JHWCR JOURNAL OF HEALTH, WELLNESS AND COMMUNITY RESEARCH 3007-0570

DOI: https://doi.org/10.61919/czm0c316

Original Article

Incidence and Factors of Postoperative Nausea and Vomiting Under General Anesthesia

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"Cite this Article" **Received**: 09 December 2025; **Accepted**: 10 February 2026; **Published**: 28 February 2026

Author Contributions: Concept: MS, SH; Design: SM, SH; Data Collection: MS, SM, SN, SS; Analysis: SN, SH; Drafting: MS, SM, SN, SH, SS **Ethical Approval**: The University of Lahore, Lahore, Pakistan. **Informed Consent**: Written informed consent was obtained from all participants; **Conflict of Interest**: The authors declare no conflict of interest. **Funding**: No external funding; **Data Availability**: Available from the corresponding author on reasonable request; **Acknowledgments**: NA

ABSTRACT

Background: Postoperative nausea and vomiting is a frequent complication of general anaesthesia that can impair patient comfort, delay recovery, and increase postoperative care requirements. Objective: To estimate the 24-hour incidence of postoperative nausea and vomiting and examine its associations with selected patient-, anaesthesia-, and surgery-related characteristics among patients undergoing obstetric or gynaecological surgery under general anaesthesia. Methods: This descriptive cross-sectional study included 60 adult patients undergoing elective obstetric or gynaecological surgery at Nawaz Sharif Social Security Hospital, Lahore. Participants were recruited through non-probability purposive sampling. Demographic characteristics, previous PONV, motion sickness, smoking status, anaesthesia duration, surgery type, postoperative hypotension, opioid administration, and antiemetic use were recorded using a structured questionnaire. PONV was assessed during the first 24 postoperative hours. Data were analysed using IBM SPSS Statistics version 27.0. Categorical variables were summarised as frequencies and percentages, and exploratory associations were examined using chi-square or Fisher's exact tests, as appropriate. Results: PONV occurred in 26 of 60 participants, producing a reported incidence of 43.3%. Postoperative hypotension occurred in 40%, postoperative opioids were administered to 48%, and 43% required antiemetic treatment. Reported unadjusted associations were observed for previous PONV (p=0.05), motion sickness (p=0.04), non-smoking status (p=0.04), postoperative hypotension (p=0.05), postoperative opioid administration (p=0.04), surgery type (p=0.04), and anaesthesia lasting longer than 60 minutes (p=0.01). Conclusion: PONV was common in this obstetric and gynaecological surgical population. The reported associations were exploratory and require confirmation through adequately powered prospective studies using standardised outcome definitions and adjusted analyses. Keywords: Postoperative nausea and vomiting; General anaesthesia; Obstetric surgery; Gynaecological surgery; Postoperative complications; Opioid analgesics; Antiemetics.

INTRODUCTION

Postoperative nausea and vomiting (PONV), defined as nausea, retching, or vomiting occurring during the first 24 hours after a surgical procedure, remains one of the most frequent and distressing complications associated with general anaesthesia. Although it is rarely life-threatening, PONV can substantially impair postoperative comfort and recovery and may result in dehydration, electrolyte disturbances, aspiration, wound complications, delayed oral intake, prolonged stay in the post-anaesthesia care unit, and increased healthcare costs (1,2). The physiological mechanisms underlying PONV are complex and involve interactions between the vomiting centre, nucleus tractus solitarius, chemoreceptor trigger zone, vestibular pathways, gastrointestinal afferents, and higher cortical centres. These pathways are influenced by several neurotransmitters, particularly dopamine, serotonin, histamine, acetylcholine, and neurokinin-1 (1).

The likelihood of developing PONV is determined by a combination of patient-related, anaesthesia-related, and surgery-related characteristics. Established patient-related factors include female sex, a previous history of PONV, susceptibility to motion sickness, and non-smoking status. Anaesthesia-related factors include the use of volatile anaesthetic agents, nitrous oxide, perioperative opioids, and prolonged exposure to general anaesthesia, whereas the type and duration of surgery may further modify the risk (3,4). The simplified Apfel risk model incorporates female sex, non-smoking status, a history of PONV or motion sickness, and the expected use of postoperative

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opioids as major predictors of PONV (3). Increasing exposure to these factors is associated with a progressively greater probability of postoperative symptoms.

Patients undergoing obstetric and gynaecological procedures represent an important population for PONV assessment because they frequently possess several recognised susceptibility factors. In addition to female sex and non-smoking status, the occurrence of PONV in this population may be influenced by hormonal factors, surgical manipulation, the duration of anaesthesia, perioperative haemodynamic changes, and opioid-based postoperative analgesia. Postoperative opioid administration may stimulate the chemoreceptor trigger zone, delay gastric emptying, and increase vestibular sensitivity, thereby promoting nausea and vomiting in a dose-dependent manner (5). Prolonged procedures may also increase cumulative exposure to anaesthetic and opioid agents and have been associated with a higher occurrence of PONV (6).

Despite improvements in anaesthetic techniques, multimodal prophylaxis, and antiemetic therapy, PONV remains inadequately prevented and managed in many clinical settings. Its occurrence varies considerably according to the characteristics of the surgical population, anaesthetic technique, prophylactic practices, outcome definition, and duration of postoperative observation (2,7-11). Institution-specific information is therefore important for identifying the local burden of PONV and recognising potentially modifiable perioperative characteristics. However, limited local evidence is available regarding the occurrence of PONV among patients receiving obstetric and gynaecological surgery under general anaesthesia in Lahore.

This study therefore aimed to estimate the 24-hour incidence of postoperative nausea and vomiting and examine its associations with selected patient-related, anaesthesia-related, and surgery-related characteristics among patients undergoing obstetric or gynaecological surgery under general anaesthesia at Nawaz Sharif Social Security Hospital, Lahore.

MATERIALS AND METHODS

A descriptive cross-sectional study was conducted at Nawaz Sharif Social Security Hospital, Lahore, over a four-month period. The target population comprised adult patients undergoing elective obstetric or gynaecological surgery under general anaesthesia. Patients were recruited using a non-probability purposive sampling technique until the required sample of 60 participants was achieved.

Patients aged 18 years or older with an American Society of Anesthesiologists physical status classification of I or II who were scheduled for an elective obstetric or gynaecological procedure under general anaesthesia were eligible for inclusion. Obstetric participants included pregnant patients at or near term who required an operative procedure under general anaesthesia. Patients undergoing minor procedures under local anaesthesia and those who declined or were unable to provide informed consent were excluded.

Data were collected using a structured questionnaire developed to record relevant demographic, preoperative, intraoperative, and postoperative information. Demographic and baseline variables included age, body mass index, American Society of Anesthesiologists physical status, and smoking status. Preoperative characteristics included a previous history of PONV and a history of motion sickness. Anaesthesia- and surgery-related variables included the induction agent, type of surgery, duration of anaesthesia, postoperative opioid administration, and postoperative hypotension. Postoperative information included the occurrence and severity of nausea, the number of vomiting episodes, antiemetic administration, and the antiemetic agent used.

The primary outcome was postoperative nausea and vomiting during the first 24 hours following surgery. PONV was operationally defined as the occurrence of nausea, retching, vomiting, or any combination of these symptoms within the postoperative assessment period. Nausea was assessed using a visual analogue scale and categorised as absent, mild, moderate, or severe. Scores of 1–3 represented mild nausea, scores of 4–6 represented moderate nausea, and scores of 7–10 represented severe nausea. Vomiting was recorded according to the number of postoperative episodes and classified as no vomiting, one episode, two to three episodes, or more than three episodes. Participants were assessed at 24 hours after surgery for the presence of PONV and associated postoperative outcomes.

Previous PONV was defined as a self-reported history of nausea, retching, or vomiting following an earlier surgical procedure or anaesthetic exposure. Motion sickness was recorded when participants reported recurrent nausea or vomiting associated with travel or movement. Smoking status was classified according to whether the participant was a current smoker at the time of surgery. Anaesthesia duration was calculated from the initiation to the

completion of general anaesthesia and was categorised as 60 minutes or less or longer than 60 minutes. Postoperative opioid exposure was recorded when an opioid analgesic was administered during the postoperative observation period. Postoperative hypotension was recorded according to the clinical assessment documented during postoperative monitoring.

The collected data were entered and analysed using IBM SPSS Statistics version 27.0. Categorical variables were summarised as frequencies and percentages. The 24-hour incidence proportion of PONV was calculated by dividing the number of participants who experienced at least one episode of nausea, retching, or vomiting by the total number of participants assessed. Associations between PONV and categorical patient-, anaesthesia-, and surgery-related characteristics were examined using Pearson's chi-square test. Fisher's exact test was applied when the expected frequency assumptions of the chi-square test were not satisfied. Unadjusted odds ratios with 95% confidence intervals were used to quantify the direction and magnitude of associations where complete contingency-table data were available. All tests were two-sided, and a p-value of ≤0.05 was considered statistically significant. Because of the limited sample size and number of PONV events, the association analyses were considered exploratory and were not interpreted as evidence of independent causation or prediction.

Ethical approval was obtained from the Ethical Committee of the University of Lahore before commencement of the study. Eligible participants received information regarding the purpose and procedures of the research, and written informed consent was obtained before enrolment. Participation was voluntary, and participant information was recorded anonymously and maintained confidentially throughout data collection, analysis, and reporting.

RESULTS

A total of 60 patients undergoing obstetric or gynaecological surgery under general anaesthesia were included in the analysis. Half of the participants were older than 51 years, 30% were aged 31–50 years, and 20% were aged 18–30 years. Most participants were overweight or had a normal body mass index, while 68% were classified as American Society of Anesthesiologists physical status II. Only five participants were current smokers.

Table 1. Demographic and Preoperative Characteristics of the Participants (n=60)

Characteristic	Category	n (%)
Age, years	18–30	12 (20.0)
	31–50	18 (30.0)
	>51	30 (50.0)
Body mass index, kg/m²	Underweight, <18.5	3 (5.0)
	Normal, 18.5–24.9	23 (38.3)
	Overweight, 25.0–29.9	28 (46.7)
	Obese, ≥30.0	6 (10.0)
ASA physical status	I	19 (31.7)
	II	41 (68.3)
Current smoking	Yes	5 (8.3)
	No	55 (91.7)
Previous history of PONV	Yes	17 (28.3)
History of motion sickness	Yes	15 (25.0)

ASA, American Society of Anesthesiologists; PONV, postoperative nausea and vomiting.

Propofol was used as the induction agent in 46 participants, whereas ketamine was administered to 14. Obstetric procedures accounted for 32 cases and gynaecological procedures for 28. Anaesthesia lasted longer than 60 minutes in 50 participants. During the first 24 postoperative hours, PONV was reported in 26 participants, corresponding to an incidence proportion of 43.3%. Fifteen participants experienced postoperative nausea and 11 experienced vomiting; however, the available aggregate results did not establish whether these symptom groups overlapped.

Table 2. Anaesthetic Characteristics and Postoperative Outcomes (n=60)

Characteristic or outcome	Category	n (%)
Induction agent	Propofol	46 (76.7)
	Ketamine	14 (23.3)
Type of surgery	Obstetric	32 (53.3)
	Gynaecological	28 (46.7)
Anaesthesia duration	≤60 minutes	10 (16.7)
	>60 minutes	50 (83.3)
PONV	Present	26 (43.3)

Characteristic or outcome	Category	n (%)
	Absent	34 (56.7)
Postoperative nausea	Present	15 (25.0)
Vomiting	Present	11 (18.3)
Postoperative hypotension	Present	24 (40.0)
Postoperative opioid administration	Yes	29 (48.3)
Antiemetic treatment required	Yes	26 (43.3)

PONV, postoperative nausea and vomiting. PONV was assessed during the first 24 hours after surgery.

Among all participants, 75% reported no nausea, while mild, moderate, and severe nausea were reported in 8%, 12%, and 5%, respectively. No vomiting occurred in 82% of participants; 13% experienced one vomiting episode, 3% experienced two to three episodes, and 2% experienced more than three episodes. Antiemetic treatment was administered to 26 participants, and metoclopramide accounted for 58% of the reported antiemetic use.

Table 3. Severity of Nausea and Frequency of Vomiting During the First 24 Postoperative Hours

Postoperative symptom	Category	Participants (%)
Nausea severity	None	75
	Mild, VAS 1–3	8
	Moderate, VAS 4–6	12
	Severe, VAS 7–10	5
Vomiting frequency	No episode	82
	One episode	13
	Two to three episodes	3
	More than three episodes	2

VAS, visual analogue scale.

Table 4. Reported Unadjusted Associations Between Selected Characteristics and PONV

Characteristic	PONV yes (%)	PONV no (%)	p-value
Previous history of PONV	53	47	0.05
History of motion sickness	60	40	0.04
Non-smoking status	45	55	0.04
Postoperative hypotension	58	42	0.05
Postoperative opioid administration	52	48	0.04
Type of surgery	—	—	0.04
Anaesthesia duration >60 minutes	48	52	0.01

PONV, postoperative nausea and vomiting.

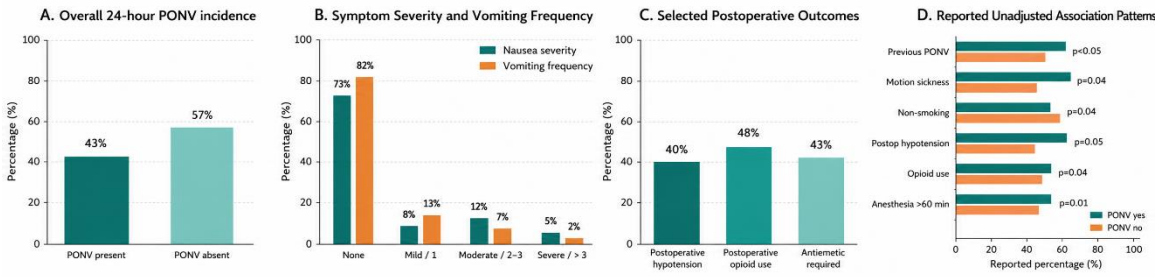

Figure 1 showed overall 24-hour incidence of PONV was 43%, whereas 57% of participants experienced no PONV. Nausea was absent in 75% of participants, while mild, moderate, and severe nausea occurred in 8%, 12%, and 5%, respectively. No vomiting was reported by 82% of participants; 13% experienced one episode, 3% experienced two to three episodes, and 2% experienced more than three episodes. Postoperative hypotension occurred in 40%, postoperative opioid administration in 48%, and antiemetic treatment was required in 43%. The highest reported PONV proportions were observed among participants with motion sickness (60%), postoperative hypotension (58%), previous PONV (53%), and postoperative opioid exposure (52%). Anaesthesia lasting longer than 60 minutes showed the smallest reported p-value (p=0.01). Panel D should be interpreted cautiously because the original table did not provide raw contingency counts, clearly defined percentage denominators, confidence intervals, or adjusted estimates.

Exploratory unadjusted analyses showed reported associations between PONV and previous PONV, motion sickness, non-smoking status, postoperative hypotension, postoperative opioid administration, surgery type, and anaesthesia lasting longer than 60 minutes. The smallest reported p-value was observed for anaesthesia duration greater than 60 minutes (p=0.01). Motion sickness, non-smoking status, postoperative opioid administration, and

surgery type each had reported p-values of 0.04. Previous PONV and postoperative hypotension had reported p-values of 0.05.

Overall, the reported findings indicated that PONV affected approximately two in every five participants. The highest reported PONV proportions were observed among participants with motion sickness, postoperative hypotension, previous PONV, and postoperative opioid exposure. These analyses were exploratory and unadjusted and therefore did not establish that the examined characteristics were independent predictors of PONV.

DISCUSSION

The present study found that postoperative nausea and vomiting occurred in 26 of 60 patients, corresponding to a reported 24-hour incidence of 43.3% among patients undergoing obstetric or gynaecological surgery under general anaesthesia. The findings indicate that PONV remained a frequent postoperative complication in this clinical population despite developments in anaesthetic practice and antiemetic management. Exploratory unadjusted analyses suggested associations between PONV and a previous history of PONV, motion sickness, non-smoking status, postoperative hypotension, postoperative opioid administration, type of surgery, and anaesthesia lasting longer than 60 minutes. These findings should be interpreted as preliminary associations rather than independent predictors because the study did not perform an adequately powered multivariable analysis (12-16).

The incidence observed in this study was higher than the commonly reported incidence of approximately 20–30% among unselected surgical populations but remained within the range expected among patients with multiple susceptibility factors. PONV occurrence varies according to patient characteristics, surgical procedure, anaesthetic technique, opioid exposure, prophylactic antiemetic use, outcome definition, and the duration and frequency of postoperative assessment (1,2). The study population consisted entirely of female patients undergoing obstetric or gynaecological procedures, which may partly explain the comparatively high incidence. Female sex is one of the four components of the simplified Apfel risk score, together with non-smoking status, a history of PONV or motion sickness, and anticipated postoperative opioid administration (3). Because all participants shared one established susceptibility characteristic, the presence of additional factors may have increased their cumulative PONV risk (17).

A previous history of PONV showed a reported association with PONV in the current study. This finding was consistent with the simplified Apfel model, in which a history of PONV or motion sickness is treated as an important patient-related predictor (3). Previous PONV may indicate an underlying susceptibility to emetic stimuli associated with anaesthetic agents, opioid administration, vestibular activation, and surgical stress. However, the present study relied on self-reported history, and the timing, severity, previous anaesthetic technique, and prophylactic treatment associated with earlier episodes were not documented. Consequently, the observed relationship may have been affected by recall error and differences in previous perioperative exposures.

Motion sickness was also associated with PONV in the unadjusted analysis. This observation was compatible with previous evidence identifying vestibular susceptibility as an important determinant of postoperative nausea and vomiting (3,4). Shared neural pathways involving vestibular nuclei, the nucleus tractus solitarius, and the vomiting centre may explain why individuals susceptible to motion-related nausea also experience symptoms following anaesthetic and surgical stimulation (1). Nevertheless, motion sickness was recorded as a binary self-reported variable, without information regarding its frequency, severity, or diagnostic criteria. A more precisely defined measure would improve comparability with validated risk-stratification models (18).

Non-smoking status was common in the study population and showed a reported association with PONV. Non-smoking is a recognised component of the simplified Apfel score, whereas current smoking has repeatedly been associated with a lower observed risk of PONV (3,8). Proposed explanations include hepatic microsomal enzyme induction and adaptation to recurrent exposure to emetogenic substances, although the biological mechanism remains uncertain and smoking should not be interpreted as a preventive intervention. Only five participants in the present study were smokers. This marked imbalance is likely to have generated small expected cell counts and an unstable estimate. The smoking analysis therefore required verification using Fisher's exact test rather than reliance on a conventional Pearson chi-square test (19).

Postoperative opioid administration was associated with PONV in the reported analysis. Opioids may provoke nausea and vomiting by activating opioid receptors within the chemoreceptor trigger zone, delaying gastric emptying, reducing gastrointestinal motility, and increasing vestibular sensitivity. Previous evidence has shown a

dose-related relationship between postoperative opioid exposure and both nausea and vomiting, indicating that opioid dose may provide more clinically useful information than a simple exposed versus unexposed classification (5). The present study recorded postoperative opioid administration as a binary variable and did not report the drug, dose, route, frequency, or timing. The apparent association may therefore reflect differences in analgesic requirements, surgical complexity, anaesthesia duration, or procedure type rather than an isolated opioid effect.

Postoperative hypotension was reported in 24 participants and was associated with PONV at the prespecified threshold. Reduced arterial pressure may contribute to nausea through decreased cerebral or gastrointestinal perfusion, although hypotension can also act as a marker of anaesthetic depth, blood loss, fluid status, procedure duration, or perioperative medication exposure. The study did not provide the blood-pressure threshold, duration, timing, or treatment used to define postoperative hypotension. These omissions limited the clinical interpretation and reproducibility of the finding. Future studies should use a prespecified haemodynamic definition and distinguish transient measurements from sustained or clinically treated hypotension (20).

Anaesthesia lasting longer than 60 minutes produced the smallest reported p-value among the examined variables. Prolonged anaesthesia may increase cumulative exposure to volatile anaesthetics, opioids, and other emetogenic stimuli. Large prospective studies have similarly identified anaesthesia or surgery duration as a contributor to PONV risk (6). In the present study, however, 83% of procedures lasted longer than 60 minutes, leaving a relatively small comparison group. Duration was also dichotomised rather than analysed as a continuous exposure. The relationship may have been confounded by procedure type, surgical complexity, blood loss, fluid administration, and postoperative analgesic requirements.

Propofol was used as the induction agent in 77% of participants. Propofol-based anaesthesia has been associated with a lower baseline risk of PONV than volatile anaesthetic techniques, and contemporary guidance recommends reducing avoidable baseline risks and using multimodal prophylaxis in susceptible patients (7). However, the present study recorded only the induction agent and did not describe the maintenance technique, volatile anaesthetic exposure, nitrous oxide use, intraoperative opioid administration, or prophylactic antiemetic regimen. It was therefore not possible to determine whether propofol materially influenced the observed incidence. Similarly, 43% of participants received antiemetics, but prophylactic administration was not distinguished from rescue treatment. The identical reported percentages for PONV and antiemetic requirement may indicate that treatment was given to affected patients, although this cannot be confirmed from the aggregate data.

The results support the practical importance of structured preoperative PONV assessment in obstetric and gynaecological surgical patients. The simplified Apfel score provides a clinically accessible framework for recognising cumulative susceptibility, while consensus guidance recommends reducing modifiable baseline risks and matching the number of prophylactic interventions to the estimated level of risk (3,7). The present study did not evaluate a risk-stratified prophylaxis protocol or compare antiemetic regimens; therefore, it cannot establish the effectiveness of any preventive strategy. Its findings may instead be used to support institutional audit, improve documentation of relevant risk characteristics, and inform the design of prospective local studies .

A strength of the study was its focus on a clinically relevant postoperative outcome within a defined obstetric and gynaecological surgical population. It also assessed several established patient-, anaesthesia-, and postoperative characteristics and evaluated symptoms during the first 24 hours after surgery. Nevertheless, several limitations require consideration. The single-centre setting, non-probability sampling, small sample, and heterogeneous combination of obstetric and gynaecological procedures limited external validity. The reported sample-size calculation was not consistent with the stated assumptions of 95% confidence, 5% precision, and 50% expected prevalence and therefore requires verification. Participant screening, exclusions, refusals, and completeness of follow-up were not reported.

Additional limitations involved outcome measurement and statistical analysis. PONV was presented as the sum of 15 participants with nausea and 11 with vomiting, but the manuscript did not clarify whether these categories overlapped. As nausea and vomiting commonly occur in the same patient, the construction of the composite outcome should be verified from the original dataset. The questionnaire's development, validation, language, administration, and reliability were not described. Relevant anaesthetic exposures and prophylactic antiemetic practices were incompletely reported. Several categorical comparisons likely contained sparse cells, and exact contingency-table counts were unavailable for independent verification of the p-values. Multiple unadjusted tests were conducted without effect estimates, confidence intervals, or adjustment for confounding. With only 26

reported events, the study was also insufficiently powered for a stable multivariable model containing all examined factors.

Future research should use a prospective multicentre design, consecutive recruitment, a reproducible sample-size calculation, and a standardised definition of nausea, retching, vomiting, and clinically important PONV. Assessments should be conducted at predefined postoperative intervals, and nausea-only, vomiting-only, combined symptoms, and rescue antiemetic use should be recorded separately. Detailed documentation of anaesthetic maintenance, volatile-agent exposure, nitrous oxide, intraoperative and postoperative opioid dose, fluid therapy, haemodynamic changes, and prophylactic antiemetic use would permit more meaningful analysis. Adequately powered regression modelling should report adjusted odds ratios with 95% confidence intervals and evaluate the independent contribution of clinically relevant variables.

CONCLUSION

Postoperative nausea and vomiting occurred in 43.3% of the studied patients during the first 24 hours following obstetric or gynaecological surgery under general anaesthesia. Previous PONV, motion sickness, non-smoking status, postoperative hypotension, postoperative opioid administration, surgery type, and anaesthesia lasting longer than 60 minutes showed reported associations with PONV in exploratory unadjusted analyses. These findings indicate a substantial local PONV burden but do not establish independent prediction or causation because of the small sample, incomplete exposure measurement, and absence of adjusted analysis.

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