# Frequency and Risk Factors of Postoperative Nausea and Vomiting in Patients Receiving General Anesthesia – A Cross-Sectional Study

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ABSTRACT

**Introduction:** Postoperative nausea and vomiting (PONV) are among the most frequent problems after general anesthesia that can negatively impact a patient's comfort and recovery. Several factors determine the occurrence of PONV, such as patient characteristics, nature and length of surgery, anesthetic method, and use of opioids around the time of surgery. **Methods and materials:** This cross-sectional study was conducted on 68 patients scheduled for elective surgery under general anesthesia at the Department of Anaesthesiology at Manipal AFC Hospital, from July 2021 to June, 2022. Adult patients aged 18 years and above were included in this study. Data were analyzed using SPSS version 26.0. **Result:** Thirty-eight patients (55.9%) were females, 50 (73.5%) were non-smokers, and 14 (20.6%) had a history of motion sickness or previous PONV, among the risk factors for PONV. Twenty, one patient (30.9%) had PONV within 24 hours; 12 (17.6%) had only nausea, and 9 (13.3%) had vomiting and nausea. The occurrence of PONV was more among females (16/38, 42.1%), patients who had surgery for >2 hours (9/16, 56.3%), and those who were given opioids postoperatively (16/40, 40.0%). The incidence also went up with increasing Apfel scores, 15.0% in low-risk, risk, 30.8% in moderate-risk, and 45.5% in high-risk patients. **Conclusion:** This cross-sectional study revealed that the rate of postoperative nausea and vomiting (PONV) was 30.9% for patients who underwent general anaesthesia. Major determiners of PONV were female gender, the length of the surgery, the use of opioids after the surgery, and a higher Apfel score.

***Keywords:*** *Postoperative Nausea and Vomiting, General Anesthesia, Opioid.*

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## INTRODUCTION

Postoperative nausea and vomiting (PONV) still constitute some of the most frequent and distressing complications experienced by patients who undergo surgery with general anesthesia. PONV is defined as nausea, retching, or vomiting experienced within the first 24 hours post-surgery. It is a leading cause of patient discomfort, delays in patient recovery, and unplanned hospital readmissions resulting from complications such as dehydration, electrolyte imbalance, wound dehiscence, and aspiration pneumonitis. On top of that, patients who experience uncontrolled PONV become dissatisfied, and hospital costs go up, which is why healthcare professionals must be able to identify the risk factors and provide the right approach to perioperative care that will focus on prophylaxis and target interventions [1,2]. Find more. Even though there have been significant developments in anesthetic techniques and antiemetic prophylaxis, PONV is still frequently experienced. Approximately 25 to 30 % of all patients who undergo general anesthesia for surgery are affected by PONV if it is not treated, but this figure may climb to 70 to 80 % in patients who are at a high risk of the disorder because they have several predisposing factors [1,3]. Recent observational studies have shown that the rate of PONV differs significantly among different populations and clinical settings; for instance, a cross-sectional study in Ethiopia documented a prevalence of 35.4 % among adult surgical patients, whereas a study in Bangladesh reported an incidence of 25.6 % in patients undergoing general anesthesia [4,5]. Other recent publications have recorded PONV incidences of approximately 29.9 % in large cohorts of same-day surgical patients and about 31.1 % following laparoscopic cholecystectomy, thus indicating that PONV remains a common problem in the modern era [6]. The pathophysiology of PONV is complex and involves multiple factors, with patient characteristics, anesthetic methods, and surgical elements playing an important role. Known patient, related risk factors are being female, younger age, nonsmoking, having a history of PONV or motion sickness, and higher body mass index (BMI) [1,6]. Anesthesia, related factors such as the use of volatile anesthetics (e.g., sevoflurane and isoflurane), nitrous oxide, and perioperative opioids have always been associated with higher PONV risk because of their emetogenic properties [7]. Longer duration of anesthesia and surgery also bring about higher risks, with studies showing that the chance of getting PONV increases with longer surgical times [6,8]. Besides patient and anesthesia factors, the nature of the surgery also has an effect on the risk of PONV; laparoscopic procedures, gynecologic surgeries, and surgeries with pneumoperitoneum are always associated with a higher number of PONV cases compared to other types of operations [6,7]. This difference emphasizes the necessity of taking into account the type and complexity of the surgery when assessing the risk of PONV and putting in place preventive measures. One of the ways to assess risk is through tools such as risk prediction charts. For example, the simplified scoring system proposed by a group led by Apfel, this score takes into consideration the four main risk factors: female gender, nonsmoker, positive history of PONV or motion sickness, and use of postoperative opioids, and helps to categorize patients into low, moderate, and high-risk groups for PONV [1,3]. There are numerous predictive tools of PONV that have been tested for their validity and accuracy; however, the global implementation of risk-adapted antiemetic prophylaxis is still quite different between healthcare institutions. This inconsistency is most evident in low-resource settings, where routine risk assessment for PONV and the use of a multimodal prophylaxis approach may not be part of the regular practice [5].

## METHODS & MATERIALS

This cross-sectional study involved a total of 68 patients who were going to electively have general anesthesia at the Department of Anaesthesiology at Manipur AFC

Hospital, Cumilla, Bangladesh, from July, 2021 to June, 2022. Adults of 18 years and above who gave their consent were included, while those with pre-existing nausea or vomiting, gastrointestinal problems, or incomplete records were excluded. Demographic data, surgical information such as the type and duration of the surgery, anesthetic technique (inhalational vs. total intravenous anesthesia), and the use of opioids during the perioperative period were documented. Known risk factors for postoperative nausea and vomiting (PONV), such as female sex, non-smoking status, and history of motion sickness or prior PONV, were recorded, and Apfel risk scores were determined for each patient. Postoperative surveillance lasted for 24 hours, during which time the instances of nausea and vomiting were noted. Data were processed with SPSS ver. 26.0, to find out the incidence of PONV and its relationship with demographic, surgical, and anesthetic variables, as well as the total Apfel scores. Statistical tests comprised descriptive statistics, chi-square tests for categorical variables, and p-values <0.05 were deemed significant. Ethical clearance was taken from Rokeya Specialised Hospital.

## RESULTS

According to *Table I*, the largest group of patients was between 31 and 45 years of age, 24 (35.3%), next in numbers were patients between 18 and 30 years, 18 (26.5%), 17 (25.0%) were between 46 and 60 years, and 9 (13.2%) were >60 years. There were 38 female (55.9%) and 30 male (44.1%) patients in the study. The majority of patients had a normal weight (42, 61.8%), while 26 (38.2%) were either overweight or obes.

**Table I**
Socio-demographic characteristics of the study participants (*n*=68).

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| **Age group (years)** | | |
| 18–30 | 18 | 26.5 |
| 31–45 | 24 | 35.3 |
| 46–60 | 17 | 25.0 |
| >60 | 9 | 13.2 |
| **Sex** | | |
| Male | 30 | 44.1 |
| Female | 38 | 55.9 |
| **BMI** | | |
| Normal (<25 kg/m²) | 42 | 61.8 |
| Overweight/Obese (≥25 kg/m²) | 26 | 38.2 |

*Table II* illustrates that 26 patients (38.2%) had general surgery, gynecological procedures (18, 26.5%) were the next biggest group, followed by orthopedic (14, 20.6%) and other surgeries (10, 14.7%). The majority of operations were 1- 2 hours long (32, 47.1%), 20 (29.4%) were under one hour, and 16 (23.5%) exceeded two hours. 52 patients (76.5%) received inhalational anesthesia, while 16 (23.5%) had TIVA. Forty (58.8%) patients were given postoperative opioid analgesics.

**Table II**
Surgical and anesthetic characteristics (*n*=68).

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| **Type of surgery** | | |
| General surgery | 26 | 38.2 |
| Gynecological | 18 | 26.5 |
| Orthopedic | 14 | 20.6 |
| Others | 10 | 14.7 |
| **Duration of surgery** | | |
| <1 hour | 20 | 29.4 |
| 1–2 hours | 32 | 47.1 |
| >2 hours | 16 | 23.5 |
| **Type of anesthesia** | | |
| Inhalational (volatile agents) | 52 | 76.5 |
| Total intravenous anesthesia (TIVA) | 16 | 23.5 |
| **Postoperative opioid use** | | |
| Yes | 40 | 58.8 |
| No | 28 | 41.2 |

From *Table III*, it can be seen that 38 patients (55.9%) were female and 50 (73.5%) did not smoke. A history of either motion sickness or PONV was noted in 14 patients (20.6%). Use of postoperative opioids, a further significant risk factor, was detected in 40 patients (58.8%).

**Table III**
Distribution of established PONV risk factors (*n*=68).

| Risk factor | Present n (%) |
|---|---|
| Female sex | 38 (55.9) |
| Non-smoker | 50 (73.5) |
| History of motion sickness/PONV | 14 (20.6) |
| Postoperative opioid use | 40 (58.8) |

According to *Table IV*, 47 patients (69.1%) were free of PONV. Twelve patients (17.6%) out of the affected ones reported only nausea, whereas 9 (13.3%) had vomiting either with or without nausea. In total, PONV was present in 21 patients (30.9%) during the first 24 hours following the operation.

**Table IV**
Incidence and pattern of PONV within 24 hours (*n*=68).

| Outcome | Frequency (n) | Percentage (%) |
|---|---|---|
| No PONV | 47 | 69.1 |
| Nausea only | 12 | 17.6 |
| Vomiting (± nausea) | 9 | 13.3 |
| Total PONV | 21 | 30.9 |

*Table V* suggests that females were more likely to have PONV than males. (16 of 38, 42.1% vs. 5 of 30, 16.7%). There were more patients with PONV in the group with a surgery duration of more than 2 hours (9 of 16, 56.3%) as compared to the group with a shorter duration (12 of 52, 23.1%). Likewise, postoperative nausea and vomiting (PONV) were more frequent in patients who received postoperative opioids (16 out of 40, 40.0%) as compared to patients who did not (5 of 28, 17.9%). These relationships were statistically significant.

**Table V**
Association between selected factors and PONV (*n*=68).

| Variable | PONV n/N (%) | No PONV n/N (%) | p-value |
|---|---|---|---|
| Female | 16/38 (42.1) | 22/38 (57.9) | 0.03 |
| Male | 5/30 (16.7) | 25/30 (83.3) | |
| Duration >2 hrs | 9/16 (56.3) | 7/16 (43.7) | 0.01 |
| ≤2 hrs | 12/52 (23.1) | 40/52 (76.9) | |
| Opioids (Yes) | 16/40 (40.0) | 24/40 (60.0) | 0.02 |
| Opioids (No) | 5/28 (17.9) | 23/28 (82.1) | |

*Table VI* illustrates how PONV incidence gradually rises with the Apfel score. Only three out of twenty patients with a low risk (score 01) developed PONV. In the moderate risk category (score 2), 8 of 26 patients (30.8%) had PONV; therefore, the highest rate was in the high-risk group (score 34), where 10 of 22 patients (45.5%) were afflicted.

**Table VI**
Relationship between Apfel score and PONV (*n*=68).

| Apfel score | Patients (n) | PONV n (%) |
|---|---|---|
| 0–1 (Low risk) | 20 | 3 (15.0) |
| 2 (Moderate risk) | 26 | 8 (30.8) |
| 3–4 (High risk) | 22 | 10 (45.5) |

## DISCUSSION

In this cross-sectional study of 68 patients undergoing surgery under general anesthesia, the overall incidence of postoperative nausea and vomiting (PONV) was 30.9%. This finding is consistent with contemporary literature reporting PONV rates between 20% and 40% in general surgical populations. Qiu et al. reported a 29.9% incidence among 7,759 ambulatory surgical patients, while Gan et al. noted that PONV occurs in approximately 30% of all surgical patients and may increase to 70–80% in high-risk individuals [3,9]. Teshome et al. also documented a 35.4% prevalence in a hospital-based study [10]. With regard to demographic factors, our study demonstrated a significantly higher incidence of PONV among females (42.1%) compared with males (16.7%). This pattern is well documented in previous research. In the study by Qiu et al., the incidence was 34.3% in females versus 19.0% in males [3]. Similarly, Apfel et al. identified female gender as one of the strongest independent predictors, with the risk being approximately two to three times higher than in males [11]. Surgical duration was another important determinant. Patients undergoing procedures lasting more than 2 hours experienced a PONV incidence of 56.3%, compared with 23.1% among those with shorter procedures. Previous studies have reported similar associations. Qiu et al. found that procedures exceeding one hour were associated with a PONV incidence of approximately 38–40%, compared with about 20–22% for shorter operations [3]. Jamtsho et al. reported 45.0% PONV following prolonged laparoscopic surgeries [2]. In our cohort, postoperative opioid use was associated with a PONV incidence of 40.0%, compared with 17.9% among patients who did not receive opioids. Similar observations have been reported previously. Teshome et al. documented 41.2% PONV in opioid users versus 21.5% in non-users [10]. Apfel et al. also demonstrated that postoperative opioid administration significantly increases the likelihood of PONV [11]. Regarding baseline risk factors, non-smokers constituted 73.5% of our study population, and 20.6% had a history of motion sickness or previous PONV. Prior studies have reported similar distributions. Veiga-Gil et al. noted that nonsmokers comprised approximately 70–80% of surgical cohorts and had a significantly higher risk of PONV [12]. Qiu et al. reported a history of motion sickness/PONV in 18.5% of patients, which was independently associated with postoperative symptoms [3]. The cumulative effect of risk factors was evident when assessed using the Apfel score. The incidence of PONV increased progressively from 15.0% in the low-risk group, to 30.8% in the moderate-risk group, and 45.5% in the high-risk group. The original Apfel model demonstrated a graded increase in risk, with PONV rates of approximately 10%, 20%, 40%, and up to 60–80% as the number of

risk factors increased from one to four [11]. A validation study by Eberhart et al. similarly confirmed a stepwise rise in incidence across risk categories [13].

## LIMITATIONS

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

## CONCLUSION

In this cross-sectional study, the incidence of postoperative nausea and vomiting (PONV) was 30.9% in patients who underwent general anesthesia. PONV occurrence was significantly associated with female gender, prolonged surgery, postoperative administration of opioids, and higher Apfel scores.

## RECOMMENDATION

According to the data we have just discussed, a simple preoperative risk assessment tool such as an Apfel score should be a routine procedure for anyone going under general anesthesia. High-risk patients, for example, women, patients with long operation times, or those who may need postoperative opioids, should be specifically targeted for prophylactic antiemetic therapy and good postoperative surveillance.

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## CONFLICT OF INTEREST

None declared.

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