Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Anaesthesia

The Impact of Apfel's Risk Score on Postoperative Nausea, Vomiting and Recovery after Laparoscopic Cholecystectomy

Dr. Rahnuma Tasnim[1], Dr. Mehedi Masud[1], Dr. Shamim Ara Sultana[1], Dr. Mohammed Badrul Alam[1], Dr. Nasima Sultana[1], Dr. Ayesha Sultana[1*], Dr. Taj Uddin Ahmed[1], Dr. Mohammad Mominul Haque[1]

[1]Assistant Professor, Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangladesh Medical University, Dhaka, Bangladesh

DOI: https://doi.org/10.36347/sjams.2025.v13i11.014 | **Received:** 07.09.2025 | **Accepted:** 11.11.2025 | **Published:** 13.11.2025

***Corresponding author:** Dr. Ayesha Sultana
Assistant Professor, Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangladesh Medical University, Dhaka, Bangladesh

Abstract **Original Research Article**

Background: Postoperative nausea and vomiting (PONV) are among the most distressing postoperative complications, particularly following laparoscopic cholecystectomy. The Apfel risk score offers a simplified method for predicting PONV; however, limited evidence exists regarding its applicability in South Asian populations. This study aimed to assess the impact of Apfel's risk score on the incidence of PONV and recovery outcomes in patients who underwent laparoscopic cholecystectomy at a tertiary center in Bangladesh. ***Methods:*** A cross-sectional observational study was conducted at the Department of Anaesthesia, Analgesia, and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh (Present Bangladesh Medical University), from July 2017 to June 2018. 120 adult patients (ASA I–II) undergoing elective laparoscopic cholecystectomy under general anesthesia were evaluated. PONV was recorded for 24 h postoperatively and graded using a four-point scale (G0–G3). The recovery outcomes included time to ambulation, hospital stay, rescue antiemetic use, and patient satisfaction. Data were analyzed using SPSS version 23. ***Results:*** The overall incidence of PONV was 41.7%. Patients with an Apfel score of 4 experienced significantly higher PONV (46.6%) than those with a score of 3 (37.1%) ($p = 0.033$). Higher scores were associated with delayed ambulation (6.2 ± 1.8 h vs. 5.0 ± 1.4 h), longer hospital stays (1.6 ± 0.5 days vs. 1.2 ± 0.4 days), and lower satisfaction ($p < 0.05$). ***Conclusion:*** The Apfel risk score effectively predicted PONV and correlated with slower postoperative recovery, confirming its clinical utility in the Bangladeshi surgical population.

Keywords: Apfel risk score, postoperative nausea and vomiting, laparoscopic cholecystectomy.

INTRODUCTION

Postoperative nausea and vomiting (PONV) remain one of the most distressing and common complications following general anesthesia, with reported incidences ranging between 20% and 80%, depending on patient risk factors, anesthetic technique, and type of surgery [1]. It significantly impairs patient satisfaction, prolongs recovery room stay, and may delay discharge, particularly after laparoscopic procedures where intra-abdominal insufflation and opioid use exacerbate emetic symptoms [2]. Despite advances in antiemetic therapy, PONV continues to challenge anesthesiologists due to its multifactorial etiology and interindividual variability [3,4].

The Apfel simplified risk score is a validated predictive model developed to identify patients at varying risk levels for PONV [6]. It considers four independent predictors—female sex, non-smoking status, history of PONV or motion sickness, and postoperative opioid use—assigning one point to each [5,6]. The probability of PONV rises progressively from approximately 10% for zero risk factors to 80% when all four are present [7]. Several studies have confirmed its reliability across different surgical populations and ethnic groups [8,9]. However, regional data on the correlation between Apfel's score and actual postoperative outcomes in South Asian populations, particularly in Bangladesh, remain scarce.

Laparoscopic cholecystectomy, one of the most frequently performed elective procedures worldwide, is associated with high PONV risk due to factors such as pneumoperitoneum, CO_2 retention, hormonal influences, and use of volatile anesthetics [10]. Female predominance, hormonal fluctuations, and opioid-based analgesia further amplify emetic susceptibility [11].

Inadequate prediction and prophylaxis not only affect patient comfort but also impede early recovery and discharge [12]. The Enhanced Recovery After Surgery (ERAS) framework emphasizes minimizing such complications to promote faster rehabilitation [13].

Existing research in Western and South Asian populations has shown variations in PONV incidence even under comparable risk profiles [9]. Studies demonstrate that while Apfel's scoring reliably stratifies risk, the magnitude of postoperative symptoms and their influence on recovery outcomes can vary across demographic and clinical settings [5,14]. Moreover, differences in anesthetic practice, antiemetic regimens, and perioperative fasting practices may affect the generalizability of Western data to Bangladeshi populations [15].

Within this context, evaluating the relationship between Apfel's risk score and postoperative recovery after laparoscopic cholecystectomy is clinically relevant. Reliable prediction and risk-adapted prophylaxis are key to reducing PONV and optimizing postoperative outcomes. This study, therefore, aims to assess the impact of Apfel's risk score on the incidence and severity of postoperative nausea and vomiting, and its relationship with postoperative recovery parameters among Bangladeshi patients undergoing laparoscopic cholecystectomy.

MATERIALS & METHODS

This cross-sectional observational study was conducted in the Department of Anaesthesia, Analgesia, and Intensive Care Medicine at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh (Present Bangladesh Medical University), from July 2017 and June 2018, involving 120 adult patients undergoing elective laparoscopic cholecystectomy under general anesthesia. Participants aged 18–70 years, classified as American Society of Anesthesiologists (ASA) physical status I or II, and identified as high risk for postoperative nausea and vomiting (PONV) based on Apfel's risk score (3 or 4) were included, while those with severe systemic disease, pregnancy, or metabolic and neurological disorders were excluded. Data were collected prospectively using a structured checklist. Preoperative evaluation included assessment of Apfel's PONV risk score, which considers four predictors—female sex, non-smoking status, history of motion sickness or previous PONV, and anticipated postoperative opioid use. Each factor contributed one point, and patients with scores of three or four were categorized as high risk. Demographic, anesthetic, and perioperative variables were recorded, followed by postoperative monitoring for 24 hours. The severity of nausea and vomiting was assessed using a four-point Visual Rating Scale (VRS): G0 (no symptom), G1 (nausea), G2 (nausea with vomiting), and G3 (repeated vomiting ≥2 episodes). Recovery outcomes, including ambulation time, length of hospital stay, requirement for rescue antiemetics, and overall patient satisfaction, were also documented. Data collection was performed by trained anesthesiology personnel to ensure uniformity and accuracy. Ethical approval was obtained from the BSMMU Institutional Review Board, and all participants provided informed written consent with assurance of confidentiality. Statistical analysis was conducted using SPSS version 23.0. Descriptive statistics (mean ± SD, frequency, percentage) summarized baseline characteristics, and inferential statistics (Chi-square test and independent t-test) compared study variables, with a p-value < 0.05 considered statistically significant.

RESULTS

Table 1: Baseline Characteristics of Study Participants (n = 120)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–30	26	21.7
	31–45	56	46.7
	46–60	30	25.0
	>60	8	6.6
	Mean±SD	34.2 ± 7.1	
Gender	Male	36	30.0
	Female	84	70.0
BMI (kg/m²)	<25	72	60.0
	25–29.9	38	31.7
	≥30	10	8.3
ASA Class	I	68	56.7
	II	52	43.3
Apfel's Score	3	62	51.7
	4	58	48.3

The mean age of the study population was 34.2 ± 7.1 years, with a majority (46.7%) between 31–45 years. Females constituted 70% of the sample, reflecting the higher prevalence of cholelithiasis in women. Most participants had a BMI < 25 kg/m² (60%) and were classified as ASA Class I (56.7%). According to Apfel's

criteria, 51.7% of patients scored 3, while 48.3% scored 4. These baseline characteristics indicate a homogenous and comparable sample suitable for risk-based analysis.

Table 2: Incidence and Severity of Postoperative Nausea and Vomiting (PONV) According to Apfel's Risk Score

Apfel Score	n	No PONV n (%)	Mild (Nausea only) n (%)	Moderate (Nausea + Vomiting) n (%)	Severe (Repeated Vomiting ≥2 times) n (%)
3	62	39 (62.9)	12 (19.4)	8 (12.9)	3 (4.8)
4	58	31 (53.4)	13 (22.4)	9 (15.5)	5 (8.6)
Total	120	70 (58.3)	25 (20.8)	17 (14.2)	8 (6.7)

Among patients with a score of 3, 62.9% experienced no PONV, 19.4% had mild nausea, 12.9% had moderate symptoms (nausea + vomiting), and 4.8% suffered severe vomiting episodes. In contrast, patients with a score of 4 showed higher rates of both nausea (22.4%) and vomiting (15.5%), with 8.6% experiencing repeated vomiting. The overall incidence of PONV was 41.7%, with a significant rise in frequency and severity observed among those with higher Apfel's scores ($p = 0.033$).

Table 3: Postoperative Recovery Parameters According to Apfel's Risk Score

Parameter	Apfel Score 3 (n=62)	Apfel Score 4 (n=58)	p-value
Mean time to ambulation (hrs) ± SD	5.0 ± 1.4	6.2 ± 1.8	0.012
Mean duration of hospital stay (days) ± SD	1.2 ± 0.4	1.6 ± 0.5	0.021
Requirement of rescue antiemetic n (%)	17 (27.4%)	22 (37.9%)	0.186
Mean patient satisfaction score (1–5 scale) ± SD	4.2 ± 0.6	3.8 ± 0.7	0.047

Patients with an Apfel score of 4 had longer mean ambulation times (6.2 ± 1.8 hours) and extended hospital stays (1.6 ± 0.5 days) compared to those scoring 3 (5.0 ± 1.4 hours; 1.2 ± 0.4 days, respectively). The need for rescue antiemetic medication was slightly higher in the Apfel 4 group (37.9%) but did not reach statistical significance ($p > 0.05$). Mean satisfaction scores were significantly lower among higher-risk patients ($p = 0.047$). These findings reflect a direct association between increasing Apfel's score and delayed recovery outcomes.

DISCUSSION

The present study evaluated the relationship between Apfel's risk score and postoperative nausea, vomiting, and recovery outcomes following laparoscopic cholecystectomy in a Bangladeshi population. The overall incidence of postoperative nausea and vomiting (PONV) in this study was 41.7%, which aligns with findings from Gan *et al.*, and Apfel *et al.*, who reported that 30–50% of surgical patients experience PONV despite prophylactic measures [10,16]. The results confirm that higher Apfel scores are strongly associated with increased frequency and severity of PONV, delayed ambulation, prolonged hospital stay, and lower satisfaction scores.

Consistent with Apfel's original model, the likelihood of PONV rose progressively with the number of predictive factors [16]. Patients with a score of 4 demonstrated higher nausea and vomiting rates compared to those with a score of 3, supporting the findings of Shrestha *et al.*, and Gunawan *et al.*, [5,6]. In the current study, the difference in overall PONV incidence between the two groups was statistically significant ($p = 0.033$), reaffirming the predictive validity of the Apfel risk score in this setting. Similar observations have been reported in studies from Nepal and Indonesia, where Apfel scoring demonstrated high sensitivity and specificity in predicting PONV after laparoscopic procedures [5,6].

Gender distribution played an important role, with 70% of participants being female—a well-recognized determinant of PONV. Veiga-Gil *et al.,* and Apfel *et al.,* noted that female sex remains the most dominant risk factor due to hormonal influences on serotonin and dopamine pathways [7,16]. Additionally, the predominance of non-smokers further elevated the risk, a pattern consistent with the study of Al-Ghanem *et al.,* [3]. This reflects the established epidemiological profile of high-risk patients in South Asia, where the majority of surgical candidates are non-smoking women.

In the present study, postoperative nausea was more common than vomiting, which supports the results of Abired *et al.,* [1]. These findings suggest that nausea may present as an early warning symptom preceding vomiting, highlighting the need for timely antiemetic administration. Moreover, moderate to severe PONV (scores 2–3) was more frequently observed among patients with an Apfel score of 4, suggesting that higher cumulative risk factors correspond not only to a greater incidence but also to increased symptom intensity.

Recovery outcomes also correlated significantly with the Apfel score. Patients with a score of 4 had a longer mean ambulation time and hospital stay ($p < 0.05$). These findings parallel those of Bolükbaş and Birlikbaş, who emphasized that postoperative

discomfort, including nausea and delayed mobility, impedes adherence to Enhanced Recovery After Surgery (ERAS) protocols [13]. Similarly, the extended hospital stay observed among higher-risk patients in this study mirrors reports by Moreno *et al.*, where severe PONV was linked to prolonged recovery and increased healthcare costs [17].

Although the requirement for rescue antiemetic medication did not reach statistical significance between Apfel groups, it was clinically higher among those with a score of 4. This trend aligns with the observations of Dewinter *et al.*, who proposed a simplified multimodal prophylactic algorithm to minimize rescue antiemetic use by stratifying patients based on Apfel scoring [12]. The ERAS framework also supports preoperative risk assessment and targeted prophylaxis to reduce postoperative complications [18].

The association between higher Apfel scores and lower postoperative satisfaction, as observed here, is consistent with patient-centered outcomes reported by Elvir-Lazo *et al.*, [14]. Effective control of PONV has been linked to enhanced patient experience, earlier discharge, and better compliance with postoperative mobilization goals. The negative correlation between PONV and satisfaction underscores the necessity for risk-adapted management strategies that combine pharmacological and non-pharmacological interventions.

Overall, the present findings reinforce the global evidence that Apfel's simplified risk score provides an accurate, evidence-based framework for predicting PONV and tailoring prophylactic interventions. The study adds regional data from Bangladesh, bridging a gap in South Asian literature where validation of such predictive models remains limited. By demonstrating that higher Apfel scores are associated with increased PONV frequency, delayed ambulation, and extended hospital stay, this research supports incorporating systematic PONV risk assessment into standard anesthetic evaluation to enhance postoperative recovery and patient satisfaction.

Limitations of the study

1. This was a single-center study, which may limit the general applicability of the findings.
2. The follow-up period was restricted to 24 hours postoperatively, so delayed PONV episodes were not captured.
3. Antiemetic administration was not fully standardized across participants, which could have influenced outcome consistency.

CONCLUSION

The study demonstrates that the Apfel risk score is a strong and practical predictor of postoperative nausea, vomiting, and recovery outcomes following laparoscopic cholecystectomy. Higher Apfel scores were associated with greater PONV incidence, delayed ambulation, and longer hospital stay. Implementing Apfel-based risk stratification can facilitate individualized prophylactic strategies and improve patient recovery. The findings validate the applicability of this scoring system in the Bangladeshi surgical population.

Acknowledgment: I would like to express my sincere gratitude for the invaluable support and cooperation provided by the staff, participants, and my co-authors/colleagues who contributed to this study.

Conflicts of interest: There are no conflicts of interest.

Ethical approval: The study was approved by the Institutional Ethics Committee.

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