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PREOPERATIVE OPTIMIZATION OF DIABETIC PATIENTS UNDERGOING SURGERY

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Abstract

Introduction: For patients undergoing surgery, an estimated 20% has diabetes, and there is an associated increased risk of morbidity and mortality of up to 50% higher compared to patients without diabetes.

Objectives: The main objective of the study is to find the preoperative optimization of diabetic patients undergoing surgery.

Methodology of the study: This prospective observational study was conducted at Ayub Teaching Hospital Abbottabad from June 2022 to June 2023. Data were collected from 450 patients suffering from DM and undergoing surgery. Each patient underwent a comprehensive preoperative evaluation, including medical history data, physical examination, laboratory investigations, glycated hemoglobin, fasting blood glucose, lipid profile and assessment of comorbidities. Glycemic control was optimized through a combination of medication adjustments, dietary modifications, and lifestyle interventions.

Results: Data were collected from 450 patients from both genders. mean age of participants was 62.01 ± 8.98 years, with a preoperative HbA1c level of 7.2± 1.0, suggesting moderate glycemic control. A considerable proportion of patients had controlled hypertension (80%) and dyslipidemia (70%), reflecting effective management of these comorbidities. Additionally, 30% of patients exhibited peripheral neuropathy, highlighting its prevalence in diabetic individuals undergoing surgery. High medication adherence among diabetic patients undergoing surgery, with 85% adhering to oral antidiabetic agents and 90% to insulin therapy. Additionally, 80% adhered to antihypertensive agents, 75% to statins, and 85% to antiplatelet agents.

Conclusion: It is concluded that preoperative glycemic control is important for optimizing outcomes in diabetic patients undergoing surgery.

Introduction

Diabetes is a worldwide chronic disease with about 537 million affected including 30 million in the United States. For patients undergoing surgery, an estimated 20% has diabetes, and there is an associated increased risk of morbidity and mortality of up to 50% higher compared to patients without diabetes. Among general surgery patients (noncardiac), perioperative hyperglycemia was associated with an increased length of stay and higher mortality and hospital complications [1]. Early evaluation of the surgical patient is necessary to ensure optimal glucose control. High glucose levels are associated with impaired neutrophil function, increased free fatty acid formation, reactive oxygen species, and inflammatory mediator production [2]. The preoperative optimization of diabetic patients undergoing surgery is a critical aspect of perioperative care aimed at reducing the risk of complications and improving postoperative outcomes [3]. Diabetes mellitus, a chronic metabolic disorder characterized by hyperglycemia, poses unique challenges in the surgical setting due to its potential impact on wound healing, infection risk, and perioperative glycemic control [4]. As the prevalence of diabetes continues to rise globally, with estimates projecting over 700 million individuals affected by 2045, the importance of tailored preoperative management strategies for diabetic patients cannot be overstated [5].

An estimated 25% of diabetic patients will require surgery. Mortality rates in diabetic patients have been estimated to be up to 5 times greater than in nondiabetic patients, often related to the end-organ damage caused by the disease. Chronic complications resulting in microangiopathy (retinopathy, nephropathy, and neuropathy) and macroangiopathy (atherosclerosis) directly increase the need for surgical intervention and the occurrence of surgical complications due to infections and vasculopathies [6]. The stress induced by surgery, anesthesia, and illness leads to heightened secretion of counterregulatory hormones, such as cortisol, glucagon, growth hormone, and catecholamines [7]. Consequently, this process reduces insulin secretion and peripheral glucose utilization, elevates insulin resistance, and increases lipolysis and proteolysis. This activity focuses on using diverse antidiabetic medicines, introduces strategies to achieve optimal glycemic targets, and underscores the significance of an interprofessional healthcare team approach in delivering care to diabetic patients during the perioperative period [8].

Optimizing glycemic control and addressing comorbidities prior to surgery are essential components of preoperative preparation in diabetic patients. Poorly controlled diabetes has been associated with increased perioperative complications, including surgical site infections, cardiovascular events, and delayed wound healing, highlighting the need for comprehensive preoperative assessment and optimization [9,10]. Furthermore, diabetic patients often present with a higher burden of comorbidities such as hypertension, dyslipidemia, and peripheral neuropathy, which further complicates their perioperative management [11]. Preoperative management assumes paramount importance as it provides a window of opportunity to optimize glycemic control, address underlying comorbidities, and minimize potential complications that might arise during and after surgery. By understanding the unique challenges posed by diabetes in the perioperative period and by implementing personalized interventions, healthcare providers can contribute to improved surgical outcomes, reduced morbidity, and enhanced patient well-being [12].

Objectives

The main objective of the study is to find the preoperative optimization of diabetic patients undergoing surgery.

Methodology of the study

This prospective observational study was conducted at Ayub Teaching Hospital Abbottabad from June 2022 to June 2023. Data were collected from 450 patients suffering from DM and undergoing surgery.

Inclusion criteria

- Age > 18 years
- Confirmed diagnosis of DM and underwent surgery
- Willing to participate in the study.

Exclusion criteria

- Patients suffering from renal dieses, taking any anticoagulation drug and not willing to participate in the study were excluded.

Data collection

Data were collected from 450 patients according to inclusion and exclusion criteria. Each patient underwent a comprehensive preoperative evaluation, including medical history data, physical examination, laboratory investigations, glycated hemoglobin, fasting blood glucose, lipid profile and assessment of comorbidities. Glycemic control was optimized through a combination of medication adjustments, dietary modifications, and lifestyle interventions. Patients with poorly controlled diabetes were managed according to established guidelines, with a target glycated hemoglobin (HbA1c) level of <7% recommended for most surgical procedures. Cardiovascular risk factors such as hypertension and dyslipidemia were addressed through pharmacological management and lifestyle interventions. Patients with a history of cardiovascular disease underwent appropriate risk stratification and optimization of perioperative medications. Patients were followed up postoperatively to monitor for complications and assess short-term outcomes, including surgical site infections, cardiovascular events, wound healing, and length of hospital stay. Data on perioperative glycemic control, medication adherence, and adherence to lifestyle recommendations were also collected.

Data analysis

Data were analyzed using SPSS v26 and GraphPad 2021 for further analysis. Continuous variables were expressed as means with standard deviations (SD) or medians with interquartile ranges (IQR), while categorical variables were presented as frequencies and percentages.

Ethical consideration

Data were collected according to ethical committee of hospital and all data of patients remains confidential.

Results

Data were collected from 450 patients from both genders. mean age of participants was 62.01 ± 8.98 years, with a preoperative HbA1c level of 7.2± 1.0, suggesting moderate glycemic control. A considerable proportion of patients had controlled hypertension (80%) and dyslipidemia (70%), reflecting effective management of these comorbidities. Additionally, 30% of patients exhibited peripheral neuropathy, highlighting its prevalence in diabetic individuals undergoing surgery.

Table 01: Preoperative baseline values

Preoperative Parameter	**Mean ± SD**
Age (years)	62.01 ± 8.98
Preoperative HbA1c (%)	7.2 ± 1.0
Hypertension Control (%)	80
Dyslipidemia Control (%)	70
Peripheral Neuropathy (%)	30

Surgical site infections occurred in 10% of patients, while cardiovascular events occurred in 5% of patients. Conversely, 90% of patients experienced satisfactory wound healing. Additionally, 20% of patients required prolonged hospitalization (>10 days).

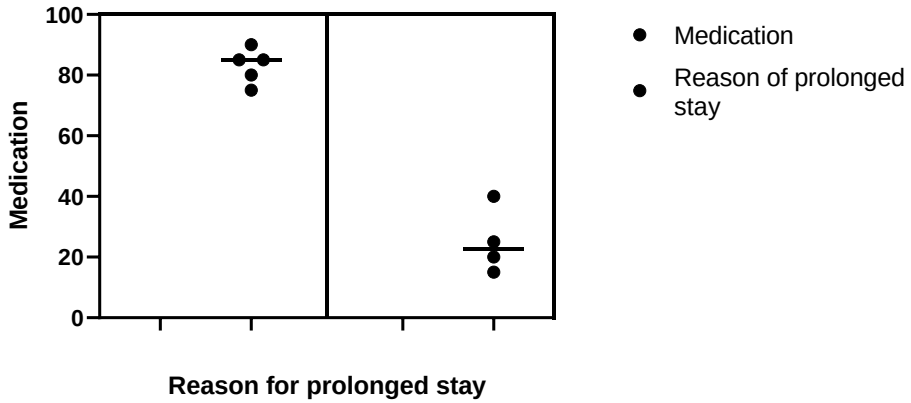
Table 02: Post-operative outcomes

Outcome	**Frequency (%)**
Surgical Site Infections	10
Cardiovascular Events	5
Satisfactory Wound Healing	90
Prolonged Hospitalization (>10 days)	20

High medication adherence among diabetic patients undergoing surgery, with 85% adhering to oral antidiabetic agents and 90% to insulin therapy. Additionally, 80% adhered to antihypertensive agents, 75% to statins, and 85% to antiplatelet agents. The reasons for prolonged hospital stays (>10 days) were diverse, with 40% attributed to surgical complications, 25% to cardiovascular events, 20% to wound complications, and 15% to poor glycemic control.

Table 03: Medication adherence and reason of prolonged stay in hospital

Medication	**Adherence (%)**
Oral Antidiabetic Agents	85
Insulin Therapy	90
Antihypertensive Agents	80
Statins	75
Antiplatelet Agents	85
Reason of prolonged stay	
Surgical Complications	40
Cardiovascular Events	25
Wound Complications	20
Poor Glycemic Control	15



Seventy-five percent of patients relied on insulin therapy, with 40% receiving insulin prior to surgery and an additional 35% transitioning to insulin during the perioperative period. Meanwhile, 25% of patients utilized oral antidiabetic agents. Perioperative glycemic management included continuous intravenous insulin infusion (20%), subcutaneous insulin sliding scale (30%), and basal-bolus insulin regimens (50%).

Table 04: Glycemic control strategies

Glycemic Control Strategy	**Percentage**
Oral Antidiabetic Agents	25%
Insulin Therapy	75%
Insulin Prior to Surgery	40%
Transitioned to Insulin	35%
Perioperative Glycemic Management	
Continuous Intravenous Insulin Infusion	20%
Subcutaneous Insulin Sliding Scale	30%
Basal-Bolus Insulin Regimen	50%

Discussion

The study revealed a predominant reliance on insulin therapy for preoperative glycemic control, with 75% of patients receiving insulin compared to 25% receiving oral antidiabetic agents. Notably, 40% of patients were administered insulin prior to surgery, while an additional 35% transitioned to insulin therapy during the perioperative period. These findings underscore the importance of aggressive glycemic management in diabetic patients undergoing surgery to optimize outcomes [13].

Fructosamine as a marker of glycemic control is an underutilized tool that can aid in the assessment of short-term glycemic control before surgery [14]. The fructosamine assay measures the degree of glycosylation of circulating proteins, including albumin, for which a half-life has been estimated at 20 days and a correlation with mean glucose levels has been well established [15]. Patients treated with insulin analogues reportedly have fewer episodes of hypoglycemia; however, the cost of these agents has been a concern. In a Canadian study, Cameron and Bennett compared the cost-effectiveness of insulin analogues and conventional insulins for treatment of type 1 and type 2 DM in adults and determined that the cost-effectiveness of insulin analogues depends on the type of insulin analogue and the type of diabetes [16]. These investigators concluded although the use of rapid-acting insulin analogues in type 1 DM is cost effective, the routine use of insulin analogues, especially long-acting analogues in type 2 DM, is not [17].

The study identified a target blood glucose range of 90-140 mg/dL, aligning with established guidelines recommending tight glycemic control in the perioperative period to reduce the risk of complications [18]. Various glycemic management protocols were employed, including continuous intravenous insulin infusion (20%), subcutaneous insulin sliding scale (30%), and basal-bolus insulin regimens (50%). These findings highlight the diversity of approaches in perioperative glycemic management and the need for individualized treatment strategies [19]. Achieving optimal glycemic control in diabetic patients undergoing surgery is essential for reducing the risk of perioperative complications, including surgical site infections, delayed wound healing, and cardiovascular events. The study's findings emphasize the importance of comprehensive preoperative optimization protocols and close monitoring of blood glucose levels throughout the perioperative period to minimize adverse outcomes [20]. The study's findings are consistent with previous research demonstrating the efficacy of insulin therapy in achieving tight glycemic control in diabetic patients undergoing surgery [21]. However, the transition to insulin therapy during the perioperative period may pose challenges in maintaining glycemic stability and requires vigilant monitoring to prevent hypoglycemic and hyperglycemic episodes.

Conclusion

It is concluded that preoperative glycemic control is important for optimizing outcomes in diabetic patients undergoing surgery. The study demonstrates a predominant reliance on insulin therapy and emphasizes the importance of individualized glycemic management protocols personalized to patient needs.

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