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Comparison of Postoperative nausea and vomiting prevalence in patients with routine NPO and NPO with clear fluids 2 hours before cataract surgery

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A B S T R A C T

Introduction: Postoperative nausea and vomiting (PONV) is a common complication after cataract surgery, potentially affecting patient comfort and recovery. Traditional fasting protocols (nil per os, NPO) aim to reduce aspiration risk but may cause discomfort, especially in elderly patients. This study evaluates the impact of preoperative fasting duration on PONV incidence in cataract surgery patients.

Materials and Methods: This randomized, double-blind clinical trial included 100 patients undergoing elective cataract surgery, divided into two groups (n=50 each): one following strict fasting (8 hours) and the other allowed clear fluids up to 2 hours before surgery. All procedures were performed without local anesthesia, and PONV incidence was assessed in the recovery unit by blinded nurses. Statistical analysis was conducted to compare PONV severity between groups.

Results: There was no significant difference in the mean severity of PONV between the intervention (6.01 ± 1.14) and control groups (8.88 ± 1.14). Nine patients in the intervention group and ten in the control group required metoclopramide for severe PONV.

Conclusion: Preoperative fasting duration does not significantly impact PONV incidence in cataract surgery. Permitting clear fluids up to two hours preoperatively can enhance patient comfort without increasing aspiration risk.

Introduction

Postoperative nausea and vomiting (PONV) remain among the most common and distressing complications following surgery, significantly impacting patient comfort, recovery, and overall healthcare costs. The risk of PONV is multifactorial, with contributions from patient-related factors, anesthetic techniques, and perioperative management strategies [1]. One critical aspect of perioperative care influencing PONV is preoperative fasting protocols [2]. Traditionally, patients scheduled for surgery are instructed to follow nil per os (NPO) guidelines, refraining from oral intake for extended periods before anesthesia to

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reduce the risk of aspiration.However, emerging evidence suggests that modifications to these fasting protocols, particularly permitting the intake of clear fluids up to two hours before surgery, may not only be safe but also beneficial in reducing adverse postoperative outcomes such as PONV [3].

Historically, NPO after midnight has been the standard fasting regimen for surgical patients, aimed at minimizing the risk of pulmonary aspiration during anesthesia. This practice, however, has been challenged by studies demonstrating that prolonged fasting may lead to dehydration, hypoglycemia, and increased patient discomfort without significantly reducing gastric volume or acidity [4].

In contrast, more liberal fasting guidelines, including the allowance of clear fluids up to two hours preoperatively, have been associated with better hydration status, improved patient satisfaction, and potentially reduced incidence of PONV. In the context of cataract surgery, where general anesthesia is less commonly used but sedation and regional anesthesia are prevalent, understanding the impact of these modified fasting guidelines on PONV is particularly relevant [4].

Cataract surgery, one of the most frequently performed surgical procedures worldwide, is typically conducted under local or regional anesthesia with sedation. While the risk of aspiration is inherently lower in this population compared to those undergoing general anesthesia, PONV remains a concern, particularly in patients receiving intravenous sedatives or opioids [5].

Additionally, given that cataract surgery is often performed on an elderly population, prolonged fasting may contribute to dehydration and discomfort, potentially exacerbating PONV risk factors. Therefore, a comparative evaluation of PONV prevalence in patients following traditional NPO guidelines versus those permitted clear fluids up to two hours preoperatively is warranted [5].

Several studies have examined the effects of preoperative fluid intake on gastric emptying, hemodynamic stability, and overall patient outcomes. Evidence suggests that clear fluids, such as water, carbohydrate-rich beverages, and electrolyte solutions, empty rapidly from the stomach and do not increase the risk of aspiration [6].

Moreover, maintaining hydration with clear fluids has been associated with reduced anxiety, improved hemodynamic stability, and enhanced metabolic function, which may collectively contribute to a lower incidence of PONV. In contrast, prolonged fasting may trigger stress responses, including increased catecholamine release and altered gastrointestinal motility, which could heighten the likelihood of PONV [7].

The pathophysiology of PONV is complex and involves multiple mechanisms, including stimulation of the chemoreceptor trigger zone, vestibular system, and gastrointestinal tract. Factors such as anesthetic agents, opioid use, and patient-specific risk factors, including female sex, history of motion sickness, and previous PONV episodes, all contribute to its occurrence [8]. While fasting status is not traditionally considered a primary risk factor for PONV, emerging evidence suggests that hydration and metabolic homeostasis may play a crucial role in modulating nausea and vomiting symptoms postoperatively. Therefore, evaluating whether a more liberal fluid intake policy mitigates PONV in cataract surgery patients could have significant clinical implications [8-10].

From a patient-centered care perspective, preoperative fasting guidelines should balance safety concerns with comfort and well-being. The psychological and physiological distress associated with prolonged fasting has been well documented, with patients often reporting symptoms of thirst, hunger, and anxiety.The introduction of modified fasting protocols that allow clear fluids closer to surgery time has been associated with increased patient satisfaction, reduced preoperative discomfort, and potentially improved postoperative outcomes. Given that cataract surgery is commonly performed on an ambulatory basis, minimizing discomfort and expediting recovery are essential components of optimal perioperative care [11].

While existing literature has demonstrated the safety of preoperative clear fluid intake, its specific impact on PONV prevalence in cataract surgery patients remains an area of ongoing research. Comparative studies evaluating traditional NPO guidelines against more relaxed fluid intake policies are essential to determine whether such modifications can contribute to a meaningful reduction in PONV rates. Additionally, understanding the physiological mechanisms underlying any observed differences will be crucial in refining perioperative fasting recommendations across various surgical populations [12].

The implementation of evidence-based fasting guidelines is critical in modern anesthesia practice, where patient safety and comfort are prioritized. The shift towards allowing clear fluids up to two hours before surgery aligns with enhanced recovery after surgery (ERAS) principles, which advocate for reducing unnecessary perioperative stressors. If permitting clear fluids preoperatively is shown to lower PONV incidence, it could represent a simple yet effective strategy to improve perioperative outcomes in cataract surgery patients without compromising safety [13].

In conclusion, postoperative nausea and vomiting remain significant concerns in perioperative care, influencing patient satisfaction and recovery trajectories. Traditional NPO guidelines have long been implemented to reduce aspiration risk, but recent evidence challenges the necessity of prolonged fasting, particularly for patients

undergoing procedures like cataract surgery under regional anesthesia. The comparison of PONV prevalence in patients following strict NPO versus those allowed clear fluids two hours preoperatively represents a critical area of investigation. By evaluating these approaches, we can refine fasting guidelines to optimize patient outcomes while maintaining the highest standards of perioperative safety and efficacy [14-16].

Material and Methods

Study Setting

A total of 100 patients with a confirmed diagnosis of cataract, who were admitted to Nikookari Hospital (affiliated with Tabriz University of Medical Sciences) and scheduled for cataract surgery, were evaluated in this study. This study was conducted in the operating room of Nikookari Hospital (affiliated with Tabriz University of Medical Sciences) during 2023. Participants were selected based on predefined inclusion and exclusion criteria.

Inclusion Criteria

- Willingness to participate in the study and signing informed consent
- Candidates for elective cataract surgery
- Age above 60 years
- ASA class I and II patients

Exclusion Criteria

- Presence of diabetes or other endocrine disorders
- Use of antiemetic medications within 24 hours prior to surgery
- History of motion sickness or PONV
- Patients with Crohn's disease
- Patients consuming ginger-containing supplements
- Patients unwilling to continue participation in the study

Sampling Method

A convenience sampling method was employed, where all 100 patients meeting the inclusion and exclusion criteria were enrolled in the study.

Sample Size

The sample size was determined based on a similar study in this field, with $\alpha = 0.05$, $\beta = 0.1$, and a power of 80%. Considering the Rhodes Index scores reported in the referenced study (control group: 11.47±4.45, intervention group: 7.28±3.74), the required sample size was estimated at 45 patients per group. Accounting for a potential dropout rate of 10%, the final sample size was determined to be 50 patients per group.

Randomization

This study utilized block permutation randomization to ensure balance in sample allocation. Blocks of four patients were used, with all possible block combinations as follows: block 1: BBAA, block 2: AABB, block 3: ABAB, block 4: BABA, block 5: ABBA, and block 6: BAAB. To randomize 100 participants, 25 blocks were required. Block sequences were generated using the Random Allocation Software, selecting numbers from 1 to 6 to form a randomized sequence. For example, if block 6 was chosen first, followed by block 2, the assignment sequence would be BAABAABB, ensuring equal distribution into the intervention (Group 1) and control (Group 2) groups.

Blinding

As the anesthesiologist performing the procedure was aware of the study groups, they were not blinded. However, the outcome analyst and the intern responsible for recording postoperative outcomes were blinded to the group allocation. Thus, the study maintained a double-blind design.

Study Procedure

Patients were randomly assigned into two groups of 50: one group followed the traditional NPO fasting protocol, while the other group was allowed to consume 200 cc of clear fluids (e.g., water, filtered juice) up to two hours before surgery. Anesthesia was induced using intravenous fentanyl (0–1.1 µg/kg), propofol (2 mg/kg), and atracurium (0.5 mg/kg). Anesthesia maintenance was achieved with a continuous infusion of propofol (50 µg/kg/min), while patients received a gas mixture of 50% O2 and 50% N2O. No local anesthesia was used during surgery.

After surgery, patients were transferred to the recovery room, where the incidence of PONV and the need for antiemetic treatment were assessed by blinded nurses. Nausea and vomiting were recorded every five minutes for the first 30 minutes upon arrival in the recovery room and subsequently every hour for the next six hours in the ward.

Assessment Tools

PONV was evaluated using the Rhodes Index, an eight-question, five-point Likert scale (scores ranging from 0 to 4), with a total score range of 0 to 32. Higher scores indicated increased severity of nausea and vomiting. The mean nausea and vomiting scores were calculated for each group. Potential confounding variables, including age, gender, and duration of anesthesia, were controlled and adjusted using statistical methods.

Data Analysis

Data, including age, gender, comorbidities, and other recorded factors, were entered into SPSS version 20. The normality of the data distribution was assessed. If the data followed a normal distribution, descriptive statistics, including mean, median, standard deviation, and mode, were reported. If the data were non-normally distributed, the 25th to 75th percentiles and median were reported. The relationship between variables was

analyzed using linear regression. Group comparisons were conducted using an independent t-test for normally distributed continuous variables and the chi-square test for categorical variables. In the case of non-normally distributed data, the Kruskal-Wallis test was applied.

Ethical Considerations

- Approval from the Regional Ethics Committee (IR.TBZMED.REC.1402.420) on 2023-09-04
- Registration in the Iranian Registry of Clinical Trials (IRCT20190325043107N36)
- Permission obtained from Nikookari Hospital authorities
- Explanation of study objectives to participants
- Obtaining signed informed consent from participants
- Use of credible sources in thesis writing
- Commitment to integrity and honesty in presenting results, with no data manipulation
- No falsification or bias in reporting study findings

Results

The mean age of the study participants was 63.45 ± 3.19 years. The majority of the participants were female. The mean height, weight, and body mass index (BMI) of the participants were 169.58 ± 15.69 cm, 85.27 ± 8.37 kg, and 29.57 ± 4.41, respectively. Most participants were classified as ASA class II. The comparison of baseline variables between the two study groups showed no statistically significant differences.

Table 1. Comparison of Baseline Variables between the Study Groups

Variable	Intervention Group (N=50)	Control Group (N=50)	P Value
Age (years)	43.3 ± 88.03	64.3 ± 09.28	0.853
Height (cm)	168.14 ± 89.27	172.15 ± 27.44	0.744
Weight (kg)	86.5 ± 57.29	84.5 ± 96.28	0.695
BMI (kg/m²)	29.4 ± 14.96	29.5 ± 49.22	0.859
Gender	Male (42%) Female (58%)	Male (44%) Female (56%)	0.783
ASA Class	I (30%) II (70%)	I (34%) II (66%)	0.799

Among all study participants, 41 patients in the intervention group and 40 patients in the control group had pre-existing conditions, such as hypertension and chronic lung disease (P = 0.754). The mean duration of surgery was 28.11 ± 8.58 minutes, and the mean duration of anesthesia was 50.58 ± 11.13 minutes. The mean intravenous fluid administration was 1.19 ± 1.49 liters, and the mean fentanyl consumption was 90.10 ± 25.07 µg. All patients received Ringer's lactate solution (P = 0.999). A comparison of intraoperative parameters between the two groups showed no significant differences (Table 2).

Table 2. Comparison of Intraoperative Parameters between the Study Groups

Variable	Intervention Group (N=50)	Control Group (N=50)	P Value
Duration of Surgery (min)	28.10 ± 59.29	29.10 ± 85.45	0.637
Duration of Anesthesia (min)	49.12 ± 55.37	51.12 ± 17.44	0.689
IV Fluid (L)	1.1 ± 12.41	1.0 ± 24.19	0.703
Fentanyl Dose (µg)	89.10 ± 45.33	91.11 ± 11.28	0.637

Heart rate was measured preoperatively, one minute after anesthesia induction, three minutes after induction, three minutes before extubation, one minute before extubation, and one minute after extubation. The comparison revealed no statistically significant differences between the two groups at any time point (P > 0.05)(Fig 1). The mean arterial pressure (MAP) was also measured at the same time points, showing no significant differences between the groups (P > 0.05), although the MAP stability was slightly higher in the intervention group(fig 2).

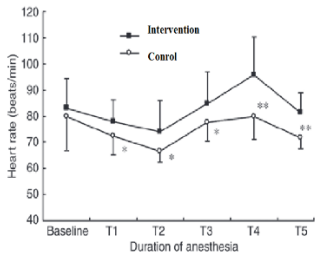

Figure 1. Comparison of Heart Rate between the Two Study Groups

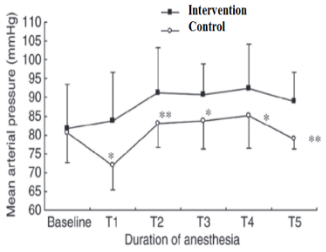

Figure 2. Comparison of Mean Arterial Pressure between the Two Study Groups

Postoperative pain intensity was assessed using the Visual Analog Scale (VAS) over 48 hours after surgery. The comparison between groups indicated no statistically significant differences at any time point (P > 0.05)(fig 3).

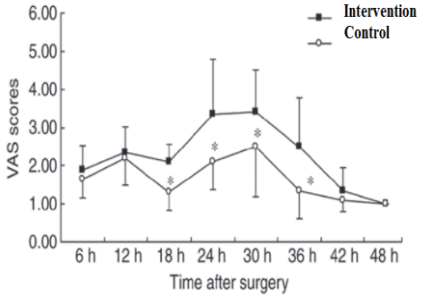

Figure 3. Comparison of Pain Intensity during the First 48 Hours after Surgery between the Two Study Groups

The nausea and vomiting scores were measured in the recovery unit at three different time points. Although the Roders nausea score did not show significant differences between the two groups, nausea and vomiting scores were consistently lower in the intervention group.

The mean nausea and vomiting severity score in the recovery unit was 6.01 ± 1.14 in the intervention group and 8.88 ± 1.14 in the control group (P = 0.069). Nine patients in the intervention group and ten patients in the control group experienced severe nausea and vomiting, requiring metoclopramide administration (P = 0.225). The detailed comparison of nausea and vomiting severity and the need for antiemetic treatment is provided in Table 3.

Table 3. Comparison of Nausea and Vomiting Severity and Antiemetic Requirement between the Study Groups

Variable	Intervention Group (N=50)	Control Group (N=50)	P Value
Nausea Severity Score (Mean ± SD)	4.01 ± 1.14	4.88 ± 1.14	0.069
Nausea and Vomiting			0.115
None	10 patients	11 patients	
Mild	11 patients	10 patients	
Moderate	20 patients	19 patients	
Severe	6 patients	7 patients	
Very Severe	3 patients	3 patients	
Need for Metoclopramide			0.225
Yes	9 patients	10 patients	
No	41 patients	40 patients	

The overall findings suggest no statistically significant differences in baseline characteristics, intraoperative parameters, hemodynamic stability, postoperative pain, or nausea and vomiting severity between the two groups. However, the intervention group showed a slight trend toward better stability in mean arterial pressure and lower nausea and vomiting scores.

Discussion

The objective of this study was to evaluate the incidence of postoperative nausea and vomiting (PONV) in patients undergoing cataract surgery under two different preoperative fasting regimens: complete fasting versus the allowance of clear fluids up to two hours before surgery [14-16]. The findings indicated that the mean ± standard deviation of nausea and vomiting severity in the recovery unit was 6.01 ± 1.14 in the intervention group and 8.88 ± 1.14 in the control group [17-19].

Additionally, nine patients in the intervention group and ten patients in the control group experienced severe nausea and vomiting in the recovery unit, necessitating administration of metoclopramide [20-22].

In recent years, cataract surgery has significantly advanced due to the introduction of minimally invasive techniques and the development of safer and more efficient anesthetic regimens. Among various factors influencing the success of cataract surgery, anesthesia strategies and pain management play a critical role [23-25]. Traditionally, cataract surgery has been performed under local anesthesia combined with intravenous sedation, with the primary aim of ensuring a comfortable and pain-free surgical experience while maintaining sufficient patient alertness and cooperation. To achieve this balance, opioids have been valuable components of anesthesia regimens, providing potent analgesia while minimizing the dose of sedatives required for patient comfort [26-28].

Cataract surgery, one of the most commonly performed ophthalmic procedures worldwide, has evolved significantly not only in terms of surgical techniques and technology but also in postoperative care protocols. One major area of interest and ongoing research in postoperative management is the prevention and treatment of PONV [29-31]. PONV is a common and distressing complication following various surgical procedures, including cataract surgery. It can negatively impact the patient's immediate postoperative experience, and in some cases, may delay recovery and prolong hospital stay [32].

Historically, preoperative fasting guidelines, commonly referred to as nil per os (NPO) protocols, were established to reduce the risk of aspiration during anesthesia induction. These guidelines often mandate strict fasting from midnight (or a specified duration before surgery), prohibiting both solid food and clear fluids. The rationale behind these fasting protocols is to ensure an empty stomach, thereby minimizing the risk of regurgitation and pulmonary aspiration during anesthesia [33-35].

However, in recent years, emerging research and evolving clinical practices have challenged conventional NPO guidelines. This raises the critical question: Can more liberal fasting protocols be implemented without compromising patient safety while simultaneously enhancing patient comfort and optimizing the surgical experience, particularly in low-risk procedures such as cataract surgery?

This study compares the incidence of PONV between patients who adhered to conventional NPO guidelines and those who were permitted to consume clear fluids up to two hours before elective cataract surgery [36-38].

The study also explores the scientific rationale behind fasting protocols, the potential physiological effects of fasting, and the emerging paradigm shift towards more individualized fasting practices in the context of cataract surgery [39-41].

The fundamental question addressed in this research is: Does allowing clear fluid intake closer to cataract surgery increase the risk of aspiration? Conversely, does it influence the incidence of PONV? [42]. By comparing these two patient groups, our study aims to contribute to the growing body of evidence regarding preoperative fasting strategies and their implications for postoperative outcomes in cataract surgery [43].

The findings of this study suggest no significant statistical difference in the mean severity of nausea and vomiting between the intervention and control groups in the recovery unit. These results align with previous studies by Erdurmus et al. [44], Ghodki et al., Muttu et al., and Na et al., Additionally, nine patients in the intervention group and ten patients in the control group experienced severe nausea and vomiting, requiring administration of metoclopramide, findings consistent with those reported by Yagan et al., Virkkila et al., and Ayoglu et al.

Conclusion

The results of this study indicate that the duration of preoperative fasting does not significantly impact the incidence of PONV following cataract surgery. This suggests that clear fluids can be safely permitted up to two hours before surgery without increasing the risk of nausea, vomiting, or aspiration.

Disclosure Statement

No potential conflict of interest reported by the authors.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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