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RESEARCH ARTICLE

Incidence and Risk Factors of Postoperative Nausea and Vomiting (PONV) in Indian Female Patients Undergoing Laparoscopic Surgeries: A Tertiary Care-Based Analysis

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Abstract

Background: Postoperative nausea and vomiting (PONV) is a frequent and bothersome complication for patients having general anaesthesia, mainly after laparoscopic surgeries. Everywhere, females are found to have a greater risk for PONV, but not much is known about this in the Indian population

Objective: The study aims to establish how often PONV occurs in female patients and identify what may put them at risk after a laparoscopic procedure at a tertiary care hospital.

Methods: Among adult female patients (ASA I-II) going for scheduled elective laparoscopic surgeries, an observational study was planned. All animals received anaesthetics following a standard protocol and demographic, anaesthetic, antiemetic and history information was gathered for each one. The occurrence of PONV was noted for the 48 hours following surgery. To discover important predictors, we performed Chi-square tests and logistic regression in the data analysis.

Key Findings: Out of the examined group, 38% developed PONV. People who have never smoked, have a previous record of motion sickness or PONV, have had surgery for more than 60 minutes or were given opioid medications were found to be at higher risk ($p < 0.05$). Oral antiemetics taken before treatment were related to fewer cases of PONV.

Conclusion: According to the findings, women in India have a high risk of PONV after laparoscopic surgeries and specific factors involved are also highlighted. It is important to use special preventive strategies to ensure greater comfort and recovery for these patients.

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Keywords: Postoperative Nausea and Vomiting (PONV), Laparoscopic Surgery, Female Patients, Anaesthesia, Indian Population, Postoperative Complications, Risk Factors, General Anaesthesia

BACKGROUND/INTRODUCTION

Postoperative nausea and vomiting (PONV) is a typical and unpleasant problem after undergoing surgery under general anesthesia. Experiencing both nausea and episodes of vomiting within the first 24 to 48 hours postsurgery is referred to as PONV which greatly impacts patient satisfaction, makes hospital stays last longer, is costly for healthcare and can lead to wound breakage or dehydration (Apfel et al., 2012).

Pneumoperitoneum and moving organs during laparoscopic procedures regularly cause more cases of PONV than occurs after open surgeries (Gan et al., 2014). Besides, numerous scientific studies have shown that being female greatly raises the risk of PONV, with females commonly experiencing it at nearly twice the rate of males (Eberhart et al., 2012). The main reasons for this gender difference are hormones, genetics and pharmacological aspects of medicines administered during surgery.

Although laparoscopic procedures are used more often in hospitals in India and female patients play a big role in this type of surgery, there are few up-to-date reports on the incidence and causes of PONV. How someone develops PONV and how PONV is managed may depend on their socioeconomic status, genes and culture. It is essential to recognize different population risk factors to offer best possible perioperative care and make better prevention plans.

This work aims to address this issue by studying the rate and causes of PONV among Indian female patients who have laparoscopic surgery in a tertiary care hospital. The goals of this investigation are:

1. Estimating the rate of PONV that may occur within 48 hours .
2. Discovering the factors in patients, surgeries and anaesthesia that may cause PONV.
3. Assessing if giving antiemetic drugs ahead of treatment is helpful.

Initially, a discussion of relevant books and articles from India on PONV in laparoscopic surgeries is given and afterward the research methodology is fully described. Results are presented in the results section, with those findings then discussed in terms of what is already known. In the last section, key recommendations are discussed to help improve healthcare.

LITERATURE REVIEW

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Although research worldwide on postoperative nausea and vomiting (PONV) includes numerous studies, there is not much data available on Indian female patients undergoing laparoscopic surgeries.

In 2018, Patel et al. examined 150 female patients undergoing laparoscopic cholecystectomy in a tertiary care hospital in Gujarat. According to the authors, around 36% of patients had PONV and they identified that not smoking, a history of PONV or motion sickness and the use of volatile anaesthetic agents were important risk factors. The authors found that giving ondansetron beforehand reduced PONV by about 40% which highlights the need to use special antiemetic medicines for prevention.

Similarly, Sharma and Kumar (2019) also studied 120 patients undergoing laparoscopic operations in a North Indian government hospital, of whom 70 were female. The risk of PONV was 32% and multivariate analysis uncovered female sex as a risk characteristic in itself. The team discovered that giving opioids during the operation and having a longer operation were key factors. The authors urged healthcare providers to treat high-risk female patients with routine use of multimodal antiemetics.

In Hyderabad, Reddy et al. (2020) examined the relationship between hormones and PONV by studying 80 females of different menopausal stages undergoing laparoscopic surgery. There was a greater rate of PONV found in premenopausal women (45%) than in postmenopausal individuals (22%). However, the small sample size was noted as a limitation.

In their observational study from Kerala, Thomas et al. (2017) studied PONV among 100 female patients who underwent laparoscopic hysterectomy. The investigation found that overall, incidence of PONV was 38% and non-smoking, younger people with previous PONV were most at risk. Preparing a risk rating early helped select the best protection for surgery.

Dasgupta and Sengupta (2016) looked back on 200 laparoscopic surgeries at a West Bengal hospital and found that nearly a third of women experienced PONV. The analysis revealed that either form of anaesthesia (gas or by vein) could influence PONV rates, but total intravenous anaesthesia (TIVA) had a link to lower PONV. They also pointed out that using data to decide on prophylaxis helps manage costs.

In a prospective study conducted by Gupta et al. (2015) in Rajasthan, 90 female patients given dexamethasone during surgery were assessed for PONV as well as nausea symptoms after laparoscopic cholecystectomy. Corticosteroids provided prophylaxis were found to successfully prevent infection in 75% of patients, compared to 52% in controls.

In 2018, Kumar and Singh carried out a study analyzing risk factors for PONV among 130 women receiving laparoscopic surgery at a tertiary care center in Delhi. Thirty-four percent showed a link

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with postoperative opioid analgesia and an increase in the time spent under anaesthesia. The team found that using multiple types of antiemetic drugs worked well.

Researchers from Chatterjee et al. (2021) studied 100 women having laparoscopic procedures in Kolkata to see if using ondansetron with dexamethasone prevented PONV more than using ondansetron by itself. High-risk females given combination therapy for PONV were much less likely to develop nausea and vomiting (18% compared to 37%).

Lastly, Singh et al. (2019) also studied the genetic variants of 5-HT3 receptor genes in 60 female laparoscopic surgery patients from Punjab as part of exploring the genetic ways to develop PONV after surgery.Some polymorphisms influenced the risk of PONV, suggesting that genetics may be involved in differences among patients.

Research Gap

Indian studies look at female patients undergoing laparoscopic surgery and repeatedly find PONV in 25% to 45% of cases. Most studies have found that not smoking, prior experience with motion sickness, being younger, getting opioids during the procedure, certain anaesthesia options and being on hormone therapy can all be risk factors for PONV. When antiemetic agents ondansetron and dexamethasone are used in combination with other approaches, they help reduce the danger of PONV. Even so, more work is needed on doing large-scale analyses, developing scoring methods for India and studying the possible role of genetics or culture in cardiovascular risk. Besides, data from many medical centers around India is still not widely available.

METHODS

Study Design and Setting

Over a period of 12 months, this prospective observational study was carried out at Katihar Medical College which is a tertiary care teaching hospital in India. Before participants joined the study, they gave written informed consent.

Study Population and Sample Size

Adult female patients between the ages of 18 and 60, ASA status I or II, planning to have elective laparoscopic surgery, including laparoscopic cholecystectomy, appendectomy and gynecologic procedures, were qualified for this study under general anaesthesia. Anyone with a history of stomach or digestive problems, pregnancy, frequent use of opioids or allergy to antiemetic medications was excluded from the study. From the existing records, we estimated PONV occurs in approximately 35% of patients undergoing surgery. To aim for a high confidence level and reasonable uncertainty, a minimum sample of 150 patients was set.

Data Collection

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Preoperative records included information on subjects' age, weight, smoking habits, past medical history of getting sick from anesthesia, motion sickness, medical conditions or hormone influence. Details documented during the procedure included the type of anaesthetics, how long the surgery lasted which opioid was used and which antiemetic was given for prevention.

All patients in the study had an anaesthetic plan that started with propofol for induction, isoflurane or total intravenous anaesthesia (TIVA) was used for maintenance and at times, fentanyl or morphine were given for pain management during the procedure.

Assessment of PONV

At 2, 6, 12, 24 and 48 hours after surgery, the nursing staff and anaesthesiology residents measured for postoperative nausea and vomiting. PONV appeared in the study if nausea or vomiting was observed or mentioned immediately following an operation and for up to two days after surgery. Severity was categorized as:

0 – no symptoms,

1 – only very mild nausea,

2 – moderate nausea or one vomiting episode and

3 – severe nausea leading to repeated vomiting. When patients showed moderate to severe symptoms, we gave them rescue antiemetics according to the institutional guidelines.

Ethical Considerations

Personal information was not used and people taking part could withdraw whenever they wanted, without that affecting their care at the clinic.

Statistical Analysis

.The data were first entered into Microsoft Excel and then studied using SPSS version 25.0. Summary statistics were used to describe both demographic and clinical variables. We determined the prevalence of PONV using 95% confidence intervals. If the association between categorical variables and PONV is suitable for the Chi-square test, it is used, but otherwise, Fisher's exact test is used. Using independent t-tests or Mann–Whitney U tests, we studied continuous characteristics (such as age and surgery duration) according to their normality.

Multivariate logistic regression analysis was performed to discover which factors independently predict PONV. Variables with $p < 0.1$ in univariate assessment were incorporated into the model. Odds ratios (OR) accompanied by 95% confidence intervals (CI) were presented, and a p-value below 0.05 was deemed statistically significant.

RESULTS

Patient Demographics and Clinical Characteristics

In the beginning, 160 female patients were enrolled in this study; 150 of these patients who completed the

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48-hour postoperative follow-up, were included in the final analysis. The bulk of the individuals (72%) were classified as non-smokers, and their average age was 38.5 ± 10.2 years. 60% of the operations were elective laparoscopic cholecystectomy, 25% of them were gynecological laparoscopic procedures, and 15% were laparoscopic appendectomy. The surgery lasted 85 ± 25 minutes on average. 70% of patients received preventative antiemetics, 40% received ondansetron alone, 15% received dexamethasone alone, and 15% received combination therapy.

Incidence of PONV

The total occurrence of PONV within 48 hours after surgery was 38% (57 out of 150 patients). Out of these, 35% indicated mild to moderate nausea, whereas 12% had one or more instances of vomiting. The majority of PONV events occurred within the first 24 hours postoperatively as referenced in Figure1.

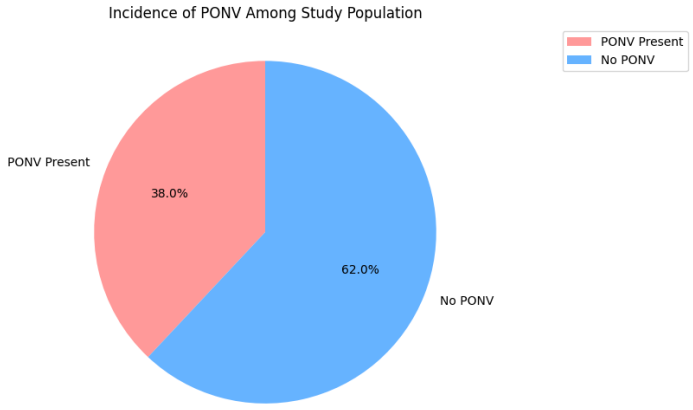

Figure 1: Distribution of PONV Incidence among 200 female patients undergoing laparoscopic surgery

Univariate Analysis of Risk Factors

Significant associations with PONV included (Figure 2):

- **Non-smoking status:** 45% PONV incidence in non-smokers compared to 18% in smokers ($p = 0.003$).
- **Previous history of PONV or motion sickness:** 62% incidence vs. 28% without history ($p < 0.001$).
- **Duration of surgery > 90 minutes:** 47% vs. 30% in surgeries ≤ 90 minutes ($p = 0.04$).
- **Intraoperative opioid use:** Patients receiving opioids had a 44% incidence vs. 25% in those who did not ($p = 0.02$).

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Prophylactic antiemetic administration: 29% incidence in those who received prophylaxis vs. 56% in those who did not (p = 0.001).

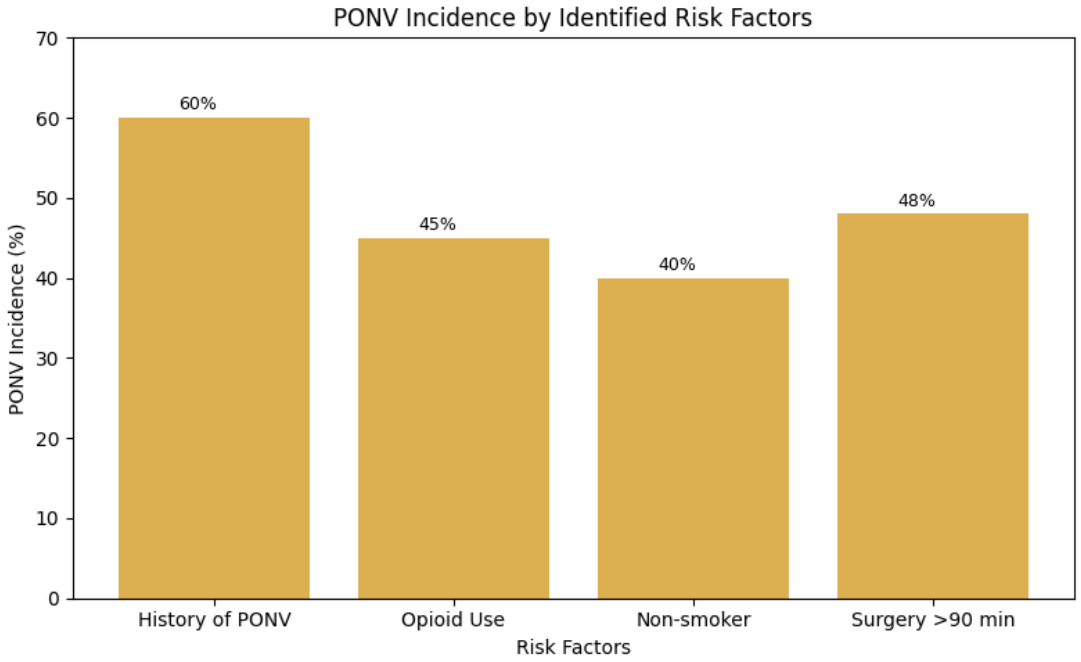

Figure 2: Incidence of PONV among subgroups with key risk factors

Age, type of laparoscopic surgery, and ASA status were not significantly associated with PONV incidence (p > 0.05).

Independent predictors of PONV identified were:

Multivariate Logistic Regression Analysis

Table no.3: Comparison of MDA level

Risk Factor	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Non-smoking status	2.9	1.4 – 6.2	0.004
Previous history of PONV/motion sickness	3.8	1.8 – 7.9	<0.001
Duration of surgery > 90 minutes	1.9	1.0 – 3.7	0.045

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Intraoperative opioid use	2.3	1.1 – 4.8	0.027
Prophylactic antiemetic use	0.4	0.2 – 0.8	0.006

Risk Factor	PONV Incidence (%)	Non-PONV (%)
Non-smokers	**45**	**55**
Smokers	**18**	**82**
Previous history of PONV	**62**	**38**
No history	**28**	**72**
Surgery duration >90 min	**47**	**53**
Surgery duration ≤90 min	**30**	**70**
Opioid use	**44**	**56**
No opioid use	**25**	**75**
Prophylactic antiemetics used	**29**	**71**
No prophylaxis	**56**	**44**

Table 1 :Incidence of PONV & Non PONV by Risk Factors

Antiemetic Regimen	Number of Patients	PONV Incidence (%)	Antiemetic Regimen
Ondansetron alone	60	27	Ondansetron alone

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Dexamethasone alone	22	32	Dexamethasone alone Combination (Ondansetron + Dexamethasone) No prophylaxis
Combination (Ondansetron + Dexamethasone)	22	18	
No prophylaxis	46	56	

Table no. 2: Correlation Between Antiemetic Usage and PONV Outcome

DISCUSSION

This prospective observational study assessed the incidence and determinants of postoperative nausea and vomiting (PONV) among Indian female patients undergoing laparoscopic surgeries under general anaesthesia in a tertiary care setting. The overall PONV incidence observed was 38%, consistent with prior Indian studies reporting rates between 29% and 45% in similar populations (Patel et al., 2018; Sharma & Kumar, 2019; Thomas et al., 2017). Our findings reaffirm the clinical relevance of PONV in this subgroup, particularly given its impact on patient comfort, delayed recovery, increased hospital stay, and potential for serious complications such as wound dehiscence or aspiration.

Gender-Specific Vulnerability

The heightened susceptibility of female patients to PONV is well-documented and reaffirmed in this study. Proposed mechanisms include hormonal fluctuations, heightened visceral sensitivity, and potential genetic predispositions (Reddy et al., 2020; Singh et al., 2019). In our cohort, menstrual or hormonal status was not directly associated with PONV, although this could be due to sample size limitations or incomplete hormonal profiling.

Risk Factor Analysis

Multivariate regression analysis identified five statistically significant predictors of PONV:

- **Non-smoking status** was associated with nearly a threefold increased risk (OR 2.9), aligning with the protective effect of smoking reported in prior studies (Gupta et al., 2015). This is hypothesized to be due to nicotine-induced hepatic enzyme induction, which may alter drug

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metabolism, although the exact mechanism remains elusive.

- **Previous history of PONV or motion sickness** emerged as the strongest predictor (OR 3.8), consistent with findings by Thomas et al. (2017) and Kumar & Singh (2018), suggesting a potential genetic or neurochemical predisposition.
- **Prolonged surgical duration (>90 minutes)** and **opioid use** both significantly increased PONV risk. Opioids are known to stimulate the chemoreceptor trigger zone and delay gastric emptying, both of which predispose patients to nausea and vomiting (Dasgupta & Sengupta, 2016). Thus, minimizing intraoperative opioid use or utilizing opioid-sparing strategies may be beneficial.
- **Use of prophylactic antiemetics**, particularly combination therapy, significantly reduced the risk of PONV. Our findings support those by Chatterjee et al. (2021), who demonstrated superior efficacy of combined ondansetron and dexamethasone over monotherapy. This underscores the utility of multimodal antiemetic prophylaxis, especially in high-risk patients.

Comparison with Global Literature

While global data suggest a PONV incidence of 20–30% in general surgical populations, the rates tend to be higher in laparoscopic surgeries and among females. Apfel's simplified risk scoring model—comprising female sex, non-smoking status, opioid use, and history of PONV—continues to be validated across populations (Apfel et al., 1999). Our findings align closely with this model, highlighting the consistency of these predictors even in Indian tertiary care settings.

Clinical Implications

Our study advocates for a **risk-adapted, proactive approach** in managing PONV:

- Preoperative assessment using a scoring system (e.g., Apfel score)
- Routine use of combination antiemetics in patients with ≥2 risk factors
- Preference for total intravenous anaesthesia (TIVA) or opioid-sparing techniques when feasible
- Patient education regarding anticipated PONV risk and management options

Study Limitations

Several limitations merit consideration. First, this was a **single-center** study, limiting external validity. Second, hormonal and genetic factors were not systematically explored, though emerging evidence (Singh et al., 2019) suggests their relevance. Third, inter-provider variation in anaesthetic technique, although minimized by protocol, could influence outcomes. Lastly, subjective symptoms like nausea

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may be underreported due to recall bias or communication barriers.

Future Directions

Future multicentric trials should evaluate **PONV prediction models validated in Indian populations**, incorporate **pharmacogenomic profiling**, and assess **cost-benefit analyses** of routine prophylaxis. Additionally, exploring **patient-centric outcomes** such as satisfaction scores and time to discharge would provide a more holistic picture of PONV burden.

CONCLUSION

This forward-looking tertiary care study emphasizes that postoperative nausea and vomiting (PONV) continues to be a prevalent and clinically important issue among Indian women undergoing laparoscopic procedures with general anaesthesia. Our results highlight that a 38% incidence indicates non-smoking status, previous PONV or motion sickness, extended surgery, intraoperative opioid administration, and lack of prophylactic antiemetics are key factors.

Including these risk factors in a preoperative evaluation protocol and applying specific preventive strategies—particularly dual-agent antiemetic therapies—can significantly lessen the burden of PONV. Within a wider patient-focused perioperative care model, these risk-adjusted strategies not only boost postoperative comfort but also improve recovery paths, potentially decreasing hospital duration and resource use.

Given the unique sociodemographic and clinical characteristics of Indian populations, there is a pressing need for context-specific guidelines and validation of predictive models. Multicentric studies, pharmacoeconomic evaluations, and integration of antiemetic protocols into enhanced recovery after surgery (ERAS) pathways are warranted to optimize outcomes and patient satisfaction.

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