Low socioeconomic status / poor hygiene	66	75.00
Smoking	44	50.00
Alcohol consumption	30	34.09
Diabetes mellitus	28	31.82
Hypertension	27	30.68
Malignancy	27	30.68
Anemia	22	25.00
Intra-abdominal infection	21	23.86
Malnutrition	17	19.32
Jaundice	14	15.90
Pulmonary disease	13	14.77
Renal failure	12	13.64
Obesity	10	11.36
Cardiovascular disease	8	9.09

4.2 Nutritional and Biochemical Profile

Normal BMI was observed in 56.82% of the patients, with 50% presenting hypoproteinemia and 40.91% being diagnosed with hypoalbuminemia. Additionally, 36.36% of the patients had hypokalemia and 36.36% had hyponatremia. Anemia with hemoglobin levels below 10 g/dL was present in 25% of the patients, while 15.91% had hyperbilirubinemia. Furthermore, 19.32% were underweight, 14.77% were overweight, 9.09% were obese, and 13.64% had uremia. It can be concluded that nutritional, hematological, and biochemical disorders were prevalent among patients who developed AWD.

Table 2. Biochemical abnormalities and operative characteristics

Variable	n	%
Hypoproteinemia	44	50.00
Hypoalbuminemia	36	40.91
Hypokalemia	32	36.36
Hyponatremia	32	36.36
Anemia (Hb <10 g/dL)	22	25.00
Hyperbilirubinemia	14	15.91
Uremia	12	13.64
Emergency surgery	54	61.36
Elective surgery	34	38.64
Midline incision	71	80.68
Operation >2 hours	50	56.82

4.3 Intra-Abdominal Pathology and Operative Procedures

Malignancy was the most frequent intra-abdominal pathology diagnosed (30.68%), which was followed by intestinal perforation (23.86%), intestinal obstruction (21.60%), acute appendicitis (9.09%), and appendicular perforation (5.68%). Intestinal tuberculosis, pancreatic pseudocyst, abdominal trauma, choledocholithiasis, and intussusception were less commonly diagnosed pathologies. Resection and anastomosis with or without stoma formation was performed in

26.14% of cases, perforation repair in 22.73%, appendicectomy in 14.77%, colorectal procedures in 12.50%, adhesiolysis in 9.09%, stoma formation in 6.82%, cholecystectomy in 4.55%, and hemicolectomy in 3.40%.

4.4 Postoperative Risk Profile, Wound Class, and Timing

Thus, out of 88 patients, 80 (90.90%) had wound infection, which was the most common postoperative complication. Moreover, 60.23% of patients experienced respiratory complications, while 46.59% of patients required mechanical ventilation. In addition, 39.77% of surgical wounds were classified as dirty, 30.68% of wounds were contaminated, 21.6% of surgical wounds were clean-contaminated, and 7.95% of surgical wounds were classified as clean. The most common postoperative day (POD) for AWD diagnosis was the sixth day after surgery in 31.82% of patients, followed by the fifth POD and seventh POD that accounted for 18.18% and 13.64% of patients, respectively. In terms of postoperative wound discharge, 45.45% of patients presented with purulent wound discharge, 37.5% of patients had serous drainage, and 17.05% of patients suffered hemorrhagic discharge.

4.5 Microbiological Profile

Staphylococcus aureus was the most commonly detected microorganism, present in 43.18% of the patients. The next most common organisms were Escherichia coli (13.64%), Klebsiella aerogenes (6.82%), and Enterococcus bacilli (2.27%). At the same time, 34.09% of patients had no bacterial growth detected.

4.6 Type of Dehiscence, Management, Hospital Stay, and Outcome

Partial wound dehiscence occurred in 73 patients (82.95%). Of these patients, 42 were treated conservatively with regular dressing changes and allowed to heal by secondary intention, while 31 patients were subjected to secondary suture. Complete dehiscence developed in 15 patients (17.05%), and these patients were treated with tension suturing. The average hospital stay was 11.45 days, with a reported range of 3 to 32 days. Eighty-five patients (96.60%) recovered and were discharged, whereas three patients (3.40%) died. The deaths were associated with septicemia and cardiovascular or pulmonary postoperative complications.

Table 3. Key postoperative findings and clinical outcomes

Finding	n	%
Wound infection	80	90.90
Respiratory complications	53	60.23
Mechanical ventilation	41	46.59
Dirty wound (Class IV)	35	39.77
Contaminated wound (Class III)	27	30.68
Peak detection on postoperative day 6	28	31.82
Purulent discharge	40	45.45
Staphylococcus aureus isolated	38	43.18
Partial dehiscence	73	82.95
Complete dehiscence	15	17.05
Recovered / discharged	85	96.60
Death	3	3.40

5. Discussion

The current study shows that abdominal wound dehiscence remains an important complication after open abdominal surgery at a tertiary care hospital. Its incidence rate of 11.54% is higher than that in most of the western series, but it comes into the range of several reports conducted in low-and middle-income countries and Indian literature. This might be due to the higher rates of emergency surgeries, contaminated/dirty wounds, late presentations, nutritional inadequacies, and complicated abdominal pathology in the referrals in tertiary care facilities.

Male patients accounted for more than two-thirds of the AWD cohort, and the mean age at presentation was nearly 50 years. The same trends were reported in the previous studies. Aging is associated with increased burden of comorbidities, deregulated immune responses, and impaired tissue repair. The possible explanation for the predominance of males includes the higher prevalence of smokers in the study population and higher incidence of some emergency abdominal conditions among males.

The identified pattern indicated that 65.90% of the patients were from rural areas, and 75% of them were from low socioeconomic status with poor personal hygiene. Low socioeconomic status may be associated with malnourishment, delay in seeking treatment, little access to early treatment, poor general health condition on admission, and severity of

illness at referral. Therefore, these factors should be considered as part of the clinical picture, not as independent risk factors.

Smoking was the most frequent preoperative behavior reported by patients, being present in half of the cases. Smoking may lead to decreased tissue oxygenation and blood circulation and impaired collagen deposition and immune response. Alcohol consumption was also prevalent among the patients. Moreover, diabetes was present in almost a third of the patients, which may result in poor wound healing due to microvascular dysfunction, hyperglycemia, and altered host defense. Anemia and malnutrition are additional factors that may interfere with oxygen transport and collagen synthesis.

Nutritional abnormalities were prominent and half of the patients had hypoproteinemia and 40.91% had hypoalbuminemia. Protein-calorie malnutrition may decrease wound tensile strength, cellular immunity, phagocytic function, and collagen formation. Although the study design does not permit independent calculation of relative risk, the frequency of these abnormalities among AWD cases supports the need for careful preoperative nutritional assessment and correction if clinically feasible.

Emergency surgery preceded 61.36% of cases. Emergency procedures may limit the time available for correction of anemia, malnutrition, electrolyte abnormalities, hyperglycemia and respiratory disease. They are also more commonly associated with perforation, peritonitis, obstruction, contamination or systemic sepsis. More than half of the operations lasted over two hours, which may indicate more complex surgical procedures and longer exposure of tissues to contamination.

Midline incisions were used in 80.68% of cases. This observation should be regarded with caution, as the denominator of all patients undergoing individual types of incisions was not provided. Midline laparotomy is a common approach for many emergency abdominal surgeries that allows rapid access to the abdominal cavity, and its prevalence among AWD cases may partly be explained by the preference for this type of intervention.

Malignancy, intestinal perforation, and intestinal obstruction were the leading underlying pathologies. In association with advanced disease, impaired nutrition, contamination, and emergency surgery, resection and anastomosis, and perforation repair were therefore among the most commonly represented procedures. Intestinal spillage and peritoneal contamination may increase the bacterial burden and consequently post-surgical infection.

The most common postoperative complication found in the study results was wound infection, present in 90.90%. Infection can lead to the development of edema, local ischemia, enzymatic destruction, sloughing, and loss of suture-holding capacity contributing to the separation of the abdominal wall. The high frequency of dirty or contaminated wounds is consistent with the importance of bacterial burden and infection in wound dehiscence.

Respiratory complications were also common, as persistent cough and respiratory distress increase intra-abdominal pressure and place repetitive mechanical stress on the abdominal closure, while hypoxia may impair collagen synthesis and tissue repair. Almost half of the patients required mechanical ventilation, suggesting significant post-operative systemic illness.

The sixth postoperative day was the most common time for dehiscence to be detected. This finding may be related to the incision being relatively weak during the first week after surgery. Purulent discharge was the most common wound discharge and patients with multiple risk factors should be examined more closely for wound dehiscence.

Staphylococcus aureus was the most prevalent microorganism, followed by *Escherichia coli*. This observation may indicate the involvement of skin flora, as well as the enteric microorganisms. About one-third of cultures did not yield any growth, which could be explained by the antimicrobial treatment, timing of specimen collection, or other factors that were not identified in the study.

Most cases were partial dehiscence, which could be managed by conservative wound therapy or secondary suture. Complete dehiscence occurred in 17.05% and required tension suturing. Despite significant postoperative complications, 96.60% recovered and were discharged. A 3.40% mortality rate was associated with severe postoperative systemic complications. Thus, the overall clinical outcome was positive, with a 96.60% recovery rate.

6. Clinical Implications

Patients undergoing open abdominal surgery should be assessed for potentially correctable risk factors, such as dehydration, electrolyte disorders, anemia, hyperglycemia, malnutrition, pulmonary disease, and infection, and these conditions should be optimized if possible before surgery.

In addition, proper handling of tissues, good repair of the fascia, appropriate antibiotic use, aseptic technique, and a decrease in the risk of additional tissue damage and contamination are intraoperatively important considerations. Patients with perforation, peritonitis, malignancy, dirty wounds, or long procedures need enhanced postoperative

monitoring.

Postoperatively there is a need to focus on the prevention and management of surgical site infection, control of glucose levels, nutritional support, respiratory function and cough, and inspection of the incision. Serous or purulent drainage from the incision within the first postoperative week should alert the clinician to the possibility of underlying wound dehiscence.

7. Limitations

This was a single-center observational study, and thus reflects the case mix and practice environment of one tertiary care institution.

Detailed exposure data for the 674 patients who did not develop AWD was not available for most variables. Therefore, odds ratios, relative risks and independent predictors could not be calculated, and the frequencies presented here should be considered in the context of a clinical risk profile for cases of AWD.

The original analysis was descriptive and did not include adjustment for multiple variables. A future multicenter prospective cohort study that includes both AWD and non-AWD patients would be valuable for the development and validation of locally relevant risk prediction models.

8. Conclusion

The incidence of abdominal wound dehiscence following an open abdominal surgical procedure was 11.54% in a tertiary care setting. The majority of the patients who experienced this post-surgical complication presented with several adverse host- and perioperative-related factors, such as smoking, diabetes mellitus, anemia, nutritional irregularities, emergency operations, prolonged operation times, contaminated/dirty wounds, and post-operative respiratory complications. Moreover, wound infection was the most frequent post-operative complication, occurring in 90.90% of the cases. The most frequent time-point for dehiscence was found on the sixth post-operative day, and the majority of the cases were classified as partial dehiscence managed with conservative therapy or secondary suture, while complete dehiscence necessitated tension suturing. In total, 96.60% of the patients with post-surgical abdominal wound dehiscence recovered, whereas 3.40% died. In general, the obtained results stress the importance of preventing post-surgical abdominal wound dehiscence by optimizing patient-related factors before surgery, correcting nutritional and metabolic irregularities before and during the surgery, minimizing tissue trauma by using proper techniques, reducing the risk of infection, managing respiratory complications, and post-operative surveillance of the incision site during the first post-operative week.

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