

Incidence and severity of surgical wound complications in diabetic vs non-diabetic patients

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Abstract

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Background: Surgical wound complications are a common cause of postoperative morbidity, with diabetes mellitus recognized as a key risk factor. **Objective:** This study aimed to compare the incidence and severity of surgical wound complications in diabetic versus non-diabetic patients. **Methods:** This comparative cross-sectional study was conducted at Shaikh Zayed Hospital, Lahore from January 2025 to June 2025. A total of 355 surgical patients were enrolled, including 178 diabetics and 177 non-diabetics. Data on patient demographics, type of surgery, wound complications, and glycemic control (HbA1c) were collected. Postoperative wound assessments were performed on Day 3, Day 7, and Day 14 using CDC criteria and the ASEPSIS scoring system. **Results:** Surgical wound complications were significantly more frequent in diabetic patients (36.5%) compared to non-diabetics (18.1%) ($p < 0.001$). Diabetics exhibited higher rates of deep surgical site infections (6.7% vs. 2.3%, $p = 0.02$), wound necrosis (3.4% vs. 0%, $p = 0.01$), and required more wound re-suturing or debridement (8.4% vs. 2.3%, $p = 0.01$). Moderate to severe complications (ASEPSIS score >20) were more common in the diabetic group (22.4% vs. 9.6%, $p < 0.01$). Patients with HbA1c $\geq 9\%$ had the highest complication rate (61.3%) among diabetics. Diabetic patients also had a longer mean hospital stay (9.2 ± 3.7 vs. 6.4 ± 2.9 days, p

< 0.001) and higher 30-day readmission rates (11.2% vs. 4.5%). **Conclusion:** It is concluded that diabetes mellitus significantly increases the risk and severity of surgical wound complications, particularly in patients with poor glycemic control. Preoperative optimization of blood glucose, individualized postoperative wound care, and extended follow-up are essential to improve surgical outcomes in this vulnerable group.

Introduction

Surgical wound complications represent a significant burden on healthcare systems globally, not only due to their direct clinical impact but also because of the associated financial implications and increased length of hospital stays [1]. Among the patient groups at highest risk associated with postoperative wound complications, patients with diabetes mellitus have persistently shown higher frequencies of unfavorable outcomes than patients without diabetes mellitus [2]. To a major extent, this difference can be explained by systemic and local physiologic changes related to persistent hyperglycemia that all contribute to the impairment of wound healing and immune reactions [3]. Diabetes mellitus is a worldwide community health issue and is currently observed to affect more than 537 million individuals globally, and the number is expected to skyrocket in the next few decades. The incidence of diabetes in surgical patients has also risen proportionately, and this necessitates clinicians to further comprehend and attend to its consequences regarding surgical outcome [4]. The disruption of the normal inflammatory responses mediated by poorly controlled glucose levels in blood, the decreased activity of the leukocyte, and impaired synthesis of collagen are critical processes involved in wound healing in adrenal disease. In addition, diabetes tends to be accompanied by microvascular disease, peripheral neuropathy, and an enhanced susceptibility, all of which will result in slow wound healing and a higher morbidity of surgical site complications [5]. Complications associated with a surgical wound can vary widely; they may only be minor, where there is a separation of the wound at the superficial level, or formation of seroma, to more serious complications that include a deep surgical site infection, dehiscence fascial tract, wound necrosis, or re-intervention surgery [6]. This, in addition to its hospital stays extending, could also require re-suturing, negative pressure wound therapy, use of antibiotics in general, and limb amputation in serious situations. Of special concern among diabetic patients is that they have an increased baseline risk of morbidity and mortality [7]. Various studies have tried to measure this correlation between diabetes and surgical wound complications. Nonetheless, estimated incidences are reported to be highly variable based on the surgical subspeciality, type of patient, and strategies of glycemic control during the perioperative period. Although research has revealed a strong relationship between diabetes and the augmented morbidity of wounds with patients undergoing orthopedic, cardiovascular, and abdominal surgeries, different studies have shown even lesser differences, thus indicating that other elements also contribute significantly, like obesity, nutrition status, and infection control procedures [8]. However, there is an agreement that diabetes is one of the independent risk factors to poor wound healing results [9]. In contrast, patients without diabetes have more formulaic and successful trajectories of wound recovery when other comorbidities do not occur. The tissue repair process and immune functioning are generally in good condition, and it is possible to eliminate the inflammation on time and regenerate the tissues quickly [10]. There is an urgent necessity for studies that compare the frequency and severity of operative wound complications in both diabetic and non-diabetic populations during

various surgical procedures in various healthcare facilities [11]. Knowledge of these differences has the added benefit of not only offering significant knowledge on the burden of surgical morbidity among diabetic patients but also guiding the provision of focused perioperative interventions. These could be stricter glycemic management guidelines, more frequent wound checks, proactive antibiotic measures, or application of add-on wound healing solutions to diabetic patients [12].

Objective

The present study aims to fill this gap by evaluating and comparing the incidence and severity of surgical wound complications in diabetic versus non-diabetic patients.

Methodology

This was a comparative cross-sectional study conducted at Shaikh Zayed Hospital, Lahore from January 2025 to June 2025. A total of 355 patients undergoing elective or emergency surgical procedures were included in the study. These patients were divided into two groups based on their diabetic status: 178 patients with diagnosed diabetes mellitus and 177 non-diabetic patients serving as the comparison group. A non-probability consecutive sampling technique was employed to recruit eligible patients.

Inclusion Criteria:

Adult patients (≥ 18 years of age) undergoing any major or minor surgical procedure
Patients willing to provide informed consent
Both diabetic (Type 1 or Type 2) and non-diabetic individuals

Exclusion Criteria:

Patients on chronic immunosuppressive therapy or corticosteroids
Individuals with autoimmune disorders, malignancies, or end-stage renal disease
Patients lost to follow-up or who refused postoperative wound evaluation

Data Collection

After obtaining informed consent, patient demographic information and clinical history were recorded, including age, sex, comorbidities, BMI, smoking status, type of surgery, and duration of surgery. Diabetic status was confirmed based on previous diagnosis and current medication history. Glycemic control was assessed using recent HbA1c values. Diabetic status was verified through documented medical history and current treatment regimen. Glycemic control was further evaluated using recent HbA1c levels, where available. Postoperative wound assessments were conducted on Day 3, Day 7, and Day 14, or until discharge, using a standardized wound evaluation checklist. Wound complications were recorded and categorized into superficial surgical site infections, deep infections, wound dehiscence, seroma or hematoma formation, and wound necrosis. The primary outcome of interest was the overall incidence of surgical wound complications in diabetic versus non-diabetic patients. It also included the severity of complications, based on standardized clinical criteria such as the CDC classification and ASEPSIS scoring system, and the need for additional interventions such as antibiotic therapy, wound debridement, or re-suturing.

Statistical Analysis

All data were compiled and analyzed using SPSS version 26.0. Categorical variables, such as the presence or absence of wound complications, were compared between groups using the Chi-square test. Continuous variables, including age and BMI, were

analyzed using independent sample t-tests. A p-value of less than 0.05 was considered statistically significant.

Results

Data were collected from 355 patients. The diabetic group had a higher mean age (58.3 ± 10.6 years) compared to the non-diabetic group (51.4 ± 12.2 years). The mean BMI was also higher in diabetics (29.8 ± 3.5 kg/m²) than non-diabetics (26.4 ± 2.9 kg/m²). Hypertension was present in 66.3% of diabetic patients (n = 118) versus 36.7% (n = 65) of non-diabetic patients. The overall wound complication rate was 36.5% (n = 65) in diabetics and 18.1% (n = 32) in non-diabetics. Superficial SSIs were noted in 15.7% (n = 28) of diabetics and 9.6% (n = 17) of non-diabetics; deep SSIs in 6.7% (n = 12) vs. 2.3% (n = 4); wound dehiscence in 7.9% (n = 14) vs. 4.0% (n = 7); wound necrosis in 3.4% (n = 6) vs. 0%; and seroma/hematoma in 2.8% (n = 5) vs. 2.3% (n = 4). General surgery was the most common procedure in both groups 41.6% (n = 74) in diabetics and 40.7% (n = 72) in non-diabetics. Orthopedic surgeries accounted for 20.2% (n = 36) and 19.2% (n = 34), urological surgeries 13.5% (n = 24) and 15.3% (n = 27), gynecological surgeries 11.2% (n = 20) and 10.2% (n = 18), and other procedures 13.5% (n = 24) and 14.7% (n = 26), respectively.

Table 1. Baseline Characteristics of Study Participants (n = 355)

Variable	Diabetic (n = 178)	Non-Diabetic (n = 177)
Age (Mean \pm SD)	58.3 \pm 10.6	51.4 \pm 12.2
Male Gender (%)	102 (57.3%)	94 (53.1%)
BMI (Mean \pm SD) (kg/m ²)	29.8 \pm 3.5	26.4 \pm 2.9
Hypertension (%)	118 (66.3%)	65 (36.7%)
Smokers (%)	47 (26.4%)	42 (23.7%)
Complication		
Any Complication (%)	65 (36.5%)	32 (18.1%)
Superficial SSI (%)	28 (15.7%)	17 (9.6%)
Deep SSI (%)	12 (6.7%)	4 (2.3%)
Wound Dehiscence (%)	14 (7.9%)	7 (4.0%)
Wound Necrosis (%)	6 (3.4%)	0 (0.0%)
Seroma/Hematoma (%)	5 (2.8%)	4 (2.3%)
Type of Surgery		
General Surgery (%)	74 (41.6%)	72 (40.7%)
Orthopedic Surgery (%)	36 (20.2%)	34 (19.2%)
Urological Surgery (%)	24 (13.5%)	27 (15.3%)
Gynecological Surgery (%)	20 (11.2%)	18 (10.2%)
Other Procedures (%)	24 (13.5%)	26 (14.7%)

Diabetic patients demonstrated significantly more severe wound complications, as indicated by higher ASEPSIS scores (>20 in 22.4% of diabetics vs. 9.6% of non-diabetics; p < 0.01). A greater proportion required wound re-suturing or debridement (8.4% vs. 2.3%), and prolonged antibiotic use beyond 7 days was more frequent in

diabetics (20.2% vs. 10.7%). The average hospital stay was longer in diabetic patients (9.2 ± 3.7 days) compared to non-diabetics (6.4 ± 2.9 days), with significantly more readmissions within 30 days post-surgery (11.2% vs. 4.5%).

Table 2. Severity and Clinical Outcomes of Wound Complications

Outcome	Diabetic (n = 178)	Non-Diabetic (n = 177)	p-value
ASEPSIS Score > 20 (Moderate/Severe) (%)	40 (22.4%)	17 (9.6%)	<0.01
Wound Re-suturing / Debridement (%)	15 (8.4%)	4 (2.3%)	0.01
Prolonged Antibiotic Use (>7 days) (%)	36 (20.2%)	19 (10.7%)	0.02
Mean Hospital Stay (days \pm SD)	9.2 ± 3.7	6.4 ± 2.9	<0.001
30-day Readmissions (%)	20 (11.2%)	8 (4.5%)	0.01

In diabetic patients, 29.2% of complications presented within 3 days, while 49.2% developed between days 4–7. The pattern was similar in non-diabetics, with 25.0% experiencing early complications and 56.2% in the 4–7 day range. Delayed complications (>7 days) were slightly more common in diabetics (21.5%) than non-diabetics (18.7%), though these differences were not statistically significant.

Table 3. Time of Onset of Wound Complications

Time of Onset Post-Surgery	Diabetic (n = 65 with complications)	Non-Diabetic (n = 32 with complications)	p-value
≤ 3 Days (%)	19 (29.2%)	8 (25.0%)	0.67
4–7 Days (%)	32 (49.2%)	18 (56.2%)	0.49
>7 Days (%)	14 (21.5%)	6 (18.7%)	0.73

Patients with HbA1c < 7% had the lowest complication rate (18.8%), whereas those with HbA1c between 7–8.9% had a complication rate of 37.1%. Notably, patients with HbA1c $\geq 9\%$ had a markedly higher complication rate of 61.3%, demonstrating a strong and statistically significant association between poor glycemic control and postoperative wound morbidity ($p < 0.001$).

Table 4. Glycemic Control and Complication Rate in Diabetics

HbA1c Level Category	No. of Patients (n)	Complications (n, %)	p-value
HbA1c < 7%	64	12 (18.8%)	Reference
HbA1c 7–8.9%	70	26 (37.1%)	0.01
HbA1c $\geq 9\%$	44	27 (61.3%)	<0.001

Discussion

This study highlights a significantly higher incidence and severity of surgical wound complications in diabetic patients compared to non-diabetic individuals. Among the total cohort of 355 patients, complications were observed in 36.5% of diabetic patients versus 18.1% in the non-diabetic group, a statistically significant difference. Such results are very much in line with the existing literature, according to which diabetes mellitus has been identified as an independent risk factor where wound healing is affected and there is a higher risk of postoperative infections. Superficial surgical site infections are the most widespread issue in both groups, but it was by far more evident in diabetics (15.7% vs. 9.6%) [13]. Diabetes was also disproportionately

higher in patients with more severe and collective outcomes, including deep SSI, surgical wound necrosis, and surgical re-intervention. This could be ascribed to the fact that diabetes has well-established pathophysiological mechanisms which undermine the healing of wounds, such as impaired leukocyte functioning, microvascular disease, and retardation of collagen remodelling [14]. Wound necrosis was only present in the diabetic group, and it is a testimony to the huge impact of uncontrolled diabetes on tissue functionality and circulation. The proportion of moderate-to-severe cases was greater in diabetics as per severity of complications, which was measured in the form of the ASEPSIS scoring system [15]. Also, antibiotic treatment and wound debridement were more intensive in patients with diabetes and may indicate that not only is the incidence of postoperative infection is more predisposed, but also the postoperative care is resource-consuming [16]. This resulted in longer mean hospitalization and increased 30-day readmission among the diabetic factors that constitute a substantial burden to the overall healthcare. Analysis of complications about time-to-onset revealed that the majority of wound complications surfaced between 0 and 7 days after surgery in both groups [17]. These results help to support the idea of the long-term monitoring of high-risk diabetic patients, even during the postoperative period (after hospital discharge). Interestingly, during subgroup analysis (among the diabetic cohort), the results were found to be strongly associated between poor glycemic control and the rate of complications [18]. This dose-response relationship emphasizes the importance of preoperative optimization of blood glucose levels and reinforces previous studies suggesting that strict perioperative glycemic control can significantly reduce postoperative complications [19]. The type of surgical procedure did not differ significantly between groups, ruling out procedural bias as a contributing factor [20,21]. The argument that the observed outcomes differences were primarily influenced by diabetic pathophysiological metabolic and vascular differences rather than surgical complexity or specialty is strengthened by these points [22,23]. The results of this study carry practical implications. First, they underscore the importance of rigorous preoperative screening and optimization of diabetic patients. Secondly, they advocate for tailored perioperative protocols, such as stricter glycemic control, prophylactic antibiotic adjustments, and perhaps delayed closure techniques or advanced wound dressings in high-risk patients. Finally, due to the tendency for complications to develop later, postoperative wound monitoring in diabetic patients must be extended beyond the typical early follow-up window. Despite these insights, this study is not without limitations. Being a single-center cross-sectional study, causal inferences are limited. The lack of randomization may introduce selection bias, and unmeasured confounding variables such as nutritional status, operative blood loss, or adherence to wound care protocols could have influenced outcomes. However, the strength of the analysis is enhanced by the inclusion of severity indices, a large sample size, and direct group comparisons.

Conclusion

It is concluded that diabetic patients are at a significantly higher risk of developing surgical wound complications compared to non-diabetic individuals. Not only is the overall incidence of wound-related issues greater in diabetic patients, but the severity of these complications is also markedly higher, often requiring additional medical or surgical interventions. The presence of poorly controlled diabetes, as indicated by elevated HbA1c levels, further amplifies this risk, demonstrating a clear relationship between glycemic status and adverse postoperative outcomes.

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