



## Postoperative Nausea and Vomiting Following General Anaesthesia: A Prospective Study

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*(Received: 16 June 2025*

*Revised: 20 July 2025*

*Accepted: 19 August 2025)*

### KEYWORDS

American Society of Anaesthesiologists, Postoperative Nausea and Vomiting, Pre-Anaesthetic Checkup, 5 Hydroxytryptamine-3, Body Mass Index

### ABSTRACT:

**Background and Aim:** Postoperative nausea and vomiting are the most significant complication related with the use of general anaesthesia for surgical patients. Many premedication with opioids can also results into nausea and vomiting by triggering vomiting center. This prospective study was conducted to assess the post operative nausea and vomiting following General Anaesthesia on 60 patients in the Department of Anesthesiology over a period of one year. **Material and Methods:** Endotracheal intubation was facilitated by the use of 1.5-2mg/kg succinylcholine, 0.1mg/kg vecuronium, 0.5mg/kg atracurium. Intraoperative analgesia was achieved with either of fentanyl 1µg/kg and maintenance dose 0.5µg/kg after 45 minutes to 1 hour. Anesthesia was maintained with oxygen (34%) and nitrous oxide (66%) in isoflurane, sevoflurane.

**Statistical Analysis and Results:** Qualitative data were displayed in the form of frequency tables, pie chart and bar charts. Where necessary, categorical variables were compared using chi-square and fisher's exact tests while students T test and analysis of variance (ANOVA) was used for the continuous data.

**Conclusion:** Within the limitations of this study, authors stated that the overall incidence of postoperative nausea was 17 (28.3%) and vomiting 17 (28.3%) of the 60 patients studied (P=0.139). Both Propofol and Etomidate induction agents was associated with lower incidence of PONV compared to thiopentone sodium (P=0.366). Future comprehensive and extended researches would be crucial to deepen our understanding and potentially refine these applications in similar clinical settings.

### Introduction

Postoperative nausea and vomiting are a most important complication associated with the use of general anaesthesia for surgical patients. Nausea is pleasing to vomit without expulsive muscular movements and vomiting is the expulsion of stomach content in varying volume and nature. When the stomach contents are not expelled out and that movement is called retching. Vomiting and Retching occurs together is called emetic episode.<sup>1</sup> Surgery which involves stretching the gut wall may contribute to PONV and the presence of a

nasogastric tube may decrease the frequency of symptoms. Premedication with opioids may cause nausea and vomiting due to stimulate the vomiting center. Premedication with atropine and hyoscine may prevent PONV. The incidence of PONV may depends on the use of anesthetic induction agents. Patient induced with etomidate may cause more PONV compared to thiopentone sodium and it has been suggested that propofol possesses antiemetic actions.<sup>1</sup> General anaesthesia (GA) techniques used to cause PONV due to emetic properties of Volatile anaesthetics



and opioids administration.<sup>2</sup> If the risk of PONV is high, the use of intravenous Propofol can reduce the incidence.<sup>3</sup> PONV occurs during the first 2 days after general anaesthesia and surgery.<sup>4</sup> In the absence of antiemetic treatment, The incidence of PONV in the recovery room is around 10% but range between 20% - 30% during the first 24 hours after surgery according to recent reports.<sup>5</sup> PONV occurs during postoperative care of patients which may cause decrease patient comfort and satisfaction, and, rarely, may cause electrolyte imbalances and dehydration, aspiration of gastric contents, suture dehiscence, esophageal rupture and bleeding. PONV and its resulting complications are costly for the healthcare sector worldwide.<sup>6</sup> The use of an opioid analgesic and nitrous oxide (N<sub>2</sub>O) anesthesia is associated with a higher incidence of nausea and vomiting than an intravenous or inhalation anesthetic. However, there are some studies which suggest that an opioid supplemented anesthetic technique (fentanyl 1.5-2µg/kg i.v. or alfentanil 6-8µg/kg i.v.) results in earlier ambulation and discharge from the day-case unit.<sup>7</sup> Carbon dioxide (CO<sub>2</sub>) insufflations during laparoscopic surgical procedure, which may causes stretching and irritation, is known to play an important role in Postoperative nausea and vomiting. If temporally enlarged, the pneumoperitoneum can also increase the risk of PONV. Postoperative nausea and vomiting create patient discomfort and can lead to prolonged stay in the past anesthesia care unit (PACU). Patients with PONV are also mended to complications of dehydration, aspiration, pneumonia, electrolyte imbalance, increased wound dehiscence, delayed recovery, prolonged hospital stay and increased medical cost. However, anesthesiologist give attention to preventing PONV in patients undergoing laparoscopic surgery.<sup>8</sup> The nature of PONV being Multifactorial makes it unlikely that all the condition will be taken care of by a single therapy. The mostly used antiemetic such as 5- hydroxytryptamine -3 (5-HT<sub>3</sub>) receptors antagonists have been found highly effective in chemotherapy induced nausea and vomiting. However, these antagonists do not have such effect on opioid induced emesis or motion sickness. Anaesthetic drugs and techniques also influence the occurrence of PONV. However, anaesthetic technique in comparison to laparoscopic techniques remains variable to influence the incidence of PONV.<sup>9</sup>

## Material and Methods

A prospective study on post operative nausea and vomiting following General Anesthesia after the ethical committee clearance on 60 patients in the Department of Anesthesiology over a period of one year.

### Study Population

Any patients planned for elective surgery under general anaesthesia, admitted at hospital.

#### Inclusion Criteria

- Patients aged between 18-70 years
- Patients with ASA grade I and II
- Patient undergoing general anaesthesia
- Both male and female patients
- Weight 55 -80 kg

#### Exclusion Criteria

- Emergency nature of surgery, Patient with full stomach
- Patients with nasogastric tubes for management
- Patients on preoperative antiemetic treatment
- Patient with ASA grade III or IV

**Study Design:** Prospective Study

### Methodology

Pre- anesthetic check- up (PAC) was done for all patients undergoing elective surgical procedure under general anesthesia in the preoperative room. All patients were premedicated with the glycopyrrolate and to check the previous history of postoperative nausea, vomiting and motion sickness. Explain to the all patients about the nausea, vomiting and retching previously. General anesthesia was induced with either Thiopentone sodium 4 - 5 mg/kg or Propofol 2 - 3 mg/kg intravenously. Maintenance was inhalationally by different types of face mask and endotracheal intubation. Intubated patients were allowed to breathe spontaneously or paralyzed and ventilated. Endotracheal intubation was facilitated by the use of 1.5-2mg/kg succinylcholine, 0.1mg/kg vecuronium, 0.5mg/kg atracurium. In patients where a relaxant technique was adopted, So



maintenance by the use of 0.1mg/kg atracurium and 0.01mg/kg vecuronium. Intraoperative analgesia was achieved with either of fentanyl 1µg/kg and maintenance dose 0.5µg/kg after 45 minutes to 1 hour. Anesthesia was maintained with oxygen (34%) and nitrous oxide (66%) in isoflurane, sevoflurane. At the end of surgery, residual muscle relaxant was reversed with the use of 2.5mg neostigmine, 0.5mg glycopyrrolate who received atracurium and vecuronium. Postoperative follow-up in the postoperative room the patients were interrogated and a questionnaire filled. The study period was subdivided into 0-2 and 2-24 hours. The observations were recorded during the first (0-2) hours and 2-24 hours postoperatively.

### Statistical Analysis

The data were entering into a microcomputer for analysis with the aid of EPI-INFO (version 6) epidemiologic statistical software package. Data were determined both quantitatively and qualitatively. Qualitative data were displayed in the form of frequency tables, pie chart and bar charts. Where necessary, categoric variables were compared using chi-square and fisher's exact tests while students T test and analysis of variance (ANOVA) was used for the continuous data.

The level of significance was set at 95% confidence interval with p value < 0.05.

### Observations and Results

This prospective study was carried out on 60 patients of ASA Grade I and II between the age group of 18-70 years to investigate the incidence of postoperative nausea and vomiting following general anesthesia. Figure 1 & Table 1- 5 (8.3%) patients in the age <30 years. 16 (26.7%) patients in the age group 31-40 years, 22 (36.7%) patients in the age group 41-50 years and 17 (28.3%) patients in the age >50%. Figure 2 & Table 2- 38 (63.3%) females and 22 (36.7%) males in our study. On statical analysis, gender comparison was comparable with no statistical difference between patients. P value (<0.05). Figure 3 & Table 3- 28 patients with ASA grade, I and 32 patients with grade II. Figure 4 & Table 4- Out of 60 patients, 4 patients with <18.5 BMI, 44 patients with 18.5-24.9 BMI and 8 patients with 25-29.9 BMI, 4 patients >30 BMI. Figure 5 & Table 5- 17 patients have <60 minutes of general anaesthesia and 37 patients have 61-120 minutes of general anaesthesia and 6 patients >120 minutes of general anaesthesia. Figure 6 & Table 6- Out of 60 patients, incidence rate of nausea is 17 (28.3%) in 0-2 hours postoperatively. Figure 7 & Table 7 - Out of 60 patients, incidence rate of nausea is 17 (28.3%) in 2-24 hours postoperatively. Figure 8 & Table 8- Out of 60 patients, incidence rate of vomiting is 17 (28.3%) in 0-2 hours postoperatively. Figure 9 & Table 9- Out of 60 patients, incidence rate of vomiting is 17 (28.3%) in 2-24 hours postoperatively.

Figure - 1: Distribution of Patients According To Age

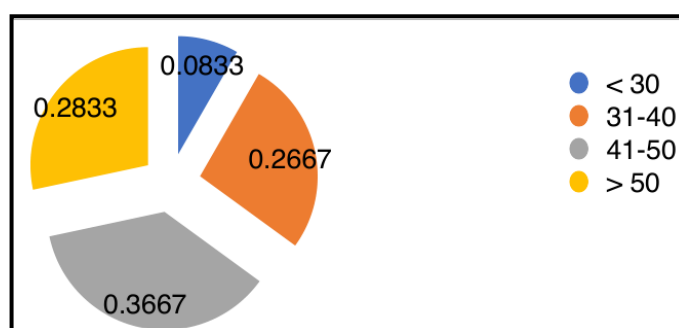


Table -1: Distribution of patients according to age

AGE	No. of cases	Percentage
<30	5	8.3%
31-40	16	26.7%



41-50	22	36.7%
>50	17	28.3%
Total	60	100.0%

Figure- 2: Distribution of Patients According To Gender

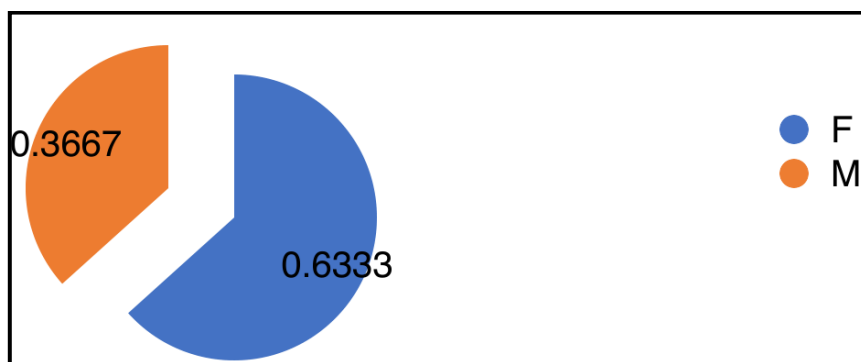


Table - 2: Distribution of patients according to gender

SEX	No. of cases	Percentage
F	38	63.3%
M	22	36.7%
Total	60	100.0%

Figure - 3: Distribution of Patients According To ASA

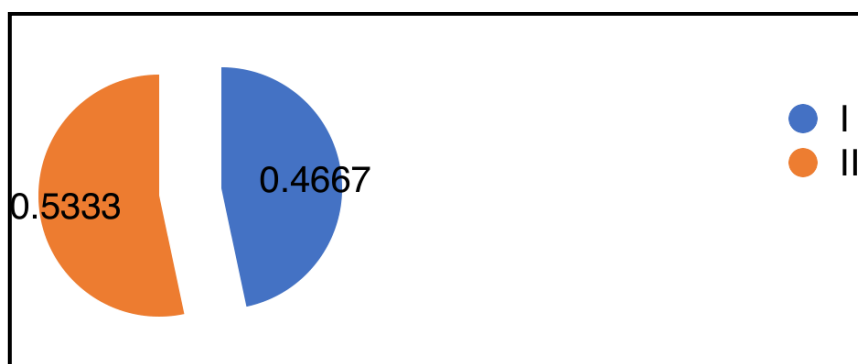


Table - 3: Distribution of patients according to ASA

ASA	No. of cases	Percentage
I	28	46.7%
II	32	53.3%
Total	60	100.0%



Figure - 4: Distribution of Patients According To BMI (KG/M2)

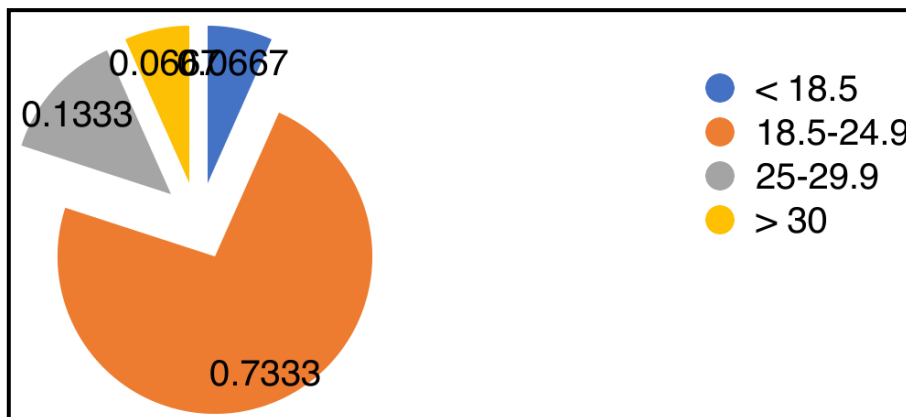


Table - 4: Distribution of patients according to BMI (Kg/m2)

BMI	No. of cases	Percentage
<18.5	4	6.7%
18.5-24.9	44	73.3%
25-29.9	8	13.3%
>30	4	6.7%
Total	60	100.0%

Figure - 5: Duration of General Anaesthesia

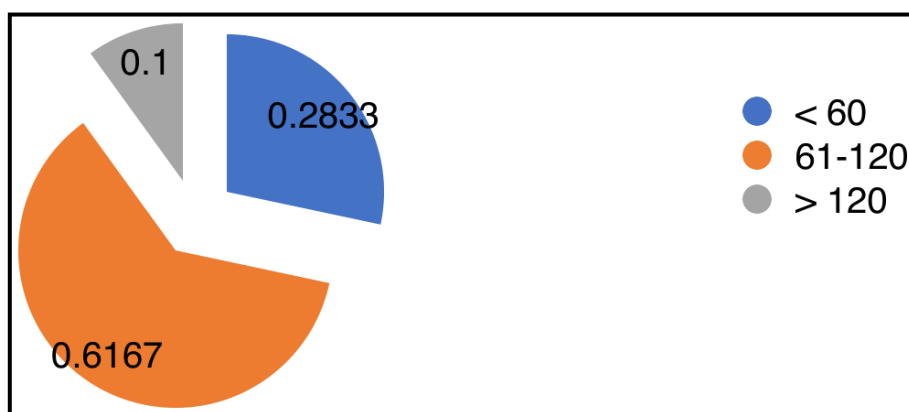


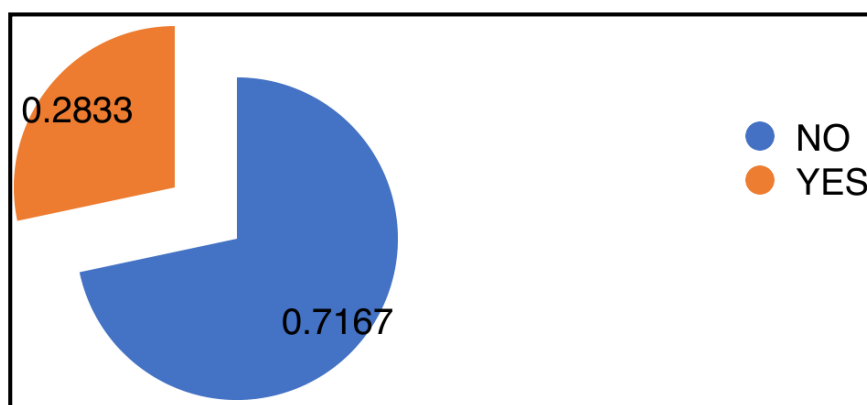
Table - 5: Duration of General Anaesthesia

Duration of General Anaesthesia	No. of Cases	Percentage
30	1	1.7%
60	16	26.7%



70	3	5.0%
75	6	10.0%
80	3	5.0
85	1	1.7%
90	7	11.7%
95	1	1.7%
100	2	3.3%
105	3	5.0%
110	2	3.3%
120	9	15.0%
150	2	3.3%
155	1	1.7%
210	2	3.3%
240	1	1.7%
Total	60	100.0%
<b>Duration of General Anaesthesia</b>	<b>No. of cases</b>	<b>Percentage</b>
<60	17	28.3%
61-120	37	61.7%
>120	6	10.0%

Figure - 6: Incidence of Nausea (0-2 Hours)

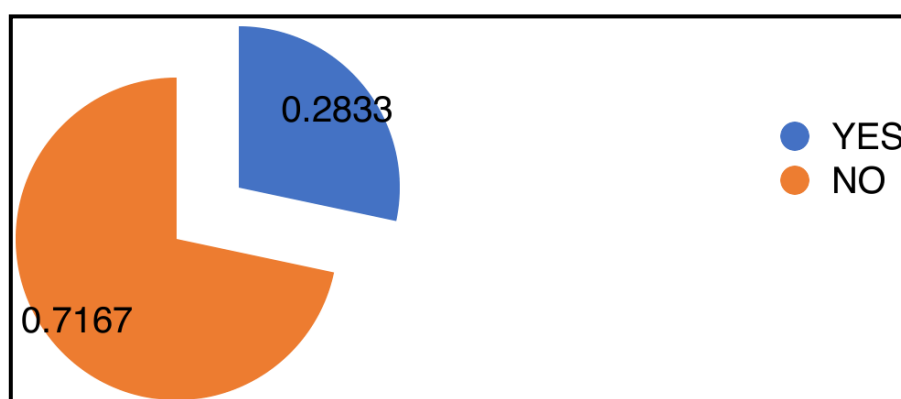




**Table - 6: Incidence of nausea (0-2 hours)**

Nausea_0-2 hours	No. of cases	Percentage
NO	43	71.7%
YES	17	28.3%
Total	60	100.0%

**Figure - 7: Incidence of Nausea (2- 24 Hours)**



**Table - 7: Incidence of Nausea (2-24 hours)**

Nausea_2-24 hours	No. of cases	Percentage
NO	43	71.7%
YES	17	28.3%
Total	60	100.0%

**Figure -8: Incidence of Vomiting (0-2 Hours)**

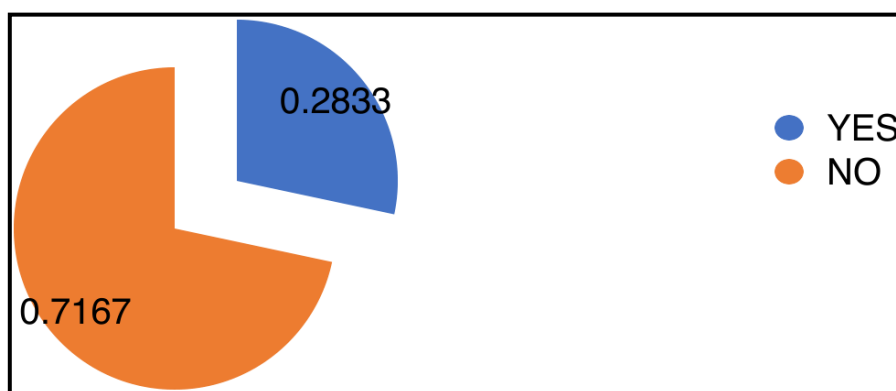




Table -8: Incidence of Vomiting (0-2 Hours)

Vomiting_0-2 hours	No. of cases	Percentage
NO	43	71.7%
YES	17	28.3%
Total	60	100.0%

Figure - 9: Incidence of Vomiting (2- 24 Hours)

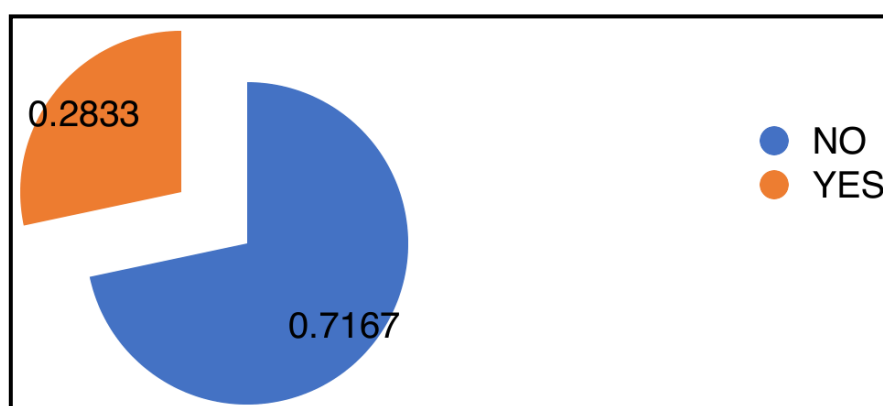


Table - 9: Incidence of Vomiting (2-24 hours)

Vomiting 2_24 hours	No. of cases	Percentage
NO	43	71.7%
YES	17	28.3%
Total	60	100.0%

## Discussion

In our study, the postoperative nausea and vomiting (PONV) is one of the most common complications of general anaesthesia. The incidence of PONV is between 1 and 43%, this study reports the incidence of nausea of 17 (28.3%) while that of vomiting is 17 (28.3%). This is equal to the 14.6% for nausea and 19.6% for vomiting reported by Soyannwo.<sup>10</sup> The lower incidence may be referring to the anesthetic agents used and selection of patients. Some patients who vomited in the series were given N<sub>2</sub>O (nitrous oxide) and nalbuphine as part of their general anaesthesia (GA). There are logical reasons for expecting post-operative nausea and vomiting (PONV) with the use of (N<sub>2</sub>O) nitrous oxide use. N<sub>2</sub>O and halogenated anesthetic agents decrease tone of lower esophageal sphincter. N<sub>2</sub>O and halogenated

agents may facilitate gas entering the stomach during assisted mask ventilation. Flatus, belching and gastric distention which promote postoperative vomiting. The higher incidence of postoperative nausea and vomiting (PONV) associated with administration of nitrous oxide. N<sub>2</sub>O is an inhalational anesthetic agent which cause nausea and vomiting. Nitrous oxide can also cause PONV due to changes in bowel distension and middle ear pressure due to diffusion into closed cavities. Gan et al reported consensus guidelines for managing postoperative nausea and vomiting PONV and that the use of N<sub>2</sub>O during maintenance of anaesthesia should be avoided.<sup>11</sup> In this study, patients had routine overnight preoperative fast for elective surgery which the Ibadan study consisted of both fasted and unfasted patients for elective and emergency surgery respectively. Gender



differences may play a role in the higher incidence of PONV in Indian females. Postoperative pain, especially visceral and pelvic is associated with PONV. In this study, there arise to be a significant relationship between the severity of pain and the occurrence of postoperative nausea and vomiting (PONV). The incidence of PONV increased with severity of pain in patient. Opioids may be used to relieve moderate to severe pain but nausea and vomiting are unvented side effects. In the presence of severe pain, however opioids act on the causative factor of PONV which may help to progress the severity. In this study, the use of Propofol and Etomidate for induction was associated with a lower incidence of 17(29.3%) Postoperative nausea and vomiting than 2(0.0%) ketamine hydrochloride in out of 60 patients (P=0.366). Boysen et al<sup>12</sup> have shown a more incidence of PONV with the thiopentone induction when compared with propofol. Induction with propofol has been recommended for day care procedures because of antiemetic property and its prompt recovery. Patient paralyzed with succinylcholine in this study, were likely to have PONV than those who were not paralyzed (P=0.193). When the use of muscle relaxants does not affect postoperative nausea and vomiting (PONV). Antagonism of residual neuromuscular block with a mixture of neostigmine with atropine increased emesis against the antiemetic action of atropine. In this study, all the 60 patients who received atracurium were given neostigmine and atropine at the end of surgery to reverse its action. Neostigmine has been spoken to have significant emetic properties. It is possible that the use of muscle relaxant increased incidence of PONV observed among the patients who were paralyzed. endotracheal intubation without the use of muscle relaxants and subsequent reversal spread emesis in the postoperative period even through the tube is removed. Patients induced by mechanical stimulation of the pharynx resulting in activation of glossopharyngeal afferents property to the brain stem so that the PONV is show greater in patients maintained with an orotracheal tube than with a nasotracheal tube. This difference is imputed to the angle and probably reflexes to different regional sensitivities for evoking the gag reflex from the pharynx. Throughout the period of this study, potent opioids such as tramadol, fentanyl and nalbuphine were available. Fentanyl and subanesthetic doses of

nalbuphine were used for intra-operative analgesia. Nalbuphine was associated with higher incidence of PON 7 (41.2%) in 0-2 hours and 2-24 hours in the postoperative period compared with fentanyl. Nalbuphine was associated with higher incidence of POV 3 (17.6%) in 0-2 hours and (41.2%) 2-24 hours in the postoperative period compared with fentanyl Nausea and vomiting are reported among the side effects of nalbuphine and fentanyl but it is said to be less common than morphine. The experienced anesthetist has support to the patients who suffer from PONV than the inexperienced this may result from a tendency of the experienced to maintain deeper level of anesthesia. Manual ventilation of lung by using face mask by inexperienced anesthetist before tracheal intubation more responsible for POV compared with an experienced on this effect continued for up to 6 hours after operation. The authors suggested that it may result from nonchalant distension of the stomach with anaesthetic gases. In this study, there was a 28.3% incidence of nausea and 28.3% incidence of vomiting in first 0-2 postoperative hours. This constituted 28.3% of the entire PONV recorded in 2-24 hours. The medical impact of PONV is spoken to be minor because it never chronic and almost never kills although prolong vomiting may lead to more serious complications in rare cases. Postoperative nausea and vomiting may have an economic impact. As major patients undergo surgery under day care condition, the humanitarian and economic implication of postoperative nausea and vomiting are becoming increasingly important from the patient's perspective, PONV interferes with the patient comfort. Most surgical patient reported the fear of suffering postoperative nausea and vomiting PONV more after that the fear of post-op pain.

### Limitations of This Study

In our study, the use of anticholinesterase and atropine was not avoidable and these data may not be applicable for other surgical procedure and anesthesia techniques. No pre-study power analysis was not performed.

### Conclusion

In this study, the overall incidence of postoperative nausea was 17 (28.3%) and vomiting 17 (28.3%) of the 60 patients studied (P=0.139). Sex had more influence on the incidence with females having nausea 8 (21.1%), 11 (28.3%) in 0-2 hours, 2-24 hours postoperatively



while males had 9 (40.9%), 6 (27.3%) in 0-2 hours, 2-24 hours postoperatively. Both Propofol and Etomidate induction agents was associated with lower incidence of PONV compared to thiopentone sodium ( $P=0.366$ ). Nalbuphine was associated with a higher incidence of PONV than opioids using fentanyl. Moderate to severe postoperative pain increased the incidence of postoperative nausea and vomiting ( $P=0.165$ ). To substantiate these outcomes and their clinical relevance, future long-term studies must be conducted to deepen our understanding in these perspectives.

## Bibliography

1. Kortilla K. The study of postoperative nausea and vomiting. *Br J Anaesth.* 1992;69:20s-23s.
2. Koivuranta M, Laara E, Snare L, Alahuhta SA. Survey of postoperative nausea and vomiting. *Anesthesia.* 1997;52:443-449.
3. Vance JP, Neill RS, Norris W. The incidence and etiology of Postoperative nausea and vomiting in a plastic surgical unit. *British Journal of Plastic Surgery* 1973;26:336-339.
4. Rowley MP, Brown TCK. Postoperative vomiting in children. *Anaesthesia and Intensive Care* 1982;10:309-313.
5. Bellville JW, Bross IDJ, Howlans WS. Postoperative nausea and vomiting. IV. Factors related to postoperative nausea and vomiting. *Anesthesiology* 1960;6:186-193.
6. Korttila K, Kauste A, Auvinen J. Comparison of domperidone, droperidol and metoclopramide in the prevention and treatment of emesis sequelae after balanced general anesthesia. *Anesthesia and Analgesia* 1979;58:396-400.
7. Bailey PL, Steisand JB, Pace NL, Bubbers SJM, East KA, Mulder S, Standley TH. Transdermal scopolamine reduces nausea and vomiting after outpatient laparoscopy. *Anesthesiology* 1990;72:977-980.
8. Korttilak, Tammisto T, Aromaa U. Comparison of etomidate in combination with fentanyl or diazepam, with thiopentone as an induction agent for general anesthesia. *British Journal of Anesthesia* 1979;51:1151-1157.
9. Apfel CC, Kranke P, Katz MH, Goepfert C, Papenfuss T, Rauch S, Heineck R, Greim CA, Roewer N. Volatile anaesthetics may be the main cause of early but not delayed postoperative vomiting: a randomized controlled trial of factorial design. *Br J anaesth* 2002;88:659-68.
10. Pierre S, Whelan R. Nausea and vomiting after surgery. *Contin Educ Anesth Crit Care Pain* 2013;13:28-32.
11. Diamond MJ, Bailey D, McPhee A. The gender-dependent pharmacodynamic difference in the antiemetic action of metoclopramide is a dose-related phenomenon. *Canadian Journal of Anesthesia* 1988;35:S65.
12. Lerman J. Surgical and patient factors involved in postoperative nausea and vomiting. *British Journal of Anaesthesia* 1992;69 (Suppl. 1): 24-32.