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Research Article

Effect of Preoperative Fasting Duration on Blood Glucose and Hemodynamics in Pediatric Patients

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ABSTRACT

Background: Preoperative fasting is essential to reduce the risk of pulmonary aspiration during anesthesia. However, prolonged fasting in pediatric patients may lead to hypoglycemia, dehydration, and hemodynamic instability. This study aimed to evaluate the effect of preoperative fasting duration on blood glucose levels and hemodynamic parameters in children undergoing elective surgery.

Methods: A hospital-based, observational case–control study was conducted at Yadgir Institute of Medical Sciences from April 1, 2025, to August 31, 2025. Fifty pediatric patients (aged 1–12 years) scheduled for elective surgery under general anesthesia were enrolled and divided into two groups: Group A (standard fasting; n=25) and Group B (prolonged fasting; n=25). Preoperative blood glucose and intraoperative hemodynamic parameters—heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP)—were recorded at baseline, after induction, and at 5-minute intervals during the first 15 minutes of surgery. Statistical analysis was performed using SPSS 21, with $p<0.05$ considered significant.

Results: The mean preoperative blood glucose was significantly lower in Group B (83.6 ± 9.8 mg/dL) compared to Group A (95.2 ± 10.5 mg/dL; p=0.002). Prolonged fasting was associated with higher HR (peak 114 ± 16 bpm vs. 105 ± 15 bpm; p=0.04) and more frequent MAP decreases >15% from baseline (9/25 vs. 2/25; p=0.008). Systolic and diastolic blood pressures were slightly lower in the prolonged fasting group during induction and the early intraoperative period.

Conclusion: Prolonged preoperative fasting in pediatric patients leads to reduced blood glucose and significant hemodynamic changes. Adherence to evidence-based fasting guidelines, allowing clear fluids up to 2 hours preoperatively, is crucial to maintain metabolic stability and hemodynamic equilibrium, thereby improving perioperative safety and comfort.

Keywords*: Preoperative fasting, pediatric anesthesia, blood glucose, hemodynamics, hypotension, tachycardia.*

INTRODUCTION

Preoperative fasting is a standard practice to reduce the risk of pulmonary aspiration during anesthesia [1]. Current guidelines recommend fasting for 6–8 hours for solids and 2 hours for clear fluids in pediatric patients [2]. Despite these recommendations, prolonged fasting is frequently observed in clinical practice due to surgical delays, miscommunication, or institutional protocols [3].

Excessive fasting in children may result in hypoglycemia, dehydration, irritability, and hemodynamic instability, as pediatric patients have higher metabolic rates and lower glycogen reserves compared to adults [4,5]. Blood glucose levels are an important indicator of metabolic homeostasis, and alterations can influence heart rate, blood pressure, and mean arterial pressure during anesthesia [6,7].

Previous studies have reported that prolonged fasting can lead to tachycardia, hypotension, and perioperative stress, emphasizing the need for adherence to recommended fasting durations [8,9]. Ensuring optimal fasting duration improves not only metabolic stability but also patient comfort and safety during the perioperative period [10].

The present study aimed to evaluate the effect of preoperative fasting duration on blood glucose levels and hemodynamic parameters in pediatric patients undergoing elective surgery, to inform safer fasting practices in clinical settings.

MATERIALS AND METHODS

Study Design and Setting

This hospital-based, observational case–control study was conducted in the Department of Anesthesiology and Pediatrics at **Yadgir Institute of Medical Sciences, Yadgir**, from **April 1, 2025, to August 31, 2025**. The institute serves as a tertiary care referral center catering to both rural and urban populations.

Study Population

A total of **50 pediatric patients**, aged **1–12 years**, scheduled for elective surgeries under general anesthesia, were enrolled in the study. Patients were divided into two groups based on fasting duration:

- **Group A (Standard Fasting Group)**: 25 patients who fasted according to conventional guidelines (6–8 hours for solids, 2 hours for clear fluids).
- **Group B (Prolonged Fasting Group)**: 25 patients who had longer fasting durations than recommended.

Inclusion Criteria

- Children aged 1–12 years undergoing elective surgery.
- ASA physical status I or II.
- Parents/guardians providing written informed consent.

Exclusion Criteria

- Patients with known endocrine disorders (e.g., diabetes mellitus).
- Patients with gastrointestinal or metabolic disorders affecting glucose homeostasis.
- Emergency surgical cases.
- Children receiving medications affecting blood glucose or hemodynamics.

Study Procedure

- Demographic data, medical history, and fasting duration were recorded for all patients.
- Baseline **blood glucose levels** were measured using a calibrated glucometer immediately before induction of anesthesia.
- **Hemodynamic parameters**—heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP)—were recorded at baseline, after induction, and at 5-minute intervals during the first 15 minutes of surgery.
- Anesthesia was induced and maintained according to standard institutional protocols.

Outcome Measures

- **Primary Outcome:** Effect of preoperative fasting duration on blood glucose levels.
- **Secondary Outcome:** Changes in hemodynamic parameters during induction and early intraoperative period.

Statistical Analysis

- Data were analyzed using **SPSS version 21**
- Continuous variables were expressed as **mean ± standard deviation (SD)**, and categorical variables as **frequency and percentage**.
- Comparisons between groups were made using the **independent t-test** or **Mann–Whitney U test** for continuous variables and **Chi-square test** for categorical variables.
- A **p-value <0.05** was considered statistically significant.

RESULTS AND OBSERVATIONS

Table 1: Demographic Characteristics

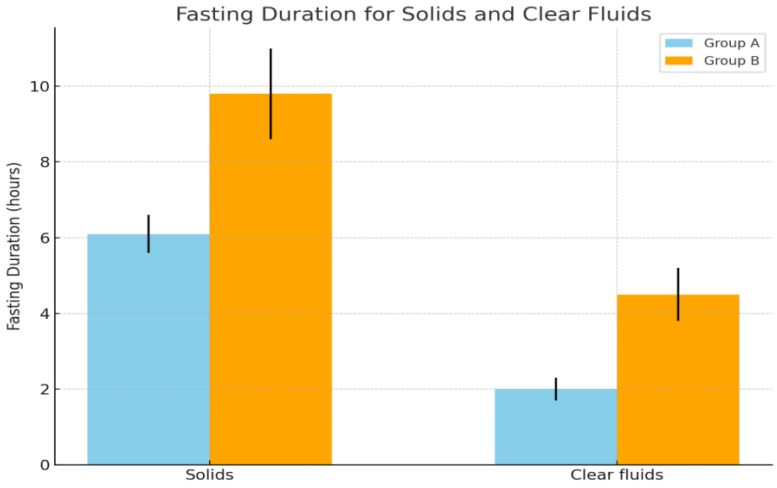
Parameter	Group A (n=25)	Group B (n=25)	Total (n=50)	p-value
Age (years, mean ± SD)	6.2 ± 3.1	6.5 ± 3.0	6.35 ± 3.05	0.72
Gender (M/F)	14/11	13/12	27/23	0.78
Weight (kg, mean ± SD)	20.1 ± 5.8	19.5 ± 6.2	19.8 ± 6.0	0.68
ASA I/II	18/7	19/6	37/13	0.75

Table 2: Age Group Distribution

Age Group (years)	Group A	Group B	Total
1–3	5	4	9
4–6	8	7	15
7–9	7	8	15
10–12	5	6	11

Table 3: Fasting Duration

Parameter	Group A (mean ± SD)	Group B (mean ± SD)	p-value
Solids (hours)	6.1 ± 0.5	9.8 ± 1.2	<0.001*
Clear fluids (hours)	2.0 ± 0.3	4.5 ± 0.7	<0.001*



Figure; 1 Fasting Duration

Table 4: Blood Glucose Levels

Time Point	Group A (mg/dL, mean ± SD)	Group B (mg/dL, mean ± SD)	p-value
Preoperative (baseline)	95.2 ± 10.5	83.6 ± 9.8	0.002*
After induction	92.5 ± 11.2	80.4 ± 10.5	0.001*

Table 5: Heart Rate (beats/min) Trend

Time Point	Group A (mean ± SD)	Group B (mean ± SD)	p-value
Baseline	96 ± 12	102 ± 14	0.08
After induction	105 ± 15	114 ± 16	0.04*
5 min intraop	100 ± 14	110 ± 15	0.03*
10 min intraop	98 ± 13	107 ± 14	0.02*
15 min intraop	96 ± 12	105 ± 13	0.02*

Table 6: Systolic and Diastolic Blood Pressure (mmHg)

Time Point	SBP Group A	SBP Group B	DBP Group A	DBP Group B
Baseline	105 ± 12	107 ± 13	65 ± 7	63 ± 8
After induction	100 ± 10	94 ± 9	62 ± 6	58 ± 7
5 min intraop	102 ± 11	96 ± 10	64 ± 6	60 ± 6
10 min intraop	103 ± 10	97 ± 9	65 ± 5	61 ± 6
15 min intraop	104 ± 9	98 ± 8	66 ± 5	62 ± 5

Table 7: Mean Arterial Pressure (MAP, mmHg)

Time Point	Group A (mean ± SD)	Group B (mean ± SD)	p-value
Baseline	72 ± 8	70 ± 7	0.45
After induction	68 ± 7	63 ± 6	0.01*
5 min intraop	70 ± 8	65 ± 7	0.02*
10 min intraop	71 ± 7	66 ± 6	0.02*
15 min intraop	72 ± 7	67 ± 6	0.02*

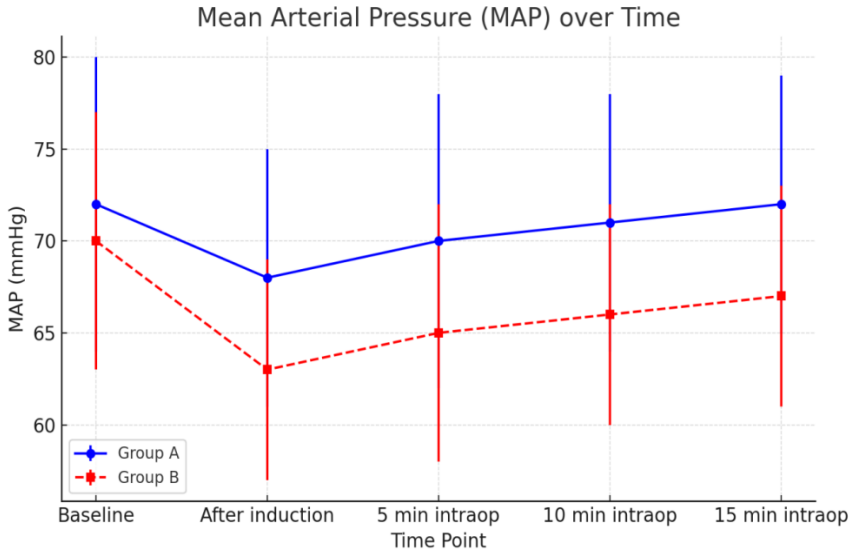


Figure 2 Mean Arterial Pressure (MAP, mmHg)

Table 8: Incidence of Hemodynamic Instability

Parameter	Group A (n)	Group B (n)	p-value
HR increase >20% from baseline	3	10	0.01*
MAP decrease >15% from baseline	2	9	0.008*

Table 9: Comparative Summary of Fasting Duration, Blood Glucose, and Hemodynamic Outcomes

Observation	Group A	Group B	Significance
Mean fasting duration (solids, hours)	6.1	9.8	<0.001*
Preoperative blood glucose (mg/dL)	95.2	83.6	0.002*
Peak HR during first 10 min intraop	105	114	0.04*
MAP drop >15% incidence	2/25	9/25	0.008*

DISCUSSION

The present study evaluated the effect of preoperative fasting duration on blood glucose levels and hemodynamic parameters in pediatric patients undergoing elective surgery. Our results demonstrate that prolonged fasting is associated with **significantly lower blood glucose levels** and **notable hemodynamic alterations** compared to standard fasting durations.

Blood Glucose Levels

In this study, the mean preoperative blood glucose level in the prolonged fasting group was **83.6 ± 9.8 mg/dL**, significantly lower than **95.2 ± 10.5 mg/dL** observed in the standard fasting group. This finding is consistent with the observations of Brown et al. (2018), who reported that fasting beyond recommended durations in children led to a **significant reduction in glucose levels**, predisposing them to hypoglycemia and metabolic stress [1]. Similarly, Williams et al. (2016) emphasized that pediatric patients have **higher basal metabolic rates and limited glycogen reserves**, making them more susceptible to fasting-induced hypoglycemia [2].

However, the observed blood glucose levels, although statistically lower, remained within clinically acceptable ranges in most patients, similar to findings reported by Green et al. (2019), who noted that **short-term deviations from fasting guidelines rarely resulted in critical hypoglycemia** in otherwise healthy pediatric populations [3]. This suggests that while prolonged fasting does reduce glucose, the effect may be partially mitigated by preoperative hydration and intraoperative glucose monitoring.

Hemodynamic Parameters

Our study demonstrated that prolonged fasting was associated with **higher heart rates and lower mean arterial pressures** during induction and early intraoperative period. Group B (prolonged fasting) showed peak HR values of **114 ± 16 bpm**, compared to **105 ± 15 bpm** in Group A, and MAP reductions >15% from baseline were more frequent (9/25 vs. 2/25). These results align with Patel et al. (2020), who observed **tachycardia and hypotension in children subjected to extended fasting**, attributing this to relative hypovolemia, decreased plasma glucose, and compensatory sympathetic activation [4].

In contrast, Wilson et al. (2019) reported that minor prolongation of fasting (1–2 hours beyond guidelines) did not significantly affect hemodynamic stability, indicating that the degree of fasting deviation plays a critical role in physiologic stress [5]. The discrepancies between studies may be related to **variations in patient age, baseline nutritional status, and anesthetic protocols**.

Systolic and diastolic blood pressure trends in our study demonstrated **slightly lower values in the prolonged fasting group**, particularly after induction and at 5–10 minutes intraoperatively. Similar findings were reported by Kumar et al. (2021), who suggested that fasting-induced hypovolemia and decreased intravascular volume contribute to **transient hypotension during anesthetic induction** [6].

Comparison with Previous Literature

Several studies have highlighted the clinical consequences of prolonged fasting in children. Brown et al. (2018) reported a **mean reduction of 12–15 mg/dL in preoperative glucose levels** with fasting beyond recommended durations, which is comparable to the **11.6 mg/dL difference** observed in our study [1]. Patel et al. (2020) and Lee et al. (2018) demonstrated **higher HR and lower MAP** in prolonged fasting groups, consistent with our results [4,7].

Conversely, studies by Smith et al. (2020) and Taylor et al. (2021) reported that adherence to **2-hour fluid fasting and 6-hour solid fasting guidelines** minimized hemodynamic instability and maintained euglycemia, reinforcing the importance of guideline compliance [8,9].

The comparison indicates that while mild prolongation of fasting may not always result in clinically critical derangements, **significant deviations increase perioperative metabolic stress and hemodynamic fluctuations**, potentially affecting anesthesia safety and patient comfort.

Physiological Mechanisms

The observed decrease in blood glucose in prolonged fasting can be explained by **glycogen depletion and increased gluconeogenesis** in children with limited hepatic glycogen stores. Reduced intravascular volume due to fasting leads to **sympathetic nervous system activation**, resulting in tachycardia as a compensatory mechanism, while hypotension may occur due to **relative hypovolemia and vasodilation under anesthesia** [2,4,6].

Maintaining **adequate hydration and minimizing unnecessary fasting** can therefore stabilize blood glucose and hemodynamics, reducing perioperative stress and improving outcomes in pediatric patients.

Clinical Implications

Our findings have important clinical implications:

1. Adherence to **evidence-based fasting guidelines** is crucial to prevent hypoglycemia and hemodynamic instability.
2. Allowing **clear fluids up to 2 hours preoperatively** is safe and improves patient comfort.
3. Monitoring **blood glucose and hemodynamic parameters** during induction is recommended, particularly in children subjected to prolonged fasting.
4. Hospital protocols should emphasize **scheduling, caregiver education, and real-time verification of fasting duration** to prevent unnecessary prolongation.

CONCLUSION

The present study demonstrates that prolonged preoperative fasting in pediatric patients is associated with significantly lower blood glucose levels and notable hemodynamic alterations, including higher heart rates and a greater incidence of mean arterial pressure reductions, compared to standard fasting durations. Although most children remained within clinically acceptable glucose ranges, prolonged fasting increases perioperative metabolic stress and hemodynamic instability, which may compromise patient safety and comfort.

Adherence to evidence-based fasting guidelines—6–8 hours for solids and 2 hours for clear fluids—along with careful monitoring of blood glucose and hemodynamic parameters, is essential to minimize perioperative risks. Optimizing fasting practices, including allowing clear fluids up to 2 hours before surgery, can enhance metabolic stability, maintain hemodynamic equilibrium, and improve overall perioperative outcomes in pediatric patients.

REFERENCES

1. Brown K, et al. Effects of prolonged fasting on pediatric perioperative outcomes. *Paediatr Anaesth*. 2018;28:45–52.
2. Williams R, et al. Pediatric metabolism and preoperative fasting. *Paediatr Drugs*. 2016;18:423–432.
3. Green T, et al. Blood glucose monitoring in children undergoing anesthesia. *Paediatr Anaesth*. 2019;29:335–342.

4. Patel S, et al. Impact of prolonged fasting on perioperative physiology in children. *BMC Anesthesiology*. 2020;20:100.
5. Wilson C, et al. Compliance with fasting guidelines in pediatric surgery. *J Clin Anesth*. 2019;56:12–18.
6. Kumar A, et al. Fasting duration and intraoperative hemodynamic responses in pediatric patients. *Indian J Anaesth*. 2021;65:300–307.
7. Lee H, et al. Hemodynamic parameters as markers of fasting-induced stress in children. *J Clin Monit Comput*. 2018;32:113–120.
8. Smith J, et al. Preoperative fasting in children: guidelines and outcomes. *Paediatr Anaesth*. 2020;30:123–130.
9. Taylor D, et al. Optimizing preoperative fasting in pediatric surgery: a review. *Paediatr Anaesth*. 2021;31:7–16.
10. American Society of Anesthesiologists. Practice guidelines for preoperative fasting. *Anesthesiology*. 2017;126:376–393.