

Original article

Association of prolonged preoperative fasting with post-operative nausea and vomiting in patients of orthopaedic surgeries undergoing General Anaesthesia

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ABSTRACT

Background: Excessive preoperative fasting remains common despite guidance permitting clear liquids until two hours before elective anesthesia. Its association with postoperative nausea and vomiting (PONV) may be influenced by established risk factors. **Objective:** To assess the association between prolonged preoperative fasting and PONV among patients undergoing elective orthopedic surgery under general anesthesia. **Methods:** This single-center observational comparative study included 68 purposively sampled patients aged at least 17 years with ASA physical status I-II. Fasting was classified as 6-8 hours or >8 hours, and PONV was assessed within 24 hours. Crude risk ratios (RRs), 95% confidence intervals (CIs), and Fisher exact p-values were derived from the reported contingency tables. **Results:** PONV occurred in 24 patients (35.3%): 20/34 fasting >8 hours (58.8%) and 4/34 fasting 6-8 hours (11.8%), giving a crude RR of 5.00 (95% CI 1.91-13.09; $p < 0.001$) and an absolute risk difference of 47.1 percentage points (95% CI 27.3-66.8). PONV was more frequent among females than males (53.6% vs 22.5%; RR 2.38, 95% CI 1.22-4.64; $p = 0.011$). Age and ASA differences were not significant. **Conclusion:** Fasting >8 hours was strongly associated with PONV, but residual confounding and the inability to separate solid- and clear-fluid fasting prevent causal interpretation. **Keywords:** Preoperative fasting, Postoperative nausea and vomiting, General anesthesia, Orthopedic surgery, Observational study

EDITORIAL INFORMATION

Author Contributions: Concept: MU, MH, TA; Design: MU, MH, TA, IU; Data Collection: MU, MH, TA, AA; Analysis: IU, AA, TRU; Drafting: MU, MH, TA, IU, AA, TRU.

Ethical Approval: Faculty of Allied Health Sciences, The University of Lahore, Lahore, Pakistan.

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INTRODUCTION

Preoperative fasting is a core component of anesthetic preparation because residual gastric contents may be regurgitated and aspirated after loss of protective airway reflexes. The purpose of fasting is therefore to achieve an appropriate balance: gastric volume and aspiration risk should be minimized without exposing patients to avoidable physiological and psychological consequences of unnecessarily prolonged food and fluid restriction. Contemporary guidance for healthy patients undergoing elective procedures generally permits clear liquids until 2 hours before anesthesia and recommends minimum fasting intervals of 6 hours after a light meal and 8 hours after a fatty or fried meal (1,2). These intervals are minimum safety requirements rather than instructions for every patient to remain nil per mouth from midnight.

Despite these recommendations, prolonged fasting remains common in routine surgical care. Uniform midnight fasting instructions, uncertainty about the order of the operating list, postponement of procedures, inadequate communication among clinical teams, and fear of cancellation can extend fasting well beyond the recommended period (3,4). The actual duration experienced by the patient may consequently differ substantially from the interval prescribed by the anesthetist. This difference is clinically important because the potential safety benefit of an appropriate fast may be replaced by thirst, hunger, headache, anxiety, weakness, and perioperative fluid deficit when restriction continues unnecessarily.

Postoperative nausea and vomiting (PONV) is among the most frequent and distressing adverse outcomes after anesthesia. It encompasses nausea, retching, or vomiting occurring during the postoperative period and is commonly evaluated during the first 24 hours. Approximately one-third of unselected surgical patients experience PONV, while the risk may approach 80% in highly susceptible patients (5,6). Although often regarded as a transient complication, PONV can delay oral medication and fluid intake, contribute to dehydration and electrolyte disturbance, increase wound tension, interfere with rehabilitation, prolong post-anesthesia care, delay discharge, and reduce overall satisfaction (5,9). These consequences are particularly relevant after orthopedic surgery, where early pain control, mobilization, nutrition, and participation in rehabilitation are central to recovery.

PONV has a multifactorial etiology. The simplified APFEL score identifies female sex, nonsmoking status, previous PONV or motion sickness, and postoperative opioid use as major predictors (7). Later evidence has confirmed the importance of these factors while also identifying younger age, increasing duration of anesthesia, volatile anesthetic exposure, nitrous oxide, procedure type, perioperative opioid requirements, pain, and hydration status as potential contributors (8-10). The risk associated with fasting duration must therefore be considered within a wider network of patient, anesthetic, surgical, and postoperative influences. An apparent fasting effect may reflect, or be modified by, differences in these coexisting factors.

Evidence specifically involving orthopedic patients remains heterogeneous. PONV has been described after orthopedic surgery performed under both general and regional anesthesia, with substantial variation according to patient susceptibility, procedure, anesthesia, postoperative pain, anxiety, and analgesic exposure (11,12,16,22). Observational work has also documented fasting durations exceeding recommended intervals and associations between longer fasting and less favorable clinical recovery (3,13,14). However, studies use different thresholds for prolonged fasting and do not always distinguish solids from clear liquids. This distinction is essential because a patient may meet the recommended solid-food interval while experiencing unnecessarily prolonged clear-fluid restriction.

The historical development of fasting practice helps explain this continuing variation. Traditional instructions were designed for a period when anesthetic techniques, airway management, operating schedules, and evidence concerning gastric emptying differed from current practice. Fasting after midnight was administratively simple and created a safety margin when the exact timing of surgery was uncertain. However, a rule that is easy to communicate may not be physiologically optimal for every patient. When an afternoon operation is preceded by fasting from midnight, the resulting restriction can extend far beyond the intended minimum interval. Modern recommendations therefore emphasize the nature and timing of intake rather than a single universal period of abstinence (1,2,17,4).

Clear liquids and solid meals are not equivalent exposures. Clear liquids leave the stomach more rapidly, whereas gastric emptying after solid food depends on meal composition, caloric density, fat content, volume, and individual patient factors. Consequently, the recommended interval following clear fluids is shorter than that following a light or fatty meal (1,2). Combining both into one total fasting duration may conceal clinically meaningful differences. A recorded fast of more than 8 hours could indicate appropriately timed restriction of a heavy meal, unnecessarily prolonged clear-fluid restriction, or both. Interpretation of an association with PONV therefore requires precise documentation of the last solid meal and last clear-liquid intake.

The timing and definition of PONV are similarly important. Nausea is a subjective sensation, while retching and vomiting are observable events; combining them into a single binary outcome simplifies analysis but loses information about severity and clinical burden. Early symptoms in the post-anesthesia care unit may be influenced strongly by anesthetic agents and immediate opioid exposure, whereas later symptoms may relate to mobilization, oral intake, pain, rescue medications, and individual susceptibility. Studies that assess patients once may produce different estimates from those using repeated standardized assessments over 24 hours. These differences partly explain why reported PONV incidence varies even among apparently similar surgical groups (5,6,9).

The consequences of PONV extend beyond discomfort. Repeated vomiting may increase the risk of aspiration, disrupt surgical dressings, aggravate pain, and delay the administration of oral analgesics. Persistent nausea can prevent patients from drinking, eating, mobilizing, and participating in

physiotherapy. In orthopedic pathways that prioritize early mobilization and discharge, even moderate symptoms may interrupt planned recovery. PONV also increases observation and nursing requirements and may contribute to delayed discharge or unplanned admission after ambulatory procedures (5,9,20). Prevention is therefore relevant to patient experience, clinical efficiency, and use of hospital resources.

Risk assessment is central to contemporary PONV management. The APFEL model provides a practical approach by assigning one point each for female sex, nonsmoking status, previous PONV or motion sickness, and expected postoperative opioid use (7). Risk rises as the number of factors increases, supporting prophylaxis tailored to baseline susceptibility rather than a uniform strategy for all patients (5,24). Nevertheless, predictive scores do not include every potentially modifiable exposure. Fasting duration, hydration, anesthetic technique, and postoperative pain may interact with baseline susceptibility, making it important to examine process-related factors while retaining established risk variables in the analysis.

The relationship between prolonged fasting and PONV may also be bidirectional at the level of clinical care. Patients scheduled for complex or later operations may fast longer because of delays, while those same procedures may require longer anesthesia, more opioids, and more intensive postoperative analgesia. In such circumstances, fasting duration can act as a marker of procedural complexity or disrupted workflow rather than the sole biological cause of PONV. Confounding by indication, schedule position, or perioperative treatment is therefore a major consideration in observational research. Demonstrating an independent effect requires detailed covariate measurement and multivariable analysis rather than comparison of crude percentages alone.

Available studies have not produced entirely uniform conclusions. Some observational investigations report associations between excessive fasting and nausea, discomfort, or delayed recovery, whereas intervention studies examining hydration or carbohydrate-containing drinks show variable effects on PONV (13,16-19). Differences in patient selection, surgical specialty, fasting definition, comparator care, anesthesia protocol, antiemetic prophylaxis, and outcome timing can alter the estimated effect. This heterogeneity supports further focused research but also requires restraint: consistency of biological rationale does not replace direct measurement of confounding factors or establish clinical effectiveness.

Evidence from Pakistan concerning actual fasting duration and postoperative symptoms in elective orthopedic patients is limited. Local scheduling practices, communication systems, patient understanding of instructions, and perioperative care pathways may affect both fasting exposure and recovery. Establishing the frequency and direction of an association in this setting is therefore useful for developing better prospective research and for examining whether perioperative processes require improvement. This study assessed the association between documented preoperative fasting duration and PONV within 24 hours among patients undergoing elective orthopedic surgery under general anesthesia, comparing patients fasting for 6-8 hours with those fasting for >8 hours.

MATERIALS AND METHODS

A single-centre observational comparative study was conducted over approximately six months at Central Park Teaching Hospital, Lahore. Purposively selected patients aged ≥ 17 years undergoing elective orthopaedic surgery under general anaesthesia were eligible if they had ASA physical status I-II and documented times of last oral intake. Exclusion criteria were emergency surgery, regional anaesthesia, pregnancy or lactation, smoking, previous PONV or motion sickness, delayed gastric emptying, prolonged bag-mask ventilation, nitrous oxide exposure, and surgery lasting >2 hours. The analysis included all 68 reported eligible participants.

Fasting duration was obtained from clinical documentation and categorized as 6-8 hours or >8 hours. PONV was a binary composite of nausea and/or vomiting during the first 24 postoperative hours. Demographic and clinical information was abstracted using a structured form and checked before coding. The available report did not separate fasting from solids and clear liquids; the exposure therefore represents documented overall fasting duration.

Data were analyzed using IBM SPSS Statistics version 27.0. Categorical variables were summarized as n (%). Two-sided Fisher exact tests, crude RRs, odds ratios (ORs), absolute risk differences, and 95% CIs were calculated from complete 2x2 tables. No adjusted model was fitted because participant-

level covariate data were not supplied. Statistical significance was $p < 0.05$. Reporting followed STROBE guidance (15). Ethical approval was obtained from the Ethical Review Committee, Faculty of Allied Health Sciences, The University of Lahore before recruitment (Ref. No.: DRC/DHPT004/04/24). All participants provided written informed consent.

RESULTS

All 68 participants were included. Forty (58.8%) were male, 39 (57.4%) were aged 26-45 years, and 50 (73.5%) had ASA status I. Each fasting group included 34 patients. Overall, 24 patients (35.3%) experienced PONV (Table 1).

PONV occurred in 20/34 patients fasting >8 hours (58.8%) and 4/34 fasting 6-8 hours (11.8%). Prolonged fasting was associated with a fivefold crude risk (RR 5.00, 95% CI 1.91-13.09; OR 10.71, 95% CI 3.08-37.28; $p < 0.001$). The absolute risk difference was 47.1 percentage points (95% CI 27.3-66.8).

Females had more PONV than males (53.6% vs 22.5%; RR 2.38, 95% CI 1.22-4.64; $p = 0.011$). Age-group (RR 1.49, 95% CI 0.74-2.99; $p = 0.310$) and ASA-status differences (RR 1.39, 95% CI 0.71-2.71; $p = 0.395$) were not significant (Table 2). All estimates were unadjusted.

Table 1. Participant characteristics

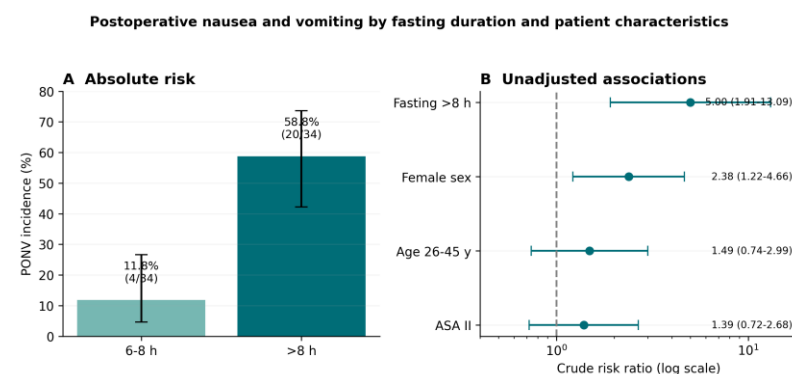
Characteristic	Category	n	%
Sex	Male	40	58.8
	Female	28	41.2
Age	17-25 years	29	42.6
	26-45 years	39	57.4
ASA status	I	50	73.5
	II	18	26.5
Fasting	6-8 hours	34	50.0
	>8 hours	34	50.0
PONV	No	44	64.7
	Yes	24	35.3

Table 2. Unadjusted associations with PONV

Comparison	PONV/total (%)	RR (95% CI)	OR (95% CI)	p
Fasting >8 vs 6-8 h	20/34 (58.8) vs 4/34 (11.8)	5.00 (1.91-13.09)	10.71 (3.08-37.28)	<0.001
Female vs male	15/28 (53.6) vs 9/40 (22.5)	2.38 (1.22-4.64)	3.97 (1.42-11.11)	0.011
Age 26-45 vs 17-25 y	16/39 (41.0) vs 8/29 (27.6)	1.49 (0.74-2.99)	1.83 (0.64-5.21)	0.310
ASA II vs I	8/18 (44.4) vs 16/50 (32.0)	1.39 (0.71-2.71)	1.70 (0.57-5.09)	0.395

RR, risk ratio; OR, odds ratio; CI, confidence interval; ASA, American Society of Anaesthesiologists; PONV, postoperative nausea and vomiting. P-values are two-sided Fisher exact tests.

Figure 1. PONV by fasting duration and patient characteristics



PONV increased from 11.8% (4/34) after 6-8 hours of fasting to 58.8% (20/34) after >8 hours. Fasting had the largest crude association (RR 5.00, 95% CI 1.91-13.09); female sex was also associated (RR 2.38, 95% CI 1.22-4.64), whereas age and ASA estimates crossed 1.0.

DISCUSSION

The principal finding was a strong unadjusted association between fasting for >8 hours and PONV during the first postoperative day. Nearly three in five patients in the prolonged-fasting group experienced PONV, compared with approximately one in nine patients fasting for 6-8 hours. This corresponded to a crude fivefold relative risk and an absolute difference of 47.1 percentage points. Female participants also had a higher PONV incidence, whereas the age- and ASA-related estimates were imprecise and their confidence intervals included no association. The magnitude of the fasting comparison is clinically notable, but the observational design and absence of adjusted analysis mean that it should not be interpreted as an independent causal effect.

The overall PONV incidence of 35.3% is consistent with the substantial burden described across surgical populations. The Fourth Consensus Guidelines and a systematic review indicate that PONV commonly affects about 30% of general surgical patients, with much higher rates among patients carrying several established risk factors (5,6). Comparable prevalence estimates have also been reported in perioperative observational studies, although rates vary according to the surgical population, outcome definition, prophylaxis, and assessment period (20,21). The present incidence therefore appears clinically plausible rather than exceptional.

Variation between studies is expected because PONV is a final common outcome produced by multiple interacting pathways. Patient susceptibility, anesthesia duration, volatile anesthetic and nitrous oxide exposure, perioperative opioids, type and duration of surgery, postoperative pain, hydration, antiemetic prophylaxis, and the timing of outcome assessment may all change the observed incidence (5,8-10,25). Orthopedic populations are themselves diverse: a short upper-limb procedure may create a different emetic risk profile from major lower-limb reconstruction or trauma surgery. Studies involving orthopedic patients under regional anesthesia likewise demonstrate that procedure and postoperative management remain relevant even when exposure to general anesthetic agents is avoided (11,12,22).

The finding concerning sex is consistent with the simplified APFEL risk score and subsequent evidence syntheses, which identify female sex as one of the most reproducible predictors of PONV (7,8,24). In the present sample, 53.6% of females and 22.5% of males experienced PONV. This difference may be clinically important, but it also complicates interpretation of the fasting result. If the distribution of females differed between fasting groups, sex could partly explain the observed association. The aggregate tables do not permit stratified or multivariable adjustment to assess this possibility.

All participants were nonsmokers by design, and individuals with previous PONV or motion sickness were excluded. These criteria reduced variability in two important APFEL factors but also created a selected study population that differs from ordinary clinical practice. Postoperative opioid exposure, the remaining major component of the APFEL score, was not reported. This omission is particularly relevant in orthopedic surgery because painful procedures often require opioids, which can increase emetic risk. Consequently, the present sex and fasting estimates should be viewed as crude associations rather than a hierarchy of independent predictors.

The age pattern observed in this study should also be interpreted cautiously. PONV occurred in 41.0% of participants aged 26-45 years and 27.6% of those aged 17-25 years, but the confidence interval was wide and included the null value. This finding does not demonstrate that older age increased risk. Published evidence more often associates younger age with PONV, although the relationship may be altered by procedure mix, sex distribution, and anesthetic management (8). The restricted age range in the present sample and the use of only two age categories further limit meaningful comparison with broader adult populations.

Similarly, the higher descriptive incidence among ASA II participants than ASA I participants did not reach statistical significance. ASA classification summarizes systemic health and perioperative risk but is not a component of the simplified APFEL score (7). Any apparent ASA difference could reflect

comorbidity, medication use, procedure complexity, or chance. It would therefore be inappropriate to describe ASA II status as a confirmed predictor on the basis of these data.

Several mechanisms may explain why extended fasting could accompany higher PONV incidence. Prolonged restriction of clear fluids can contribute to thirst and relative fluid deficit, which may increase susceptibility to hypotension, dizziness, weakness, and nausea during recovery. Hunger, anxiety, and metabolic stress may further worsen the subjective experience of postoperative symptoms. Evidence from randomized studies and systematic reviews suggests that supplemental perioperative crystalloid can reduce postoperative nausea, vomiting, or rescue antiemetic requirements in some populations (16-18). These findings are compatible with a hydration-related pathway, but they cannot be directly transferred to the present study because intravenous fluid administration was not reported and fasting from solids was not separated from clear-fluid restriction.

Preoperative carbohydrate-containing clear liquids have also been evaluated as part of enhanced recovery pathways. Meta-analytic evidence indicates potential benefits for insulin resistance and aspects of postoperative well-being, although effects on PONV are inconsistent (19). The relevant implication is not that every patient should receive carbohydrate loading, but that modern fasting practice seeks to avoid unnecessary restriction while maintaining aspiration safety. A study measuring only total fasting duration cannot determine which component of fasting, if any, is related to PONV.

The study contributes local preliminary evidence by examining an everyday perioperative exposure in a defined orthopedic population and by following PONV through the first 24 postoperative hours. The reported fasting and outcome totals were internally consistent, allowing clinically interpretable effect estimates and confidence intervals to be calculated. The equal numbers in the two fasting categories also provided a direct descriptive comparison, although the method used to obtain this balance was not explained.

Important limitations remain. The sample was small, purposively selected, and recruited from one hospital, creating risks of selection bias and limited generalizability. Fasting was dichotomized at 8 hours, which discarded information about the actual duration and prevented assessment of a dose-response relationship. Solid-food and clear-fluid fasting were not reported separately, so guideline adherence could not be determined. PONV was recorded as a binary composite without separate nausea and vomiting frequencies, symptom severity, number of episodes, rescue treatment, or scheduled assessment points. Anesthetic technique, intraoperative fluids, opioid exposure, antiemetic prophylaxis, postoperative pain, procedure type, and surgery duration were not available for adjustment. Exclusion of smokers and patients with previous PONV or motion sickness further restricted applicability. Because only 24 outcome events occurred, even a future multivariable model would require careful prespecification and avoidance of overfitting.

Future research should use prospective consecutive recruitment and record the precise type and time of the last oral intake. Fasting duration should be analyzed both continuously and according to guideline-relevant solid and clear-fluid thresholds. Standardized PONV assessment should distinguish nausea, retching, and vomiting and record severity, timing, rescue antiemetic use, and post-discharge symptoms where relevant. Collection of the complete APFEL profile, anesthetic agents, opioid doses, intravenous fluids, antiemetic prophylaxis, pain, and procedure characteristics would permit adjusted modeling. A larger multicenter sample could then determine whether prolonged fasting contributes independently to PONV and whether the association differs across orthopedic procedures or risk groups.

CONCLUSION

Among 68 selected elective orthopedic patients receiving general anesthesia, fasting for >8 hours was strongly associated with PONV within 24 hours compared with fasting for 6-8 hours. Because fasting type and important perioperative confounders were not fully characterized, this should be interpreted as an unadjusted association rather than causation. Larger prospective studies with separate solid- and clear-fluid measures and adjusted analyses are required.

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