PREVALENCE AND PREDICTORS OF POSTOPERATIVE NAUSEA AND VOMITING WITHIN 24 HOURS OF ELECTIVE SURGERIES: A CROSS-SECTIONAL STUDY FROM A TEACHING HOSPITAL IN DEHRADUN

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Abstract

Background: Postoperative nausea and vomiting (PONV) remains one of the most common and distressing complications following surgical procedures, significantly impacting patient satisfaction and recovery outcomes. Despite advances in anesthesia and surgical techniques, PONV continues to affect a substantial proportion of patients undergoing elective surgeries in Indian healthcare settings.
Objectives: To determine the prevalence of PONV within 24 hours post-surgery and identify significant predictors among patients undergoing elective surgeries at a tertiary teaching hospital in Dehradun, India.
Methodology: A hospital-based cross-sectional study was conducted from September 2019 to July 2020 among 384 patients aged 18-65 years undergoing elective surgeries. Data collection involved structured questionnaires, clinical assessments, and 24-hour post-operative monitoring. Statistical analysis was performed using SPSS version 26.0, employing descriptive statistics, chi-square tests, and multivariate logistic regression.
Results: The overall prevalence of PONV was 42.7% (164/384 patients). Female gender (OR=2.34, 95% CI: 1.45-3.78), history of motion sickness (OR=3.12, 95% CI: 1.89-5.16), duration of surgery >120 minutes (OR=1.87, 95% CI: 1.23-2.84), and use of volatile anesthetics (OR=2.45, 95% CI: 1.56-3.85) emerged as significant independent predictors.
Conclusion: PONV prevalence in our setting aligns with global estimates but requires targeted prevention strategies considering identified risk factors, particularly focusing on high-risk patient populations in the Dehradun healthcare context.

Keywords: Postoperative nausea, vomiting, elective surgery, prevalence, predictors, India

1. Introduction

Postoperative nausea and vomiting (PONV) represent a significant clinical challenge in modern surgical practice, affecting patient comfort, satisfaction, and overall recovery experience. Despite

substantial advances in anesthetic techniques and perioperative care, PONV continues to be reported as one of the most undesirable aspects of surgical experience by patients worldwide. The condition not only causes considerable patient distress but also contributes to increased healthcare costs through prolonged hospital stays, delayed discharge, and additional medical interventions.

In the Indian healthcare context, particularly in rapidly developing urban centers like Dehradun, the increasing volume of elective surgeries and evolving anesthetic practices necessitate a comprehensive understanding of PONV patterns and associated risk factors. Dehradun, being a major healthcare hub in the National Capital Region, serves diverse patient populations with varying socioeconomic backgrounds, comorbidities, and cultural factors that may influence PONV occurrence and management.

The economic burden of PONV extends beyond immediate healthcare costs, encompassing reduced productivity, increased caregiver burden, and potential complications such as aspiration, wound dehiscence, and electrolyte imbalances. Furthermore, in resource-constrained settings common in Indian hospitals, effective PONV management becomes crucial for optimal resource utilization and improved patient throughput.

Current literature suggests PONV prevalence ranges from 20-80% depending on patient population, surgical procedures, and anesthetic techniques employed. However, limited data exists specifically addressing PONV patterns in Indian tertiary care settings, particularly in the context of regional healthcare delivery models and patient demographics characteristic of North Indian populations.

This study addresses the critical knowledge gap by providing comprehensive data on PONV prevalence and predictors in a teaching hospital setting in Dehradun, contributing valuable insights for evidence-based PONV prevention and management strategies tailored to local healthcare contexts.

2. Review of Literature

Recent international studies have consistently demonstrated significant variability in PONV incidence across different healthcare settings and patient populations. Martinez et al. (2018) reported a 35.2% prevalence rate in a large European multicenter study, while identifying female gender, non-smoking status, and history of PONV as primary risk factors. Similarly, Kim and colleagues (2019) documented a 41.8% incidence in Asian populations, highlighting the influence of genetic polymorphisms on PONV susceptibility.

Contemporary research has increasingly focused on developing robust prediction models for PONV occurrence. The Apfel scoring system, validated across multiple populations, continues to demonstrate strong predictive accuracy with area under curve values ranging from 0.72-0.84 in recent validation studies (Thompson et al., 2019). However, population-specific modifications have been suggested to improve prediction accuracy in diverse ethnic groups.

Surgical procedure-specific PONV rates have been extensively studied in recent literature. Laparoscopic procedures consistently demonstrate higher PONV rates (45-60%) compared to open surgeries, attributed to peritoneal stretching and increased intra-abdominal pressure (Johnson et al., 2020). Gynecological and ear-nose-throat surgeries have emerged as particularly high-risk categories, with some studies reporting PONV rates exceeding 70% in female patients undergoing these procedures.

Anesthetic technique variations significantly influence PONV occurrence according to recent comparative studies. Total intravenous anesthesia (TIVA) has demonstrated consistent superiority over volatile anesthetic-based techniques, with relative risk reductions of 25-40% reported across multiple randomized controlled trials (Anderson et al., 2019). Regional anesthesia techniques have shown promise in reducing PONV rates, particularly in lower abdominal and extremity surgeries.

Limited studies have specifically addressed PONV patterns in Indian hospital settings. Sharma and associates (2018) reported a 38.4% prevalence in a North Indian tertiary center, while Patel et al. (2020) documented similar rates in Western Indian populations. However, these studies involved

smaller sample sizes and lacked comprehensive multivariate analysis of predictor variables, highlighting the need for more robust epidemiological studies in Indian contexts.

3. Objectives
Primary Objective:
To determine the prevalence of postoperative nausea and vomiting within 24 hours among patients undergoing elective surgeries at a tertiary teaching hospital in Dehradun, India.

Secondary Objectives:
1. To identify significant demographic, clinical, and procedural predictors associated with PONV occurrence
2. To analyze the temporal distribution of PONV episodes within the 24-hour postoperative period
3. To evaluate the severity patterns of PONV using standardized scoring systems
4. To assess the impact of different anesthetic techniques on PONV incidence
5. To develop a risk stratification model applicable to the local healthcare setting in Dehradun

4. Methodology
Study Design:
A hospital-based cross-sectional observational study was conducted to assess PONV prevalence and associated factors among patients undergoing elective surgeries.

Study Setting:
The study was conducted at a 500-bedded tertiary care teaching hospital in Dehradun, India, serving patients from the National Capital Region and surrounding areas.

Study Duration:
Data collection was performed from September 2019 to July 2020, spanning 10 months to ensure adequate sample representation across seasonal variations and healthcare delivery patterns.

Study Population:
Adult patients aged 18-65 years undergoing elective surgeries under general or regional anaesthesia were included in the study population.

Sample Size Calculation:
Based on anticipated PONV prevalence of 40% (α=0.05, precision=5%), the calculated sample size was 369 patients. Accounting for 10% non-response rate, the final sample size was determined as 384 patients.

Sampling Method:
Systematic random sampling technique was employed, with every third eligible patient being recruited until the desired sample size was achieved.

Ethical Considerations:
The study protocol received approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants, ensuring confidentiality and voluntary participation throughout the study period.

Data Collection Tools:
A structured, validated questionnaire was developed incorporating:
- Demographic characteristics
- Medical history and comorbidities

- Surgical and anesthetic details
- Postoperative monitoring parameters
- PONV assessment using standardized scoring scales

Statistical Analysis:
Data analysis was conducted using SPSS version 26.0. Descriptive statistics included frequencies, percentages, means, and standard deviations. Chi-square tests assessed categorical variable associations, while independent t-tests compared continuous variables. Multivariate logistic regression identified independent PONV predictors with adjusted odds ratios and 95% confidence intervals.

5. Data Collection Tool
Patient Assessment Questionnaire
6. Inclusion and Exclusion Criteria
Inclusion Criteria:
- Adult patients aged 18-65 years
- Elective surgical procedures under general or regional anesthesia
- ASA physical status I-III
- Ability to provide informed consent
- Expected postoperative monitoring for minimum 24 hours
- Procedures lasting more than 30 minutes

Exclusion Criteria:
- Emergency surgeries
- Patients with preexisting nausea or vomiting
- Pregnancy and lactating mothers
- Severe cognitive impairment or psychiatric disorders
- Patients on chronic antiemetic therapy
- ASA physical status IV-V
- Procedures under local anesthesia only
- Patients refusing consent or unable to complete follow-up

7. Results and Analysis
Demographic Characteristics
The study included 384 patients with mean age of 41.3 ± 12.7 years. Female patients comprised 58.3% (224/384) of the study population. The majority of participants (67.4%) resided in urban areas around Dehradun, reflecting the hospital's catchment area demographics.

Table 1: Demographic and Clinical Characteristics of Study Participants

Characteristics	Frequency (n)	Percentage (%)
Age Groups		
18-30 years	98	25.5
31-45 years	156	40.6
46-60 years	108	28.1
>60 years	22	5.7
Gender		
Male	160	41.7
Female	224	58.3

Characteristics	Frequency (n)	Percentage (%)
BMI Categories		
<18.5 kg/m²	34	8.9
18.5-24.9 kg/m²	186	48.4
25-29.9 kg/m²	128	33.3
≥30 kg/m²	36	9.4
Smoking Status		
Never smoker	298	77.6
Former smoker	43	11.2
Current smoker	43	11.2

PONV Prevalence and Distribution

The overall prevalence of PONV within 24 hours post-surgery was 42.7% (164/384 patients). Among affected patients, 67.1% experienced onset within the first 6 hours postoperatively, while 21.3% developed symptoms between 6-12 hours, and 11.6% experienced late-onset PONV (12-24 hours).

Table 2: PONV Characteristics and Temporal Distribution

PONV Parameters	Frequency (n=164)	Percentage (%)
Time of Onset		
0-2 hours	56	34.1
2-6 hours	54	32.9
6-12 hours	35	21.3
12-24 hours	19	11.6
Severity Score		
Mild (1-3)	71	43.3
Moderate (4-6)	68	41.5
Severe (7-10)	25	15.2
Number of Episodes		
1-2 episodes	89	54.3
3-4 episodes	52	31.7
>4 episodes	23	14.0

Surgical and Anesthetic Factors

Laparoscopic procedures demonstrated the highest PONV rates (58.2%), followed by gynaecological surgeries (54.7%) and ENT procedures (48.9%). General anaesthesia with volatile agents was associated with significantly higher PONV incidence compared to total intravenous anaesthesia (47.3% vs 28.1%, p<0.001).

Multivariate Analysis Results

Multivariate logistic regression analysis identified several independent predictors of PONV occurrence with statistical significance.

Table 3: Multivariate Analysis of PONV Predictors

Predictor Variables	Adjusted OR	95% CI	P-value
Female gender	2.34	1.45-3.78	<0.001
History of motion sickness	3.12	1.89-5.16	<0.001
Non-smoking status	1.89	1.14-3.13	0.014
Surgery duration >120 min	1.87	1.23-2.84	0.003
Volatile anesthetics use	2.45	1.56-3.85	<0.001
Intraoperative opioids	1.67	1.08-2.58	0.021
Laparoscopic approach	2.18	1.34-3.55	0.002

Risk Stratification Analysis

Based on identified predictors, patients were stratified into low (0-1 factors), moderate (2-3 factors), and high-risk (4+ factors) categories. PONV rates were 18.2%, 43.7%, and 76.4% respectively across these risk groups (p<0.001).

Software used for statistical analysis: SPSS version 26.0, Microsoft Excel 2019 for data management and preliminary analysis

8. Discussion and Interpretation

The observed PONV prevalence of 42.7% in our study aligns closely with contemporary international literature, suggesting consistent patterns across diverse healthcare settings despite regional variations in patient demographics and clinical practices. This finding validates the universal nature of PONV as a significant postoperative complication while highlighting the need for standardized prevention strategies.

The predominance of female gender as the strongest predictor (OR=2.34) corroborates extensive global evidence attributing this association to hormonal influences, particularly estrogen and progesterone fluctuations affecting neurotransmitter pathways involved in emesis control. The higher proportion of female patients (58.3%) in our study population may reflect the regional healthcare-seeking patterns in Dehradun, where women increasingly access tertiary healthcare services.

History of motion sickness emerged as the most potent predictor (OR=3.12), supporting the shared pathophysiology between motion-induced and postoperative nausea involving vestibular-chemoreceptor trigger zone interactions. This finding has particular relevance in the Indian context, where long-distance travel to healthcare facilities often involves various transportation modes that may exacerbate motion sensitivity.

The significant association between surgical duration and PONV occurrence reflects the cumulative effect of prolonged anesthetic exposure, increased tissue manipulation, and extended perioperative stress responses. In the context of Dehradun's evolving surgical landscape, where complex procedures are increasingly performed, this finding emphasizes the importance of optimizing surgical efficiency and anesthetic management protocols.

Volatile anesthetic agents demonstrated substantially higher PONV rates compared to total intravenous anesthesia, consistent with established mechanisms involving direct chemoreceptor trigger zone stimulation. The economic implications of this finding are particularly relevant in Indian healthcare settings, where cost-effectiveness considerations often influence anesthetic choice decisions.

The temporal distribution pattern, with 67.1% of PONV episodes occurring within six hours postoperatively, provides valuable insights for targeted monitoring and intervention strategies. This early predominance suggests that immediate postoperative care protocols should incorporate intensive PONV assessment and management frameworks.

Risk stratification analysis revealed clinically meaningful differences across patient categories, enabling evidence-based allocation of prophylactic interventions. The 76.4% PONV rate in high-risk patients justifies aggressive prevention strategies, while the 18.2% rate in low-risk patients supports selective prophylaxis approaches aligned with resource optimization principles.

9. Recommendations and Future Scope

Immediate Clinical Recommendations:

1. Implementation of standardized PONV risk assessment protocols using identified predictors for all elective surgical patients
2. Development of procedure-specific antiemetic prophylaxis guidelines, with mandatory prophylaxis for high-risk categories
3. Enhanced utilization of total intravenous anesthesia techniques, particularly for high-risk patient populations
4. Establishment of dedicated PONV monitoring protocols with intensive surveillance during the first six hours postoperatively

Institutional Policy Recommendations:

1. Integration of PONV prevention strategies into hospital quality improvement initiatives and patient safety protocols
2. Regular training programs for anesthesia and nursing staff on evidence-based PONV management techniques
3. Development of patient education materials addressing PONV risks and prevention strategies in local languages
4. Implementation of PONV outcome metrics in hospital performance indicators and quality assurance programs

Future Research Directions:

1. Longitudinal studies assessing long-term patient outcomes and satisfaction following PONV episodes
2. Pharmacoeconomic analyses evaluating cost-effectiveness of various prophylactic antiemetic strategies in Indian healthcare contexts
3. Genetic polymorphism studies examining population-specific factors influencing PONV susceptibility in North Indian populations
4. Multi-center collaborative studies encompassing diverse Indian healthcare settings to develop population-specific prediction models

Healthcare System Implications:

Future research should focus on developing culturally appropriate PONV management protocols that consider regional dietary patterns, traditional medicine practices, and healthcare delivery models prevalent in Indian settings. Integration of telemedicine platforms for postoperative PONV monitoring represents an emerging opportunity for improved patient care continuity.

10. Conclusion

This comprehensive cross-sectional study provides robust evidence on PONV prevalence and predictors in a tertiary teaching hospital setting in Dehradun, contributing valuable insights to the limited literature addressing postoperative complications in Indian healthcare contexts. The observed

prevalence rate of 42.7% reflects a significant clinical burden requiring systematic prevention and management approaches.

The identification of female gender, motion sickness history, prolonged surgical duration, and volatile anesthetic use as independent predictors enables evidence-based risk stratification and targeted intervention strategies. These findings support the development of contextualized PONV prevention protocols tailored to regional patient demographics and healthcare delivery patterns.

The study's implications extend beyond immediate clinical applications, informing healthcare policy decisions, resource allocation strategies, and quality improvement initiatives within the rapidly evolving healthcare landscape of Dehradun and similar urban centers in India. The demonstrated feasibility of comprehensive PONV assessment in resource-constrained settings provides a foundation for broader implementation across Indian healthcare systems.

11. Application to Practical Findings

Healthcare Delivery Context in Dehradun:

The findings have direct applicability to Dehradun's expanding healthcare infrastructure, where increasing surgical volumes and diverse patient populations necessitate standardized PONV management protocols. The predominance of urban patients (67.4%) reflects the city's role as a regional healthcare hub, requiring protocols that address varied socioeconomic backgrounds and cultural preferences.

Resource Optimization Strategies:

The risk stratification model enables efficient allocation of antiemetic resources, with high-risk patients receiving comprehensive prophylaxis while minimizing unnecessary interventions in low-risk categories. This approach aligns with healthcare cost-containment objectives while maintaining quality care standards essential in competitive healthcare markets.

Quality Improvement Integration:

PONV prevention protocols can be integrated into existing quality improvement frameworks, contributing to patient satisfaction scores and hospital performance metrics increasingly important for healthcare accreditation and patient choice decisions in Dehradun's healthcare market.

Regional Healthcare Network Applications:

The study findings provide a foundation for developing standardized PONV protocols across hospital networks in the National Capital Region, facilitating consistent care quality and enabling comparative outcome assessments across healthcare facilities.

12. Limitations of the Study

Several limitations must be acknowledged when interpreting study findings. The single-center design may limit generalizability to other healthcare settings with different patient demographics, surgical case-mix, or anesthetic practices. However, the hospital's diverse catchment area and comprehensive case-mix provide reasonable representation of tertiary care patterns in urban North India.

The 24-hour observation period, while clinically relevant, may have missed delayed PONV episodes occurring beyond this timeframe. Extended monitoring protocols could provide additional insights into PONV temporal patterns but were constrained by practical healthcare delivery considerations and patient discharge patterns.

Potential recall bias in patient-reported symptoms and historical factors such as motion sickness history may have influenced data accuracy. However, standardized questionnaire administration and immediate postoperative assessment minimize this concern for primary outcome measurements.

The study did not comprehensively assess all potential confounding variables, including detailed nutritional status, cultural dietary patterns, or traditional medicine usage that may influence PONV

occurrence in Indian populations. Future research should incorporate these culturally relevant factors for comprehensive understanding.

Seasonal variations in PONV occurrence were not systematically analyzed despite data collection spanning multiple seasons. Regional climate patterns and associated physiological adaptations may influence PONV susceptibility and warrant specific investigation in future studies.

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