ISSN: 2581 – 3633

International Journal of Medical Science and Advanced Clinical Research (IJMACR)

Available Online at: *https://www.ijmacr.com*

Volume – 9, Issue – 4, August – 2026, Page No.: 999 – 1011

A Prospective Study Evaluating the Incidence, Risk Factors, Severity, and Perioperative Management of Postoperative Nausea and Vomiting Among Patients Undergoing General Anesthesia for Elective Surgical Procedures in A Tertiary Care Teaching Hospital

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How to citation this article: Dr. Mallikarjun Rao, Dr. Ranjan Kumar, "A Prospective Study Evaluating the Incidence, Risk Factors, Severity, and Perioperative Management of Postoperative Nausea and Vomiting Among Patients Undergoing General Anesthesia for Elective Surgical Procedures in A Tertiary Care Teaching Hospital", IJMACR– August – 2026, Volume – 9, Issue – 4, P. No. 999 – 1011.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Postoperative nausea and vomiting (PONV) is a common complication following general anaesthesia and may adversely affect postoperative recovery and patient satisfaction. Identification of risk factors and appropriate prophylactic management are essential to reduce its occurrence.

Aim: To evaluate the incidence, risk factors, severity, and perioperative management of PONV among patients undergoing elective surgical procedures under general anaesthesia.

Materials and Methods: This prospective observational study was conducted in the Department of Anaesthesiology at a tertiary care teaching hospital, Hyderabad, from September 2025 to April 2026. A total of 150 adult patients undergoing elective surgery under general anaesthesia were included. Patient-related, surgical, and an aesthetic risk factors were recorded. PONV risk was assessed using the simplified Apfel score, and patients were followed for 24 hours postoperatively. The occurrence, severity, timing of PONV, prophylactic antiemetic use, and requirement for rescue antiemetic therapy were documented.

Results: PONV occurred in 57 of 150 patients, giving an overall incidence of 38.0%. The incidence was higher in females than males (47.6% vs. 26.5%) and in non-smokers than smokers (43.5% vs. 20.0%). Patients with a previous history of PONV or motion sickness had a

higher incidence (62.5% vs. 33.3%). PONV increased progressively with Apfel score, from 10.0% at a score of 0 to 85.7% at a score of 4. Patients undergoing surgery for more than 2 hours had a PONV incidence of 70.6%, while postoperative opioid recipients had an incidence of 46.9% compared with 21.2% among non-recipients. PONV incidence was 55.3% without prophylaxis, 35.4% with single-agent prophylaxis, and 23.3% with combination prophylaxis. Nausea alone was the most common presentation (49.1%), and 68.4% of first episodes occurred within 6 hours. Rescue antiemetic therapy was required in 50.9% of patients who developed PONV.

Conclusion: PONV remains a frequent complication after general anaesthesia. Higher Apfel risk scores and established patient-, surgical-, and opioid-related risk factors were associated with increased PONV. Risk-based prophylaxis, appropriate multimodal prevention, and early postoperative monitoring may help reduce its clinical burden.

Keywords: Postoperative Nausea and Vomiting, PONV, General Anaesthesia, Apfel Score, Risk Factors, Antiemetic Prophylaxis, Rescue Therapy.

Introduction

Postoperative nausea and vomiting (PONV) is one of the most common adverse events following general anaesthesia and remains an important cause of patient discomfort during the early postoperative period. Although advances in an aesthetic drug, surgical techniques, perioperative monitoring, and recovery pathways have improved postoperative care, PONV continues to occur frequently after surgery. The reported incidence varies according to patient characteristics, type and duration of surgery, an aesthetic technique, and use of prophylactic antiemetic therapy. PONV may adversely affect patient satisfaction and recovery and, when severe or persistent, may contribute to dehydration, electrolyte disturbances, wound complications, aspiration, delayed recovery, and prolonged hospital stay [1,2].

The development of PONV is multi factorial and results from the interaction of patient-related, anaesthesia-related, and surgery-related factors. Important patient-related risk factors include female sex, a previous history of PONV or motion sickness, and non-smoking status. Anaesthesia-related factors include the use of volatile an aesthetic agent, nitrous oxide, and perioperative opioids, while surgical factors include the type and duration of surgery. Laparoscopic and intra-abdominal procedures are particularly associated with an increased risk of PONV. Recognition of these factors is important because identification of patients at increased risk allows appropriate preventive measures to be instituted before the onset of symptoms [1,3].

Risk stratification is an important component of contemporary PONV prevention. The simplified Apfel risk score is one of the most widely used clinical prediction tools in adults. It incorporates four independent predictors: female sex, non-smoking status, previous PONV or motion sickness, and postoperative opioid use. Each predictor contributes one point, producing a total score from 0 to 4. In the original validation study, the incidence of PONV increased progressively with the number of risk factors, supporting the use of the score for identifying patients at increased risk[4]. Subsequent studies have also demonstrated that the Apfel score has clinically useful discriminatory ability in adult surgical populations[5].

The prevention and management of PONV have evolved toward a risk-adapted and multimodal approach. Current

consensus recommendations emphasize identification of patients at risk, reduction of modifiable an aesthetic risk factors where feasible, and appropriate prophylactic administration of antiemetic agents, particularly in patients with multiple risk factors. Combination prophylaxis using agents with different mechanisms of action may provide greater protection than single-agent therapy in patients at increased risk [6]. The effectiveness of preventive strategies is clinically important because PONV that develops despite prophylaxis may require additional rescue treatment and may interfere with postoperative recovery.

The timing and clinical pattern of PONV are also relevant to postoperative care. Symptoms may occur during the immediate postoperative period or later during the first postoperative day. Nausea may occur without vomiting, while some patients experience both nausea and vomiting. The severity of symptoms and frequency of vomiting episodes determine the clinical burden and the need for rescue antiemetic therapy. Early recognition and treatment are therefore important components of perioperative management [1,6].

Despite the availability of established risk prediction tools and prophylactic strategies, the incidence and pattern of PONV may vary between institutions because of differences in patient populations, surgical case mix, an aesthetic practices, opioid utilization, and prophylaxis protocols. Hospital-based prospective assessment is therefore useful for identifying the local burden of PONV and determining the patient-, surgical-, and anaesthesia - related factors associated with its occurrence.

The present prospective observational study was undertaken to evaluate the incidence, risk factors, severity, and perioperative management of PONV among adult patients undergoing elective surgical procedures under general anaesthesia at a tertiary care teaching hospital. The study specifically assessed the relationship of PONV with established patient-related risk factors, Apfel risk score, type and duration of surgery, postoperative opioid use, prophylactic antiemetic therapy, clinical severity, timing of onset, and requirement for rescue antiemetic treatment.

Materials and Methods

Study Design and Setting

This prospective observational study was conducted to evaluate the incidence, risk factors, severity, and perioperative management of postoperative nausea and vomiting (PONV) among patients undergoing elective surgical procedures under general anaesthesia. The study was conducted in the Department of Anaesthesiology at a tertiary care teaching hospital, Premier Hospital, Hyderabad, Telangana, India.

The study period was from September 2025 to April 2026. A total of 150 patients fulfilling the eligibility criteria were enrolled in the study.

Study Population

The study included adult patients scheduled to undergo elective surgical procedures under general anaesthesia. Patients were assessed preoperatively for demographic characteristics and established risk factors for PONV and were subsequently followed during the postoperative period for the occurrence and severity of nausea and vomiting.

Sample Size

A total sample size of 150 patients was selected for the study. Consecutive eligible patients presenting for elective surgical procedures under general anaesthesia during the study period were recruited until the predetermined sample size was achieved.

Inclusion Criteria

Patients were included if they fulfilled all of the following criteria:

1. Adult patients aged ≥18 years.
2. Patients scheduled for elective surgical procedures.
3. Patients receiving general anaesthesia.
4. Patients willing to participate in the study and providing informed written consent.
5. Patients expected to remain under postoperative observation for at least 24 hours.

Exclusion Criteria

Patients were excluded if they had any of the following:

1. Emergency surgical procedures.
2. Age <18 years.
3. Pre-existing nausea or vomiting before induction of anaesthesia.
4. Patients undergoing procedures under regional or local anaesthesia alone.
5. Patients with significant gastrointestinal disorders associated with nausea or vomiting.
6. Patients receiving antiemetic therapy for causes unrelated to PONV during the preoperative period.
7. Patients who were unable to provide relevant clinical information or complete postoperative assessment.
8. Patients who declined participation in the study.

Preoperative Assessment

All patients underwent a detailed pre-an aesthetic evaluation before surgery. Demographic and clinical data, including age, sex, body weight, type of surgery, relevant medical history, previous history of PONV or motion sickness, smoking status, and other relevant co morbidities, were recorded.

The risk of PONV was assessed using the Apfel simplified risk score. The four major predictors considered were:

- Female sex
- Previous history of PONV or motion sickness
- Non-smoking status
- Postoperative use of opioids

Each risk factor was assigned one point, giving a total score ranging from 0 to 4. Patients were categorised according to their cumulative risk score.

Intraoperative An aesthetic Management

All patients received standardised general anaesthesia according to the institutional an aesthetic practice and the clinical requirements of the surgical procedure. Standard monitoring, including electrocardiography, non-invasive blood pressure, pulse oximetry, and end-tidal carbon dioxide monitoring, was used as appropriate. An aesthetic drugs, airway management, maintenance technique, intravenous fluids, analgesics, and other perioperative medications were recorded. Particular attention was given to factors known to influence PONV, including the use of volatile an aesthetic agent, nitrous oxide, Intraoperative opioids, and postoperative opioid analgesia.

The duration of anaesthesia and duration of surgery were recorded for each patient. The use of prophylactic antiemetic medication, including the type, dose, timing, and number of agents administered, was also documented.

Postoperative Assessment of Nausea and Vomiting

Patients were followed prospectively during the postoperative period for the occurrence of nausea and vomiting. Postoperative assessment was performed at predefined intervals during the first 24 hours after surgery.

Nausea was defined as a subjective unpleasant sensation associated with an urge to vomit. Vomiting was defined as forceful expulsion of gastric contents through the

mouth. Retching without expulsion of gastric contents was also recorded separately when present.

The occurrence of PONV was documented during the early postoperative period and subsequently during the remainder of the first 24 postoperative hours. The severity of nausea was assessed using a numerical rating scale from 0 to 10, where 0 represented no nausea, and 10 represented the most severe nausea imaginable.

The number of vomiting or retching episodes was recorded. PONV was categorised according to clinical severity based on the intensity of nausea and frequency of vomiting episodes. The requirement for rescue antiemetic treatment was also documented.

Perioperative Management of PONV

The study also evaluated the perioperative strategies used for prevention and treatment of PONV. The administration of prophylactic antiemetics, choice and number of antiemetic agents, timing of administration, and use of multimodal prophylaxis were recorded.

For patients who developed PONV postoperatively, rescue treatment was administered according to the treating anesthesiologist's clinical judgment and institutional practice. The type and dose of rescue antiemetic administered and the subsequent response were documented.

Patients were considered to have experienced PONV if they developed nausea, vomiting, or retching during the postoperative observation period.

Outcome Measures

The primary outcome of the study was the incidence of PONV within the first 24 hours following general anaesthesia.

The secondary outcomes included:

1. Identification of patient-related risk factors associated with PONV.
2. Association between Apfel risk score and occurrence of PONV.
3. Assessment of the severity of postoperative nausea and vomiting.
4. Evaluation of anaesthetic and surgical factors associated with PONV.
5. Assessment of the use and effectiveness of prophylactic antiemetic therapy.
6. Evaluation of the requirement for rescue antiemetic treatment.
7. Assessment of the relationship between post operative opioid use and occurrence of PONV.

Data Collection

All relevant information was recorded prospectively using a structured data collection proforma. Preoperative, Intraoperative, and postoperative variables were documented for each participant.

The following variables were collected:

- Age and sex
- Body weight/body mass index, where available
- Smoking status
- Previous history of PONV or motion sickness
- Type and duration of surgery
- Duration of anaesthesia
- Type of general anaesthetic technique
- Use of volatile anaesthetic agents
- Use of nitrous oxide
- Intraoperative opioid administration
- Postoperative opioid administration
- Prophylactic antiemetic administration
- Occurrence of nausea
- Occurrence and number of vomiting episodes
- Severity of PONV
- Requirement for rescue antiemetic therapy
- Response to rescue treatment

Statistical Analysis

Data were entered into a Microsoft Excel spreadsheet and analysed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation or median with interquartile range, depending on the distribution of the data. Categorical variables were expressed as frequencies and percentages.

The incidence of PONV was calculated as the proportion of patients who developed nausea, vomiting, or both during the postoperative observation period.

Associations between categorical variables and the occurrence of PONV were assessed using the Chi-square test or Fisher's exact test, as appropriate. Continuous variables were compared using the independent Student's t-test for normally distributed data or the Mann–Whitney U test for non-normally distributed data.

The relationship between the Apfel risk score and incidence of PONV was assessed by comparing the frequency of PONV across different risk-score categories. Where appropriate, logistic regression analysis was performed to identify independent predictors of PONV.

A two-sided p-value <0.05 was considered statistically significant. Appropriate measures of association, including odds ratios with 95% confidence intervals, were reported where applicable.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of the concerned tertiary care teaching hospital. Written informed consent was obtained from all participants before enrollment. Patient confidentiality was maintained throughout the study, and the collected information was used solely for research purposes. Participation was voluntary, and patients were free to withdraw from the study at any time without affecting their medical care.

Results And Observations

A total of 150 patients undergoing elective surgical procedures under general anaesthesia were included in the present prospective observational study. All patients were followed for 24 hours postoperatively for the occurrence of nausea, vomiting, and retching. The incidence, severity, risk factors, and perioperative management of PONV were assessed.

Table 1: Distribution of patients according to age and sex

Variable	Number (n=150)	Percentage (%)
Age (years)		
18–30	35	23.3
31–40	38	25.3
41–50	35	23.3
51–60	27	18.0
>60	15	10.0
Sex		
Male	68	45.3
Female	82	54.7

The mean age of the study population was 41.8 ± 13.2 years. Females constituted 54.7% of the study population.

Table 2: Incidence of postoperative nausea and vomiting

PONV status	Number (n=150)	Percentage (%)
PONV present	57	38.0
PONV absent	93	62.0
Total	150	100

PONV occurred in 57 patients (38.0%) during the first 24 postoperative hours.

Table 3: Association of sex and smoking status with PONV

Variable	Total	PONVn (%)	No PONVn(%)
Sex			
Male	68	18 (26.5)	50 (73.5)
Female	82	39 (47.6)	43 (52.4)
Smoking status			
Smoker	35	7 (20.0)	28 (80.0)
Non-smoker	115	50 (43.5)	65 (56.5)

PONV was more frequent among female patients (47.6%) than male patients (26.5%). Similarly, non-smokers demonstrated a higher incidence of PONV (43.5%) compared with smokers (20.0%).

Table 4: Association of previous PONV/motion sickness with postoperative PONV

Previous history of PONV/motion sickness	Total	PONV n (%)	NoPONV n (%)
Present	24	15(62.5)	9 (37.5)
Absent	126	42(33.3)	84 (66.7)
Total	150	57(38.0)	93 (62.0)

Patients with a previous history of PONV or motion sickness had a higher incidence of PONV (62.5%) compared with those without a previous history (33.3%).

Table 5: Distribution according to Apfel risk score

Apfel score	Total patients	PONV n (%)	No PONV n (%)
0	10	1 (10.0)	9 (90.0)
1	32	7 (21.9)	25 (78.1)
2	51	16 (31.4)	35 (68.6)
3	43	21 (48.8)	22 (51.2)
4	14	12 (85.7)	2 (14.3)
Total	150	57 (38.0)	93 (62.0)

A progressive increase in PONV incidence was observed with increasing Apfel risk score. The incidence increased from 10.0% in patients with a score of 0 to 85.7% in patients with a score of 4.

Table 6: Distribution of PONV according to type of surgical procedure

Type of surgery	Total patients	PONV n (%)
Laparoscopic/abdominal surgery	45	21 (46.7)
Gynecological surgery	30	14 (46.7)
ENT surgery	20	8 (40.0)
Orthopaedic surgery	25	6 (24.0)
General surgical procedures	20	5 (25.0)
Urological surgery	10	3 (30.0)
Total	150	57 (38.0)

The highest incidence of PONV was observed among patients undergoing laparoscopic /abdominal and gynecological procedures (46.7% each).

Table 7: Association of duration of surgery and postoperative opioid use with PONV

Variable	Total	PONV n (%)	No PONV n (%)
Duration of surgery			
≤1 hour	38	8 (21.1)	30 (78.9)
1–2 hours	78	25 (32.1)	53 (67.9)
>2 hours	34	24 (70.6)	10 (29.4)
Postoperative opioid use			
Yes	98	46 (46.9)	52 (53.1)
No	52	11 (21.2)	41 (78.8)

Patients undergoing surgery lasting more than 2 hours had a higher incidence of PONV (70.6%). PONV was also more frequent among patients receiving postoperative opioids (46.9%).

Table 8: Use of prophylactic antiemetic therapy and incidence of PONV

Prophylactic antiemetic therapy	Total	PONV n (%)	No PONV n (%)
No prophylaxis	38	21 (55.3)	17 (44.7)
Single-agent prophylaxis	82	29 (35.4)	53 (64.6)
Combination prophylaxis	30	7 (23.3)	23 (76.7)
Total	150	57 (38.0)	93 (62.0)

The incidence of PONV was highest among patients who did not receive prophylactic antiemetic therapy (55.3%). It was lower among patients receiving single-agent (35.4%) and combination prophylaxis (23.3%).

Table 9: Clinical presentation and severity of PONV

Parameter	Number	Percentage(%)
Clinical presentation (n=57)		
Nausea alone	28	49.1
Vomiting alone	8	14.0
Nausea with vomiting	21	36.8
Severity of nausea (n=49)		
Mild	24	49.0
Moderate	21	42.9
Severe	4	8.2

Nausea alone was the most common presentation of PONV. Among patients experiencing nausea, mild severity was most frequently observed.

Table 10: Frequency of vomiting episodes and time of onset of PONV

Parameter	Number	Percentage(%)
Vomiting episodes (n=29)		
1 episode	13	44.8
2 episodes	10	34.5
≥3 episodes	6	20.7
Time of first PONV episode (n=57)		
0–6 hours	39	68.4
6–12 hours	11	19.3
12–24 hours	7	12.3

Most PONV episodes occurred within the first 6 postoperative hours (68.4%). A single vomiting episode was the most common pattern among patients who developed vomiting.

Table 11: Requirement for rescue antiemetic therapy

Rescue antiemetic therapy	Number (n=57)	Percentage (%)
Required	29	50.9
Not required	28	49.1
Total	57	100

Of the 57 patients who developed PONV, 29 (50.9%) required rescue antiemetic therapy, while 28 (49.1%) did not require rescue medication.

Table 12: Association between Apfel risk score and occurrence of PONV

Apfel risk category	PONV present	PONV absent	Total
Low risk (0–1)	8	34	42
Moderate risk (2)	16	35	51
High risk (3–4)	33	24	57
Total	57	93	150

PONV was observed in 19.0% of patients with low Apfel risk, 31.4% of patients with moderate risk, and 57.9% of patients with high risk. Thus, a clear increase in the occurrence of PONV was observed with increasing Apfel risk category.

Discussion

The present prospective observational study evaluated the incidence, risk factors, severity, and perioperative management of postoperative nausea and vomiting among 150 adult patients undergoing elective surgical procedures under general anaesthesia. All patients were

followed for 24 hours after surgery. PONV, defined in the present study as the occurrence of nausea, vomiting, or retching during the postoperative observation period, was observed in 57 of 150 patients, giving an overall incidence of 38.0%. Thus, more than one-third of the study population experienced at least one PONV-related symptom during the first 24 postoperative hours. The observed incidence is consistent with the continuing clinical importance of PONV reported in previous literature, although direct comparison between studies should be made cautiously because incidence is influenced by patient characteristics, surgical case mix, anaesthetic techniques, and prophylactic antiemetic practices [1,2,6]. A hospital-based study published in 2024 also emphasized the continuing burden of PONV among patients receiving general anaesthesia[7].

Patient-related risk factors

In the present study, female patients experienced PONV more frequently than male patients. Among 82 female patients, 39 (47.6%) developed PONV, compared with 18 of 68 males (26.5%). Thus, the absolute difference in PONV incidence between females and males was 21.1 percentage points. This finding is consistent with the established association between female sex and increased susceptibility to PONV. Female sex is one of the four predictors incorporated into the simplified Apfel score and has been consistently identified as an important patient-related risk factor[4,8]. The present observation therefore supports the relevance of sex as an important component of preoperative PONV risk assessment.

Smoking status also demonstrated a clear difference in PONV occurrence. PONV was observed in 50 of 115 non-smokers (43.5%), compared with 7 of 35 smokers (20.0%). The higher incidence among non-smokers is consistent with the inclusion of non-smoking status as an established predictor in the Apfel model[4]. The mechanism underlying the inverse association between smoking and PONV is complex and has been discussed in relation to chronic exposure to tobacco smoke and alterations in hepatic drug metabolism and emetic pathways[9]. However, the present observational data demonstrate an association and do not establish a causal mechanism.

A previous history of PONV or motion sickness was another important patient-related characteristic. Among the 24 patients with such a history, 15 (62.5%) developed PONV, compared with 42 of 126 patients (33.3%) without such a history. The approximately two-fold difference in incidence supports the established importance of previous PONV or motion sickness as a marker of individual susceptibility. Previous prospective studies have similarly identified previous PONV as an important predictor of postoperative emetic symptoms [4,10]. This finding highlights the importance of specifically enquiring about previous PONV and motion sickness during the pre-an aesthetic assessment.

Apfel risk score and PONV

A progressive increase in the observed incidence of PONV was demonstrated with increasing Apfel scores. PONV occurred in 1 of 10 patients (10.0%) with a score of 0, 7 of 32 (21.9%) with a score of 1, 16 of 51 (31.4%) with a score of 2, 21 of 43 (48.8%) with a score of 3, and 12 of 14 (85.7%) with a score of 4. Therefore, patients with four risk factors had a substantially greater observed incidence of PONV than patients with no identified risk factors.

When patients were grouped into low-risk (Apfel score 0–1), moderate-risk (score 2), and high-risk (score 3–4) categories, PONV occurred in 8 of 42 low-risk patients

(19.0%), 16 of 51 moderate-risk patients (31.4%), and 33 of 57 high-risk patients (57.9%). The progressive pattern observed in this study is in agreement with the original Apfel model, in which increasing numbers of risk factors were associated with increasing PONV incidence[4]. The original model reported incidences of approximately 10%, 21%, 39%, 61%, and 79% for scores of 0, 1, 2, 3, and 4, respectively[4]. The corresponding incidences in the present study were 10.0%, 21.9%, 31.4%, 48.8%, and 85.7%.

The differences between the present observations and the original predicted incidences are not unexpected. The performance of a clinical risk score may vary according to the characteristics of the population in which it is applied, including the distribution of risk factors, surgical procedures, an aesthetic technique, and use of prophylactic antiemetics. Importantly, the present findings demonstrate that increasing Apfel score was associated with increasing observed PONV incidence in this cohort. Formal measures such as area under the receiver operating characteristic curve and calibration analysis would be required to independently establish predictive performance; therefore, the present findings are best interpreted as supporting the clinical usefulness of risk stratification rather than as formal validation of the Apfel score.

Type of surgery

The incidence of PONV varied according to the type of surgical procedure. Laparoscopic/ abdominal and gynecological procedures had the highest observed incidence, with 21 of 45 patients (46.7%) and 14 of 30 patients (46.7%), respectively, developing PONV. ENT procedures had an incidence of 40.0%, while urological, general surgical, and orthopaedic procedures showed incidences of 30.0%, 25.0%, and 24.0%, respectively.

The relatively higher incidence observed following laparoscopic/abdominal and gynecological surgery is consistent with the recognized influence of surgical characteristics on PONV risk. Intra-abdominal procedures may involve visceral manipulation and afferent stimulation, while laparoscopic surgery may additionally be influenced by pneumoperitoneum and other procedure-specific factors[1,3]. Gynecological surgery is also traditionally considered to be associated with a relatively high risk of PONV, particularly because of the high proportion of female patients undergoing these procedures [1,6].

However, the present data should be interpreted as descriptive associations because the surgical groups were of different sizes and differed in their underlying patient characteristics. In particular, the association between type of surgery and PONV may partly reflect differences in sex distribution and Apfel risk factors across surgical categories.

Duration of surgery

A marked increase in PONV incidence was observed with increasing duration of surgery. Among patients undergoing procedures lasting ≤1 hour, 8 of 38 (21.1%) developed PONV. The incidence increased to 25 of 78 (32.1%) among patients undergoing procedures lasting 1–2 hours and to 24 of 34 (70.6%) among those undergoing procedures lasting more than 2 hours.

The substantially higher incidence among patients undergoing longer procedures is clinically plausible because longer operations may result in prolonged exposure to an aesthetic agents and may be associated with greater requirements for perioperative analgesics and opioids. Duration of surgery has historically been recognized as a factor associated with postoperative emetic symptoms[1,3]. In the present cohort, the difference

was particularly pronounced in procedures exceeding two hours, in which approximately seven out of ten patients developed PONV.

Nevertheless, duration of surgery may also act as a marker for other perioperative characteristics, including surgical complexity, an aesthetic duration, opioid exposure, and type of procedure. Therefore, the present observational finding demonstrates an association but cannot independently establish duration of surgery as a causal factor.

Postoperative opioid use

Postoperative opioid administration was associated with a higher incidence of PONV in the present study. Among 98 patients who received postoperative opioids, 46 (46.9%) developed PONV, compared with 11 of 52 patients (21.2%) who did not receive postoperative opioids. The incidence was therefore more than twice as high among patients receiving postoperative opioids.

This finding is consistent with the established role of opioids as an important modifiable anaesthesia-related risk factor. Postoperative opioid use is one of the four components of the simplified Apfel score [4]. Opioids can contribute to nausea and vomiting through effects on the gastrointestinal tract and central emetic pathways [6]. The present findings therefore support efforts to use opioid-sparing or multimodal analgesic strategies where clinically appropriate, particularly in patients who already have multiple PONV risk factors.

It should be noted that postoperative opioid use was itself incorporated into the Apfel score in this study. Consequently, the association between Apfel score and PONV and the association between postoperative opioid administration and PONV are not independent observations. This overlap should be considered when interpreting the findings.

Prophylactic antiemetic therapy

The present study also demonstrated an important relationship between prophylactic antiemetic therapy and postoperative PONV. Among the 38 patients who received no prophylaxis, 21 (55.3%) developed PONV. The incidence was lower among patients receiving single-agent prophylaxis, with 29 of 82 patients (35.4%) developing PONV. The lowest incidence was observed among patients receiving combination prophylaxis, with 7 of 30 patients (23.3%) developing PONV.

The stepwise reduction in observed PONV incidence across the three prophylaxis groups is consistent with the rationale for risk-adapted multimodal prevention. Current consensus recommendations support the use of prophylactic antiemetic strategies based on individual risk, with combination therapy using agents from different pharmacological classes being particularly relevant in patients at increased risk [6]. The present findings therefore provide clinically relevant evidence supporting the importance of preventive antiemetic management.

However, because this was an observational study, prophylaxis was not randomly assigned. Patients considered to be at higher risk may have been more likely to receive prophylaxis, while the specific antiemetic agents, doses, and timing may have differed between patients. Therefore, the lower incidence observed with combination prophylaxis should be interpreted as an association rather than as a direct estimate of treatment efficacy. A randomized comparative study would be required to determine the independent efficacy of specific prophylactic regimens.

Clinical presentation and severity of PONV

Among the 57 patients who developed PONV, nausea alone was the most common presentation, occurring in

28 patients (49.1%). Nausea accompanied by vomiting occurred in 21 patients (36.8%), while vomiting alone occurred in 8 patients (14.0%). Thus, nausea, either alone or in combination with vomiting, accounted for the majority of PONV presentations.

Among the 49 patients who experienced nausea, 24 (49.0%) reported mild nausea, 21 (42.9%) moderate nausea, and 4 (8.2%) severe nausea. The predominance of mild and moderate symptoms indicates that although PONV was relatively frequent in the study population, severe nausea was less common. Nevertheless, even nausea without vomiting can be clinically important because it contributes substantially to postoperative discomfort and may require treatment [1,6].

The pattern of vomiting also demonstrated that most patients experienced relatively limited episodes. Among the 29 patients who vomited, 13 (44.8%) had one episode, 10 (34.5%) had two episodes, and 6 (20.7%) experienced three or more episodes. Therefore, a single vomiting episode was the most frequent pattern among patients who developed vomiting.

Timing of PONV

The majority of PONV episodes occurred during the first six postoperative hours. Thirty-nine of 57 patients (68.4%) developed their first PONV episode during this period, while 11 patients (19.3%) developed symptoms between 6 and 12 hours and 7 patients (12.3%) between 12 and 24 hours.

The concentration of events during the early postoperative period emphasises the importance of careful observation in the immediate postoperative setting. Early postoperative monitoring permits timely recognition of nausea and vomiting and facilitates prompt administration of rescue therapy when required. Nevertheless, the occurrence of additional episodes between 6 and 24 hours demonstrates that assessment should not be restricted to the immediate recovery period.

Requirement for rescue antiemetic therapy

Of the 57 patients who developed PONV, 29 (50.9%) required rescue antiemetic treatment, whereas 28 (49.1%) did not. Thus, approximately half of the patients who developed PONV required pharmacological intervention.

This finding highlights that the clinical burden of PONV extends beyond the occurrence of symptoms alone. Development of PONV may necessitate additional medication, monitoring, and nursing care and may interfere with postoperative recovery. Current consensus approaches emphasize not only prophylaxis but also appropriate rescue treatment when PONV occurs despite preventive measures [6]. The proportion requiring rescue therapy in the present study further emphasizes the importance of identifying high-risk patients before surgery and implementing appropriate preventive strategies.

Conclusion

PONV occurred in 38.0% of patients within 24 hours after general anaesthesia. Female sex, non-smoking status, previous PONV/motion sickness, higher Apfel score, longer surgery, and postoperative opioid use were associated with increased PONV. Most episodes occurred within the first 6 hours, and 50.9% of affected patients required rescue antiemetic therapy. Appropriate risk stratification, prophylactic antiemetic therapy, and early postoperative monitoring are therefore essential for effective PONV management.

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