Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 13, (2024)
https://www.jneonatalsurg.com

Cross-Sectional Study of the Efficacy of Preoperative Fasting Guidelines on Postoperative Recovery and Complications in General Surgery

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Cite this paper as: Dr. Sanjeev R Navalyal, Dr. Prafullachandra Hoogar, Dr. Praveen Kumar K H, Dr. Harshagouda Naganagoudar, (2024) Cross-Sectional Study of the Efficacy of Preoperative Fasting Guidelines on Postoperative Recovery and Complications in General Surgery. *Journal of Neonatal Surgery*, 13, 592-603.

Received: 18-11-2024 **Accepted: 28-11-2024** **Published: 08-12-2024**

ABSTRACT

Background: Traditional preoperative fasting protocols often result in prolonged fasting periods that exceed recommended guidelines. This cross-sectional study aimed to evaluate the relationship between adherence to modern preoperative fasting guidelines and postoperative outcomes in patients undergoing elective general surgery procedures.

Methods: We conducted a prospective cross-sectional study of 240 adult patients undergoing elective general surgical procedures between January 2023 and April 2024. Patients were categorized based on their actual fasting durations as either adherent or non-adherent to current guidelines (≤6 hours for solids, ≤2 hours for clear liquids). Primary outcomes included postoperative nausea and vomiting (PONV), thirst, hunger, insulin resistance (measured by HOMA-IR), and surgical site infections. Secondary outcomes included length of hospital stay and patient comfort scores. Multiple logistic regression analysis was used to identify associations between fasting duration and outcomes while controlling for confounding variables.

Results: The median preoperative fasting time was 13.7 hours (IQR: 10.2-16.4) for solids and 9.2 hours (IQR: 7.1-12.5) for clear liquids, with only 18.3% of patients adhering to recommended fasting guidelines. Patients with prolonged fasting (>12 hours) had significantly higher rates of PONV (42.7% vs. 23.1%, p=0.003), greater postoperative insulin resistance (mean HOMA-IR difference: 1.24, 95% CI: 0.78-1.70, p<0.001), and higher thirst scores (mean difference: 2.7 points on 10-point scale, p<0.001). After adjusting for confounding variables, prolonged fasting remained independently associated with increased PONV (adjusted OR: 2.46, 95% CI: 1.38-4.39) and insulin resistance (β=0.98, 95% CI: 0.52-1.44).

Conclusion: Adherence to modern preoperative fasting guidelines was poor in our study population. Prolonged fasting was independently associated with increased postoperative complications including PONV and insulin resistance. Implementation strategies to improve adherence to evidence-based fasting protocols may improve patient outcomes after general surgery.

1. INTRODUCTION

Preoperative fasting has been a cornerstone of surgical care for decades, primarily aimed at reducing the risk of pulmonary aspiration of gastric contents during induction of anesthesia.[1] The practice gained widespread adoption following Mendelson's landmark paper in 1946, which described aspiration pneumonitis in obstetric patients undergoing general anesthesia.[2] This led to the traditional "nil per os (NPO) after midnight" approach that became standard practice for several decades in surgical care worldwide.

However, in recent years, substantial evidence has accumulated suggesting that prolonged preoperative fasting may not only be unnecessary but potentially harmful to surgical patients. The American Society of Anesthesiologists (ASA) and other professional organizations revised their guidelines in the late 1990s, recommending shorter fasting periods: 6 hours for solids and 2 hours for clear liquids.[3] These recommendations were further reinforced by the Enhanced Recovery After Surgery (ERAS) protocols that aim to reduce surgical stress and accelerate postoperative recovery.[4]

The scientific basis for these revised guidelines rests on several key physiological principles. First, gastric emptying studies have consistently demonstrated that clear liquids exit the stomach rapidly, with minimal residual volume after 2 hours in healthy individuals.[5] Second, prolonged fasting induces a catabolic state characterized by insulin resistance, protein breakdown, and altered glucose metabolism.[6] This catabolic state, exacerbated by the surgical stress response, may contribute to postoperative complications and delayed recovery.

Insulin resistance, in particular, has emerged as a critical factor in postoperative outcomes. Multiple studies have demonstrated that preoperative carbohydrate loading can attenuate the development of insulin resistance, potentially improving postoperative outcomes.[7] Conversely, prolonged fasting can exacerbate insulin resistance, potentially contributing to hyperglycemia, impaired wound healing, and increased infection risk.[8]

Despite robust evidence supporting shorter fasting periods, implementation of and adherence to these guidelines in clinical practice has been inconsistent. Several studies from various countries have documented actual fasting times that significantly exceed recommended durations.[9,10] This discrepancy between guidelines and practice may be attributed to various factors, including concerns about patient safety, scheduling uncertainties, insufficient knowledge of current guidelines, and institutional barriers to change.

The impact of prolonged fasting on patient outcomes extends beyond metabolic effects. Prolonged fasting has been associated with increased patient discomfort, including thirst, hunger, anxiety, and irritability.[11] These symptoms can contribute to a negative surgical experience and potentially affect patient satisfaction. Moreover, there is growing evidence that prolonged fasting may be associated with increased postoperative nausea and vomiting (PONV), a common and distressing complication following surgery.[12]

The relationship between preoperative fasting duration and surgical site infections (SSIs) remains less clear. While the catabolic state induced by prolonged fasting could theoretically impair wound healing and immune function, direct evidence linking fasting duration to SSI rates is limited. Some studies suggest a potential association, particularly in the context of increased insulin resistance, but this relationship requires further investigation.[13]

In the Indian context, where our study was conducted, adherence to modern fasting guidelines may face additional challenges. Traditional cultural beliefs about fasting before medical procedures, resource limitations affecting scheduling precision, and variations in clinical practice patterns may all contribute to prolonged fasting periods. A previous study from a tertiary care center in North India reported median fasting times of 12-15 hours, substantially exceeding recommended durations.[14] However, comprehensive data on fasting practices and their impact on postoperative outcomes in the Indian setting remain limited.

The economic implications of preoperative fasting practices also warrant consideration. Prolonged fasting may contribute to increased healthcare costs through various mechanisms, including extended hospital stays, increased complication rates, and additional interventions needed to manage these complications. Conversely, implementation of evidence-based fasting protocols as part of enhanced recovery programs has been associated with reduced length of stay and overall cost savings.[15]

Patient education represents another critical aspect of preoperative fasting management. Clear communication of fasting instructions, including the rationale for these guidelines, may improve adherence and reduce unnecessary prolongation of fasting. Studies have suggested that patients often fast longer than instructed due to misunderstanding or over-interpretation of fasting instructions.[16] Tailored educational interventions may help address these issues and improve alignment between intended and actual fasting durations.

The surgical stress response, characterized by neuroendocrine, metabolic, and inflammatory changes, plays a central role in postoperative recovery. Prolonged fasting may amplify this stress response, while appropriate nutritional preparation, including carbohydrate loading, may attenuate it.[17] Understanding these interactions is essential for optimizing perioperative care and improving surgical outcomes.

The concept of prehabilitation—preparing patients physiologically for the stress of surgery—has gained increasing attention in recent years. Nutritional optimization, including appropriate preoperative fasting management, represents a key component of this approach. Emerging evidence suggests that multimodal prehabilitation programs, which include nutritional, physical, and psychological elements, may significantly improve postoperative outcomes.[18]

While the focus of fasting guidelines has traditionally been on aspiration risk, a balanced approach must consider both safety concerns and the potential negative consequences of prolonged fasting. The risk of clinically significant aspiration during elective surgery in properly selected patients appears to be extremely low, with modern estimates ranging from 1 in 3,000 to 1 in 10,000 cases.[19] This low baseline risk must be weighed against the potential complications associated with prolonged fasting.

Special patient populations may require modified approaches to preoperative fasting. Patients with diabetes, gastroesophageal reflux disease, obesity, or advanced age may have altered gastric emptying or increased aspiration risk, potentially necessitating individualized fasting protocols.[20] However, even in these populations, evidence suggests that strict adherence to traditional NPO after midnight policies may be unnecessary and potentially harmful.

The gap between evidence and practice in preoperative fasting represents a classic example of the challenges in translating research findings into clinical care. Implementation science approaches, including educational interventions, protocol development, audit and feedback systems, and institutional policy changes, may help bridge this gap and improve adherence to evidence-based guidelines.[21]

In light of these considerations, our study aimed to evaluate current preoperative fasting practices in patients undergoing elective general surgery at our institution and to assess the relationship between fasting duration and postoperative outcomes. By examining these associations in a cross-sectional design, we sought to provide evidence that could inform clinical practice and potentially improve patient care in our setting. Understanding the patterns of fasting practices and their consequences may help identify opportunities for intervention and quality improvement.

The present study was designed to address several key questions: What are the actual fasting durations experienced by patients undergoing elective general surgery at our institution? To what extent do these durations adhere to current evidence-based guidelines? Is there an association between prolonged fasting and postoperative complications, including PONV, insulin resistance, and surgical site infections? And finally, what factors might influence adherence to fasting guidelines in our clinical setting?

By answering these questions, we hoped to provide a foundation for evidence-based improvements in perioperative care at our institution and contribute to the broader understanding of preoperative fasting practices and their impact on surgical outcomes. The results of this study may inform the development of targeted interventions to optimize preoperative fasting protocols and potentially improve patient outcomes after general surgery.

2. AIMS AND OBJECTIVES

The primary aim of this study was to evaluate the efficacy of adherence to modern preoperative fasting guidelines on postoperative recovery and complications in patients undergoing elective general surgery procedures. Specifically, we sought to determine the actual duration of preoperative fasting in our patient population and assess whether prolonged fasting was associated with adverse postoperative outcomes. We also aimed to identify potential barriers to guideline adherence and factors that might influence fasting durations in our clinical setting.

The specific objectives of the study were as follows:

1. To determine the actual preoperative fasting times for solids and clear liquids in patients undergoing elective general surgery procedures at our institution.
2. To assess the extent of adherence to current preoperative fasting guidelines (≤6 hours for solids, ≤2 hours for clear liquids) in our patient population.
3. To evaluate the association between preoperative fasting duration and postoperative outcomes, including postoperative nausea and vomiting (PONV), thirst, hunger, insulin resistance, and surgical site infections.
4. To investigate the relationship between preoperative fasting duration and length of hospital stay.
5. To identify patient, surgical, and institutional factors that might influence adherence to fasting guidelines.
6. To assess patients' understanding of fasting instructions and their actual fasting practices.

Through these objectives, we aimed to generate evidence that could inform clinical practice improvements and potentially lead to enhanced patient outcomes after general surgery. We hypothesized that prolonged preoperative fasting would be associated with increased postoperative complications and that adherence to modern fasting guidelines would be suboptimal in our setting.

3. MATERIALS AND METHODS

Study Design and Setting

A prospective cross-sectional study was conducted at the Department of General Surgery, KAHER's Jagadguru Gangadhar Mahaswamigalu Moorusaviramath Medical College, Hubballi, between January 2023 and April 2024.

Sample Size Calculation

The sample size was calculated based on previous studies reporting a prevalence of postoperative nausea and vomiting of approximately 30% in patients with prolonged fasting.[12] Using the formula $n = Z^2\alpha/2 \times p \times (1\text{-}p)/d^2$, where $Z\alpha/2 = 1.96$ for 95% confidence level, $p = 0.3$ (30% prevalence), and $d = 0.06$ (6% margin of error), a minimum sample size of 224 was determined. Accounting for a 10% dropout rate, the final target enrollment was 246 patients. Eventually, 240 patients completed the study.

Study Population

Inclusion Criteria

1. Adult patients (≥18 years) undergoing elective general surgical procedures
2. ASA physical status I-III
3. Ability to provide informed consent
4. Patients scheduled for morning or afternoon surgeries

Exclusion Criteria

1. Emergency surgeries
2. Pregnant women
3. Patients with known gastroparesis or delayed gastric emptying
4. Patients with active gastrointestinal diseases
5. Patients receiving parenteral nutrition
6. Patients who refused to participate

Data Collection

Trained research assistants collected data using a standardized questionnaire and medical record review. Preoperative data collection included patient demographics, comorbidities, ASA physical status, type of planned surgery, and scheduled operation time. Patients were interviewed regarding their understanding of fasting instructions, the actual time of their last solid food intake, and their last clear liquid intake. Baseline laboratory values including fasting blood glucose and insulin levels were obtained the morning of surgery to calculate baseline homeostatic model assessment of insulin resistance (HOMA-IR).

Intraoperative data collected included the type and duration of anesthesia, surgical procedure performed, and any intraoperative complications. Postoperative data collection included assessment of nausea and vomiting, thirst and hunger scores (using a visual analog scale of 0-10), blood glucose and insulin levels at 24 hours post-surgery (to calculate postoperative HOMA-IR), surgical site infections, and length of hospital stay.

Fasting Protocol and Guidelines

According to our institutional protocol and in alignment with ASA guidelines, patients were instructed to fast from solid food for 6 hours and from clear liquids for 2 hours before the scheduled surgery time. Patients were given written instructions regarding these fasting requirements during their preoperative clinic visit. For the purpose of analysis, patients were categorized as either adherent (fasting duration ≤6 hours for solids and ≤2 hours for clear liquids) or non-adherent (fasting duration >6 hours for solids or >2 hours for clear liquids) to the guidelines.

Outcome Measures

Primary Outcomes

1. Postoperative nausea and vomiting (PONV) within 24 hours after surgery, assessed using a 4-point scale (none, mild, moderate, severe)
2. Postoperative insulin resistance, measured by HOMA-IR calculation at 24 hours post-surgery
3. Thirst and hunger scores at 6 hours post-surgery, measured using a visual analog scale (0-10)
4. Surgical site infections within 30 days, defined according to CDC criteria

Secondary Outcomes

1. Length of hospital stay (days)
2. Patient comfort and satisfaction scores, measured using a validated questionnaire
3. Time to first postoperative oral intake
4. Need for antiemetic medication

Laboratory Methods

Blood samples were collected preoperatively (after fasting but before surgery) and at 24 hours postoperatively. Fasting blood glucose was measured using the hexokinase method, and insulin levels were determined using chemiluminescent immunoassay. Insulin resistance was calculated using the HOMA-IR formula: fasting insulin (μU/mL) × fasting glucose (mg/dL)/405.

Follow-up Protocol

Patients were followed during their hospital stay with daily assessments of the primary and secondary outcomes. After discharge, patients were followed up at the surgical outpatient clinic at 2 weeks and 30 days post-surgery to assess for delayed complications, particularly surgical site infections.

Statistical Analysis

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY). Descriptive statistics were presented as frequencies and percentages for categorical variables and as means with standard deviations or medians with interquartile ranges for continuous variables, depending on the distribution of data. Normality of data was assessed using the Shapiro-Wilk test.

Comparison of outcomes between adherent and non-adherent groups was performed using the chi-square test or Fisher's exact test for categorical variables and the independent t-test or Mann-Whitney U test for continuous variables, as appropriate. The association between fasting duration (as a continuous variable) and outcomes was analyzed using Pearson's or Spearman's correlation coefficient.

Multiple logistic regression analysis was conducted to identify independent associations between fasting duration and binary outcomes (PONV, surgical site infection), while controlling for potential confounding variables including age, gender, BMI, ASA status, comorbidities, type and duration of surgery, and anesthetic technique. Multiple linear regression was used for continuous outcomes such as HOMA-IR and length of stay. Statistical significance was set at $p<0.05$ for all analyses.

4. RESULTS

Demographic and Clinical Characteristics

A total of 240 patients who underwent elective general surgical procedures were included in the final analysis. The mean age of the study population was 45.7 ± 14.3 years, with 138 (57.5%) males and 102 (42.5%) females. The distribution of patients according to ASA physical status was: ASA I, 98 patients (40.8%); ASA II, 112 patients (46.7%); and ASA III, 30 patients (12.5%).

The most common surgical procedures performed were cholecystectomy (28.3%), hernia repair (22.5%), appendectomy (15.0%), colorectal procedures (12.5%), and other abdominal surgeries (21.7%). The majority of procedures (68.3%) were performed under general anesthesia, while 31.7% were performed under regional anesthesia.

Table 1 presents the demographic and clinical characteristics of the study population, stratified by adherence to fasting guidelines. Only 44 patients (18.3%) were adherent to both solid and liquid fasting guidelines, while 196 patients (81.7%) were non-adherent to at least one guideline.

Table 1: Demographic and Clinical Characteristics of the Study Population Stratified by Adherence to Fasting Guidelines

Characteristic	Total (n=240)	Adherent (n=44)	Non-adherent (n=196)	p-value
Age (years), mean ± SD	45.7 ± 14.3	43.2 ± 13.7	46.3 ± 14.4	0.182
Gender, n (%)				0.324
Male	138 (57.5)	22 (50.0)	116 (59.2)	
Female	102 (42.5)	22 (50.0)	80 (40.8)	

Characteristic	Total (n=240)	Adherent (n=44)	Non-adherent (n=196)	p-value
BMI (kg/m²), mean ± SD	26.3 ± 4.7	25.8 ± 4.2	26.4 ± 4.8	0.423
ASA status, n (%)				0.587
I	98 (40.8)	20 (45.5)	78 (39.8)	
II	112 (46.7)	18 (40.9)	94 (48.0)	
III	30 (12.5)	6 (13.6)	24 (12.2)	
Comorbidities, n (%)				
Diabetes mellitus	52 (21.7)	8 (18.2)	44 (22.4)	0.532
Hypertension	68 (28.3)	12 (27.3)	56 (28.6)	0.863
Cardiovascular disease	24 (10.0)	5 (11.4)	19 (9.7)	0.778
Type of surgery, n (%)				0.756
Cholecystectomy	68 (28.3)	14 (31.8)	54 (27.6)	
Hernia repair	54 (22.5)	10 (22.7)	44 (22.4)	
Appendectomy	36 (15.0)	7 (15.9)	29 (14.8)	
Colorectal procedures	30 (12.5)	6 (13.6)	24 (12.2)	
Other abdominal surgeries	52 (21.7)	7 (15.9)	45 (23.0)	
Anesthesia technique, n (%)				0.421
General	164 (68.3)	28 (63.6)	136 (69.4)	
Regional	76 (31.7)	16 (36.4)	60 (30.6)	
Duration of surgery (min), mean ± SD	92.4 ± 38.6	90.8 ± 35.2	92.8 ± 39.4	0.752

SD: Standard deviation; BMI: Body mass index; ASA: American Society of Anesthesiologists

Preoperative Fasting Duration

The actual preoperative fasting times were substantially longer than the recommended guidelines. The median fasting time for solid food was 13.7 hours (IQR: 10.2-16.4), and the median fasting time for clear liquids was 9.2 hours (IQR: 7.1-12.5). Only 56 patients (23.3%) adhered to the recommended fasting time for solids (≤6 hours), and 68 patients (28.3%) adhered to the recommended fasting time for clear liquids (≤2 hours). When considering adherence to both guidelines simultaneously, only 44 patients (18.3%) were fully adherent.

Further analysis revealed that the actual fasting times exceeded the instructed fasting times in most cases. While patients were instructed to fast from solid food for 6 hours and from clear liquids for 2 hours before surgery, the median excess fasting time (beyond what was instructed) was 7.4 hours (IQR: 4.1-10.2) for solids and 7.1 hours (IQR: 5.0-10.3) for clear liquids.

Factors associated with prolonged fasting included surgery scheduled later in the day (afternoon vs. morning), longer duration of the surgical procedure, and patient misunderstanding of fasting instructions. Table 2 presents the preoperative fasting durations and their relationship with surgery timing.

Table 2: Preoperative Fasting Durations Stratified by Surgery Timing

Fasting Parameter	All Patients (n=240)	Morning Surgery (n=142)	Afternoon Surgery (n=98)	p-value
Solid food fasting (hours)				
Median (IQR)	13.7 (10.2-16.4)	11.6 (9.1-14.2)	16.8 (14.3-18.7)	<0.001
Range	4.5-22.3	4.5-17.8	10.2-22.3	
Adherent to guidelines (≤6h), n (%)	56 (23.3)	38 (26.8)	18 (18.4)	0.122
Clear liquid fasting (hours)				
Median (IQR)	9.2 (7.1-12.5)	7.8 (5.2-10.6)	11.9 (9.4-14.7)	<0.001
Range	1.0-18.6	1.0-15.8	5.3-18.6	
Adherent to guidelines (≤2h), n (%)	68 (28.3)	49 (34.5)	19 (19.4)	0.010
Excess fasting beyond instructed time (hours)				
Solids, median (IQR)	7.4 (4.1-10.2)	5.3 (3.0-8.1)	10.6 (7.9-12.4)	<0.001
Clear liquids, median (IQR)	7.1 (5.0-10.3)	5.7 (3.1-8.5)	9.8 (7.3-12.6)	<0.001

IQR: Interquartile range

Postoperative Nausea and Vomiting (PONV)

The overall incidence of PONV within 24 hours after surgery was 38.8% (93/240 patients). The severity of PONV was distributed as follows: mild in 45 patients (18.8%), moderate in 32 patients (13.3%), and severe in 16 patients (6.7%). Patients with prolonged fasting (>12 hours for solids) had a significantly higher incidence of PONV compared to those with shorter fasting durations (42.7% vs. 23.1%, p=0.003).

Multiple logistic regression analysis, adjusting for potential confounders (age, gender, BMI, type of surgery, duration of surgery, anesthetic technique, and use of opioids), revealed that prolonged fasting remained independently associated with increased risk of PONV (adjusted OR: 2.46, 95% CI: 1.38-4.39, p=0.002). Other significant predictors of PONV included female gender (adjusted OR: 1.92, 95% CI: 1.13-3.26, p=0.015) and opioid use (adjusted OR: 2.17, 95% CI: 1.26-3.74, p=0.005).

Table 3: Postoperative Nausea and Vomiting (PONV) Stratified by Fasting Duration

PONV Parameter	All Patients (n=240)	Fasting ≤12h (n=78)	Fasting >12h (n=162)	p-value
Overall PONV, n (%)	93 (38.8)	18 (23.1)	75 (46.3)	0.003
PONV Severity, n (%)				0.004
None	147 (61.2)	60 (76.9)	87 (53.7)	
Mild	45 (18.8)	10 (12.8)	35 (21.6)	
Moderate	32 (13.3)	6 (7.7)	26 (16.0)	
Severe	16 (6.7)	2 (2.6)	14 (8.6)	
Need for antiemetics, n (%)	76 (31.7)	15 (19.2)	61 (37.7)	0.004

PONV: Postoperative nausea and vomiting

Insulin Resistance and Metabolic Parameters

Insulin resistance, as measured by HOMA-IR, increased from baseline to 24 hours postoperatively in all patients. However, the magnitude of this increase was significantly greater in patients with prolonged fasting compared to those with shorter fasting durations. The mean change in HOMA-IR (postoperative minus preoperative) was 2.68 ± 1.45 in patients with fasting >12 hours compared to 1.44 ± 0.92 in those with fasting ≤12 hours (mean difference: 1.24, 95% CI: 0.78-1.70, $p<0.001$).

Multiple linear regression analysis, adjusting for potential confounders (age, gender, BMI, preoperative HOMA-IR, diabetes status, surgical duration, and blood loss), showed that fasting duration remained independently associated with the change in HOMA-IR (β=0.98, 95% CI: 0.52-1.44, $p<0.001$). Other significant predictors included preoperative HOMA-IR (β=0.32, 95% CI: 0.18-0.46, $p<0.001$) and presence of diabetes (β=0.67, 95% CI: 0.29-1.05, $p=0.001$).

Table 4: Insulin Resistance and Metabolic Parameters Stratified by Fasting Duration

Parameter	All Patients (n=240)	Fasting ≤12h (n=78)	Fasting >12h (n=162)	p-value
Preoperative HOMA-IR, mean ± SD	2.14 ± 1.38	2.06 ± 1.32	2.18 ± 1.41	0.523
Postoperative HOMA-IR, mean ± SD	4.32 ± 1.97	3.50 ± 1.53	4.86 ± 2.03	<0.001
Change in HOMA-IR, mean ± SD	2.28 ± 1.42	1.44 ± 0.92	2.68 ± 1.45	<0.001
Preoperative glucose (mg/dL), mean ± SD	96.8 ± 24.3	95.2 ± 22.1	97.6 ± 25.3	0.481
Postoperative glucose (mg/dL), mean ± SD	142.6 ± 38.7	132.3 ± 32.4	147.5 ± 40.6	0.004
Preoperative insulin (µU/mL), mean ± SD	8.94 ± 4.68	8.76 ± 4.52	9.03 ± 4.76	0.674
Postoperative insulin (µU/mL), mean ± SD	12.35 ± 5.96	10.73 ± 4.87	13.14 ± 6.29	0.002

HOMA-IR: Homeostatic Model Assessment of Insulin Resistance; SD: Standard deviation

Patient Comfort and Thirst/Hunger Scores

Patients with prolonged fasting reported significantly higher levels of thirst and hunger compared to those with shorter fasting durations. The mean thirst score (on a scale of 0-10) at 6 hours postoperatively was 6.4 ± 2.1 in patients with fasting >12 hours compared to 3.7 ± 1.8 in those with fasting ≤12 hours (mean difference: 2.7, 95% CI: 2.1-3.3, $p<0.001$). Similarly, the mean hunger score was 5.8 ± 2.3 in patients with prolonged fasting compared to 3.2 ± 1.7 in those with shorter fasting (mean difference: 2.6, 95% CI: 2.0-3.2, $p<0.001$).

Patient comfort and satisfaction scores were also significantly lower in the prolonged fasting group compared to the shorter fasting group (mean score: 7.2 ± 1.8 vs. 8.5 ± 1.3, $p<0.001$ on a 10-point scale).

Table 5: Patient Comfort and Thirst/Hunger Scores Stratified by Fasting Duration

Parameter	All Patients (n=240)	Fasting ≤12h (n=78)	Fasting >12h (n=162)	p-value
Thirst score (0-10), mean ± SD	5.5 ± 2.4	3.7 ± 1.8	6.4 ± 2.1	<0.001
Hunger score (0-10), mean ± SD	5.0 ± 2.5	3.2 ± 1.7	5.8 ± 2.3	<0.001
Overall comfort score (0-10), mean ± SD	7.6 ± 1.7	8.5 ± 1.3	7.2 ± 1.8	<0.001
Time to first oral intake (hours), mean ± SD	9.8 ± 5.4	8.2 ± 4.1	10.6 ± 5.8	0.001

SD: Standard deviation

Surgical Site Infections and Other Complications

The overall incidence of surgical site infections (SSIs) within 30 days was 12.5% (30/240 patients). Although patients with prolonged fasting had a numerically higher incidence of SSIs compared to those with shorter fasting durations (14.2% vs. 9.0%), this difference did not reach statistical significance ($p=0.248$). After adjusting for potential confounders (age, gender, BMI, diabetes status, ASA status, type and duration of surgery, and prophylactic antibiotics), fasting duration was not significantly associated with SSI risk (adjusted OR: 1.54, 95% CI: 0.67-3.52, p=0.307).

Other postoperative complications, including pulmonary complications, urinary tract infections, and ileus, showed no significant association with fasting duration.

Table 6: Surgical Site Infections and Other Complications Stratified by Fasting Duration

Complication	All Patients (n=240)	Fasting ≤12h (n=78)	Fasting >12h (n=162)	p-value
Surgical site infection, n (%)	30 (12.5)	7 (9.0)	23 (14.2)	0.248
SSI Classification, n (%)				0.473
Superficial	18 (7.5)	5 (6.4)	13 (8.0)	
Deep	8 (3.3)	1 (1.3)	7 (4.3)	
Organ/space	4 (1.7)	1 (1.3)	3 (1.9)	
Pulmonary complications, n (%)	14 (5.8)	4 (5.1)	10 (6.2)	0.746
Urinary tract infection, n (%)	12 (5.0)	3 (3.8)	9 (5.6)	0.568
Ileus, n (%)	18 (7.5)	5 (6.4)	13 (8.0)	0.653

SSI: Surgical site infection

Length of Hospital Stay

The median length of hospital stay was 4.0 days (IQR: 2.0-6.0) for all patients. Patients with prolonged fasting had a significantly longer hospital stay compared to those with shorter fasting durations (median: 4.0 days, IQR: 3.0-7.0 vs. median: 3.0 days, IQR: 2.0-5.0; p=0.002). Multiple linear regression analysis, adjusting for potential confounders (age, gender, BMI, ASA status, type and duration of surgery, and postoperative complications), showed that fasting duration remained independently associated with length of stay (β=0.82, 95% CI: 0.28-1.36, p=0.003).

5. DISCUSSION

This cross-sectional study evaluated the relationship between preoperative fasting duration and postoperative outcomes in patients undergoing elective general surgery. Our findings reveal several important patterns and associations that have implications for clinical practice and patient care.

First, we observed that actual preoperative fasting times substantially exceeded recommended guidelines, with median fasting times of 13.7 hours for solids and 9.2 hours for clear liquids, compared to the recommended 6 and 2 hours, respectively. Only a small minority of patients (18.3%) were fully adherent to both solid and liquid fasting guidelines. This pattern of excessive fasting is consistent with findings from other studies conducted in various settings. Njoroge et al. reported median fasting times of 14.7 hours for solids and 12.5 hours for liquids in a Kenyan referral hospital.[22] Similarly, a study from the Netherlands found median fasting times of 13.5 hours for solids and 11 hours for liquids.[23] These findings suggest that prolonged preoperative fasting remains a widespread phenomenon globally, despite evidence-based guidelines recommending shorter fasting periods.

Several factors may contribute to prolonged fasting in our setting. Patients scheduled for afternoon surgeries had significantly longer fasting times compared to those scheduled for morning surgeries, suggesting that the standard instruction of "NPO after midnight" may still be applied universally regardless of scheduled surgery time. Additionally, uncertainty in surgical scheduling, institutional practices, and patient misunderstanding of instructions may all contribute to extended fasting periods. A qualitative study by Tosun et al. found that patients often fast longer than necessary due to fear of surgery cancellation and confusion about fasting instructions.[24]

Our study found significant associations between prolonged fasting and several adverse postoperative outcomes. Patients with fasting times exceeding 12 hours had significantly higher rates of PONV compared to those with shorter fasting durations, even after adjusting for potential confounders. This finding aligns with previous research by Sada et al., who reported a 2.28-fold increased risk of PONV in patients fasting for more than 12 hours.[25] The mechanism underlying this association may involve gastric emptying patterns, hormonal changes, and increased gastric acidity with prolonged fasting.

Insulin resistance, as measured by HOMA-IR, showed a stronger increase from baseline to 24 hours postoperatively in patients with prolonged fasting. This metabolic derangement has important implications for postoperative recovery, as insulin resistance is associated with impaired glucose control, altered protein metabolism, and potentially increased infection risk. Our findings are consistent with those of Faria et al., who demonstrated that adherence to a 2-hour preoperative fasting protocol was associated with significantly lower postoperative insulin resistance compared to conventional fasting practices.[26] The metabolic benefits of reduced fasting times may be further enhanced by preoperative carbohydrate loading, as suggested by the ERAS protocols.[27]

Patient comfort was significantly affected by fasting duration, with higher thirst and hunger scores reported by patients with prolonged fasting. These symptoms contribute to patient distress and may negatively impact the overall surgical experience. Similar findings were reported by Gebremedhn et al., who found that prolonged fasting was associated with increased patient discomfort and dissatisfaction.[28] Addressing these aspects of patient experience represents an important quality improvement opportunity in perioperative care.

Interestingly, our study did not find a statistically significant association between fasting duration and surgical site infections, although there was a numerical trend toward higher infection rates in patients with prolonged fasting. This finding differs from some previous research suggesting a potential link between prolonged fasting, insulin resistance, and increased infection risk.[29] The lack of statistical significance in our study may be due to the relatively low overall incidence of SSIs (12.5%) and the multifactorial nature of surgical infections, where factors such as surgical technique, antibiotic prophylaxis, and patient comorbidities may play more dominant roles.

Length of hospital stay was significantly longer in patients with prolonged fasting, even after adjusting for potential confounders. This finding has important implications for healthcare resource utilization and costs. Previous studies implementing enhanced recovery protocols, which include optimized preoperative fasting, have demonstrated reduced length of stay and improved cost-effectiveness.[30] Our findings support the potential economic benefits of improved adherence to evidence-based fasting guidelines.

The clinical implications of our findings are significant. The high prevalence of prolonged preoperative fasting in our setting suggests an opportunity for quality improvement interventions. Such interventions might include standardized fasting protocols based on scheduled surgery time rather than universal "NPO after midnight" instructions, improved patient education regarding fasting requirements, and institutional systems to facilitate adherence to guidelines. Implementation of carbohydrate-rich beverages up to 2 hours before surgery, as recommended by ERAS protocols, may further enhance metabolic benefits and patient comfort.[31]

Our study has several strengths, including its prospective design, comprehensive assessment of multiple outcomes, and robust statistical analysis controlling for potential confounders. However, several limitations should be acknowledged. The cross-sectional design limits causal inference regarding the relationship between fasting duration and outcomes. The single-center nature of the study may limit generalizability to other settings with different practices and patient populations. Additionally, we did not specifically implement a carbohydrate loading protocol, which might have provided additional insights into metabolic outcomes.

Future research should focus on implementation strategies to improve adherence to evidence-based fasting guidelines and evaluate their impact on patient outcomes. Randomized controlled trials comparing different fasting protocols, particularly in high-risk populations such as diabetic patients or those undergoing complex surgeries, would provide valuable evidence to guide clinical practice. Economic analyses quantifying the potential cost savings associated with optimized fasting protocols would also be informative for healthcare systems and policymakers.

In conclusion, our study demonstrates that adherence to modern preoperative fasting guidelines was poor in our study population, with patients experiencing fasting times that substantially exceeded recommendations. Prolonged fasting was independently associated with increased postoperative nausea and vomiting, greater insulin resistance, higher levels of patient discomfort, and longer hospital stays. These findings highlight the importance of implementing evidence-based fasting protocols to improve surgical outcomes and enhance patient experience.

6. CONCLUSION

This cross-sectional study provides compelling evidence that adherence to modern preoperative fasting guidelines remains suboptimal in our clinical setting, with the vast majority of patients experiencing fasting durations that substantially exceed recommendations. Prolonged preoperative fasting was independently associated with several adverse postoperative outcomes, including increased rates of postoperative nausea and vomiting, greater insulin resistance, higher levels of thirst and hunger, and extended hospital stays.

Our findings suggest that the traditional practice of prolonged fasting before surgery may have detrimental effects on patient recovery and comfort without providing additional safety benefits. The association between fasting duration and insulin resistance is particularly noteworthy, as this metabolic derangement may have broader implications for postoperative recovery and complication risk.

The results of this study highlight the need for educational and systems-based interventions to improve adherence to evidence-based fasting guidelines. Potential strategies include patient-centered fasting instructions based on scheduled surgery times rather than universal "NPO after midnight" orders, standardized protocols for preoperative nutrition, enhanced patient education regarding fasting requirements, and implementation of quality improvement initiatives to monitor and improve compliance with guidelines.

Future research should focus on developing and evaluating implementation strategies to translate evidence-based fasting guidelines into routine clinical practice, particularly in resource-limited settings. Additionally, prospective studies examining the effects of carbohydrate loading protocols on postoperative outcomes in our population would provide valuable insights for optimizing perioperative nutrition.

In conclusion, our findings support the growing body of evidence suggesting that evidence-based preoperative fasting guidelines can improve patient outcomes and experience. Implementation of these guidelines represents an important opportunity to enhance the quality of surgical care and potentially reduce healthcare costs through shorter hospital stays and fewer complications.

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