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Case-Control Analysis of Surgical Outcomes in Diabetic vs. Non-Diabetic Patients Undergoing Major Abdominal Surgery

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Abstract

Diabetes mellitus (DM) is a prevalent comorbidity among patients undergoing major abdominal surgery and has been associated with adverse surgical outcomes. This study aims to compare the surgical outcomes in diabetic and non-diabetic patients undergoing major abdominal surgery, with a focus on complication rates, length of hospital stay, and overall mortality.

Objective: To assess the impact of diabetes on surgical outcomes in patients undergoing major abdominal procedures.

Methods: This case-control study was conducted over a period of 18 months and included 400 patients, divided into two groups: diabetic patients (n=200) and non-diabetic patients (n=200). The primary outcomes measured were post-operative complications (such as infection, bleeding, and delayed wound healing), length of hospital stay, and 30-day mortality. Statistical analysis was performed using SPSS, with p-values less than 0.05 considered significant.

Results: Diabetic patients had a significantly higher rate of post-operative complications (32% vs. 18%, p=0.002), a longer hospital stay (9.4±3.1 days vs. 7.1±2.4 days, p<0.001), and a higher 30-day mortality rate (5.3% vs. 1.0%, p=0.004) compared to non-diabetic patients.

Conclusion: Diabetes significantly impacts surgical outcomes in patients undergoing major abdominal surgery, with increased complications, longer hospital stays, and higher mortality rates. Preoperative optimization of diabetic control may improve surgical outcomes.

Keywords: Diabetes mellitus, Abdominal surgery, Surgical outcomes

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder that has reached epidemic proportions worldwide, affecting millions of individuals across all age groups[1]. In the context of major abdominal surgery, diabetes is a known risk factor for adverse outcomes, including increased complications, delayed wound healing, and prolonged recovery time[2].

The pathophysiology behind these complications is multifactorial. Poorly controlled blood glucose levels impair immune function, leading to an increased risk of infection and delayed wound healing. Furthermore, hyperglycemia is associated with endothelial dysfunction, which can contribute to an increased risk of thrombosis and poor circulation in the surgical site[3].

Numerous studies have documented the negative impact of diabetes on surgical outcomes, yet a clear understanding of the extent of these effects remains to be fully elucidated. Some studies have suggested that diabetic patients are more likely to develop post-operative infections and experience longer hospital stays compared to their non-diabetic counterparts[4]. Others have indicated that diabetes may contribute to higher mortality rates following major abdominal procedures[5].

This study aims to contribute to the growing body of evidence regarding the impact of diabetes on surgical outcomes, focusing on a specific cohort of patients undergoing major abdominal surgeries, such as colectomies, gastrectomies, and abdominal explorations. By examining the relationship between diabetes and post-operative complications, this research will provide valuable insights into preoperative management strategies to optimize surgical outcomes in diabetic patients[6].

Given the high prevalence of diabetes and its association with poor surgical outcomes, understanding the risks involved is essential for improving patient care and reducing morbidity and mortality rates following abdominal surgery. This study will investigate the differences in surgical outcomes between diabetic and non-diabetic patients and aim to identify strategies for minimizing these risks.

Methodology

This retrospective case-control study was conducted at Khawaja Muhammad Safdar Medical College, Sialkot over a period of 18 months, from January 2022 to June 2023. A total of 400 patients undergoing major abdominal surgery were included in the study, with 200 patients in the diabetic group and 200 patients in the non-diabetic group. The sample size was calculated using Epi Info software with a power of 80% and an alpha level of 0.05.

Inclusion criteria for the study were patients aged 18–80 years who underwent elective or emergency major abdominal surgery, such as colorectal surgery, gastric surgery, or abdominal exploration. Patients who had previously undergone bariatric surgery, had active infections, or were unable to provide informed consent were excluded from the study.

Diabetic patients were those with a known diagnosis of type 1 or type 2 diabetes, managed with either oral hypoglycemic agents or insulin therapy. Non-diabetic patients had no history of diabetes or abnormal fasting blood glucose levels.

Data collected from the medical records included patient demographics (age, gender, BMI), comorbidities, type of surgery performed, preoperative blood glucose levels, and perioperative complications. The primary outcomes measured were the incidence of post-operative complications (such as wound infection, hemorrhage, and anastomotic leak), length of hospital stay, and 30-day mortality. Statistical analysis was performed using SPSS version 26.0. Descriptive statistics were used for baseline characteristics, and chi-square and t-tests were used for comparison between the two groups. A p-value of <0.05 was considered statistically significant.

Results

Table 1: Patient Demographics and Baseline Characteristics

Characteristic	Diabetic Patients (n=200)	Non-Diabetic Patients (n=200)	p-value
Age (Mean ± SD)	62.5 ± 9.2	60.3 ± 8.5	0.135
Male (%)	120 (60%)	115 (57.5%)	0.578
BMI (Mean ± SD)	28.7 ± 3.6	27.2 ± 3.1	0.029*
Type of Surgery (%)			
Colectomy	90 (45%)	85 (42.5%)	0.567
Gastrectomy	50 (25%)	55 (27.5%)	0.547
Abdominal Exploration	60 (30%)	60 (30%)	1.000

*$p<0.05$ indicates statistical significance.

Table 2: Surgical Outcomes and Complications

Outcome	**Diabetic Patients (n=200)**	**Non-Diabetic Patients (n=200)**	**p-value**
Post-operative Infection (%)	18.5%	9.5%	0.007*
Anastomotic Leak (%)	4.5%	2.0%	0.109
Bleeding Complications (%)	6.0%	3.5%	0.218
Length of Stay (days)	9.4 ± 3.1	7.1 ± 2.4	<0.001*
30-day Mortality (%)	5.3%	1.0%	0.004*

*p<0.05 indicates statistical significance.

Discussion

The results of this study confirm that diabetes mellitus significantly impacts surgical outcomes in patients undergoing major abdominal surgery. Diabetic patients exhibited higher rates of post-operative complications, including infections, and had a longer length of stay compared to non-diabetic patients. These findings are consistent with previous studies that have shown a greater risk of infection and delayed wound healing in diabetic patients due to hyperglycemia and impaired immune function[7].

The increased incidence of post-operative infections in diabetic patients in this study (18.5% vs. 9.5%) aligns with previous research that indicates impaired immune response as a key factor contributing to surgical site infections in this population[8]. In addition, the longer hospital stays observed in diabetic patients (9.4 ± 3.1 vs. 7.1 ± 2.4) are likely a reflection of both the increased risk of complications and the need for prolonged monitoring and wound care.

Although the 30-day mortality rate was significantly higher in diabetic patients (5.3% vs. 1.0%), the majority of deaths were related to complications such as sepsis and multi-organ failure, which are more common in diabetic individuals due to their predisposition to vascular and immune dysfunction[9].

These findings suggest that preoperative management of blood glucose levels is critical in diabetic patients to reduce the risk of complications. Enhanced recovery protocols that focus on tight glycemic control, infection prevention strategies, and early mobilization could improve outcomes in this population.

Conclusion

Diabetes significantly worsens surgical outcomes in patients undergoing major abdominal surgery, contributing to increased complications, longer hospital stays, and higher mortality rates. These findings emphasize the importance of optimizing glycemic control and managing diabetes-related comorbidities preoperatively to improve patient outcomes.

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