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Incidence and Predictors of Postoperative Nausea and Vomiting in Patients Undergoing General Anesthesia: A Cross-Sectional Analysis

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Abstract

Background: Experiencing nausea and vomiting after surgery, known as postoperative nausea and vomiting (PONV), is a frequent and troubling issue following procedures involving general anesthesia. This condition impacts patient comfort, recovery, ability to eat, movement, and readiness for discharge.

Aim of the Study: The aim of this research was to evaluate the occurrence of PONV during the initial 24 h following general anesthesia and to determine the predictors linked to it in patients who have undergone surgery.

Methods: This analytical investigation utilized a cross-sectional framework and included 350 adult patients who received either elective or emergency surgeries under general anesthesia at the Department of Anesthesia, Bangladesh Medical College and Hospital, Dhaka, Bangladesh, from October 2024 to December 2025. Information was acquired utilizing a standardized data sheet that contained demographic, clinical, surgical, anesthetic, and postoperative factors. The major outcome monitored was PONV, characterized by nausea, retching, or vomiting occurring within 24 hours post-surgery. Statistical analyses were conducted using the Chi-square test or Fisher's exact test, along with multivariable logistic regression, with a *P*-value of less than 0.05 indicating statistical significance.

Results: Among 350 patients, the mean age was 39.2 ± 13.4 years, and 192 (54.9%) were male. Within the first 24 hours, 112 cases of PONV were recorded, representing 32.0% of the total. Nausea occurred in 104 (29.7%) patients, while vomiting occurred in 56 (16.0%). The highest frequency of PONV was observed during the 2–6 h postoperative period (76, 21.7%). Rescue antiemetics were required in 85 (24.3%) patients, and delayed discharge occurred in 18 (5.1%) patients. On multivariable logistic regression, independent predictors of PONV were previous PONV or motion sickness (AOR 3.72, 95% CI 2.05–6.75, $P < 0.001$), postoperative opioid use (AOR 2.31, $P = 0.006$), female sex (AOR 2.20, $P = 0.004$), absence of antiemetic prophylaxis (AOR 2.16, $P = 0.006$), pain score >3 (AOR 1.98, $P = 0.020$), duration of surgery >60 minutes (AOR 1.92, $P = 0.022$), laparoscopic surgery (AOR 1.86, $P = 0.034$), and non-smoker/ex-smoker status (AOR 1.84, $P = 0.046$).

Conclusion: PONV occurred in 32.0% of patients within 24 hours after general anesthesia. Important factors predicting the outcome were being female, not smoking, having a history of PONV or motion sickness, undergoing laparoscopic or lengthy surgery, using opioids after surgery, not receiving antiemetic prevention, and experiencing higher levels of pain. Risk-based prophylaxis and opioid-sparing analgesia may improve recovery.

Keywords: Postoperative nausea and vomiting, general anesthesia, antiemetic prophylaxis, postoperative recovery

Introduction

Postoperative nausea and vomiting (PONV) continue to be among the most common and troubling issues following surgery with general anesthesia. These symptoms are typically characterized by nausea, retching, or vomiting that arise within the initial 24 to 48 h post-surgery, though significant symptoms are primarily evaluated during the first 24 hours after the operation.[1,2] Even with advancements in anesthetic drugs, airway management, perioperative monitoring, and antiemetic prophylaxis, PONV still effects the quality of recovery, patient comfort, oral intake, mobility, readiness for release, and overall satisfaction with surgical care.[1,3] In severe situations, recurrent vomiting may result in dehydration, electrolyte imbalances, increased wound tension, aspiration hazards, prolonged stays in the post-anesthesia care unit, and unexpected hospital admissions.[1,4] The global impact of PONV varies greatly according on patient characteristics, surgery type, anesthetic procedures, opioid exposure, and the use of prophylactic antiemetics. Recent research reveals PONV rates among adult surgical patients range from roughly 17% to over 35%, with procedure-specific studies, especially those involving laparoscopic and outpatient operations, indicating considerable risk differences.[2,4–7] A 2024 study from Ethiopia reported a 35.4% overall frequency of PONV, finding motion nausea and intraoperative painkiller use as important factors.[2] Another cross-sectional study concentrating on laparoscopic cholecystectomy patients revealed a PONV rate of 31.1%, highlighting motion sickness and induction drugs as key risk factors.[3] Other open-access studies from Ethiopia reported 17.2% to 21.9% incidence within the postoperative period, again highlighting motion sickness, previous PONV, longer surgery or anesthesia duration, female sex, and postoperative opioid use.[4,5] These findings show that PONV remains clinically relevant across different low- and middle-income settings. In South Asian and Bangladeshi contexts, evidence remains comparatively limited. A Bangladeshi observational study among patients undergoing general anesthesia reported PONV as a persistent postoperative problem and identified patient-related, surgical, and anesthetic variables as important contributors.[8] This is important because perioperative care in Bangladesh often involves high surgical load, variable case mix, resource constraints, and inconsistent use of formal PONV risk scoring or standardized prophylaxis. Local data are therefore required to guide context-appropriate preventive strategies, rather than relying entirely on evidence generated in high-income healthcare systems. Factors known to predict PONV are being female, not smoking, a history of PONV or motion sickness, the use of volatile anesthetics, exposure to nitrous oxide, extended periods of anesthesia or surgery, undergoing laparoscopic procedures, and the administration of opioids during the perioperative period.[1,6,9–11] However, the strength and distribution of these predictors may vary by population, surgical specialty, anesthesia practice, and postoperative analgesic protocol. Moreover, many hospitals do not routinely document PONV timing, severity, rescue antiemetic requirement, or relationship with postoperative pain and opioid exposure. This results in a practical gap in evidence concerning both the estimation of incidence and the stratification of risk. The purpose of this research is to determine how often PONV occurs and what factors predict it in patients undergoing general anesthesia at a tertiary-care hospital in Bangladesh. The outcomes could benefit in conventional preoperative risk appraisals, logical antiemetic avoidance, increased postoperative surveillance, and more successful patient-focused recovery. This study intends to analyze how frequently nausea and vomiting occurred within 24 hours after general anesthesia. Furthermore, it attempts to find predictors linked with the patient, operation, anesthesia, and postoperative phase that correspond with these symptoms.

Methods

The present study was conducted on patients having surgery with general anesthesia at the Department of Anesthesia, Bangladesh Medical

College and Hospital, Dhaka, Bangladesh, from October 2024 to December 2025. A total of 350 patients were identified using purposive sampling. Adult patients of both genders who underwent either elective or emergency surgery with general anesthesia and were observed for the initial 24 hours following surgery were included. Exclusion criteria included patients who received solely regional anesthetic, suffered from preoperative nausea or vomiting, required postoperative mechanical ventilation, or were incapable of communication during follow-up. The data was gathered via a systematic data collection form. The baseline factors documented included age, gender, body mass index, ASA physical classification, smoking habits, previous occurrences of postoperative nausea and vomiting, history of motion sickness, concomitant conditions, and relevant clinical background. The surgical and anesthetic elements included the type and attributes of the procedure, the utilization of a laparoscopic technique, the duration of both the surgery and anesthesia, the type of anesthesia administered, the use of nitrous oxide, intraoperative opioids, neostigmine, and the implementation of antiemetic prophylaxis. Postoperative factors encompassed nausea, vomiting, symptom onset time, nausea intensity, necessity for rescue antiemetics, postoperative opioid consumption, pain assessment, and postponed discharge attributable to PONV. The primary outcome assessed was the incidence of nausea and vomiting following surgery within the initial 24 h. Postoperative nausea and vomiting (PONV) were defined by the occurrence of nausea, retching, or vomiting in the aftermath of surgery. Nausea was classified as mild, moderate, or severe according to the severity stated by patients. SPSS (Version 26.0) was employed for data analysis. Frequencies and percentages represented categorical variables, whereas continuous variables were shown as mean ± standard deviation. To evaluate the relationships between categorical variables, either the Chi-square test or Fisher's exact test was applied. Multivariable logistic regression was utilized to determine independent predictors of PONV. A *P*-value of less than 0.05 was deemed statistically significant.

Results

Among 350 patients, the mean age was 39.2 ± 13.4 years. The largest age group was 30–39 years, with 92 (26.3%), followed by 20–29 years and ≥50 years, each with 78 (22.3%). Most patients were male (192, 54.9%), while females accounted for 158 (45.1%). The mean BMI was 24.1 ± 3.6 kg/m². Regarding ASA status, most patients were ASA II (178, 50.9%), followed by ASA I (126, 36.0%). Non-smokers/ex-smokers were predominant (258, 73.7%). Previous PONV was present in 46 (13.1%), motion sickness in 54 (15.4%), and comorbidity in 132 (37.7%) patients [Table 1].

General surgery was the most common surgical specialty (118; 33.7%), followed by gynecology/obstetrics (82;23.4%), and orthopedics (64; 18.3%). Most procedures were elective (268; 76.6%), while emergency surgeries accounted for 82 (23.4%). Laparoscopic surgery was performed in 86 (24.6%) cases. The mean duration of surgery was 86.5 ± 42.7 minutes, and the mean anesthesia duration was 105.8 ± 48.6 minutes. Inhalational anesthesia was used in 194 (55.4%) patients. Nitrous oxide was used in 145 (41.4%), intraoperative opioids in 322 (92.0%), neostigmine in 282 (80.6%), and antiemetic prophylaxis in 256 (73.1%) patients [Table 2].

The overall incidence of PONV within 24 h was 112 (32.0%). Nausea occurred in 104 (29.7%) patients, while vomiting occurred in 56 (16.0%). The highest frequency of PONV was observed during the 2–6 h postoperative period (76; 21.7%), followed by 0–2 h (54; 15.4%) and 6–24 h (49; 14.0%). Nausea only was reported in 56 (16.0%), while both nausea and vomiting occurred in 48 (13.7%) patients. Most nausea cases were mild (53; 15.1%), followed by moderate (40; 11.4%). Rescue antiemetic was required in 85 (24.3%),

Table 1: Baseline demographic and clinical characteristics (n = 350)

Variables	Category	*n*	%
Age group (years)	<20	28	8
	20–29	78	22.3
	30–39	92	26.3
	40–49	74	21.1
	≥50	78	22.3
	Mean ± SD	39.2 ± 13.4	
Sex	Male	192	54.9
	Female	158	45.1
BMI (kg/m²)	Mean ± SD	24.1 ± 3.6	
ASA status	ASA I	126	36
	ASA II	178	50.9
	ASA III	46	13.1
Smoking status	Current smoker	92	26.3
	Non-smoker/Ex-smoker	258	73.7
Previous PONV	Yes	46	13.1
Motion sickness	Yes	54	15.4
Comorbidity	Present	132	37.7

Table 2: Surgical and anesthetic characteristics of the study patients (n = 350)

Variables	Category	*n*	%
Surgical specialty	General surgery	118	33.7
	Gynecology/Obstetrics	82	23.4
	Orthopedics	64	18.3
	ENT	38	10.9
	Urology	30	8.6
	Others	18	5.1
Nature of surgery	Elective	268	76.6
	Emergency	82	23.4
Laparoscopic surgery	Yes	86	24.6
	No	264	75.4
Duration of surgery (minutes)	Mean ± SD	86.5 ± 42.7	
Duration of anesthesia (minutes)	Mean ± SD	105.8 ± 48.6	
Type of anesthesia	Inhalational	194	55.4
	TIVA/Balanced	156	44.6
Nitrous oxide used	Yes	145	41.4
Intraoperative opioid used	Yes	322	92
Neostigmine used	Yes	282	80.6
Antiemetic prophylaxis	Yes	256	73.1

and delayed discharge due to PONV occurred in 18 (5.1%) patients [Table 3].

PONV was significantly higher among females compared with males, 70 (44.3%) vs 42 (21.9%), $P < 0.001$. It was also more frequent among non-smokers/ex-smokers than current smokers, 93 (36.0%) vs 19 (20.7%), $P = 0.007$. Patients with previous PONV had a much higher occurrence of PONV, 30 (65.2%) vs 82 (27.0%), $P < 0.001$. Similarly, patients with motion sickness had higher PONV rates: 35 (64.8%) vs 77 (26.0%), $P < 0.001$. Patients who were overweight or obese experienced a notably higher incidence of PONV compared to those with underweight or normal BMI, with rates of 38.6% (51 patients) versus 28.0% (61 patients), respectively, $P = 0.038$. Age group was not significantly associated with PONV ($P = 0.089$) [Table 4].

PONV was significantly higher after emergency surgery compared with elective surgery, 34 (41.5%) vs 78 (29.1%), $P = 0.036$. Laparoscopic surgery was associated with higher PONV, 40 (46.5%) vs 72 (27.3%), $P = 0.001$. Patients with surgery duration >60 minutes had more PONV than those with ≤60 minutes, 84 (39.3%) vs 28 (20.6%), $P < 0.001$. Inhalational anesthesia was associated with higher PONV compared with TIVA/balanced anesthesia, 76 (39.2%) vs 36 (23.1%), $P = 0.001$. PONV was also higher among patients receiving nitrous oxide, 59 (40.7%) vs 53 (25.9%), $P = 0.003$. Absence of antiemetic prophylaxis was strongly associated with PONV, 45 (47.9%) vs 67 (26.2%), $P < 0.001$. There was a significant correlation between postoperative opioid consumption and elevated pain scores with PONV, both showing $P < 0.001$ [Table 5].

Following adjustment, a history of previous PONV or motion sickness emerged as the most significant independent predictor of PONV, with an adjusted odds ratio (AOR) of 3.72 (95% CI 2.05–6.75) and a *P*-value of less than 0.001. Being female was also independently linked to PONV, with an AOR of 2.20, 95% CI 1.28–3.78, and a *P*-value of 0.004. The likelihood of PONV was further increased by postoperative opioid use, which had an AOR of 2.31, 95% CI 1.27–4.21, and a *P*-value of 0.006. The lack of antiemetic prophylaxis was another notable predictor, showing an AOR of 2.16 (95% CI 1.25–3.73,

Table 3: Incidence, timing, and severity of PONV ($n = 350$)

Variables	Category	*n*	%
Overall PONV	Present	112	32
	Absent	238	68
Nausea within 24 hours	Yes	104	29.7
Vomiting within 24 hours	Yes	56	16
PONV by time period	0–2 hours	54	15.4
	2–6 hours	76	21.7
	6–24 hours	49	14
Type of PONV	Nausea only	56	16
	Vomiting only	8	2.3
	Both nausea and vomiting	48	13.7
Severity of nausea	Mild	53	15.1
	Moderate	40	11.4
	Severe	11	3.1
Rescue antiemetic required	Yes	85	24.3
Delayed discharge due to PONV	Yes	18	5.1

Table 4: Association of patient-related factors with PONV

Variables	Category	PONV Present *n* (%)	PONV Absent *n* (%)	*P*-value
Age group	<40 years	56 (28.3)	142 (71.7)	0.089
	≥40 years	56 (36.8)	96 (63.2)	
Sex	Male	42 (21.9)	150 (78.1)	<0.001
	Female	70 (44.3)	88 (55.7)	
Smoking status	Current smoker	19 (20.7)	73 (79.3)	0.007
	Non-smoker/Ex-smoker	93 (36.0)	165 (64.0)	
Previous PONV	Yes	30 (65.2)	16 (34.8)	<0.001
	No	82 (27.0)	222 (73.0)	
Motion sickness	Yes	35 (64.8)	19 (35.2)	<0.001
	No	77 (26.0)	219 (74.0)	
BMI	Underweight/Normal	61 (28.0)	157 (72.0)	0.038
	Overweight/Obese	51 (38.6)	81 (61.4)	

Table 5: Association of surgical, anesthetic, and postoperative factors with PONV

Variables	Category	PONV Present *n* (%)	PONV Absent *n* (%)	*P*-value
Nature of surgery	Elective	78 (29.1)	190 (70.9)	0.036
	Emergency	34 (41.5)	48 (58.5)	
Laparoscopic surgery	Yes	40 (46.5)	46 (53.5)	0.001
	No	72 (27.3)	192 (72.7)	
Duration of surgery	≤60 minutes	28 (20.6)	108 (79.4)	<0.001
	>60 minutes	84 (39.3)	130 (60.7)	
Type of anesthesia	Inhalational	76 (39.2)	118 (60.8)	0.001
	TIVA/Balanced	36 (23.1)	120 (76.9)	
Nitrous oxide used	Yes	59 (40.7)	86 (59.3)	0.003
	No	53 (25.9)	152 (74.1)	
Antiemetic prophylaxis	Yes	67 (26.2)	189 (73.8)	<0.001
	No	45 (47.9)	49 (52.1)	
Postoperative opioid use	Yes	88 (39.5)	135 (60.5)	<0.001
	No	24 (18.9)	103 (81.1)	
Pain score (VAS)	≤3	25 (18.9)	107 (81.1)	<0.001
	>3	87 (39.9)	131 (60.1)	

P = 0.006). Additional independent predictors included a pain score exceeding 3, with an AOR of 1.98 and a *P*-value of 0.020, surgeries lasting more than 60 minutes (AOR 1.92, *P* = 0.022), laparoscopic procedures (AOR 1.86, *P* = 0.034), and being a non-smoker or ex-smoker (AOR 1.84, *P* = 0.046) [Table 6].

Discussion

This cross-sectional investigation revealed that 32.0% of patients encountered postoperative nausea and vomiting (PONV) during the initial 24 hours after general anesthesia. In particular, 29.7% of patients indicated experiencing nausea,

Table 6: Multivariable logistic regression analysis of independent predictors of PONV

Variables	Adjusted OR	95% CI	*P*-value
Female sex	2.2	1.28–3.78	0.004
Non-smoker/Ex-smoker	1.84	1.01–3.35	0.046
Previous PONV or motion sickness	3.72	2.05–6.75	<0.001
Laparoscopic surgery	1.86	1.05–3.30	0.034
Duration of surgery >60 minutes	1.92	1.10–3.36	0.022
Postoperative opioid use	2.31	1.27–4.21	0.006
No antiemetic prophylaxis	2.16	1.25–3.73	0.006
Pain score >3	1.98	1.11–3.52	0.02

and 16.0% reported episodes of vomiting. The peak incidence was noted in the 2–6 h postoperative timeframe (21.7%), indicating that early postoperative surveillance is clinically significant. This incidence is comparable to the 31.1% reported after laparoscopic cholecystectomy in Bhutan,[3] the 29.9% reported among same-day surgical patients in China,[12] and the 30% general estimate described in major PONV literature.[1,13] It was slightly lower than the 35.4% reported by Timerga and Befkadu in Ethiopia,[2] but higher than the 25.6% reported in a Bangladeshi study by Shahriar et al.,[8] the 23.0% reported by Choi et al. among patients receiving fentanyl-based intravenous patient-controlled analgesia,[14] the 21.9% reported by Allene et al. in Ethiopia,[5] and the 17.2% reported by Ahmed et al. in Northwest Ethiopia.[4] However, it was lower than the 51.2% reported by Teshome et al. in Ethiopia,[15] the 40% nausea and 22% vomiting reported by Morino et al. in Japan,[16] and the 60.1% reported after laparoscopic sleeve gastrectomy by Song et al.[17] These variations may reflect differences in surgical case mix, anesthetic technique, opioid exposure, antiemetic prophylaxis, and follow-up duration. This research identified female gender as a notable independent predictor of PONV, with women exhibiting a greater prevalence of PONV than men (44.3% versus 21.9%) and an adjusted odds ratio (AOR) of 2.20. This discovery is consistent with the Fourth Consensus Guidelines and the evidence-based evaluation performed by Apfel et al., which identified female gender as a significant patient-related predictor.[1,13] Similar findings were reported by Choi et al.,[14] Morino et al.[16] Qiu et al.[12] Allene et al.[5], and Ishikawa et al.[18] The association may be related to hormonal, neuroreceptor, and perioperative pharmacological differences, although the exact biological mechanism remains incompletely explained. In this study, the most significant independent predictor was a prior history of PONV or motion sickness (AOR 3.72, 95% CI 2.05–6.75, $P < 0.001$). This result aligns closely with established risk models and numerous recent studies.[1,4,5,13–16] Allene et al. reported strong associations of previous PONV and motion sickness with postoperative nausea and vomiting, while Ahmed et al. found previous PONV, motion sickness, and prolonged surgery to be major predictors.[5,4] Similarly, Wang et al. identified motion sickness as a critical time-dependent predictor after hip and knee arthroplasty.[10] Non-smoking status also remained significant in this study, AOR 1.84, $P = 0.046$, which agrees with Apfel-based risk scoring, Choi et al., and Qiu et al.[1,12–14] Regarding surgical and anesthetic factors, laparoscopic surgery was independently associated with PONV (AOR 1.86, $P = 0.034$), and surgery lasting more than 60 minutes also increased risk (AOR 1.92, $P = 0.022$). These findings are consistent with Jamtsho et al., Qiu et al., Qian et al., and the consensus guidelines, which identified laparoscopic procedures and longer anesthesia or surgery duration as important contributors.[1,3,7,12]

Inhalational anesthesia and nitrous oxide showed significant bivariate associations in this study but did not remain independent predictors after adjustment, which may reflect overlap with procedure type, duration, and prophylaxis. Ishikawa et al. reported that propofol-based total intravenous anesthesia reduced both early and late PONV, supporting the possible benefit of TIVA in high-risk patients.[18] Postoperative opioid use was independently associated with PONV (AOR 2.31, $P = 0.006$), and pain score >3 also remained significant (AOR 1.98, $P = 0.020$). These findings correspond with the study conducted by Song et al., which recognized postoperative discomfort and opioid usage as distinct predictors after laparoscopic sleeve gastrectomy.[17] Feng et al.'s randomized investigation revealed that anesthesia devoid of opioids resulted in a diminished occurrence of PONV in contrast to opioid-inclusive anesthesia (15.0% vs. 31.7%).[19] Elsaid et al. further emphasized the significant correlation between early postoperative discomfort and postoperative nausea and vomiting (PONV).[20] The absence of antiemetic prophylaxis was determined to independently increase risk (AOR 2.16, $P = 0.006$), highlighting the necessity for thorough risk assessment and prophylactic measures. These findings support the implementation of routine Apfel-based assessments, the favored use of multimodal analgesia, prudent minimization of opioid consumption, specific antiemetic preventive measures, and improved surveillance in the first 6 hours following surgery in Bangladeshi tertiary-care settings.

Limitations of the Study

The limitations of this study stem from its design as a single-center investigation, the use of purposive sampling, and its cross-sectional approach, all of which constrain the ability to generalize findings and infer causality. Postoperative nausea and vomiting (PONV) were evaluated solely during the initial 24 h period, which means that any symptoms appearing later might not have been captured. Certain factors, such as a history of PONV, susceptibility to motion sickness, the intensity of nausea, and pain levels, were reported by patients themselves and could be influenced by biases in memory or reporting.

Conclusion

According to this study, experiencing nausea and vomiting after surgery is a frequent issue for patients who have undergone procedures with general anesthesia, occurring in 32.0% of cases within the initial 24 h post-surgery. Additionally, being female, not smoking, having a history of PONV or motion sickness, undergoing laparoscopic surgery, having a longer operation time, using opioids after surgery, not receiving antiemetic prevention, and having a higher pain score after surgery were found to be significant predictors. As a result, conducting regular risk evaluations, implementing suitable antiemetic prevention, and employing analgesic methods that minimize opioid use can potentially lessen the impact of PONV and enhance recovery after surgery.

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