

**Occurrence of Post-Operative Nausea and Vomiting among Adult Patients Undergoing Laparoscopic Procedures in the Post Anesthesia Care Unit: Cross sectional study at Tertiary Care Hospital.**

<sup>1</sup>Mohammed Al-Harbi , <sup>1</sup>Nour Mohamed , <sup>2</sup>Nancy Massoud, <sup>2</sup>Razan A Alsaad, <sup>2</sup>Reem Ali Alhabshi, <sup>2</sup>Noor Alkhaldi, <sup>2</sup>Shoug Alqahtani , <sup>3</sup>Winnie Philip, <sup>3</sup>Fatmah Othman, <sup>3</sup>Ibrahim Noreldin Ibrahim, <sup>4</sup>Dr. Maha Abdullah Al Turki, <sup>5</sup>Mr. Salem Al-Shammari, <sup>5</sup>Mr. Abdullah Al-Hrabi, <sup>5</sup>Rahaf Fahad Alswailem

<sup>1</sup>Chairman, Anesthesia Department, King Abdulaziz Medical City –Riyadh

<sup>2</sup>Anesthesia Technology program, King Saud Bin Abdul Aziz University for Health Science, Riyadh, Saudi Arabia

<sup>3</sup>Research unit, King Saud Bin Abdul Aziz University for Health Science, Riyadh, Saudi Arabia

<sup>4</sup>King Abdullah International Medical Research Center, Riyadh, Saudi Arabia

**Corresponding Author:** Nour Mohamed, Anesthesia Technology program, King Saud Bin Abdul Aziz University for Health Science, Riyadh, Saudi Arabia

**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

**Abstract**

**Background:** Post-operative nausea and vomiting (PONV) is a serious and common complication that associated with laparoscopic procedures which can lead to post-operative morbidity. Therefore, this study aims to calculate the incidence of PONV in adult patients underwent laparoscopic procedures in National Guard Health Affairs (NGHA). The main objectives in this study are to identify the main risk factors that induce PONV, and proper prophylactic method to prevent or reduce the incidence of PONV by using intra-operative antiemetics such as, granisteron, Dexamethasone, and metoclopramide.

**Methods:** In this cohort prospective study, 130 adult patients who scheduled for laparoscopic procedure under general anesthesia were selected by a non-random convenience sampling technique and being followed perioperatively to obtain the information needed by conducting a questionnaire directed to them in the post anesthesia care unit after the surgery, and

also accessing their files in the BestCare system for more information to be extracted as data collection sheet. The data was entered on MS excel sheet then exported to SPSS version 20, and the results were extracted from there.

**Results:** Of 130 patients, 39 (30%) were males and 91 (70%) patients were females, and their mean age was 41.43 (27.855 to 55) yr. The study showed that the relationship between the incidence of PONV the variables which are history of PONV, motion sickness, smoking status, and gender was statistically insignificant with  $P > 0.05$ . Also, the result revealed that only 3.1% of patients who experienced PONV which is considered as a low incidence.

**Conclusions:** The authors found that the relationship between the incidence of PONV and the variables was statistically insignificant. Also, they found that the incidence of PONV in adult patients who underwent laparoscopic procedures under general anesthesia in NGHA was 3.1% which means the prophylactic

measures of the anesthetic techniques that NGHAs used was effective.

### **Introduction**

Many patients undergoing elective surgeries have complications post-operatively that can lead to post-operative morbidity.[1],[2] Laparoscopic procedures which are performed under general anesthesia have incidence of post-operative nausea and vomiting (PONV), which occur in post-anesthesia care unit (PACU).[3] A laparoscopic procedure is a surgical technique which uses carbon dioxide to be insufflated into the abdomen in continuous flow to maintain a pneumoperitoneum at a constant pressure to provide enough space for the laparoscope to be placed inside the abdomen.[3] Although laparoscopic procedures are considered as a risk factor of PONV, the use of general anesthetics have also been associated with PONV.[4] Excessive PONV lead to high risk of dehydration and electrolyte imbalance.[1] Delay in the recovery time caused by PONV can lead to a delay in patient discharge, which in return increases the cost on the hospital.[1]

Nausea is defined as the unpleasant sensation to impel to vomit without expulsive muscular movement, whereas vomiting is the forceful expulsion of upper gastrointestinal contents through mouth by the powerful sustained contraction of the abdominal muscles.[5],[6] Vomiting is related to many things such as motion sickness, morning sickness, taking certain medications, suffering from medical conditions, as well as receiving chemotherapy.[5],[6] There is a center known as the vomiting center that initiates, regulates, and controls the active vomiting.[6] There are several ways that the vomiting center itself can be stimulated. One of the main ways is stimulation of the chemoreceptor trigger zone (CTZ) which is located in the medulla.[6] When

the CTZ is stimulated by circulating toxins, it will stimulate the vomiting center which will cause emesis.[6] Another cause of nausea and vomiting is motion sickness. [6] Motion sickness will abnormally activate the vestibular nerve which connects the labyrinth to the vestibular nuclei in the brainstem.[6] The vestibular nuclei are activated by the vestibulo-cochlear nerve from the inner ear which will cause the vestibular nuclei to stimulate the CTZ.[6] As a result, the vomiting center will be stimulated which will in return stimulate the emetic reflex.[6] The vomiting center also can be activated by afferent impulses coming from the higher center of the brain. [6] They stimulate the emetic response due to pain, smell or due to sight and even memory.[6] Finally, the CTZ can be stimulated from a nerve in the gastrointestinal tract known as the vagal sensory nerve which activates the vomiting center. [6] The vagal sensory nerve can be stimulated due to peritoneum pressure caused by carbon dioxide (CO<sub>2</sub>) that used in laparoscopic procedures. [7],[8]

Laparoscopic procedure is a modern surgical technique that is performed by making a stab incision using a Veress needle. [7] This Veress needle passes through the abdomen muscle fibers to the peritoneal cavity to create pneumoperitoneum pressure by carbon dioxide, in order to provide a space for the laparoscope to be located inside the abdomen, where the surgery is performed.[7],[8] Recently, laparoscopic procedures which also known as minimally invasive procedures, are widely used these days in different operations such as, cholecystectomy, appendectomy, gynecology, and other surgeries more than open surgeries or regular surgeries due to the advantages of it such as, less recovery time, less pain, and low incidence of wound infection. [7] However, laparoscopic procedures are

associated with high risk of post-operative nausea and vomiting compare to regular surgeries. [9] A Study conducted by Iitomi *et al*, showed that laparoscopic cholecystectomy has a high risk of post-operative nausea compared to open cholecystectomy. [9]

Post-operative nausea and vomiting can be caused by two factors: surgery, and anesthesia. The surgical factor includes type of surgery, such as laparoscopic procedures. The pneumoperitoneum pressure that created during laparoscopy and the residual gas in the abdominal cavity are the causes of nausea and vomiting, where Dr. J. Lenrman showed in a study that laparoscopic procedures prevail a higher incidence of PONV. [10],[11] There is a study conducted by Dr. Feinleib proves that the anesthesia components include volatile agents, nitrous oxide, and opioid causes PONV. [4]

Several studies showed that in order to prevent PONV, utilization of regional anesthesia rather than general anesthesia is recommended to reduce PONV, because the use of agents that induce emesis is avoided when regional anesthesia is possible; use of nitrous oxide should be refrained from, for that it triggers PONV. [12],[13] Since volatile agents provoke nausea and vomiting, the use of total intravenous anesthesia (TIVA) is advised because propofol is considered an antiemetic agent. [14],[15]

This study intends to estimate the incidence of post-operative nausea and vomiting (PONV) in adult patients undergoing laparoscopic procedures in the post anesthesia care unit (PACU) in National Guard Health Affairs (NGHA), and to identify the main risk factors that induce post-operative nausea and vomiting in laparoscopic procedures and proper lines of management of post-operative nausea and vomiting.

## Methodology

This study is approved by King Abdullah International Medical Research Center (KAIMRC). This observational cohort study was conducted prospectively in the post-anesthesia care unit (PACU), where the patients are admitted after surgery to recover from anesthesia and monitoring the vital signs in King Abdulaziz Medical City/ National Guard Health Affairs in Riyadh. The target population was the adult patients who underwent laparoscopic procedures under general anesthesia. 160 patients were observed perioperatively and selected by a non-random convenience sampling technique who aged 18-60 years ASA I and II who took antiemetic intraoperatively. ASA stands for American Society of Anesthesiologists which are classified patients depend on their conditions. Class I normal healthy patients such as, healthy, non-smoking, and non-obese (BMI under 30) and class II a patient with a mild systemic disease such as, controlled hypertension, controlled diabetes mellitus, and pregnancy. The authors exclude all patients with cardiovascular diseases, pulmonary diseases, gastrointestinal diseases, cancer, and patients who take medications that induce emesis.

After getting the approval, the authors started collecting the data from 7th Oct to 13th Nov in 2018 using a questionnaire developed by the research team and accessing patients' files in Best Care system in PACU. The questionnaire was directed to patients who admitted to PACU obtaining information about their sense of nausea and vomiting, previous history of PONV, previous laparoscopic procedures, history of anesthesia complication, history of nausea and vomiting, or motions sickness, receiving antiemetic medication and how the patients respond to it, and smoking status. After conducting the questionnaire with

the patients, the data of the patients was extracted from BestCare software as data collection sheet to ensure that the patients met the study inclusion criteria. The data collection sheet included the following information:

patient code number, demographic details such as age, gender, weight, and BMI, basic vital signs on arrival to PACU ( heart rate, blood pressure, Spo2, temperature, and pain score), analgesics and antiemetics given in PACU, and duration of anesthesia and surgery. However, the main variables or data that included in the study results are demographic data, smoking status, motion sickness, previous laparoscopic procedures, history of PONV, history of anesthesia, and history of nausea and vomiting. The whole sample was collected which are 160 patients, but 30 of them were excluded as shown in figure1 because 22 of them haven't met the study inclusion criteria, and 8 of them haven't anesthesia sheet which mean some of their information were missing.

The collected data was entered to MS excel sheet and then exported to SPSS version 20 to obtain the results. Also, Chi-Square test was used to find the association between the variables (gender, motion sickness, smoking status, and history of PONV), and the incidence of PONV, and it is presented as percentage and frequencies, whereas the continues variables which are age and BMI were presented as mean and standard deviation (SD).

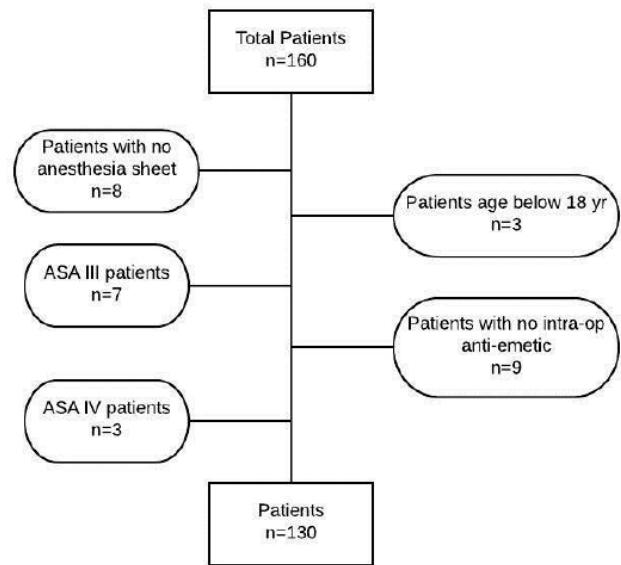


Figure 1: Flow Chart of patients

Results

The demographic characteristics of the subjects are shown in Table 1. Out of 130 subjects who underwent laparoscopic procedures 39 (30%) were males, and 91 (70%) of them were females. The mean (± SD) age and BMI of the subjects were 41.43(± 13.58) years and 29.35(± 5.53) Kg\m2 respectively.

Table 1: Demographic details of the subjects.

Variable		Frequency (percentage)
Gender	Male	39 (30)
	Female	91 (70)
Variable		Mean ± SD
Age (year)		41.43 ± 13.58
Body mass index (Kg\m <sup>2</sup> )		29.35 ± 5.53

Figure 2 describes the personal & medical history of subjects. It shows that 15 (11.5%) patients were smokers and the same number had previous laparoscopic procedure 15 (11.5%), and only 6 (4.6%) had motion sickness. There were 49 (37.7%) patients who experienced nausea and vomiting in their normal

life, and 1 (6.7%) of them had a history of post-operative nausea and vomiting. None of the subjects had any complications of anesthesia.

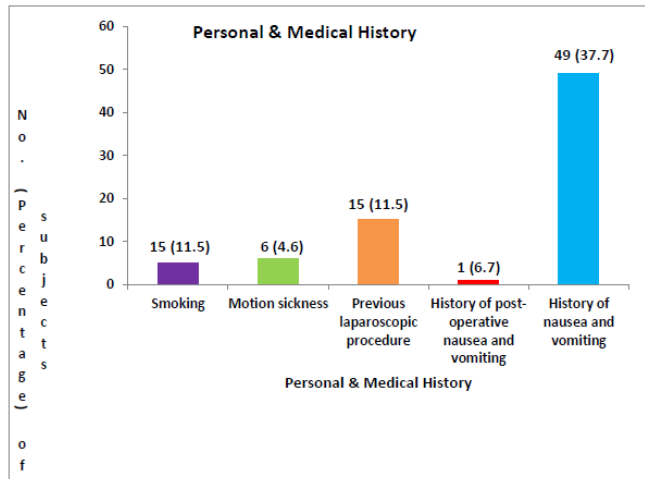


Fig 2: Personal & Medical History of the study subjects.

Figure 3 shows the incidence of post-operative nausea and vomiting. Out of 130 patients, 17 (13.08%) were nauseated after the surgery, and 4 (23.53%) of them vomited after the surgery. The patients who experienced both post-operative nausea and post-operative vomiting were 4 (3.18%) which were females with an average ( $\pm$  SD) age of 44.25 ( $\pm$  8.30) years.

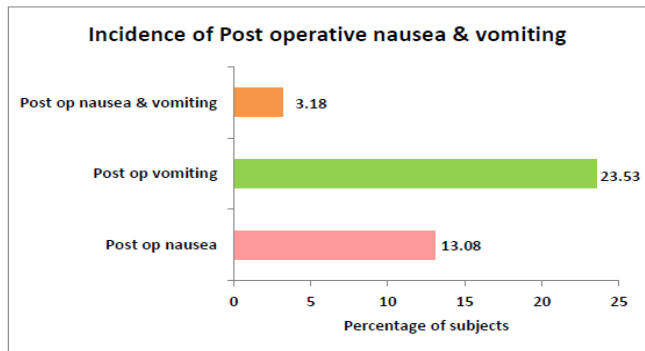


Fig 3: Bar diagram showing the incidence of post op nausea and vomiting among the subjects.

Table 2 gives the description of risk factors and incidence of post-operative nausea and vomiting. The table shows that among 130 patients, only 4 (3.18%) females, experienced PONV, whereas the remaining patients did not experience it. Among the total patients,

15 (11.9%) were smokers with no incidence of PONV, whereas 4 patients who were non-smokers experienced it. Also, 6 (4.8%) patients who had motion sickness did not experienced any PONV, and 1 (50%) patient having a previous history of post-operative nausea and vomiting, and 1 (50%) patient with no previous history of PONV, experienced post-operative nausea and vomiting.

Table 2: Risk factors for post-operative nausea & vomiting

Variable	Post-operative nausea & vomiting		Total
	Yes	No	
<b>Gender</b>			
Male	4 (100%)	87 (69%)	91 (70%)
Female	-	39 (31%)	39 (30%)
<b>Total</b>	4 (100%)	126 (100%)	130 (100%)
<b>Smoking</b>			
Yes	-	15 (11.9%)	15 (11.9%)
No	4 (100%)	111 (88.1%)	115 (88.7%)
<b>Total</b>	4 (100%)	126 (100%)	130 (100%)
<b>Motion sickness</b>			
Yes	-	6 (4.8%)	6 (4.8%)
No	4 (100%)	120 (95.2%)	124 (95.4%)
<b>Total</b>	4 (100%)	126 (100%)	130 (100%)
<b>History of post-operative nausea &amp; vomiting</b>			
Yes	1 (50%)	-	1 (6.7%)
No	1 (50%)	13 (100%)	14 (93.3%)
<b>Total</b>	2 (100%)	13 (100%)	15 (100%)

### Discussion

Post-operative nausea and vomiting is a serious complication that frequently associated with laparoscopic procedures. Therefore, this study tests the hypothesis which is adult patients undergoing laparoscopic procedures have a high incidence of post-operative nausea and vomiting in the post anesthesia care unit in National Guard Health Affairs. The result of this study showed that the incidence of post-operative nausea and vomiting was 3.10% which contradicts with the research hypothesis. Also, the

relationship between the variables or the risk factors and the incidence of post-operative nausea and vomiting was found to be statistically insignificant with  $P > 0.05$ .

A previous study conducted by *Itomi et al* showed that laparoscopic procedures were associated with a high incidence of PONV. [9] However, in this study the incidence of post-operative nausea and vomiting was low which contradicts with the previous study. The possible reason for the difference is the anti-emetic medications. In the previous study, the incidence of PONV was high because intraoperative antiemetics weren't used, whereas in this study all patients were given intraoperative anti-emetics have a low incidence of PONV. In another study, two groups of patients were compared: a group to receive intraoperative antiemetics and a group to receive none. [16] The first group significantly experienced less symptoms of PONV, similar to this study. [16]

Previous studies showed that there is no significant relationship between the incidence of PONV and the variables which are motion sickness, history of PONV, and smoking status which consistent with the finding of this study. [9] However, several studies reported that the only variable or risk factor that associated with PONV was the female gender. [16–18] In their study, the report showed that female gender is the most reliable patient-specific predictor for PONV, indeed, the incidence of PONV was two to three times higher in females than males. [16–18] It was shown that females were more susceptible than males by being the majority of the patients who have experienced PONV. [16–18] In this study, all subjects who experienced the symptoms of PONV were females only, but the association between the incidence of PONV and female gender consider to be insignificant with  $P > 0.05$ . The

strengths of this study include that there is no bias in patient's selection, all patients who underwent laparoscopic procedures and admitted to PACU were selected. Another strength, we use a primary source for collecting the data, the data were taken with direct contact with the patients to obtain accurate information. However, this study has several limitations. First, we couldn't collect the whole sample which is 160, due to limited time and receiving the approval late. Second, some of the data were missing in the BestCare, so we had to ask PACU nurses for a printed sheet for the information which consume more time. Third, the study design that we chose required more time to end up with satisfying results.

### **Conclusion / Recommendation**

In conclusion, the study demonstrates that there is no significant association between the incidence of PONV and the variables which are motion sickness, history of PONV, and smoking status, whereas the female gender is the only variable that has an association with the incidence of PONV, but the association remained insignificant. In addition, the authors found that the incidence of PONV in adult patients who underwent laparoscopic procedures in National Guard Health Affairs was 3.1% which means the prophylactic measures of the anesthetic techniques that NGHHA used was effective. Finally, the recommendation for future research is to pick a big sample size from different institutions to obtain satisfying results. Also, dividing the sample into controlled groups for different types of laparoscopic procedures to identify which type has a high incidence of PONV.

### **References**

1. Beattie WS, Lindblad T, Buckley DN, Forrest JB. The incidence of postoperative nausea and vomiting in women undergoing laparoscopy is

- influenced by the day of menstrual cycle. *Can J Anaesth* 1991;38(3):298-302
2. Bhakta P, Ghosh BR, Singh U, et al. Incidence of postoperative nausea and vomiting following gynecological laparoscopy: A comparison of standard anesthetic technique and propofol infusion. *Acta Anaesthesiol Taiwanica* 2016;54(4):108-13.
3. Rose DK, Cohen MM, Soutter DI. Laparoscopic cholecystectomy. the anaesthetist's point of view. *Can J Anaesth* 1992;39(8):809-15.
4. Jessica Feinleib, MD, PhD Lori H Kwan, MD Ammar Yamani M. Postoperative nausea and vomiting. UpToDate. Available from: <https://www.uptodate.com/contents/postoperative-nausea-and-vomiting> [cited on 2018 Dec 18]
5. Thompson HJ. The management of post-operative nausea and vomiting. *J Adv Nurs* 1999;29(5):1130-6.
6. Understanding Nausea and Vomiting. American Cancer Society. Available from: <https://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/nausea-and-vomiting/what-is-it.html> [cited on 2018 Dec 18]
7. Mishra RK. Textbook of Practical Laparoscopic Surgery. Jaypee Brothers Pvt 2013.p.67-71
8. Rosenblatt A, Bollens R, Espinoza Cohen B. Manual of laparoscopic urology. Springer 2008.p.7,21.
9. Postoperative Nausea and Vomiting in Laparoscopic Versus Open Cholecystectomy at two Major Hospitals in Jamaica. *West Indian Med J* 2009;58(2).
10. Nursal TZ, Yildirim S, Tarim A, et al. Effect of drainage on postoperative nausea, vomiting, and pain after laparoscopic cholecystectomy. *Langenbeck's Arch Surg* ;388(2):95-100.
11. Lerman J. Surgical And Patient Factors Involved In Postoperative Nausea And Vomiting. *Br J Anaesth* 1992;69:24-32.
12. Wilhelm SM, Dehoorne-Smith ML, Kale-Pradhan PB. Prevention of Postoperative Nausea and Vomiting. *Ann Pharmacother* 2007;41(1):68-78.
13. Kovac AL. Prevention and Treatment of Postoperative Nausea and Vomiting. *Drugs* 2000;59(2):213-43.
14. Apfel CC, Stoecklein K, Lipfert P. PONV: A problem of inhalational anaesthesia? *Best Pract Res Clin Anaesthesiol* 2005;19(3):485-500.
15. Kawano H, Ohshita N, Katome K, et al. Effects of a novel method of anesthesia combining propofol and volatile anesthesia on the incidence of postoperative nausea and vomiting in patients undergoing laparoscopic gynecological surgery. *Brazilian J Anesthesiol* 2016;66(1):12-8.
16. Beattie WS, Lindblad T, Buckley DN, Forrest JB. The incidence of postoperative nausea and vomiting in women undergoing laparoscopy is influenced by the day of menstrual cycle. *Can J Anaesth* 1991;38(3):298-302.
17. Lerman J. Surgical And Patient Factors Involved In Postoperative Nausea And Vomiting. *Br J Anaesth* 1992;69:24-32.
18. Bhakta P, Ghosh BR, Singh U, et al. Incidence of postoperative nausea and vomiting following gynecological laparoscopy: A comparison of standard anesthetic technique and propofol infusion. *Acta Anaesthesiol Taiwanica* 2016;54(4):108-13.