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Original Research Article

Retrospective Analysis of the Incidence and Predictors of Postoperative Nausea and Vomiting After Spinal Anaesthesia

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Abstract

Postoperative nausea and vomiting (PONV) continues to be a concern even after spinal anaesthesia, a technique traditionally considered to have low emetogenic potential. This retrospective study evaluated the incidence of PONV within 24 hours of surgery and identified patient- and treatment-related predictors using electronic medical records from a tertiary care hospital. Records of 500 ASA I and II adult patients who underwent surgery under spinal anaesthesia between March and December 2024 were analysed. The overall PONV incidence was 26.8% (n = 134), with nausea alone occurring in 18.8%, vomiting ± nausea in 8.0%, and rescue antiemetic use in 10.6%. The 95% confidence interval for overall PONV was 23.0–30.9%. On multivariable logistic regression, female sex (aOR 1.91; p = 0.001), history of prior PONV or motion sickness (aOR 2.29; p < 0.001), and postoperative opioid use (aOR 1.58; p = 0.026) were independently associated with PONV. Non-smoking status did not retain significance after adjustment. These findings reinforce the continued relevance of simplified risk models in peri operative populations and highlight the importance of opioid-sparing postoperative analgesia and individualized prophylaxis strategies.

Keywords: Postoperative Nausea And Vomiting, Spinal Anaesthesia, Predictors, Apfel Score, Opioid-Sparing Analgesia.

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Introduction

Postoperative nausea and vomiting remains one of the most frequent adverse events during peri operative period, affecting approximately 20–30% of the overall surgical population. [1,2] the clinical and economic implications of PONV are well recognized, as the condition can delay oral intake, prolong monitoring and hospital stay leading to delayed postoperative recovery. Regional anesthesia techniques, particularly spinal anaesthesia, eliminate several pharmacological triggers such as volatile agents, nitrous oxide, and airway-related stimulation. For this reason, neuraxial anesthesia has been historically proven to be a better technique to avoid PONV.

Nevertheless, accumulating evidence indicates that spinal anaesthesia does not fully prevent PONV. Incidence rates as high as 20–35% have been reported, including in populations where inhalational anaesthetics were avoided entirely. [3,4] This persistence suggests that PONV is a multifactorial postoperative neuro-autonomic response rather than a complication restricted to general anesthesia alone. Hemodynamic alterations caused by sympathetic blockade, redistribution of autonomic tone, postoperative pain severity, and rescue opioid analgesia may all contribute to activation of nausea and vomiting pathways in the absence of inhalational agents. [6]

Patient-specific risk factors have shown consistent associations across diverse studies. Female sex, non-smoking status, prior history of PONV or motion sickness, and opioid exposure during recovery form the basis of the widely validated Apfel simplified PONV risk score. [1,4] The

interaction between postoperative pain and opioid rescue analgesia deserves particular consideration in spinal anaesthesia populations, where analgesic supplementation is often required despite effective intraoperative block. Opioids independently activate the chemoreceptor trigger zone and delay gastric emptying, increasing the risk of nausea and vomiting even when neuraxial anesthesia was used. [10,11]

Given this evolving understanding, institution-specific risk profiling using EMR-based datasets is valuable to guide clinical strategy, audit recovery outcomes, and strengthen evidence for risk-stratified prophylaxis protocols. This study was conducted to quantify PONV incidence after spinal anaesthesia in adults and to identify independent predictors relevant to early postoperative recovery in a real-world tertiary care setting.

Materials and Methods

Study Design and Setting: A retrospective observational analysis was performed at Parul Sevashram Hospital, Vadodara, Gujarat, India, using the PRESCO electronic medical record system. Adult patients classified as ASA physical status I or II who underwent surgery under spinal anaesthesia between March and December 2024 were screened for inclusion. Institutional ethics approval for retrospective EMR analysis was obtained prior to data extraction.

Sample Size and Eligibility: A total of 500 patient of ASA grade I and II were included. Patients with incomplete 24-hour PONV documentation or missing analgesia records were excluded at the screening stage to maintain dataset integrity.

Anaesthetic and Postoperative Analgesia Protocol: Spinal anaesthesia was performed at the L3–L4 interspace using a 23G Quincke needle. A fixed dose of 0.5% hyperbaric bupivacaine hydrochloride was administered, with or without 10 mcg dexmedetomidine hydrochloride added intrathecally at the discretion of the treating anesthesiologist. Injection ondansetron 4 mg given before conclusion of surgery. No intraoperative systemic sedatives were given. Postoperative opioid rescue analgesia consisted of tramadol 2 mg/kg administered only when VAS pain score exceeded 4. Pain scores were recorded using the standard 0–10 Visual Analogue Scale, assessed by nursing staff during PACU stay and at ward handover.

Outcome Measures: The primary outcome was PONV incidence within 24 hours of surgery. The secondary outcome was identification of independent predictors of PONV using multivariable logistic regression modeling.

Predictor variables entered into the model included sex, history of PONV or motion sickness, postoperative opioid use, smoking status, and pain score severity. Statistical analysis was performed using standard medical biostatistics software.

Results

A total of 500 patient records were analysed. PONV was documented in 134 patients, resulting in an overall incidence of 26.8%, while 366 patients (73.2%) reported no nausea or vomiting symptoms in the 24-hour postoperative period.

Nausea alone was observed in 94 patients (18.8%), vomiting ± nausea occurred in 40 patients (8.0%), and 53 patients (10.6%) required rescue antiemetic therapy. The 95% CI for overall PONV incidence was 23.0–30.9%.

On multivariable logistic regression analysis, female sex demonstrated an adjusted odds ratio of 1.91 ($p = 0.001$). A documented history of PONV or motion sickness showed the highest association with an adjusted odds ratio of 2.29 ($p < 0.001$). Postoperative opioid rescue analgesia retained significance with an adjusted odds ratio of 1.58 ($p = 0.026$).

Although non-smoking status showed increased unadjusted risk during screening, it did not maintain statistical significance after multivariable adjustment. Female sex, prior PONV or motion sickness, and postoperative opioid use therefore remained independent predictors of PONV in this spinal anaesthesia cohort.

Table 1: Postoperative nausea and vomiting incidence, symptom pattern, and multivariable adjusted predictors after spinal anaesthesia (N = 500)

Parameter	Result
Overall PONV incidence	26.8% (n = 134), 95% CI: 23.0–30.9
Symptom pattern	Nausea only: 18.8% (n = 94) • Vomiting ± nausea: 8.0% (n = 40)
Rescue antiemetic requirement	10.6% (n = 53)
Patients without PONV	73.2% (n = 366)
Independent predictors (multivariable logistic regression)	Female sex: aOR 1.91 ($p = 0.001$) • Prior PONV/motion sickness: aOR 2.29 ($p < 0.001$) • Postoperative opioid rescue (tramadol 2 mg/kg for VAS > 4): aOR 1.58 ($p = 0.026$). Smoking status did not remain significant after adjustment.

Retrospective electronic medical record analysis of adult surgical patients (ASA I–II) receiving spinal anaesthesia. PONV = postoperative nausea and vomiting; CI = confidence interval; aOR = adjusted odds ratio; VAS = Visual Analogue Scale pain score.

Discussion

The findings of this retrospective EMR-based analysis confirm that PONV continues to affect a substantial proportion of adult patients despite the use of spinal anaesthesia and routine ondansetron prophylaxis.

The overall incidence of 26.8% aligns closely with the 22.8% rate reported by Ju JW et al. [3] and approximates the 20–35% range described in several non-obstetric regional anaesthesia populations. [4,5] These convergent observations indicate that PONV after spinal anaesthesia is a persistent recovery-phase phenomenon, influenced less by avoidance of inhalational triggers and more by individual susceptibility and analgesic exposure during early postoperative care.

The predominance of nausea (18.8%) over vomiting ± nausea (8.0%) mirrors trends described in East Asian surgical cohorts [5] and orthopaedic spinal anaesthesia populations. [3] David VV et al. [8] similarly reported nausea-dominant symptom distribution in systematic regional anaesthesia literature.

This pattern may be attributed to sympathetic blockade-mediated hemodynamic shifts and parasympathetic predominance, mechanisms that activate nausea-associated afferent pathways more readily than the coordinated motor efferent reflex required for overt emesis. Lee et al. [6] previously described hypotension-driven cerebral hypoperfusion as a trigger for central nausea pathways, a plausible contributing factor in neuraxial anaesthesia populations even when blood pressure data were not explicitly captured.

Female sex emerged as a reproducible non-modifiable risk determinant in this dataset, showing nearly twice the adjusted risk of PONV. Contemporary consensus statements and cohort analyses [4,14] continue to affirm sex-mediated serotonergic and vestibular differences as stable predictors across both general and regional anesthesia techniques.

The strongest predictor identified was a prior history of PONV or motion sickness (aOR 2.29; $p < 0.001$).

This is consistent with foundational observations by Koivuranta et al. [9] and risk-model validations by Apfel et al. [4] which suggest that prior emetic susceptibility reflects intrinsic neuro-receptor pathway sensitivity rather than perioperative drug exposure alone. Postoperative opioid rescue analgesia remained an independent predictor (aOR 1.58; $p = 0.026$), reinforcing the contribution of chemoreceptor trigger zone stimulation, opioid-induced gastric stasis, and vestibular hypersensitization during the early recovery window. [10,11] Kovac et al. [12] similarly confirmed opioid-mediated emetogenic risk persistence in mixed anesthesia populations. Importantly, the loss of smoking-status significance after adjustment is comparable to findings from spinal anaesthesia-dominant cohorts by Huh et al. [5] and pediatric/adult unadjusted analyses by Kovac et al. [12], indicating that autonomic effects of neuraxial blockade may outweigh the protective enzymatic or receptor desensitization influence classically attributed to smoking in general anesthesia datasets.

Recognition of Apfel-aligned predictors in a neuraxial anaesthesia cohort supports the continued use of simplified risk-stratification approaches in PAC clinics when spinal anaesthesia is planned, while simultaneously emphasizing postoperative opioid minimization. Gan et al. [7] and Holst et al. [16] both demonstrated improved recovery outcomes when opioid-sparing analgesic and hemodynamic optimization strategies were implemented.

Conclusion

This study confirms a 26.8% incidence of PONV within 24 hours after spinal anaesthesia.

Female sex, prior history of PONV or motion sickness, and postoperative opioid rescue analgesia were significant independent predictors, while smoking status did not retain significance after multivariable adjustment. Incorporating these predictors into PAC risk profiling and prioritizing opioid-sparing multimodal analgesia may further improve early postoperative recovery in spinal anaesthesia cohorts.

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