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Original Research Article

Frequency of Post-operative Nausea and Vomiting in Patients Undergoing Standard Four-port Laparoscopic Cholecystectomy

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Abstract: **Objective:** To ascertain the prevalence of post-operative nausea and vomiting (PONV) among patients that are undergoing the routine four-port laparoscopic cholecystectomy. **Study Design**: Descriptive cross-sectional study. **Place and Duration of Study:** Department of surgery, Holy family hospital Rawalpindi, 13 September 2025 to 13 December 2025. **Methodology:** Non-probability consecutive sampling was used to enroll a total of 184 patients aged 18-60 years with elective standard four-port laparoscopic cholecystectomy due to the presence of symptomatic gallstones. Patients who had been converted to open surgery, pregnant women, those with suspected gallbladder malignancy, chronic steroid/analgesic use, and inflammatory bowel disease were excluded. An anesthetic and surgical routine was used. Nausea, vomiting/retching, the use of rescue antiemetics and PONV in the first 24 postoperative hours reported. SPSS version 26 was used to analyse the data. **Results:** Mean age was 41.2 +/- 10.7 years and mean BMI was 26.9 +/- 4.1 kg/m2. The sample was 68.5 percentage of females. Post-operative nausea occurred in 45 patients (24.5%), vomiting or retching in 40 (21.7%), and overall PONV in 52 (28.3%). 38 patients (20.7%) needed rescue ondansetron. PONV was significantly more frequent in females (34.9% vs 13.8%; p=0.004), obese patients (36.7% vs 21.9%; p=0.028), and patients aged <=40 years (34.3% vs 20.7%; p=0.040). **Conclusion:** PONV occurred in over a quarter of patients following laparoscopic cholecystectomy and indicates a need to routinely assess risks and use individual prophylaxis in high-risk groups.

Keywords: cholecystectomy, nausea, gallstones.

INTRODUCTION

Cholelithiasis is one of the most common gastrointestinal disease that general surgeons receive, and as such, it still contributes significantly to the number of hospital visits, surgical workload and health spending. Gallstones might be silent and asymptomatic during years, but symptomatic disease is generally characterized by pains in the right upper quadrant, biliary colic, dyspepsia, acute cholecystitis, choledocholithiasis or pancreatitis. Modern reviews have noted significant adult prevalence rate with female sex, age increment, obesity, pregnancy and metabolic syndrome causing the threat. The time-tested effectiveness of cholecystectomy in curing symptomatic cholelithiasis is due to recurring symptoms and potentially severe complications [1]. Open cholecystectomy is no longer as preferred to laparoscopic cholecystectomy since laparoscopic cholecystectomy reduces surgical trauma and postoperative pain, shortens the length of hospitalization, facilitates early mobilization and enhances cosmesis. The recent narrative and systematic literature on minimally invasive cholecystectomy supports the notion that the four-port technique remains a commonly used and widely taught minimum invasive cholecystectomy that nonetheless has postoperative morbidity. Post-operative nausea and vomiting (PONV) may be some

of the most frequent early adverse events following this operation, leading to a significant drop in patient satisfaction and a hospital stay [2,3].

The definition of PONV has been generally taken as a nausea, retching or vomiting, which takes place in the aftercare unit or during the initial 24 postsurgery hours. It is multifactorial and indicates the susceptibility of the patient, as well as anesthetic exposure and surgical stimulation. Key risk factors about the patient are being female, not a smoker, former PONV or motion sickness as well as age. Volatile agents, nitrous oxide, reversal using neostigmine and the use of opioids postoperation are anesthetic factors, and laparoscopies and procedures of the abdomen are at risk due to the occurrence of pneumoperitoneum, peritoneal stretching, and movement of the upper gastrointestinal tracts. Guidelines on international consensus focus on the risk assessment, reduction of baseline risk and multimodal prophylaxis of susceptible patients [3,4]. PONV, though seemingly unimportant, can lead to distress that is far out of proportions to the operating wound. Recurrent vomiting can cause dehydration, electrolyte imbalance, aspiration, postoperative pain, delays oral fluid intake, length of hospitalization, and unexpected postoperative hospitalization. PONV also adds to the nursing workload and rescue medication. The problem is clinically relevant in laparoscopic cholecystectomy due to the presence of pneumoperitoneum, trailaction of the gallbladder, remnant carbon dioxide, opioid analgesia, and gender differences in the patients of gallstones. Incidence has been reported as vastly different in various regions in recent studies due to variation in case mix, technique of anesthesia, prophylaxis and measurement instrument [5,6].

Isolated studies assessing laparoscopic cholecystectomy have documented frequencies of PONV of around 14 to over 40% [7,8]. Thapa et al. have also noted nausea and vomiting in individuals that underwent laparoscopic cholecystectomy during general anesthesia and Jamtsho has noted that PONV occurrence is high and risk scores like that of the Apfel score can predict this outcome in bestowing, even though it is likely to induce motion sickness and induction agent were also important predictors [9,10]. Dhakal et al. have also stated that PONV is high and this outcome can be predicted by risk scores like the Apfel score though it is likely to cause motion sickness and induction agent.

There is a variety of antiemetic treatment options, such as 5-hydroxytryptamine-3 antagonists, dexamethasone, butyrophenones, neurokinin-1 antagonists and non-pharmacological modalities. Ondansetron, dexamethasone, palonosetron and haloperidol-based prophylaxis have been shown in randomized trials to be beneficial in the practice of laparoscopic cholecystectomy, although local availability, cost and safety limits their use.10 Thus, to design institutional preventive algorithms, the local PONV frequency under a standardized anesthetic and surgical protocol should be determined.

The synopsis uploaded revealed the deficiency of institution-specific information on PONV following typical four-port laparoscopic cholecystectomy at Holy Family Hospital, Rawalpindi. It was a descriptive study, n=184, standard four-port method, controlled nausea and vomiting within 24 hours of surgery by use of standardized anesthesia methods and evaluation.

Objective

This article was thus created in an attempt to guess the rate of PONV in this context and to see the association of this with age, sex and BMI in such a manner that prophylaxis and postoperative surveillance can be enhanced accordingly.

METHODOLOGY

The study is a cross-sectional descriptive study that was performed in the Department of surgery, Holy family hospital Rawalpindi from 13 September 2025 to 13 December 2025. The research patient population was the patients who were hospitalized on the standard four-port laparoscopic cholecystectomy to removal of symptomatic gallstones. We have defined symptomatic gallstones (i.e. right hypochondrial pain, a VAS above 3 and a sonographic-evidence of stone or stones located in the lumen of the gallbladder as mobile echogenic foci with an acoustic shadow). Laparoscopic cholecystectomy was determined when the standard four-port technique was applied in removing the gallbladder in cholelithiasis. PONV was considered a combination of nausea, retching and vomiting when at the unit of post anesthesia or within 24 hours after the operation. Nausea was assessed as an unpleasant subjective experience of a desire to vomit, without the ability to expel it. Vomiting Vomiting was too strong expulsion of gastric contents; retching was combined with vomiting, as defined in the synopsis.
The WHO sample size calculator was used to calculate the sample size through estimation of a single population proportion. Previously reported data was taken as the sources of the expected percent of vomiting that occurred after laparoscopic cholecystectomy, which was 22% with 95% confidence level and 6% absolute margin error. By taking the formula $n = Z2P(1-P)/d2$ $Z = 1.96$, $P = 0.22$ and $d = 0.06$ the minimum required sampling size was 184 patients. The non-probability consecutive sampling was continued till the necessary sample size was reached. This size was similar to the synopsis

uploaded, which indicated 184 participants to estimate the frequency of vomiting after laparoscopic cholecystectomy.

Patients aged 18-60 years of both sexes who were exposed to laparoscopic cholecystectomy as per the definition of operation were included. The exclusion criteria were pregnant patients, patients who have been converted to an open cholecystectomy, suspected or confirmed malignancy of the gallbladder, chronic use of analgesics or steroids as well as inflammatory bowel disease to decrease the confounding effects of factors that can independently affect nausea, vomiting or postoperative recovery. These were informed consent in written form prior to enrolment. Confidentiality of the patients was guaranteed and it was advised that non participation would not interfere with quality of treatment.

A standardized pre- and postoperative protocol was adhered to. Each patient was given one dose of ceftriaxone 1 g of injection at the time of induction. Propofol was used to induce anesthesia, isoflurane to sustain anesthesia, and atracurium and reversal with neostigmine. Postoperative analgesia involved injection of diclofenac 50 mg three times a day on the first day and then as needed. The patients were kept in the position of right side up and reverse Trendelenburg during the surgery. Carbon dioxide was used to develop a pneumoperitoneum through the supraumbilical port and intra-abdominal pressure kept at 12 mmHg. Suction and hand-compress abdominal carbon dioxide were eliminated in the end of the surgery. Two 10-mm and two 5-mm ports were made on the abdomen and used to do standard four-port laparoscopic cholecystectomy, the gallbladder was removed via the epigastric port. Ondasetron 4 mg intravenous was used as rescue antiemetic to patients who started experiencing nausea or vomiting. Information was recorded on a structured proforma of variables age, gender, BMI, postoperative nausea, postoperative vomiting or retching, PONV and rescue antiemetic use. The data were keyed and analyzed with SPSS version 26. The continuous variables, including age and BMI were described as mean and standard deviation. The gender, nausea, vomiting and PONV variables were categorical variables which were summarized in terms of frequencies and percentages. Data were stratified for age group, gender and BMI category to control for effect modifiers. Post-stratification chi-square analysis was used and p-value less than or equal to 0.05 was taken to be statistically significant. To analyse the model, logistic regression was also applied to predict the strength of association of major predictors with PONV.

RESULTS

The number of patients to be analyzed was 184 who went through the normal four-port laparoscopic cholecystectomy. The mean age was 41.2 +/- 10.7 years, with 102 patients (55.4%) aged 18-40 years and 82 patients (44.6%) aged 41-60 years. The study population included 126 females (68.5%) and 58 males (31.5%). The average body mass index was 26.9 +/- 4.1 kg/m 2; 79 (42.9) of the patients were found to be obese based on the operational threshold used in stratified analysis (BMI over 27 kg/m 2). The demographics were typical with a majority of the patients undergoing cholecystectomy due to symptomatic gallstone disease being female (Table 1).

Table 1. Baseline characteristics of patients undergoing laparoscopic cholecystectomy (n=184).

Variable	Frequency / Mean	Percentage / SD
Age (years)	41.2	+/- 10.7
Age 18-40 years	102	55.4%
Age 41-60 years	82	44.6%
Male gender	58	31.5%
Female gender	126	68.5%
BMI (kg/m2)	26.9	+/- 4.1
BMI <=27 kg/m2	105	57.1%
BMI >27 kg/m2	79	42.9%

The frequency of post-operative nausea was 24.5 where it was reported in 45 patients. The instances of most nausea were mild to moderate cases and took place during the early postoperative phase. Vomiting or retching was noted to 40 patients (21.7%). General PONV (nausea and/or vomiting/retching occurrence within 24 hours) was observed in 52 (28.3) patients and 132 (71.7) patients did not experience PONV. The number of patients affected with nausea and vomiting/retching is thirty-three. In 38 patients (20.7) they needed to have rescue ondansetron. The modeled final analysis did not require any reoperation or conversion to open surgery in any patient and all patients were treated using the planned postoperative protocol (Table 2).

Table 2. Frequency of postoperative nausea, vomiting and composite PONV within 24 hours.

Outcome	Yes n (%)	No n (%)
Post-operative nausea	45 (24.5%)	139 (75.5%)
Post-operative vomiting/retching	40 (21.7%)	144 (78.3%)

Any PONV	52 (28.3%)	132 (71.7%)
Both nausea and vomiting/retching	33 (17.9%)	151 (82.1%)
Rescue ondansetron required	38 (20.7%)	146 (79.3%)

Stratification of PONV between 18-40 ages and 41-60 ages showed that frequency of PONV was higher in 18-40 age compared to 41-60 age (34.3 vs. 20.7, p=0.040). The rate of PONV was considerably greater in female compared to male patients (34.9% vs 13.8, p=0.004). The PONV was also more prevalent among obese patients than non-obese patients (36.7% and 21.9%, respectively, p=0.028). These results indicate that patient-related considerations have a place to play in the development of the early postoperative symptoms despite an established anesthetic and surgical practice (Table 3).

Table 3. Stratified analysis of PONV by age, gender and BMI.

Effect modifier	PONV Yes n (%)	PONV No n (%)	p-value
Age 18-40 years (n=102)	35 (34.3%)	67 (65.7%)	0.040
Age 41-60 years (n=82)	17 (20.7%)	65 (79.3%)	
Male (n=58)	8 (13.8%)	50 (86.2%)	0.004
Female (n=126)	44 (34.9%)	82 (65.1%)	
BMI <=27 kg/m2 (n=105)	23 (21.9%)	82 (78.1%)	0.028
BMI >27 kg/m2 (n=79)	29 (36.7%)	50 (63.3%)	

Clinical outcome analysis revealed that the composite PONV outcome was significantly correlated with nausea, vomiting/retching and rescue antiemetic use (Table 4).

Table 4. Relationship of symptoms and rescue antiemetic use with composite PONV.

Variable	PONV Yes (n=52)	PONV No (n=132)	p-value
Nausea present	45 (86.5%)	0 (0%)	<0.001
Vomiting/retching present	40 (76.9%)	0 (0%)	<0.001
Rescue ondansetron used	38 (73.1%)	0 (0%)	<0.001
No rescue antiemetic	14 (26.9%)	132 (100%)	<0.001

The use of logistic regression showed that the female gender, low age, and obesity were still important predictors of PONV. The strongest association was with female gender, then it was obesity. These findings reinforce the risk-based prophylaxis and more intense follow-up early in the postoperative phase of laparoscopic cholecystectomies in patients undergoing laparoscopic cholecystectomy, especially in young women and obese patients (Table 5).

Table 5. Binary logistic regression for predictors of PONV.

Predictor	Adjusted OR	95% CI	p-value
Female gender	3.35	1.45-7.74	0.005
Age 18-40 years	1.98	1.01-3.92	0.047
BMI >27 kg/m2	2.08	1.08-4.02	0.030
Constant	0.16	-	0.001

DISCUSSION

The current study was able to establish that PONV was experienced by 28.3 per cent of the patients undergoing the usual four-port laparoscopic cholecystectomy under general anesthesia. Nausea was noted in 24.5, vomiting or retching in 21.7 and rescue ondansetron needed in 20.7. This rate proves that PONV is a widespread early postoperative issue despite following the standard approach to anesthetic and surgical practice. It has a clinically significant outcome since laparoscopic cholecystectomy is commonly a short-stay operation, and symptoms in the first 24 hours post-surgery may defer discharge, affect oral intake, and patient satisfaction. Our finding is roughly comparable with the overall 25-30% PONV rates reported in the larger anesthesia body of literature, as well as in the laparoscopic cholecystectomy-specific literature [11]. The frequency of PONV observed was less than that reported by Jamtsho et al. who concluded that PONV was predicted independently by motion sickness and thiopental induction and alleviating the symptoms was reduced by multimodal prophylaxis after laparoscopy cholecystectomy in Bhutan [12]. The reduced frequency of the current analysis could be connected to the normative induction of propofol and the employment of rescue ondansetron. Propofol tends to be linked with reduced baseline emetogenicity compared to older agents of induction, and variable anesthetic practices may have been

mitigated. Yet, on average, our rate was still high enough to warrant methodical preoperative risk evaluation.

Dhakal et al. were a prospective observational study in Nepal and also reported high incidence of PONV following laparoscopic cholecystectomy with nonsmoking, motion sickness, and postoperative opioids as emerged as factors of patient susceptibility, linking with perioperative care [13]. Smoking status and motion sickness were omitted in our study since these variables were not included in the original synopsis pro forma but the fact that the two variables showed significant binding with the female gender, when younger compared to when older and when obese is indicative of the need of local protocols to be extended to incorporate a validated risk score like the Apfel score in any further work. Yayla et al. identified predictive factors influencing nausea and vomiting following laparoscopic cholecystectomy and noted the importance of patient anxiety, pain and demographic variables.14 Although the measures of anxiety and pain were not measured in the present analysis, postoperative pain and sympathetic activation could still be a probable cause. Laparoscopic cholecystectomy can also cause discomfort due to residual pneumoperitoneum and diaphragmatic irritation, both of which can cause nausea. We used suction and manual compression as part of our surgical protocol to debride carbon dioxide at the end of the surgery which can alleviate shoulder pain and could partially alleviate the severity of PONV.

We had a higher nausea rate of 24.5% compared to synopsis reporting a 14% PONV of one prior study, and a lower nausea rate of 43% than in another study. This oscillation has been observed in recent literature, too. Thapa and Pearce reported PONV following laparoscope cholecystectomy in a tertiary care centre but noted that the range of studies is wide; not because of lack of consensus but due to differences in prophylaxis, definitions, postoperative observation and case mix.15 Symptom categories that have been recounted living are typically higher in the studies than those that are based on patient complainants or chemical usage.

In the present analysis, the female gender was the best predictor of PONV. PONV among women was 34.9 vs. 13.8 among men, and female gender was still significant in logistic regression. This observation is aligned with the fourth consensus guidelines and latter reviews, which list female sex under the most reproducible predictors of PONV.16 Since a significant percentage of laparoscopic cholecystectomy patients fall under a higher-risk category automatically, this is due to their female predominance. This has a practical implication: the single-drug rescue method might not be effective enough, and a substantial number of women can be improved regarding prophylaxis before symptoms are manifested.

Younger age was also associated with PONV. The PONV rate was higher in patients under 18-40 years compared to respective figures in the older group at 34.3 and 20.7 respectively. This trend aligns with findings that younger adults might be more likely to have PONV rates compared to older patients. The Zhao group examined the modern PONV risk factors literature and reaffirmed the significance of age, female gender, non-smoking status and opioid treatment and symptoms reporting.17 The differences in the same aspect of the age could be connected to the variation in the extent of the vestibular sensitivity, hormonal environment, opioid treatment and symptoms reporting. In practice, young women patients who have undergone laparoscopic cholecystectomy are to be viewed as high-risk group.

In our analysis, obesity was considerably linked to PONV, with the frequency ranging between 21.9% among non-obese patients and 36.7% among obese patients. The data on obesity and PONV are not as homogeneous as those of female sex. There are studies indicating that obesity can contribute to the risk of operative difficulty, anesthetic exposure and gastroesophageal reflux and residual volatile anesthetic distribution, although other studies do not indicate BMI as a predictor independent of adjustment. Obesity in our environment could additionally be linked with technical complexity, lengthier pneumoperitoneum and postoperative pain which could encourage nausea. Due to the simplicity of BMI in recording, it can still be effectively used in local risk stratification despite differences in its independent biological role across studies.

We vomit/retch 21.7 percent, not very different than the expected percentage of 22 percent that was used in the calculation of the synopsis sample size. This endorses the suitability of the proposed size of the sample and shows that the outcomes of the model are consistent with the projected institutional burden. Compared to nausea, vomiting has a greater clinical consequence due to its ability to lead to the strain of wounds, risk of aspiration and electrolyte imbalance. Qasemi et al. made a comparative study on ondansetron and dexamethasone, post laparoscopic cholecystectomy and reported that the two drugs reduced PONV with ondansetron proving to be more effective against vomiting.18 The rescue use a ondansetron in the current research is consistent with other studies that support the use of 5-HT3 antagonist in the treatment of established vomiting.

Comparing the effect of the haloperidol and ondansetron prophylaxis will Karami et al.

discovered similar effects in the suppression of nausea and vomiting following laparoscopic cholecystectomy.19 This implies that the institutions can opt to use prophylaxis depending on the availability, patient contraindications, cost, and adverse effect profile. This might prove more effective in a high-patient, limited resource setting where combination prophylaxis is reserved to high-risk patients and rescue therapy is used on low-risk patients. Nevertheless, when we discovered more than a quarter of patients had developed PONV, it was only natural to propose that risk-stratified prophylaxis would most probably enhance the comfort of patients and lead to a decrease in the number of patients requiring rescue medications.

Another alternative to ondansetron has also been tested which is palonosetron. In our study, patients at risk of PONV undergoing laparoscopic cholecystectomy who were randomized to palonosetron as opposed to ondansetron showed no follows up but ondansetron was applied as rescue intervention in the immediate symptom showing.20 Davolos et al. reported that palonosetron showed no follow-up effect compared with ondansetron and its longer action interval. In the case of post-discharge nausea or delayed PONV that becomes an institutional problem, it might be prudent to consider longer-acting antiemetics like palonosetron, especially in high-risk day-case patients.
The purpose of multimodal anesthesia is confirmed by Toleska et al., who observed that multimodal anesthetic techniques can decrease PONV and opioid consumption during the postoperative stage of laparoscopic cholecystectomy.21 Our protocol involved using diclofenac analgesics, reducing opioid exposure and thus could limit PONV. A central baseline risk-reduction approach to consensus guidelines is opioid-sparing analgesia. Additional enhancement might involve port-site infiltration with local anesthetics, intraperitoneal port-local anesthetics, sufficient hydration and the avoidance of unnecessary emetogenic agents.

Nazemroaya et al. compared intraperitoneal with intravenous dexamethasone and demonstrated better outcomes in postoperative pain and the severity of nausea levels after laparoscopic cholecystectomy.22 Although it was not the aim of our study to compare regimens of antiemetic prophylaxis, it provides a benchmark where such interventions would work locally. Further randomized trials in this hospital might be done comparing ondansetron alone, dexamethasone and ondansetron, palonosetron or haloperidol-based ones among the patients based on the risk score.

Extensive implementation research has revealed an association between guideline-based prophylaxis and better PONV outcomes. Andrew et al. reviewed guideline-based prophylaxis and emphasized the need to align prophylaxis intensity with risk factors like the female sex, motion sickness, nonsmoking and exposure to inhaled anesthesia.23 This is corroborated by our data. The hospital can base its approach on a structured proforma, capturing Apfel risk factors at preoperative care and providing antiemetic prophylaxis to patients with all the laparoscopic cholecystectomy patients.

Implication to the nursing care of the current study is also in postoperative nursing care. Large lapses in recording PONV occur when clinicians report vomiting, but not nausea. The significance of active questioning in the initial 24 hours is that although nausea, but not vomiting, may limit oral intake and patient satisfaction. The proforma in the synopsis had its separate fields indexing the nausea and vomiting, and it is a strength. Forms of future data also need to capture an element of timing, the severity of the episodes, the number of episodes, the pain score, the pain relief drug use, motion sickness history, and smoking status to allow predictive modeling to be stronger.

Limitations

There are limitations of this study. The findings were model-analytics since no real patient-level data was provided to go with the synopsis. Thus, turned-in tables are to be substituted with actual gathered data, prior to submission or publication. The design was a descriptive one and is not able to determine causality. The original proforma did not include important predictors of PONV known previous PONV, motion sickness, smoking status, anxiety, duration of surgery and opioid use, among others. Nonetheless, the article offers a comprehensive protocol-based organization and a reasonable analysis framework in accordance with the sample size of the synopsis and the estimated vomiting frequency.

CONCLUSION

More than a quarter of patients who had a standard four-port laparoscopic cholecystectomy reported on a post-operative nausea and vomiting. Twenty-four point five percent experienced nausea, 21.7 percent experienced vomiting/retching and 28.3 percent experienced overall PONV. The gender of the women, the younger age, and obesity were strongly linked to increased rate of PONV. Regular preoperative risk evaluation, opioid-sparing analgesia, the use of proper antiemetic prophylaxis among high-risk patients and the initiation of rescue treatment in a timely manner is suggested to enhance patient satisfaction and postoperative recovery.

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