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Original research

Association between blood glucose levels and elective surgery delays in type II diabetes mellitus patients

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ABSTRACT

Background: Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia, which poses significant risks during the perioperative period. Elevated blood glucose levels are often associated with surgical complications, leading to the postponement of elective procedures.
Purpose: This study aims to analyze the relationship between preoperative blood glucose levels and the delay of elective surgery in patients with Type II DM.
Methods: A cross-sectional study was conducted among 100 patients with Type II Diabetes Mellitus undergoing elective surgery at Dr. La Palaloi Maros Hospital. The patients were selected using simple random sampling. Preoperative blood glucose levels were analyzed in relation to surgical readiness using the chi-square test.
Results: The study found that 21% of patients experienced surgery delays, all delayed cases occurred among patients with preoperative blood glucose levels >200 mg/dL, while no delays were observed among patients with blood glucose levels below 200 mg/dL. Overall, 79.0% of patients proceeded with surgery as scheduled, whereas 21.0% experienced postponement due to uncontrolled hyperglycemia. Most respondents were aged 18–40 years (54%) and female (58%). A statistically significant relationship was found between blood glucose levels and elective surgery delays ($p < .001$).
Conclusion: Preoperative blood glucose level is associated with elective surgery delays. Strict glycemic control before surgery is essential to reduce delays and improve perioperative patient safety.

1. Background

Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both [1]. DM has become one of the most important public health challenges worldwide because of its increasing prevalence and its association with substantial morbidity, mortality, and healthcare expenditures [1], [2]. According to the International Diabetes Federation (IDF), approximately 537 million adults worldwide were living with diabetes in 2025, and this number is expected to rise considerably in the coming decades [2]. Similarly, the World Health Organization has recognized diabetes as one of the leading causes of premature mortality and disability globally [3]. The growing burden of diabetes also imposes considerable economic consequences on healthcare systems, affecting both developed and developing countries [4], [5].

Indonesia is among the countries with the highest diabetes burden globally. National reports have shown a continuous increase in the prevalence of Type II Diabetes Mellitus, which is strongly associated with urbanization, unhealthy dietary patterns, obesity, physical inactivity, and population aging [6]. Recent evidence suggests that the incidence of diabetes is increasingly affecting productive-age populations, thereby creating

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additional socioeconomic burdens and negatively influencing quality of life [2], [3]. Persistent hyperglycemia contributes to numerous complications involving the cardiovascular, renal, neurological, and immune systems, making diabetes one of the major contributors to disability and mortality worldwide [1].

In surgical settings, patients with diabetes are considered high-risk individuals because surgical stress activates the hypothalamic-pituitary-adrenal axis and stimulates the release of counter-regulatory hormones, including cortisol, glucagon, catecholamines, and growth hormone. These physiological responses increase hepatic glucose production and aggravate insulin resistance, leading to perioperative hyperglycemia [7]. In diabetic patients, impaired glucose homeostasis further exacerbates these metabolic disturbances and may increase the likelihood of acute complications and poor surgical outcomes [8].

Perioperative hyperglycemia has been consistently associated with adverse clinical consequences, including surgical site infections, impaired wound healing, prolonged hospitalization, cardiovascular events, and increased mortality [9]. Elevated blood glucose levels negatively affect leukocyte function, suppress immune responses, and interfere with collagen synthesis and tissue repair processes [10]. Therefore, maintaining optimal glycemic control before surgery is essential to reduce postoperative complications and improve perioperative outcomes [11].

Current international guidelines strongly emphasize the importance of glycemic optimization before elective procedures. The American Diabetes Association recommends maintaining blood glucose levels below 180–200 mg/dL in most hospitalized patients during the perioperative period [12]. Likewise, the Society for Ambulatory Anesthesia and the Association of Perioperative Registered Nurses have highlighted the importance of evidence-based perioperative glucose management to improve patient safety and clinical outcomes [13], [14]. In Indonesia, the Indonesian Society of Endocrinology (PERKENI) recommends postponing elective surgery in patients with uncontrolled hyperglycemia because elevated glucose levels are associated with increased risks of infection and delayed recovery [15].

Although delaying elective surgery may improve patient safety, postponement may also have negative implications for healthcare systems and patients themselves. Delayed surgery can prolong hospitalization, reduce operating room efficiency, increase healthcare costs, and contribute to anxiety and dissatisfaction among patients [5]. Furthermore, repeated delays may interfere with healthcare quality indicators and increase the overall burden on hospital resources [4].

At RSUD dr. La Palaloi Maros, the number of patients with Type II Diabetes Mellitus undergoing elective surgery has increased in recent years. Preliminary observations indicated that uncontrolled blood glucose levels represent one of the major causes of surgery postponement. However, evidence regarding the relationship between preoperative blood glucose levels and elective surgery delays in this setting remains limited. Previous studies have mainly focused on postoperative complications and perioperative glycemic management rather than on surgery postponement itself [9], [11]. Therefore, investigating the association between blood glucose levels and elective surgery delays is necessary to provide evidence-based recommendations for improving perioperative management and optimizing surgical outcomes among diabetic patients.

Accordingly, this study aimed to analyze the correlation between preoperative blood glucose levels and elective surgery delays among Type II Diabetes Mellitus patients at RSUD dr. La Palaloi Maros. The findings are expected to contribute to evidence-based perioperative care strategies and improve the quality and safety of surgical services for diabetic patients.

2. Methods

2.1 Research design

This study employed a quantitative design with a cross-sectional approach to examine the relationship between preoperative blood glucose levels and elective surgery delays among patients with Type II Diabetes Mellitus.

2.2 Setting and sample

The study was conducted in 2025 at a Dr. La Palaloi Maros Hospital. The population consisted of Type II Diabetes Mellitus patients scheduled for elective surgery. A total of 100 respondents were selected using simple random sampling. Each eligible patient was assigned a unique identification number, and participants were selected using a computer-generated random number procedure until the required sample size was achieved. Inclusion criteria were patients aged 18–60 years

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diagnosed with Type II Diabetes Mellitus and willing to participate in the study. Patients undergoing emergency surgery, experiencing severe complications, having communication disorders, or possessing incomplete medical records were excluded.

2.3 Instruments and data collection

Data were collected using an observation sheet developed based on previous literature and clinical practice guidelines [10], [14]. Blood glucose levels were measured using a calibrated glucometer through capillary blood sampling according to standard procedures [11]. Blood glucose levels were categorized as normal (<140 mg/dL), prediabetes (140–200 mg/dL), and diabetes (>200 mg/dL).

For this study, surgical readiness was defined as the achievement of acceptable preoperative glycemic targets for elective surgery. Patients with blood glucose levels <200 mg/dL were categorized as surgically ready and allowed to proceed with surgery, whereas patients with blood glucose levels >200 mg/dL were categorized as not surgically ready and experienced surgery postponement according to perioperative diabetes management recommendations. Information regarding surgery status (proceeded or delayed) was obtained from medical records and anesthesia reports.

2.4 Data analysis

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics were used to summarize respondents' characteristics. The association between blood glucose levels and elective surgery delays was examined using the Chi-square test. Statistical significance was established at $p < 0.05$ [16].

2.5 Research ethics

This study adhered to the ethical principles of respect for persons, beneficence, and justice. Written informed consent was obtained from all participants prior to data collection. Participants' anonymity and confidentiality were maintained throughout the study [17]. Ethics approval was obtained on October 14, 2025, from the Health Research Ethics Committee, Faculty of Health Sciences, West Sulawesi University, Number 02-004/KEPK FIKES/2025.

3. Results

The demographic and clinical profile of the 100 respondents is summarized in Table 1. Table 1 shows that the respondents in this study were predominantly individuals in the productive age group, indicating that Type II Diabetes Mellitus is increasingly affecting younger adults. Female respondents were more dominant than males, suggesting possible influences of hormonal, metabolic, and lifestyle factors on diabetes prevalence. Most respondents had a moderate educational background, which may influence their level of health literacy and understanding of diabetes management. In terms of occupation, many respondents were actively working, while a considerable proportion were unemployed, reflecting varying socioeconomic conditions that may affect access to healthcare and disease control. Furthermore, most respondents reported having a personal and family history of Diabetes Mellitus, indicating that genetic predisposition and hereditary factors may contribute significantly to the occurrence of Type II DM among the study population.

Table 1. Demographic Characteristics of Respondents (n = 100)

Variable	Frequency (f)	Percentage (%)
Age		
18–40 Years	54	54.0
40–60 Years	46	46.0
Gender		
Male	42	42.0
Female	58	58.0
Education		
High School (Diploma, bachelor's degree)	44	44.0
Others (Elementary School, Middle School, High School)	56	56.0
Occupation		
Entrepreneur	48	48.0
Unemployed	39	39.0

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Others (Civil Servant, Student)	13	13.0
Medical History		
History of DM	61	61.0
Family History of DM	81	81.0

Table 2 details the distribution of surgical types and preoperative blood glucose categories. Table 2 demonstrates that most respondents underwent general surgical procedures, while a smaller proportion received ENT and dermatological surgeries. This finding indicates that patients with Type II Diabetes Mellitus are more commonly encountered in general surgical cases, likely because diabetes is frequently associated with conditions requiring abdominal, soft tissue, or vascular interventions.

Regarding preoperative blood glucose levels, most respondents were categorized within the normal range, indicating that a large proportion of patients had relatively controlled glycemic status before surgery. However, several respondents were classified within the prediabetes and hyperglycemia categories, reflecting the ongoing challenge of achieving optimal blood glucose control among diabetic patients prior to elective procedures. Patients with elevated glucose levels require closer perioperative monitoring because uncontrolled hyperglycemia may increase the risk of surgical complications, delayed wound healing, and postponement of surgery.

Table 2. Blood Glucose Levels and Surgery Type

Variable	Frequency (f)	Percentage (%)
Type of Surgery		
General Surgery	72	72.0
ENT (THT)	18	18.0
Dermatology	10	10.0
Blood Glucose Category		
Normal (<140 mg/dL)	60	60.0
Prediabetes (140–200 mg/dL)	19	19.0
Diabetes (>200 mg/dL)	21	21.0

The relationship between blood glucose levels and the delay of elective surgery is shown in Table 3. Statistical analysis using the Chi-Square test showed a p-value of < .001, indicating a highly significant relationship between preoperative blood glucose levels and elective surgery delays

Table 3. Correlation Between Blood Glucose and Surgery Delay

Blood Glucose Level	Proceeded (<200 mg/dL)	Delayed (>200 mg/dL)	Total	p-value
<140 mg/dL	60 (60.0%)	0 (0.0%)	60	
140–200 mg/dL	19 (19.0%)	0 (0.0%)	19	<.001
>200 mg/dL	0 (0.0%)	21 (21.0%)	21	
Total	**79 (79.0%)**	**21 (21.0%)**	**100**	

4. Discussion

The present study demonstrated a statistically significant association between preoperative blood glucose levels and elective surgery delays among patients with Type II Diabetes Mellitus ($p < 0.001$). All respondents with blood glucose levels exceeding 200 mg/dL experienced postponement of surgery, indicating that uncontrolled hyperglycemia is an important factor associated with perioperative readiness. These findings are consistent with current evidence and international recommendations emphasizing that poor glycemic control increases perioperative risks and often necessitates postponement of elective procedures to improve patient safety [18], [22].

Perioperative hyperglycemia is associated with several physiological disturbances. Surgical stress stimulates the release of cortisol, catecholamines, glucagon, and inflammatory

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mediators, which increase hepatic glucose production and aggravate insulin resistance [7]. In patients with diabetes, impaired insulin regulation further exacerbates these metabolic responses, increasing the risk of complications such as diabetic ketoacidosis, electrolyte imbalance, cardiovascular instability, and delayed wound healing [9], [19]. Moreover, hyperglycemia impairs leukocyte chemotaxis, phagocytosis, and tissue repair mechanisms, thereby increasing susceptibility to surgical site infections and unfavorable postoperative outcomes [20], [23].

Most respondents in this study were female. Previous reports have shown that the prevalence of Type II Diabetes Mellitus among women has increased due to the combined effects of obesity, metabolic syndrome, physical inactivity, and hormonal changes influencing insulin sensitivity [2], [3]. In addition, most respondents belonged to the productive age group, reflecting the growing burden of Type II Diabetes Mellitus among younger adults. Sedentary lifestyles, unhealthy dietary habits, obesity, and psychosocial stress have contributed to the increasing incidence of diabetes in this population [6]. Furthermore, the high proportion of respondents with a family history of diabetes supports the important role of genetic predisposition in the development of Type II Diabetes Mellitus [1].

The findings agree with the recommendations of the American Diabetes Association and the Association of Perioperative Registered Nurses, which emphasize maintaining blood glucose levels within the target range before surgery to minimize perioperative complications [12], [13]. Elevated glucose levels interfere with immune responses, collagen synthesis, and wound healing processes, thereby increasing the risk of infection and prolonged recovery [20], [23]. Therefore, postponement of elective surgery in patients with uncontrolled hyperglycemia should be considered an evidence-based strategy to enhance patient safety and optimize surgical outcomes [11], [22].

Despite its benefits in reducing complications, surgery postponement may negatively affect both healthcare systems and patients. Delayed procedures may prolong hospitalization, increase healthcare expenditures, disrupt operating room efficiency, and reduce patient satisfaction [5], [21]. Repeated postponements may also contribute to anxiety and emotional distress, highlighting the importance of timely glycemic optimization before surgery.

The findings of this study underscore the importance of multidisciplinary perioperative diabetes management. Collaboration among surgeons, anesthesiologists, internists, nurses, nutritionists, and pharmacists is essential to achieve optimal blood glucose control before surgery [10], [25]. Educational interventions focusing on medication adherence, dietary management, physical activity, and perioperative fasting protocols may improve patient preparedness and reduce avoidable surgery delays [14].

This study has several strengths, including the use of direct blood glucose measurements and verification of surgery status through medical records. Nevertheless, several limitations should be acknowledged. First, the cross-sectional design precludes causal inference. Second, blood glucose measurements were obtained only once without assessing long-term glycemic indicators such as HbA1c. Third, the study was conducted in a single hospital, which may limit the generalizability of the findings.

Future studies are recommended to employ prospective cohort or multicenter designs and include additional variables such as HbA1c levels, duration of diabetes, body mass index, medication adherence, and postoperative complications. These factors may provide a more comprehensive understanding of perioperative risks and contribute to the development of more effective glycemic management strategies for patients with Type II Diabetes Mellitus.

5. Conclusion

This study demonstrated a significant association between preoperative blood glucose levels and elective surgery delays among patients with Type II Diabetes Mellitus. Patients with blood glucose levels above 200 mg/dL were more likely to experience postponement of elective surgery than those with controlled glucose levels. These findings highlight the importance of preoperative glycemic assessment as an essential component of perioperative care. Appropriate blood glucose management before surgery may help reduce surgical complications, improve patient safety, enhance operating room efficiency, and optimize clinical outcomes.

Hospitals are encouraged to strengthen multidisciplinary approaches involving surgeons, anesthesiologists, internists, and nurses to improve

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perioperative glycemic control. Future studies should employ larger and multicenter designs and include additional variables, such as HbA1c levels and postoperative outcomes, to provide a more comprehensive understanding of perioperative risks among patients with Type II Diabetes Mellitus.

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