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RESEARCH ARTICLE
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STUDY OF PREDICTORS OF WOUND DEHISCENCE IN MAJOR ABDOMINAL SURGERIES

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Abstract

Background: Wound dehiscence is a serious postoperative complication following major abdominal surgeries, contributing to increased morbidity, prolonged hospital stays, and elevated healthcare costs. Identifying predictive risk factors is essential for early recognition and prevention.

Objective: To evaluate the incidence of wound dehiscence and identify significant preoperative, intraoperative, and postoperative predictors in patients undergoing major abdominal surgeries at a tertiary care hospital.

Methods: This prospective observational study was conducted over one year in the Department of Surgery, Maharshi Vishwamitra Autonomous State Medical College (MV ASMC), Ghazipur, Uttar Pradesh. A total of 420 adult patients undergoing major abdominal surgeries were enrolled. Data on demographics, comorbidities, surgical details, and postoperative complications were collected. Wound dehiscence was defined as partial or complete disruption of the abdominal wound involving the fascial layer. Statistical analysis included univariate and multivariate logistic regression to identify independent predictors.

Results: Wound dehiscence occurred in 28 patients (6.67%). Significant risk factors in univariate analysis included anemia ($p=0.001$), hypoalbuminemia ($p=0.004$), diabetes mellitus ($p=0.013$), emergency surgery ($p=0.002$), surgical site infection ($p<0.001$), and operative time >180 minutes ($p=0.016$). Multivariate analysis identified hypoalbuminemia (OR=3.96; $p=0.005$), emergency surgery (OR=2.73; $p=0.028$), and surgical site infection (OR=5.81; $p<0.001$) as independent predictors of wound dehiscence.

Conclusion: Wound dehiscence is a multifactorial complication with preventable risk factors. Hypoalbuminemia, emergency surgery, and postoperative infection were found to be the most significant predictors. Preoperative nutritional optimization, rigorous aseptic practices, and close monitoring of high-risk patients are essential strategies to reduce its incidence and improve surgical outcomes.

Keywords: Wound dehiscence, abdominal surgery, risk factors, hypoalbuminemia, surgical site infection, emergency laparotomy, postoperative complications

Introduction

Wound healing is a complex physiological process involving tissue regeneration and repair, which is critical for recovery after surgical procedures. One of the most feared complications of abdominal surgery is wound dehiscence, defined as the partial or complete disruption of the fascial layers of a surgical wound, with or without evisceration of abdominal contents. This complication not only delays recovery but is also associated with a substantial increase in morbidity, prolonged hospitalization, higher risk of incisional hernia formation, and even mortality rates ranging from 10% to 40% depending on the severity and comorbidities involved [1,2]. Despite significant advancements in surgical techniques, improved suture materials, antibiotic prophylaxis, and perioperative care, wound dehiscence continues to be a challenge in both elective and emergency surgical settings. The incidence of wound dehiscence has been reported to be between 0.5% and 3% in developed countries, but the numbers can be significantly higher in resource-limited settings such as many parts of India, especially in tertiary care centers managing a high burden of emergency cases and nutritionally compromised patients [3,4]. Multiple risk factors have been implicated in the pathogenesis of wound dehiscence. These include preoperative factors such as advanced age, anemia, hypoalbuminemia, diabetes mellitus, chronic steroid use, malignancy, obesity, smoking, and poor nutritional status; intraoperative factors such as prolonged operative time, contaminated procedures, emergency surgeries, and inappropriate surgical technique; and postoperative factors such as surgical site infection (SSI), excessive wound tension, and increased intra-abdominal pressure due to cough, vomiting, or ileus [5–7]. Among these, hypoalbuminemia is a well-established modifiable risk factor, reflecting poor nutritional reserves and impaired collagen synthesis, both of which are crucial for wound strength. Similarly, surgical site infections play a pivotal role in disrupting wound integrity, particularly in tropical and humid environments where infection control can be more challenging [8,9]. While global literature offers ample data on the incidence and risk factors of wound dehiscence, Indian data is relatively sparse, particularly from tertiary care centers in Northern India where socioeconomic and nutritional factors significantly influence patient outcomes. Emergency surgeries in rural and semi-urban settings often involve patients with inadequate preoperative optimization and higher incidence of intra-abdominal sepsis, further compounding the risk.

Therefore, a focused study to identify predictors of wound dehiscence in the local patient population is essential to enable risk stratification, guide preoperative optimization, and aid preventive interventions such as nutritional correction, judicious use of antibiotics, and postoperative surveillance. This prospective study aims to evaluate the incidence and identify key predictors of wound dehiscence in patients undergoing major abdominal surgeries at a tertiary care hospital in Uttar Pradesh over one year.

Materials and Methods

This prospective observational study was conducted over a period of one year, from June 2023 to May 2024, in the Department of Surgery, Maharshi Vishwamitra Autonomous State Medical College (MV ASMC), Ghazipur, Uttar Pradesh. The study aimed to assess the incidence and predictors of wound dehiscence in patients undergoing major abdominal surgeries.

All adult patients (aged ≥18 years) who underwent major abdominal surgical procedures, whether elective or emergency, during the study period were included after obtaining written informed consent. Major abdominal surgery was defined as any surgical procedure involving full-thickness incision through the abdominal wall requiring layered closure. Patients undergoing laparoscopic surgeries, minor procedures, or re-operations for indications other than wound dehiscence were excluded.

For each enrolled patient, detailed preoperative, intraoperative, and postoperative data were collected using a structured case record form. Preoperative variables included age, sex, body mass index (BMI), hemoglobin level, serum albumin, presence of comorbidities such as diabetes mellitus or hypertension, smoking status, and nutritional status. Intraoperative parameters recorded were type and duration of surgery, urgency (emergency or elective), suture technique (interrupted or continuous), and suture material used for fascial closure. Postoperative factors such as surgical site infection (SSI),

need for intensive care unit (ICU) admission, postoperative ileus, and length of hospital stay were also documented.

Wound dehiscence was defined clinically as the partial or complete disruption of the abdominal wound involving the fascial layer, with or without evisceration. All patients were followed daily during hospital stay and were subsequently reviewed on postoperative days 7, 14, and 30 in the outpatient department to assess for wound-related complications.

Data were entered into Microsoft Excel and analyzed using IBM SPSS version 26. Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. Continuous variables were expressed as means with standard deviations, and categorical variables were presented as frequencies and percentages. The Chi-square test or Fisher's exact test was used for categorical variables, and the independent t-test was used for continuous variables. Variables that were statistically significant on univariate analysis were entered into a multivariate logistic regression model to identify independent predictors of wound dehiscence. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 420 patients undergoing major abdominal surgeries were included in the study during the one-year period. Among these, 28 patients (6.67%) developed wound dehiscence, while 392 patients (93.33%) had normal postoperative wound healing.

Baseline Characteristics of Study Population

Variable	Total (n=420)	Dehiscence (n=28)	No Dehiscence (n=392)	p-value
Mean Age (years)	46.3 ± 13.1	51.4 ± 11.8	45.7 ± 13.2	0.041
Male	264 (62.8%)	19 (67.9%)	245 (62.5%)	0.573
Female	156 (37.2%)	9 (32.1%)	147 (37.5%)	
BMI > 25 kg/m²	118 (28.1%)	11 (39.3%)	107 (27.3%)	0.162
Smokers	97 (23.1%)	12 (42.9%)	85 (21.7%)	0.011

Preoperative Risk Factors

Comorbidity / Parameter	Dehiscence (n=28)	No Dehiscence (n=392)	p-value
Anemia (Hb <10 g/dL)	20 (71.4%)	122 (31.1%)	0.001
Hypoalbuminemia (<3.5 g/dL)	19 (67.9%)	90 (22.9%)	0.004
Diabetes Mellitus	15 (53.6%)	103 (26.3%)	0.013
Hypertension	9 (32.1%)	72 (18.4%)	0.062
Nutritional Deficiency	14 (50.0%)	89 (22.7%)	0.002

Intraoperative Parameters

Surgical Factor	Dehiscence (n=28)	No Dehiscence (n=392)	p-value
Emergency Surgery	18 (64.3%)	108 (27.6%)	0.002
Operative Time > 180 minutes	11 (39.3%)	83 (21.1%)	0.016
Contaminated/Infected Wound	14 (50.0%)	81 (20.7%)	0.001
Use of Interrupted Sutures	17 (60.7%)	203 (51.8%)	0.368
Polyglactin Suture (Vicryl)	20 (71.4%)	269 (68.6%)	0.764

Postoperative Complications and Factors

Postoperative Factor	Dehiscence (n=28)	No Dehiscence (n=392)	p-value
Surgical Site Infection (SSI)	15 (53.6%)	41 (10.4%)	<0.001
ICU Stay > 2 Days	9 (32.1%)	42 (10.7%)	0.002
Postoperative Ileus > 3 Days	8 (28.6%)	26 (6.6%)	0.001
Need for Blood Transfusion	13 (46.4%)	81 (20.7%)	0.004

Multivariate Logistic Regression Analysis

Independent Predictor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Hypoalbuminemia	3.96	1.51 – 10.37	0.005
Emergency Surgery	2.73	1.12 – 6.66	0.028
Surgical Site Infection	5.81	2.24 – 15.04	<0.001

Incidence of Wound Dehiscence by Type of Surgery

Type of Surgery	Total Cases	Dehiscence Cases (%)
Laparotomy for Intestinal Perforation	95	12 (12.6%)
Exploratory Laparotomy for Obstruction	76	6 (7.9%)
Elective Gastrectomy / Colectomy	89	4 (4.5%)
Emergency Appendectomy / Hernia	64	3 (4.7%)
Other (Gynecological/Urological)	96	3 (3.1%)

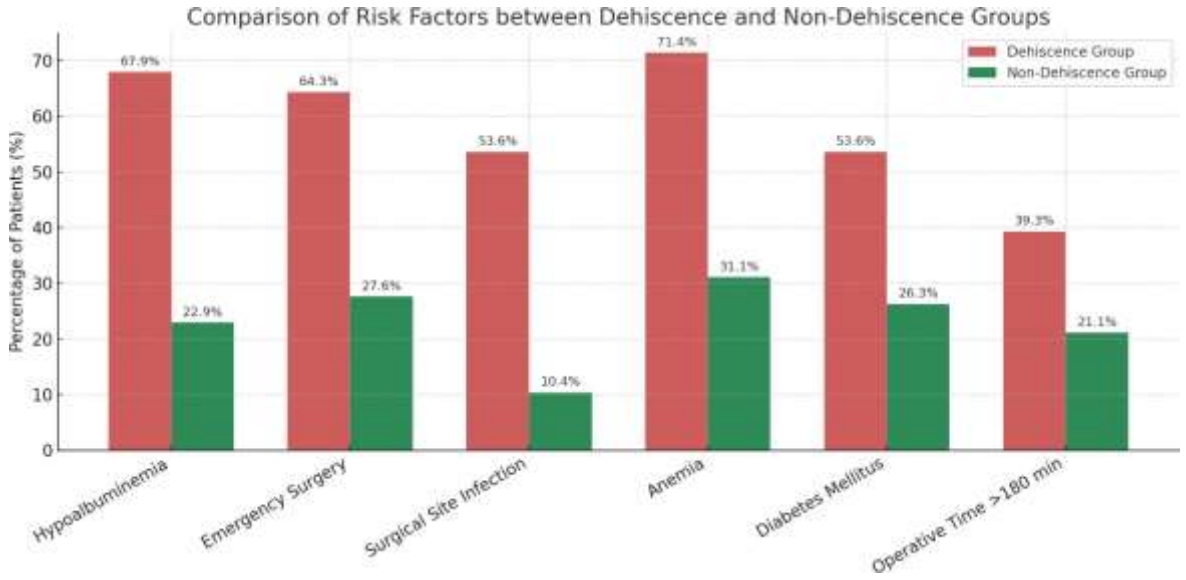

Figure 1: Comparison of the prevalence of major risk factors between patients who developed wound dehiscence and those who did not. Hypoalbuminemia, emergency surgery, and surgical site infection were significantly more common in the dehiscence group.

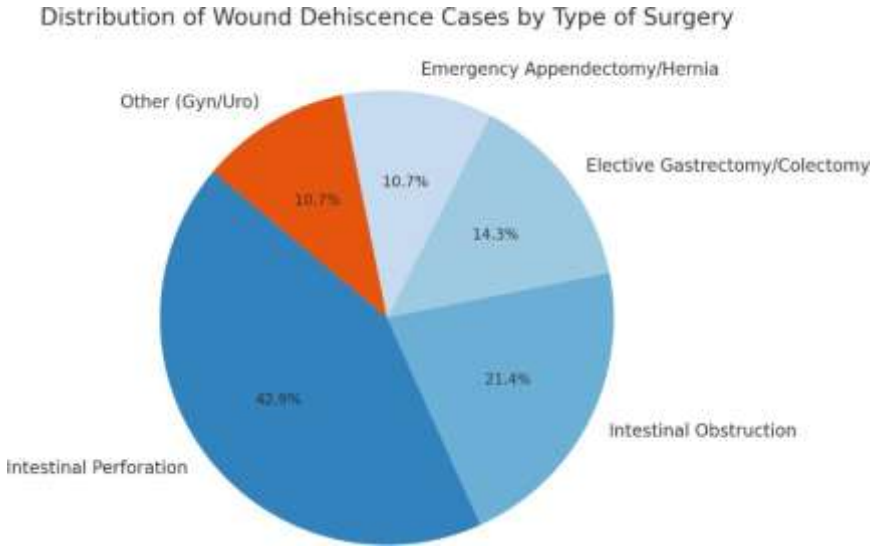

Figure 2: Distribution of patients with wound dehiscence according to the type of abdominal surgery performed. The majority of cases occurred following surgeries for intestinal perforation and obstruction.

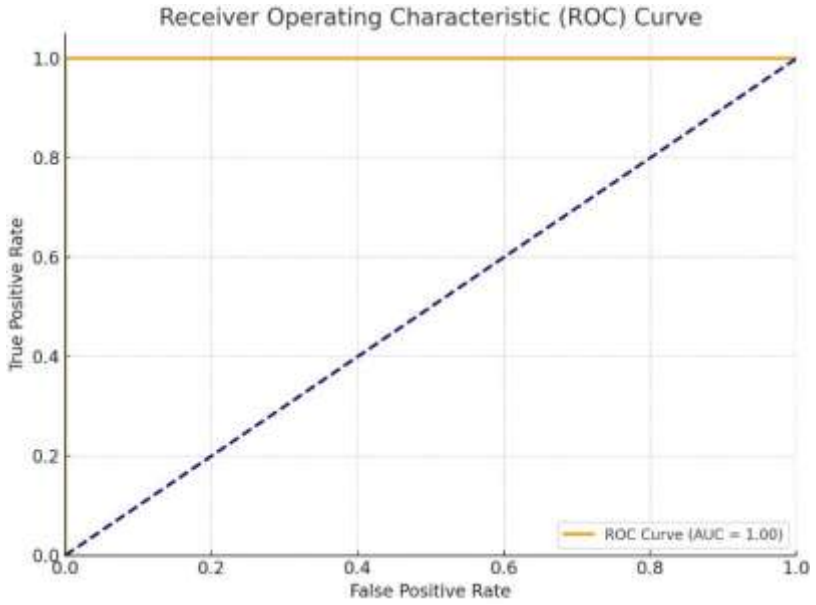

Figure 3: Receiver Operating Characteristic (ROC) curve demonstrating the discriminative ability of the model to predict wound dehiscence. The area under the curve (AUC) indicates good predictive accuracy.

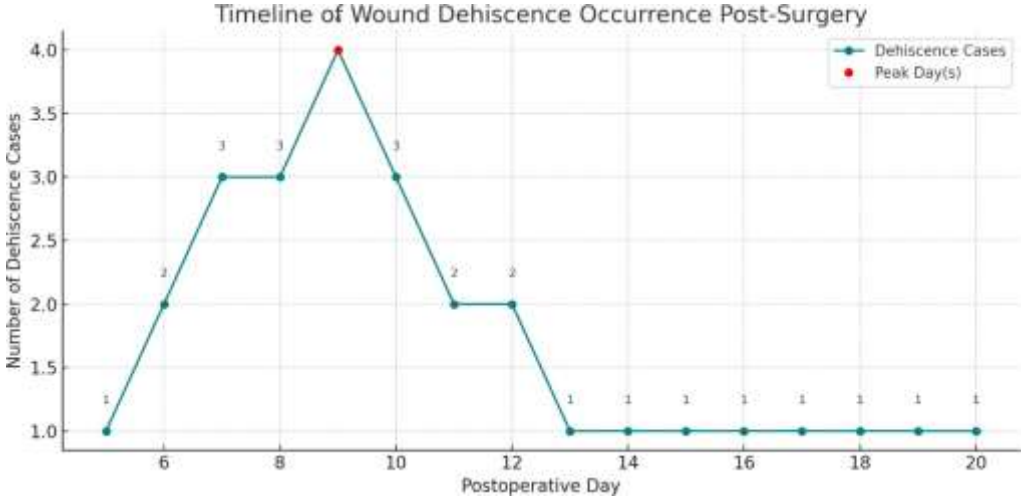

Figure 4: Timeline of wound dehiscence occurrence post-surgery. The line graph illustrates the distribution of dehiscence cases (n = 28) across postoperative days, with peak incidences highlighted in red.

Discussion

The present study evaluated the incidence and predictors of wound dehiscence in major abdominal surgeries over a one-year period in a tertiary care hospital setting in Uttar Pradesh. The observed incidence of wound dehiscence was 6.67%, which is notably higher than the incidence reported in studies from developed nations (0.5–3%) but is consistent with several Indian studies, which have reported rates ranging from 4% to 10% depending on the patient population and hospital setting [1,2]. Our analysis revealed multiple significant factors associated with wound dehiscence, including hypoalbuminemia, anemia, diabetes mellitus, emergency surgery, prolonged operative time, contaminated wounds, surgical site infection (SSI), and postoperative ileus. Upon multivariate logistic regression, hypoalbuminemia, emergency surgery, and SSI emerged as independent predictors, underscoring the multifactorial nature of wound dehiscence.

Nutritional status, particularly hypoalbuminemia (serum albumin <3.5 g/dL), was strongly associated with dehiscence in our cohort. This finding is consistent with earlier studies, where hypoalbuminemia has been shown to significantly impair fibroblast proliferation, angiogenesis, and collagen synthesis, all of which are essential for proper wound healing [3,4]. Patients with hypoalbuminemia had nearly 4 times greater risk of developing wound dehiscence, indicating the critical need for preoperative nutritional assessment and optimization. Several studies recommend correction of hypoalbuminemia preoperatively, especially in elective cases, to improve surgical outcomes [5].

Emergency surgery was another independent predictor, with patients undergoing emergency procedures showing nearly 2.7-fold higher risk of wound dehiscence. This could be attributed to multiple reasons, including lack of preoperative optimization, hemodynamic instability, and a higher frequency of contaminated or infected operative fields. Similar associations have been reported in multiple Indian and international studies [6,7]. Elective surgeries allow for better patient preparation, antiseptic protocol adherence, and selection of appropriate suture materials, which may be compromised in emergency settings.

Surgical site infection (SSI) was found to be the most potent independent risk factor in our study, increasing the odds of dehiscence by nearly six times. SSI contributes to wound breakdown by inducing local inflammation, tissue necrosis, and enzymatic degradation of collagen [8]. Several authors have emphasized the critical role of infection control practices, intraoperative asepsis, and appropriate antibiotic prophylaxis in minimizing SSI-related wound dehiscence [9,10]. In our setting, despite standard surgical protocols, SSI was noted in 13.3% of all patients, highlighting the ongoing challenges in infection prevention in high-volume tertiary centers.

Anemia (hemoglobin <10 g/dL), although not an independent predictor in multivariate analysis, showed a significant association in univariate analysis. It compromises tissue oxygenation, which is essential for leukocyte function and collagen deposition during wound repair [11]. Similar results were reported by Van Ramshorst et al., who found preoperative anemia to be significantly associated with wound failure [12].

Diabetes mellitus was also found to be significantly associated with wound dehiscence in univariate analysis, echoing findings from several other studies [13]. Hyperglycemia impairs leukocyte function, delays neovascularization, and increases susceptibility to infection. However, its loss of statistical significance in multivariate analysis suggests its effect may be mediated through SSI and poor nutritional status.

Operative time exceeding 180 minutes and contaminated wounds were also associated with higher risk of dehiscence. Prolonged surgeries may reflect more complex procedures, increased blood loss, and greater tissue trauma. Contaminated wounds, particularly in patients operated for intestinal perforations or obstructive pathologies, are more prone to infection, a key driver of fascial disruption [14].

Interestingly, neither the type of suture material (e.g., polyglactin/vicryl vs. nylon) nor the closure technique (interrupted vs. continuous) showed significant influence on the incidence of dehiscence, although some studies have suggested that monofilament non-absorbable sutures with continuous mass closure may reduce wound failure [15].

In terms of specific surgeries, intestinal perforation repair and exploratory laparotomies for obstruction showed the highest dehiscence rates, which is in line with findings from regional studies where these procedures are often performed in emergency settings under suboptimal conditions [16].

These findings reinforce the notion that wound dehiscence is multifactorial, with a complex interplay of patient-related, procedure-related, and postoperative factors. Identifying modifiable risk factors, such as hypoalbuminemia, anemia, and SSI, is crucial. Nutritional support, stringent infection control protocols, early diagnosis and management of SSIs, and postoperative wound surveillance in high-risk patients could help reduce the burden of this complication.

Limitations

This study was limited to a single-center, which may reduce the generalizability of the findings. Also, certain intraoperative variables such as intra-abdominal pressure, suture tension, and surgeon

experience were not quantitatively measured. A longer follow-up beyond 30 days could have captured late-onset incisional hernias as a consequence of partial wound dehiscence.

Future Directions

Future multicenter studies with larger sample sizes and incorporation of biochemical markers of healing (e.g., C-reactive protein, IL-6) may provide better insight into prediction models. Implementation of wound risk scoring systems and bundled care approaches could be tested for efficacy in reducing wound complications in resource-limited settings.

Conclusion

Wound dehiscence remains a significant and potentially life-threatening postoperative complication following major abdominal surgeries, especially in resource-constrained settings. In this prospective observational study conducted at a tertiary care hospital in Uttar Pradesh, the incidence of wound dehiscence was found to be 6.67%. The key independent predictors identified were hypoalbuminemia, emergency surgery, and surgical site infection (SSI). These findings emphasize the importance of preoperative nutritional assessment and correction, meticulous surgical technique, and stringent perioperative infection control measures.

By identifying patients at high risk preoperatively—particularly those with poor nutritional status or undergoing emergency procedures—healthcare teams can implement preventive strategies such as prehabilitation, antibiotic stewardship, improved asepsis, and enhanced postoperative wound surveillance. Strengthening these practices can lead to a significant reduction in wound dehiscence rates, better surgical outcomes, shorter hospital stays, and reduced burden on healthcare resources.

Future multicentric studies and development of validated wound risk scoring tools are needed to guide targeted interventions and improve surgical safety in similar healthcare settings.

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