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PREVALENCE AND APFEL RISK FACTORS OF POSTOPERATIVE NAUSEA AND VOMITING IN FEMALE PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

Original Research

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ABSTRACT

Background: Postoperative nausea and vomiting (PONV) are among the most frequent and distressing complications following surgeries performed under general anesthesia. Although often perceived as minor, PONV can significantly delay recovery, prolong hospital stays, and reduce patient satisfaction. Female patients undergoing laparoscopic cholecystectomy are particularly vulnerable due to several established risk factors. Effective identification and management of PONV are essential to improving perioperative care and patient outcomes.

Objective: To determine the prevalence and Apfel risk factors of PONV in female patients undergoing laparoscopic cholecystectomy.

Methods: This descriptive cross-sectional study was conducted at Lady Reading Hospital, Peshawar, from June to December 2023. A total of 200 ASA class I and II female patients aged above 18 years scheduled for elective laparoscopic cholecystectomy were enrolled through convenience sampling. Ethical approval was obtained, and written informed consent was taken from each participant. All patients received standardized general anesthesia with ondansetron 4 mg administered prophylactically. PONV was assessed at 4, 6, and 24 hours postoperatively. Data were analyzed using SPSS version 27, and results were presented as means, frequencies, and percentages.

Results: Out of 200 patients, 40 (20%) experienced PONV. Among these, 29 (72.5%) reported nausea, and 11 (27.5%) reported vomiting. The highest incidence occurred at 4 hours postoperatively, with 19 (68%) patients experiencing nausea and 11 (32%) vomiting. At 6 hours, 10 (20.8%) patients had nausea, and no vomiting was observed. No symptoms were recorded at 24 hours. Risk factor analysis revealed that non-smoking status, prior history of PONV or motion sickness, and postoperative opioid use were significantly associated with increased PONV incidence. The Apfel scoring system demonstrated strong predictive value.

Conclusion: PONV is a prevalent early postoperative complication in female patients undergoing laparoscopic cholecystectomy. The Apfel score proved to be an effective tool for identifying high-risk individuals. Early recognition and individualized prophylactic strategies are crucial for enhancing recovery and patient comfort.

Keywords: Cholecystectomy, Female, General Anesthesia, Nausea, Opioid Analgesics, Postoperative Complications, Vomiting.

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INTRODUCTION

Postoperative nausea and vomiting (PONV) remain among the most common and distressing complications experienced by patients following surgery under general anesthesia, often referred to as the “big little problem” due to their disproportionate impact on patient satisfaction, comfort, and recovery despite appearing clinically minor (1). This issue becomes especially significant in the context of laparoscopic cholecystectomy, a widely practiced minimally invasive procedure for gallbladder removal. Despite its advantages—such as reduced postoperative pain, shorter hospital stays, and faster recovery—it is consistently associated with a high incidence of PONV, particularly in female patients (2,3). The technique of laparoscopic surgery, while minimally invasive, involves the insufflation of carbon dioxide gas to create a pneumoperitoneum, which increases intra-abdominal pressure and irritates diaphragmatic and phrenic nerves, factors known to trigger nausea and vomiting (4). In addition, the widespread use of volatile anesthetics and opioid-based analgesia in these procedures further compounds the risk (5). The challenge of addressing PONV is compounded by its multifactorial pathophysiology. Various systems including the central nervous system, gastrointestinal tract, and chemoreceptor trigger zones are implicated, with anesthetic agents stimulating these pathways and contributing to emetic responses (6,7). Female patients represent a particularly vulnerable population due to biological predispositions such as hormonal fluctuations and higher sensitivity to anesthetics, as well as risk-enhancing characteristics like younger age, non-smoking status, and a history of motion sickness or PONV (8). These attributes align with the components of the Apfel scoring system, a validated predictive tool for assessing PONV risk based on four independent variables: female gender, non-smoking status, prior history of PONV or motion sickness, and use of postoperative opioids (9). As the Apfel score increases, so does the likelihood of experiencing PONV, making it a critical framework in guiding preventive and personalized care strategies (9-11).

Despite advancements in pharmacologic and non-pharmacologic interventions, including the use of serotonin receptor antagonists, corticosteroids, and acupressure, the management of PONV remains suboptimal in many settings due to factors such as drug side effects, availability, and inconsistent application of multimodal protocols (12,13). Moreover, the anticipation of PONV can induce preoperative anxiety, delay recovery, contribute to complications like dehydration or aspiration pneumonia, and increase healthcare costs, all of which emphasize the need for effective preventive strategies (14-16). Although multiple studies have explored PONV in general surgical populations, there is a paucity of focused research on female patients undergoing laparoscopic cholecystectomy in tertiary care environments (17). The unique risk profile of this group warrants dedicated investigation to quantify prevalence, understand contributing factors, and optimize perioperative care practices. Current literature reflects inconsistent findings due to variations in methodology, population demographics, and definitions of PONV, creating a critical gap in evidence-based guidance (17). Addressing this knowledge gap can enhance patient outcomes and promote cost-effective, individualized care. Therefore, the objective of the present study is to determine the prevalence of PONV and associated Apfel risk factors among female patients undergoing laparoscopic cholecystectomy in a tertiary care setting.

METHODS

This descriptive cross-sectional study was conducted over a six-month period from June to December 2023 at Lady Reading Hospital, Peshawar. The target population comprised female patients aged 18 years and older who were classified as American Society of Anesthesiologists (ASA) physical status class I or II and were scheduled to undergo elective laparoscopic cholecystectomy. The study excluded patients who were male, those undergoing non-laparoscopic or emergency surgeries, and individuals with ASA class III or IV status. Additional exclusion criteria included the presence of significant cardiac, neurological, or psychiatric comorbidities, pregnancy or lactation, known hypersensitivity to antiemetics, and inability to provide informed consent. Ethical clearance for the study was granted by the institutional review board (IRB) of Lady Reading Hospital prior to participant recruitment. Written informed consent was obtained from all participants after explaining the purpose and procedures of the study in their preferred language. A convenience sampling technique was employed to recruit participants, and the sample size was determined to be 200 using OpenEpi software, assuming a 95% confidence level. Upon enrollment, each patient's risk for postoperative nausea and vomiting (PONV) was evaluated preoperatively using the Apfel scoring system, which considers four key risk factors: female gender, non-smoking status, history of motion sickness or PONV, and planned postoperative opioid use.

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All participants received a standardized general anesthetic protocol. This included intravenous administration of paracetamol at 15 mg/kg as preemptive analgesia, midazolam 20 µg/kg, tramadol 0.1 mg/kg, propofol 1–2 mg/kg for induction, and atracurium 0.5 mg/kg to facilitate intubation. Anesthesia maintenance was achieved using isoflurane in oxygen. For antiemetic prophylaxis, ondansetron 4 mg was administered intravenously approximately 30 minutes before the anticipated end of surgery. Neuromuscular blockade was reversed appropriately based on clinical judgment, and patients were subsequently transferred to the post-anesthesia care unit (PACU) for further monitoring. Postoperative analgesia was provided through scheduled dosing of intravenous paracetamol 1 g every 6 hours and ketorolac 30 mg every 8 hours. Patients were closely observed for a 24-hour period following surgery. PONV assessment was systematically performed at 4, 6, and 24 hours postoperatively by trained clinical staff. Data on demographic variables, Apfel scores, and incidence of PONV were collected through a predesigned data collection tool. All collected data were entered and analyzed using the Statistical Package for the Social Sciences (SPSS) version 27. Descriptive statistics, including means, frequencies, and percentages, were used to summarize demographic and clinical variables. Results were presented in both tabular and graphical formats for better interpretability.

RESULTS

Out of the 200 female patients initially selected for the study, only 40 developed postoperative nausea and vomiting (PONV) and were included in the final analysis. The age distribution among these 40 patients revealed that the majority, 16 individuals (40%), were between 18–24 years of age. This was followed by 11 patients (27.5%) in the 25–31 age group, 7 patients (17.5%) aged 32–38 years, and 6 patients (15%) aged 39 years or older. All participants in the final sample were female. Among the 40 included patients, 29 (72.5%) experienced postoperative nausea, whereas 11 (27.5%) experienced vomiting. This distribution highlights that nausea was a more prevalent symptom than vomiting following laparoscopic cholecystectomy. In terms of occupational background, the majority of patients were housewives, accounting for 68.8% (33 out of 48, although this denominator appears inconsistent with the 40 participants in the study and may indicate a reporting error). Teachers made up 8.3% (4 individuals), students represented 4.2% (2 individuals), and nurses accounted for 2.1% (1 individual). The disproportionately high representation of housewives may reflect the demographic characteristics of the hospital's patient population. Assessment of PONV over time showed a marked decrease in symptoms as the postoperative period progressed. At 4 hours post-operation, 19 patients (68%) reported nausea and 11 (32%) experienced vomiting. By the 6-hour mark, nausea was reported by 10 patients (20.8%), while no vomiting was observed. At 24 hours post-operation, neither nausea nor vomiting was reported in any patient, indicating a significant temporal resolution of symptoms. The analysis of Apfel risk factors confirmed their predictive value in the study population. All 40 patients were female, inherently fulfilling one Apfel criterion. Non-smoking status was universal among participants, with 29 individuals (72.5%) experiencing nausea and 11 (27.5%) vomiting. A history of motion sickness or prior PONV was present in 15 patients (37.5%), of whom 10 (66.7%) reported nausea and 5 (33.3%) reported vomiting. Among the remaining 25 patients without such history, 19 (76%) experienced nausea and 6 (24%) experienced vomiting. Twelve patients (30%) received postoperative opioids, with 9 (75%) reporting nausea and 3 (25%) vomiting. These findings support the reliability of the Apfel scoring system in identifying patients at heightened risk of PONV in this surgical context.

Table 1: Postoperative Nausea and Vomiting at Different Time Intervals (n=40)

Time post-op	Number of Individuals n (%)	Nausea n (%)	Vomiting n (%)
4 Hours Post-Op	40 (100)	19 (68%)	11 (32%)
6 Hours Post-Op	40 (100)	10 (20.8%)	–
24 Hours Post-Op	–	–	–

Table 2: Postoperative Nausea and Vomiting According to Different Factors (n=40)

Factor	Number of Individuals n (%)	Nausea n (%)	Vomiting n (%)
Female Gender	40 (100)	29 (72.5)	11 (27.5)
Non-Smoker	40 (100)	29 (72.5)	11 (27.5)
History of PONV	15 (37.5)	10 (66.7)	5 (33.3)
No History of PONV	25 (62.5)	19 (76)	6 (24)
Postoperative Opioid Usage	12 (30)	9 (75)	3 (25)

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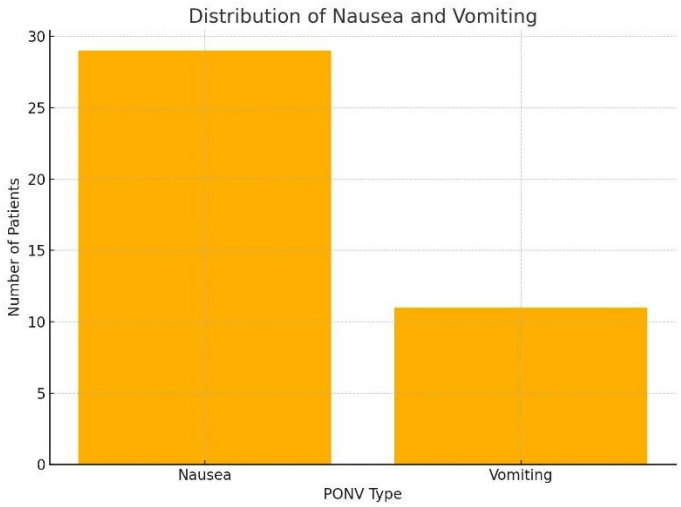

Figure 1 Distribution of Nausea and Vomiting

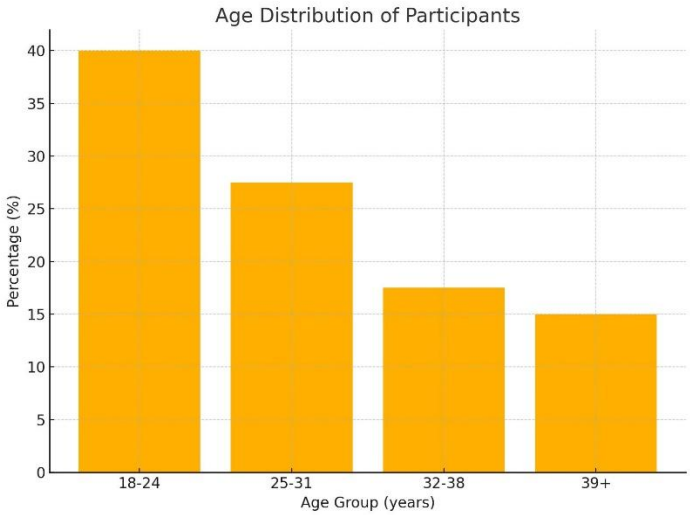

Figure 2 Age Distribution of Participants

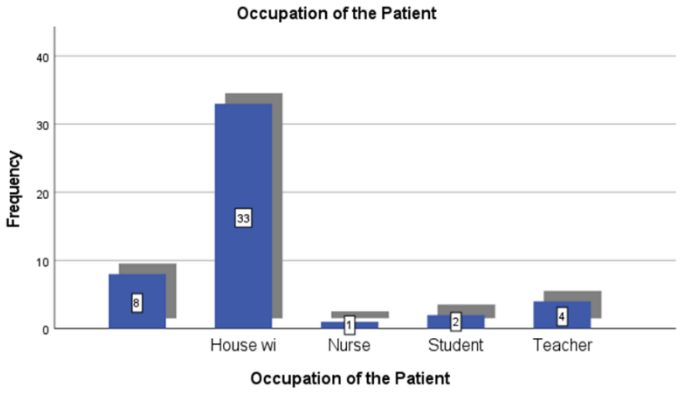

Figure 3 Occupation of the Patients

DISCUSSION

This study explored the prevalence and risk factors of postoperative nausea and vomiting (PONV) among female patients undergoing laparoscopic cholecystectomy, offering valuable insight into the temporal patterns and predictive relevance of the Apfel scoring system. The findings reaffirmed the strong association between female gender and PONV, aligning with a wide body of literature that attributes this predisposition to hormonal influences and heightened sensitivity to anesthetic agents (12). The fact that all 40 patients who developed PONV were female further reinforced the gender-specific vulnerability, emphasizing the need for gender-sensitive perioperative management protocols. A notable trend emerged in the age distribution, with younger women, particularly those aged 18 to 24 years, demonstrating a higher incidence of PONV. This observation mirrors previous reports that younger age correlates with increased susceptibility, possibly due to higher hormonal variability and metabolic responsiveness (15,16). The temporal analysis provided additional clarity, indicating that the majority of symptoms occur within the first few hours postoperatively, with a significant decline by 6 hours and complete resolution by 24 hours. This time-bound manifestation underscores the critical window during which preventive interventions are most needed and most likely to be effective (17). The application of the Apfel scoring model was validated through consistent associations across all four risk parameters. Female gender, non-smoking status, history of PONV or motion sickness, and postoperative opioid use all showed a positive correlation with the occurrence of nausea and vomiting, reflecting the utility of the scoring system in anticipating complications and guiding individualized prophylaxis. These findings echo earlier reports suggesting that

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non-smokers and patients with prior emetic histories are at elevated risk due to altered neurotransmitter responses, particularly involving serotonergic and dopaminergic pathways (18-20). Opioid administration further amplified risk, likely through stimulation of the chemoreceptor trigger zone and gastrointestinal motility inhibition (21).

The clinical relevance of these results lies in their potential to inform multimodal antiemetic strategies. Prophylaxis tailored to the Apfel risk profile may significantly reduce PONV incidence. Non-opioid analgesic regimens, timely administration of antiemetic agents such as dexamethasone and 5-HT3 receptor antagonists, and preoperative patient education could collectively enhance postoperative outcomes and patient satisfaction. This aligns with broader perioperative care guidelines that advocate risk-based prevention models integrating both pharmacologic and non-pharmacologic approaches (19,22). Despite its contributions, the study presents certain limitations. The exclusive focus on female patients limits its generalizability, precluding gender-based comparisons that could further elucidate differential risk patterns. The study also excluded patients who did not develop PONV, which, although allowing for focused analysis, restricts the broader interpretation of prevalence and reduces the robustness of predictive associations. Furthermore, the lack of data on surgical duration, intraoperative CO_2 insufflation pressure, and anesthetic depth represents a gap, as these are known modifiers of PONV risk. Additionally, no stratification was performed based on Apfel scores to directly correlate score levels with incidence severity, which could have strengthened the predictive validity of the tool in this cohort. The strengths of this study include its well-defined methodology, standardized anesthesia and analgesia protocols, and time-staged symptom assessment, all of which enhance the reliability and reproducibility of findings. The use of a validated risk stratification tool further supports its practical implications for clinical settings, especially in resource-limited environments where selective prophylaxis may be critical. Future research should incorporate broader demographic inclusion, allowing for gender-based analysis and more representative sampling. Comparative evaluations of antiemetic regimens, including newer agents such as NK-1 receptor antagonists, would provide deeper insight into optimizing care. Exploring perioperative psychological variables such as anxiety and pain perception, which may influence emetogenic responses, could also contribute to a more comprehensive understanding of PONV. A prospective design that tracks patients from preoperative risk assessment through full recovery would further enrich the evidence base and support more targeted, patient-centered strategies.

CONCLUSION

This study concludes that postoperative nausea and vomiting (PONV) remains a clinically significant challenge among female patients undergoing laparoscopic cholecystectomy, particularly in the early postoperative period. The results reinforce the effectiveness of the Apfel scoring system in identifying individuals at elevated risk, with factors such as female gender, non-smoking status, a history of PONV or motion sickness, and postoperative opioid use emerging as strong predictors. These findings underscore the value of proactive risk stratification and the implementation of individualized, multimodal prophylactic approaches to enhance patient comfort and recovery. By integrating standardized predictive tools into routine perioperative care, clinicians can better anticipate and manage PONV, ultimately improving surgical outcomes and patient satisfaction.

AUTHOR CONTRIBUTION

Author	Contribution
Muhammad Arif	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Syed Hassan Zaib	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Mudasir Khan	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Muhammad Abdullah Saleem	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Niaz Ali	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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Author	Contribution
Syed Numan Shah	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Ahmad Ullah*	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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