Evaluation of Postoperative Wound Infection in Diabetic Patients Undergoing Minor Surgery

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Abstract

Objective: To evaluate the incidence, risk factors, and clinical outcomes of postoperative wound infection (PWI) in diabetic patients undergoing minor surgical procedures.

Methods: A prospective observational study was conducted on 40 diabetic patients who underwent minor surgeries at the Department of Surgery, Rangpur Medical College and Hospital, from January 2019 to December 2019. Data collected included demographic characteristics, glycemic control (HbA1c), perioperative glucose levels, type and duration of surgery, and postoperative wound outcomes. PWI was defined according to CDC (Center for disease control and prevention) criteria, and patients were followed for at least 30 days postoperatively.

Results: PWI was observed in 6 patients (15%). Poor preoperative glycemic control (HbA1c >8%), perioperative hyperglycemia (>180 mg/dL), and longer operative duration (>1 hour) were significantly associated with infection ($p<0.05$). Two patients required wound drainage, and all infected wounds eventually healed without major complications**.**

Conclusion: Diabetic patients undergoing minor surgical procedures remain at substantial risk for postoperative wound infection. Careful preoperative glycemic optimization, strict intraoperative monitoring, and vigilant postoperative care are essential to minimize complications and ensure timely wound healing.

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Introduction

Postoperative wound infection (PWI) is a common surgical complication that increases patient morbidity, delays recovery, prolongs hospital stay, and adds to overall healthcare costs. Diabetic patients are particularly vulnerable due to impaired immune response and delayed wound healing.[1] Diabetes mellitus (DM) is a major risk factor for PWI due to impaired neutrophil function, reduced microvascular circulation, delayed collagen deposition, and overall compromised wound healing.[2,3] These factors make even minor surgical procedures—such as skin excisions, soft tissue interventions, or day-care surgeries—potentially high-risk for diabetic patients compared to non-diabetics.[1,4–6]

Previous studies have reported PWI incidence rates ranging from 8% to 15% among diabetic populations undergoing minor procedures.[7,8] Key determinants of infection include poor glycemic control, prolonged operative time, high body mass index (BMI), and perioperative hyperglycemia.[9–11] Identifying these risk factors is critical for perioperative planning, as early intervention can significantly improve wound outcomes and reduce postoperative morbidity.

The present study aimed to assess the incidence, risk factors, and postoperative outcomes of wound infections in diabetic patients undergoing minor surgery in our tertiary care setting.

Methods

Study Population: Forty consecutive diabetic patients who underwent minor surgical procedures at the Department of Surgery, Rangpur Medical College and Hospital, from January 2019 to December 2019.

Inclusion Criteria:

- Type 2 DM
- Minor surgery (<2 h, clean or clean-contaminated)
- Age ≥18 years
- Follow-up ≥30 days

Exclusion Criteria:

- Major or emergency surgery
- Uncontrolled DM (HbA1c >12%)
- Immunosuppression
- Active infection at time of surgery

*Data Collected***:** Demographics, BMI, DM duration, complications, HbA1c, perioperative glucose, type and duration of surgery, antibiotic prophylaxis.

Outcome Measures: PWI incidence per CDC (Centers for disease controls And preventions) criteria), time to infection, healing time, interventions, hospital stay.

Statistical Analysis: Categorical variables analyzed with Chi-square or Fisher's exact test; $p<0.05$ considered significant.

Results

Table 1 summarizes baseline characteristics of the 40 diabetic patients who underwent minor surgical procedures, comparing those who developed postoperative wound infection (n=6) with those who did not (n=34). The mean age of the entire cohort was 52 ± 10 years; patients who developed infection were slightly older (55 ± 9 years) than those without infection (51 ± 10 years), although this difference was not statistically significant (p=0.38). The male-to-female ratio was 22:18 overall, with 4 males and 2 females developing infection, showing no significant association between sex and infection (p=0.61).

Mean BMI was higher in the infected group (31.2 ± 3.5 kg/m²) compared to the non-infected group (27.8 ± 4.6 kg/m²), but this difference did not reach statistical significance (p=0.06). Duration of diabetes averaged 8 years overall, with infected patients having a slightly longer duration (9 ± 4 years vs. 8 ± 5 years, p=0.52).

Table I: Demographics & Baseline Characteristics

Variable	Total (n=40)	Infected (n=6)	Non-infected (n=34)	p-value
Age (years)	52 ± 10	55 ± 9	51 ± 10	0.38
Male/Female	22/18	4/2	18/16	0.61
BMI (kg/m²)	28.3 ± 4.5	31.2 ± 3.5	27.8 ± 4.6	0.06
DM Duration (years)	8 ± 5	9 ± 4	8 ± 5	0.52
HbA1c (%)	8.2 ± 1.5	9.0 ± 0.8	8.0 ± 1.6	0.02*
Perioperative glucose >180 mg/dL	13 (32.5%)	5 (83.3%)	8 (23.5%)	0.01*
Operative time >1h	17 (42.5%)	5 (83.3%)	12 (35.3%)	0.03*

Glycemic control was a significant factor: mean HbA1c in the infected group was 9.0 ± 0.8% compared to 8.0 ± 1.6% in the non-infected group (p=0.02). Additionally, perioperative hyperglycemia (>180 mg/dL) was present in 83.3% of infected patients versus 23.5% in non-infected patients (p=0.01). Prolonged operative time (>1 hour) was more common among those who developed infection (83.3% vs. 35.3%, p=0.03). These findings confirm that poor glycemic control, perioperative hyperglycemia, and longer operative duration are significant risk factors for postoperative wound infection in diabetic patients.

Table II: Surgery Type & Infection Rate

Surgery Type	Total	Infection	Infection Rate
Skin excision	15	2	13%
Minor soft tissue	10	2	20%
Day-care hernia repair	8	1	12.5%
Others	7	1	14.3%

Table II presents the distribution of different minor surgical procedures and their corresponding infection rates. Among 15 patients undergoing skin excision, 2 developed PWI, yielding an infection rate of 13%. Minor soft tissue procedures had the highest infection rate: 2 out of 10 patients (20%) developed infection. Among 8 patients undergoing day-care hernia repair, 1 developed infection (12.5%), and among the remaining 7 patients categorized as “other” procedures, 1 developed infection (14.3%). This table suggests that minor soft tissue surgeries may carry slightly higher infection risk compared to other minor procedures, although the small sample size limits statistical power. Overall, all procedure types had infection rates ranging from 12.5% to 20%, indicating that even minor surgeries in diabetic patients are not free from the risk of postoperative wound infection.

Table III: Postoperative Outcomes

Outcome	Infected (n=6)	Non-infected (n=34)
Time to infection (days)	7.5 ± 2	–
Healing time (days)	18 ± 4	12 ± 3
Drainage required	2	0
Additional antibiotics	6	0
Hospital stay (days)	3.5 ± 1	1.8 ± 0.6

Table III summarizes postoperative outcomes for infected versus non-infected patients. The mean time to infection onset was 7.5 ± 2 days among infected patients. Healing time was significantly prolonged in the infected group, averaging 18 ± 4 days compared to 12 ± 3 days in the non-infected group. Two of the six infected patients (33.3%) required surgical drainage, while none of the non-infected patients needed this intervention. All infected patients received additional antibiotic therapy, whereas none of the non-infected patients required antibiotics beyond standard prophylaxis. Hospital stay was also notably longer in infected patients, with a mean of 3.5

± 1 days compared to 1.8 ± 0.6 days in non-infected patients. These results highlight the clinical impact of postoperative wound infection, including prolonged recovery, increased interventions, and longer hospitalization, even in the context of minor surgical procedures.

Discussion

In this prospective study of 40 diabetic patients undergoing minor surgical procedures, the overall incidence of postoperative wound infection (PWI) was 15%, which aligns with previously reported rates ranging from 8% to 15% in similar populations.[1,4,6,8] This underscores that even minor surgical interventions are associated with a significant risk of infection in diabetic patients. Diabetes mellitus impairs multiple aspects of the immune response, including neutrophil function, chemotaxis, and phagocytosis, and it also compromises microvascular circulation and collagen deposition, delaying wound healing.[2,3,9] Hyperglycemia further inhibits neutrophil activity and angiogenesis, creating a favorable environment for bacterial colonization.[9,11] These pathophysiologic mechanisms explain the higher susceptibility of diabetic patients to postoperative wound infection, even after minor procedures. Our study identified poor preoperative glycemic control (HbA1c >8%), perioperative hyperglycemia (>180 mg/dL), and longer operative duration (>1 hour) as significant risk factors for infection. Specifically, infected patients had a mean HbA1c of 9.0 ± 0.8% versus 8.0 ± 1.6% in non-infected patients (p=0.02), and 83.3% of infected patients experienced perioperative hyperglycemia (p=0.01). Prolonged operative time was also associated with infection (83.3% vs. 35.3%, p=0.03). These findings are consistent with prior studies demonstrating that both chronic and acute hyperglycemia are major contributors to postoperative wound infection in diabetic patients.[9–11,13,15] Although BMI >30 kg/m² showed a trend toward increased infection risk in our cohort (31.2 ± 3.5 kg/m² in infected vs. 27.8 ± 4.6 kg/m² in non-infected, p=0.06), this did not reach statistical significance, likely due to the small sample size. Previous literature also reports obesity as a potential risk factor for surgical site infection, particularly when combined with diabetes.[10] Clinically, infections typically manifested around 7–8 days postoperatively. Healing was prolonged in infected patients (18 ± 4 days) compared to non-infected patients (12 ± 3 days), and two patients required drainage. All infected patients received additional antibiotics, and hospital stay was almost doubled (3.5 ± 1 days vs. 1.8 ± 0.6 days). These findings highlight the tangible impact of even minor postoperative infections, including prolonged recovery and increased healthcare resource utilization.[12,14,15] Limitations of the study include the small sample size, single-center design, lack of a non-diabetic control group, and relatively short-term follow-up. Future multicenter studies with larger sample sizes and longer follow-up are warranted to validate these findings and to develop evidence-based perioperative management protocols for diabetic patients undergoing minor surgical procedures.

Conclusion

Our results reinforce the importance of strict preoperative glycemic optimization, intraoperative glucose monitoring, and vigilant postoperative care to minimize the risk of PWI. Attention to modifiable risk factors, such as operative duration and perioperative hyperglycemia, is critical in improving surgical outcomes in this high-risk population.

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