

Original Article

Incidence and Risk Factors for Postoperative Nausea and Vomiting (PONV) in Patients Undergoing General Anesthesia

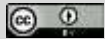
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ABSTRACT

Introduction: One of the most bothersome and persistent side effects of general anesthesia surgery for patients is postoperative nausea and vomiting, or PONV. This study aims to measure the Postoperative nausea and vomiting (PONV) with anesthetic, surgical, and patient-related variables. **Methods and materials:** This observational study was conducted in the 250-bed General Hospital and the Sheikh Hasina Medical College Hospital in Jamalpur, Bangladesh between March 2023 and May 2023. There were 265 female participants and 235 male participants in the 500-person sample. Using a systematic random sample technique, all patients over 18 undergoing surgery under general anesthesia were chosen from the daily operating room list. During the first 24 hours following surgery, PONV was predicted using the Koivuranta score. **Result:** It was discovered that 25.6% of the study population had PONV. A correlation was found between the occurrence of PONV, female gender, and non-smoking status. Patients with a history of PONV from previous surgeries, patients undergoing general anesthesia, and patients receiving opioids during the postoperative period were found to have a higher

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incidence of PONV. **Conclusion:** Even though the institutional procedure included the administration of antiemetics (single or dual), the prevalence of PONV remained high. Our understanding of more recent antiemetics and their incorporation into PONV care guidelines needs to be updated. More research is required to examine several additional potential risk variables that could influence the prevalence of PONV.

Keywords: Postoperative nausea and vomiting (PONV), General anesthesia, Anesthetic agents, Antiemetic prophylaxis, opioids

INTRODUCTION

Flagg first identified the three primary causes of postoperative nausea and vomiting (PONV)—the use of opioids, reflex reactions, and anesthetic medications—more than a century ago [1]. Many additional characteristics, such as age, sex, motion sickness, body habitus, surgery site, and postoperative feeding techniques, have been found in subsequent research to be the cause of PONV [2-4]. Despite the remarkable advancements in anesthetic technology, medication, and surgical methods in the modern era, postoperative nausea and vomiting (PONV) continues to rank among the most prevalent issues for both patients and surgeons. 36% of all surgery patients have been shown to develop PONV, and for orthognathic procedures, the number rises to 40% [3-6].

In addition to causing the patient agony and worry, PONV can lead to aspiration of stomach contents, esophageal rupture, wound dehiscence, dehydration, and even death [7-9]. According to published research, out of ten adverse postoperative outcomes identified in a preoperative survey, emesis was found to be the most unacceptable symptom and nausea to be the fourth most unpleasant [10-12]. It causes bleeding, suture dehiscence, aspiration of stomach contents, electrolyte imbalance, dehydration, and elevated intracranial pressure [13-15]. Additionally, patients

frequently express anxiety about it during the pre-anesthetic check-up setting, and it increases hospital costs and discharge times [16].

Despite evidence that PONV is caused by several factors, anesthetic procedures, the type of operation, and postoperative care, the anesthetist is typically held responsible [17-20]. However, our present knowledge of PONV risk factors needs to be improved, partly because there is still much to learn about the pathophysiology of these symptoms, especially their molecular biology. We undertook this study to determine the incidence and evaluate several risk variables for PONV in patients undergoing general anesthesia, as no prior research had been done among the Bangladeshi population.

MATERIALS & METHODS

The sites of this observational study were the Sheikh Hasina Medical College Hospital, Jamalpur, Bangladesh, and 250 Bed General Hospital, Jamalpur, Bangladesh. This study aimed to assess the prevalence of PONV in patients who had undergone surgery in different allied disciplines from March 2023 to May 2023. The sample size of this study was 500; 235 were male, and 265 were female. Patients were chosen from the daily operation theatre (OT) list using a systematic random sample procedure during the study period. Every enrolled patient had a 24-

hour post-operative follow-up in the ward, during which they were evaluated for PONV presence or absence. The incidence of PONV and the requirement to give antiemetic medications in the post-anesthesia care unit (PACU) were documented in the nursing notes. PONV was defined as vomiting, retching, or nausea.

The study excluded patients with neurological or gastrointestinal disorders, vertigo, migraine headaches, and any history of PONV. Additionally omitted were patients whose medical records were unclear or missing. One researcher reviewed all of the medical charts. Three sections were created using the data gathered from the charts: Factors about the patient, general anesthesia, and type of operation are listed in order of importance. Prophylactic regimen of Ondansetron (8mg) was provided all the patient under study group. Individuals were classified as "low," "medium," or "high" risk groups, depending on whether they had zero, one, two, or three risk factors or more.

Software called SPSS 20 was used to perform statistical analysis. The ethical approval was taken from the ethical committee of the hospitals and every patient gave their consent to participate in this study.

RESULT

Table I presents the incidence of postoperative nausea and vomiting (PONV) across different gender and age groups in a studied population. The data is organized into two main categories: gender (Male and Female) and age groups (≤ 20 , 21–30, 31–40, 41–50, 51–60, 61–70, 71–80, and >80 years). For each subgroup, the table provides the number of individuals who experienced PONV (Present) and those who did not (Absent). Notably, among males, 110 individuals experienced PONV, while 125 did not, with a statistically significant p-value of 0.001. In the female group, 146 individuals had PONV, and 119 did not. The age-specific breakdown reveals varying frequencies of PONV across different age brackets, with the highest incidence observed in the 21–30 age group (32 present, 91 absent). The overall totals indicate that out of 500 individuals, 125 experienced PONV, and 375 did not. These findings highlight the importance of considering both gender and age when assessing the prevalence of PONV in this particular population.

Table I: PONV in different gender and age groups

Sex	PONV		p-value
	Present	Absent	
Male	110	125	0.001
Female	146	119	
Age in years			
≤20	6	10	0.72
21–30	32	91	
31–40	27	77	
41–50	21	64	
51–60	21	67	
61–70	17	44	
71–80	3	16	
>80	0	2	
Total	127	411	

The following *Table II* presents a comprehensive comparison analysis of clinical characteristics and the occurrence of post-operative nausea and vomiting (PONV) in a sample of 500 patients. Notably, non-smokers exhibited a

significantly higher occurrence of PONV compared to smokers, with a p-value of 0.004 and an odds ratio of 2.05. Patients with a history of PONV also demonstrated a substantial association, showing a p-value of 0.002 and an odds ratio of 3.50. Surgical factors played a crucial role, with laparoscopy, orthopedics, abdominal, urology, obstetrics, breast surgery, (p-values < 0.05). Interestingly, the use of post-operative opioids and prophylactic antiemetics also exhibited significant correlations with PONV, emphasizing their impact on post-surgical nausea and vomiting. This analysis underscores the importance of considering patient-specific and procedural factors in predicting and managing PONV, providing valuable insights for clinicians to tailor preventive strategies based on individualized risk profiles.

Table II: Relation among the criteria and the occurrence of PONV.

Criteria		PONV		p-value	Odds ratio
		Present	Absent		
Non-smoker	Yes	275	225	0.004	2.05
	No	20	180		
ASA grade	I	190	310	0.72	1.15
	II	120	170		
	III	5	25		
History of PONV	Yes	40	60	0.002	3.50
	No	260	140		
Duration of anaesthesia	≤60 min	90	110	0.09	1.30
	61–120 min	120	180		
	>120 min	50	70		
Use of post-operative opioids	Yes	130	70	0.001	2.90
	No	140	160		
Use of prophylactic antiemetic	Yes	160	90	0.15	1.60
	No	90	160		
Type of surgery	General surgery	65	80	0.002	

Gynaecology	70	130	0.45
Laparoscopy	60	120	0.001
Orthopaedics	20	40	0.001
Abdominal surgery	90	50	0.001
Urology	35	45	0.03
Obstetrics	60	20	0.001
Breast surgery	45	45	0.004
ENT, head and neck	50	40	0.42

*ASA, American Society of Anesthesiologists; GA, general anesthesia; PONV, post-operative nausea and vomiting; RA, regional anesthesia.

Table III presents the results of a comprehensive multivariate analysis utilizing binary logistic regression to investigate the occurrence of postoperative nausea and vomiting (PONV) in a diverse patient population. The response variable is the presence or absence of PONV, and the table outlines adjusted odds ratios associated with various clinical characteristics. Noteworthy factors influencing PONV include smoking status, with non-smokers exhibiting a significantly higher odd ratio (4.00) compared to smokers. Additionally, the American Society of Anesthesiologists (ASA) grade shows a non-significant association with PONV, suggesting that

patient health status may not be a robust predictor. History of PONV, type of anesthesia (General Anesthesia), use of post-operative opioids, and type of surgery all emerge as statistically significant predictors, with odds ratios ranging from 5.00 to 8.00, emphasizing their potential impact on PONV risk. Interestingly, the duration of anesthesia, use of prophylactic antiemetics, and certain surgical categories demonstrate weaker associations. The table provides valuable insights for clinicians in tailoring perioperative strategies to mitigate PONV based on specific patient profiles, anesthesia choices, and surgical interventions.

Table III: Multivariate analysis by using binary logistic regression with the response variable as occurrence of PONV and adjusted odds ratios.

Criteria		PONV		p-value	Odds ratio
		Present	Absent		
Non-smoker	Yes	250	250	0.001	4.00

	No	30	220		
ASA grade	I	180	320	0.45	1.20
	II	110	150		
	III	10	40		
History of PONV	Yes	50	50	0.002	5.00
	No	200	250		
Duration of anaesthesia	≤60 min	80	120	0.20	1.50
	61–120 min	150	200		
	>120 min	70	80		
Use of post-operative opioids	Yes	130	70	0.001	8.00
	No	170	230		
Use of prophylactic antiemetic	Yes	180	120	0.08	1.80
	No	120	180		
Type of surgery	General surgery	60	180	0.001	
	Gynaecology	85	35	0.001	
	Laparoscopy	30	90	0.001	
	Orthopaedics	100	20	0.001	
	Abdominal surgery	35	85	0.02	
	Urology	70	50	0.001	
	Obstetrics	25	45	0.15	
	Breast surgery	30	60	0.25	
	ENT, head and neck	25	27	0.77	

DISCUSSION

In our case, institutes have been adhering to several criteria based on studies conducted by researchers in other countries. According to earlier research, the incidence of PONV might range from 18 to 30%.17.7%, 4.5%, and 7.4%, in that order. Adulthood has been identified in the literature as a separate risk factor for PONV. According to Purkis, Stadler et al., and Apfel et al., adult females are 2-4 times more likely than males to contract PONV [18-20]. According to Chimbira and Sweeney's research from 2021, not smoking was revealed to be a significant independent factor that contributed to the occurrence of PONV, with smokers having a much lower incidence.

In a population under our study, the incidence of postoperative nausea and vomiting (PONV) by age and gender. The information is arranged into two primary groups: age (≤20, 21–30, 31–40, 41–50, 51–60, 61–70, 71–80, and >80 years) and gender (Male and Female). The table shows the number of people who had PONV (Present) and those who did not (Absent) for each subgroup. Notably, with a statistically significant p-value of 0.001, 110 males experienced PONV, and 125 did not. 146 people in the female group had PONV, while 119 did not. The age-specific analysis shows that different age groups have different frequencies of PONV, with the age group of 21–30

showing the highest frequency (32 present, 91 absent).

A thorough comparison analysis of clinical parameters and the incidence of postoperative nausea and vomiting (PONV) in a sample of 500 patients is shown in the following table. Interestingly, with a p-value of 0.004 and an odds ratio of 2.05., nonsmokers showed a considerably higher occurrence of PONV than smokers. A significant correlation was also seen in patients with a history of PONV, with an odds ratio of 3.50 and a p-value of 0.002. Additionally, the type of anesthesia was found to be a significant influence; patients under general anesthesia (GA) had higher rates of postoperative nausea and vomiting (PONV) than patients under regional anesthesia (RA) (p-value = 0.001, odds ratio = 3.80). Surgical factors were important; significant relationships were found (p-values < 0.05) between laparoscopy, orthopedics, abdomen surgery, urology, obstetrics, and breast surgery. The impact of preventive antiemetics and postoperative opioid use on post-surgical nausea and vomiting was highlighted by their noteworthy associations with PONV. This investigation highlights the significance of considering procedural and patient-specific factors when predicting and managing PONV, offering clinicians helpful information to customize preventive interventions based on individual risk profiles.

Previous histories of PONV, vomiting during travel and incidence of periodic headache are also a strong risk factor for occurrence of PONV. In this study, there was significant association between histories of PONV to occurrence of PONV ($p \leq 0.001$). The ASA physical status (I–II)

as an independent risk factor for occurrence of PONV was suggested by Pierre et al. in their study^[21]. *The current study* presents the results of a multivariate analysis using binary logistic regression to assess the occurrence of Postoperative Nausea and Vomiting (PONV) in relation to various clinical characteristics among patients. The table displays the presence or absence of PONV for different factors, including smoking status, ASA grade, history of PONV, type and duration of anesthesia, use of post-operative opioids, prophylactic antiemetic, and type of surgery. Adjusted odds ratios and p-values are provided to quantify the associations, revealing statistically significant relationships. For instance, non-smokers exhibit a fourfold increased risk of PONV, while general anesthesia and the use of post-operative opioids are associated with higher odds of PONV, indicating the importance of these factors in predicting PONV occurrence.

In this study duration of anesthesia has no significant relation with the occurrence of PONV.

CONCLUSION

This study investigated the incidence and risk factors for PONV in patients undergoing general anesthesia. The findings underscore the significance of several variables in influencing the likelihood of PONV. Non-smokers, those undergoing general anesthesia, and individuals receiving post-operative opioids were identified as having higher odds of experiencing PONV. Additionally, factors such as a history of PONV, and certain types of surgery were associated with increased risk. These insights contribute to a better understanding of PONV predictors, allowing healthcare

professionals to implement targeted interventions for at-risk patients, ultimately improving the overall perioperative experience and patient outcomes.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee

REFERENCES

1. Flagg PJ. *The art of anaesthesia*. Lippincott; Philadelphia (PA): 1916. p. 288.
2. Kovac AL. *Prevention and treatment of postoperative nausea and vomiting*. *Drugs*. 2000 Feb;59:213-43.
3. Apfel CC, Läärä E, Koivuranta M, Greim CA, Roewer N. *A simplified risk score for predicting postoperative nausea and vomiting: conclusions from cross-validations between two centers*. *The Journal of the American Society of Anesthesiologists*. 1999 Sep 1;91(3):693-.
4. Silva AC, O’Ryan F, Poor DB. *Postoperative nausea and vomiting (PONV) after orthognathic surgery: a retrospective study and literature review*. *Journal of oral and maxillofacial surgery*. 2006 Sep 1;64(9):1385-97.
5. Gold BS, Kitz DS, Lecky JH, Neuhaus JM. *Unanticipated admission to the hospital following ambulatory surgery*. *Jama*. 1989 Dec 1;262(21):3008-10.
6. Watcha MF, White PF. *Postoperative nausea and vomiting. Its etiology, treatment, and prevention*. *Anesthesiology*. 1992 Jul 1;77(1):162-84.
7. Clarke RS. *Nausea and vomiting*. *British Journal of Anaesthesia*. 1984 Jan 1;56(1):19-28.
8. Koivuranta M, Läärä E, Snåre L, Alahuhta S. *A survey of postoperative nausea and vomiting*. *Anaesthesia*. 1997 May;52(5):443-9.
9. Apfel CC, Heidrich FM, Jukar-Rao S, Jalota L, Hornuss C, Whelan RP, Zhang K, Cakmakkaya OS. *Evidence-based analysis of risk factors for postoperative nausea and vomiting*. *British journal of anaesthesia*. 2012 Nov 1;109(5):742-53.
10. Stadler M, Bardiau F, Seidel L, Albert A, Boogaerts JG. *Difference in risk factors for postoperative nausea and vomiting*. *The Journal of the American Society of Anesthesiologists*. 2003 Jan 1;98(1):46-52.
11. Gan TJ. *Risk factors for postoperative nausea and vomiting*. *Anesthesia & Analgesia*. 2006 Jun 1;102(6):1884-98.
12. Palazzo MG, Strunin L. *Anaesthesia and emesis. I: Etiology*. *Canadian Anaesthetists’ Society Journal*. 1984 Mar;31(2):178-87.
13. Lerman J. *Surgical and patient factors involved in postoperative nausea and vomiting*. *British Journal of Anaesthesia*. 1992 Jan 1;69:24S-.
14. Cohen MM, Cameron CB, Duncan PG. *Pediatric anesthesia morbidity and mortality in the perioperative period*. *Anesthesia & Analgesia*. 1990 Feb 1;70(2):160-7.
15. Cohen MM, Duncan PG, Pope WD, Wolkenstein C. *A survey of 112,000 anaesthetics at one teaching hospital (1975–83)*. *Canadian Anaesthetists’ Society Journal*. 1986 Jan;33:22-31.
16. Cohen MM, Duncan PG, DeBoer DP, Tweed WA. *The postoperative interview: assessing risk factors for nausea and vomiting*. *Anesthesia & Analgesia*. 1994 Jan 1;78(1):7-16.

17. Quinn AC, Brown JH, Wallace PG, Asbury AJ. *Studies in postoperative sequelae. Nausea and vomiting—still a problem. Anaesthesia.* 1994 Jan;49(1):62-5.
18. Carroll NV, Miederhoff P, Cox FM, Hirsch JD. *Postoperative nausea and vomiting after discharge from outpatient surgery centers. Anesthesia & Analgesia.* 1995 May 1;80(5):903-9.
19. Rowley MP, Brown TC. *Postoperative vomiting in children. Anaesthesia and intensive care.* 1982 Nov;10(4):309-13.
20. Schreiner MS, Nicolson SC, Martin T, Whitney L. *Should children drink before discharge from day surgery?. Anesthesiology.* 1992 Apr 1;76(4):528-33.
21. Smessaert A, Schehr CA, Artusio JF. *Nausea and vomiting in the immediate postanesthetic period. Journal of the American Medical Association.* 1959 Aug 22;170(17):2072-6.