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Research Article

Prevalence of Postoperative Nausea and Vomiting in Orthopedic Patients in Imam Khomeini Hospital Complex during 2018-2019: A Cross-Sectional Study

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ABSTRACT

Background: Postoperative nausea and vomiting (PONV) is one of the most common postoperative complaints of the patients that affects the surgical outcome, quality of life, length of hospital stay, and costs. The prevalence of nausea and vomiting is estimated at 52% and 25% within the first 24 hours after surgery. Many risk factors have been identified for PONV, including female gender, being a non-smoker, young age, general anesthesia, use of volatile anesthetics and Nitrous Oxide, and duration of anesthesia. Following receiving reports indicating an unusually high prevalence of PONV in the male orthopedic ward of Imam Khomeini Hospital Complex despite applying regional techniques, the present study was conducted to investigate its prevalence and possible reasons.

Methods: After obtaining informed consent, 300 patients admitted to male and female orthopedic wards of Imam Khomeini Hospital complex that had undergone surgery within the past 48 hours were interviewed in person and their medical records were reviewed.

Results: Of 300 patients, 61 (20.3%) had nausea and 39 (13%) had vomiting. Three patients (1%) experienced recurrence of PONV after treatment. The risk factors associated with PONV were female gender, history of motion sickness, general anesthesia with sodium thiopental, atracurium, IV lidocaine, isoflurane, neostigmine, and postoperative administration of ciprofloxacin.

Conclusion: The prevalence of PONV was lower than other studies, which was in contrast to reports received from the ward, indicating a reduction in PONV following the use of regional techniques.

Introduction

Postoperative nausea and vomiting (PONV) is the second most common complication following pain in the postoperative period. Despite extensive studies in this regard in recent decades, PONV is still a common postoperative complaint reported by patients. It may be associated with several adverse consequences such as delayed recovery, unexpected admissions, delayed return to work, pulmonary aspiration, wound dehiscence, and dehydration [1].

The mean prevalence of nausea and vomiting is estimated at 52% and 25% within 24 hours after surgery, respectively. The incidence of PONV is reported to be 20-40% in patients with postoperative opioid use. However, it is as high as 80% in patients with multiple risk factors without proper antiemetic prophylaxis [2-5].

Several risk factors have been studied in this regard as the prevalence of PONV increases to up to 79% in high-risk populations. These risk factors include female

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gender, being a non-smoker, young age, general anesthesia, use of volatile anesthetics and Nitrous Oxide (N2O), and duration of anesthesia.

A high prevalence of PONV imposes an additional burden on the health system. Patients with unresolved PONV may require longer stay in the post anesthesia care unit (PACU) and administration of additional drugs putting an extra financial burden on the healthcare system [6-7].

Several studies have evaluated the causes, prevention, and treatment of PONV after orthopedic surgery [8-11].

There were unusual reports of a high prevalence of PONV in the male orthopedic ward of Imam Khomeini Hospital Complex despite applying regional techniques. The present study was conducted to investigate its prevalence and possible reasons. Since early ambulation of patients is of great importance to the surgical and anesthesiology teams and we did not have an explanation for these reports due to lack of proper statistics, this study was designed and conducted to investigate the incidence and prevalence of PONV and the possible reasons to improve the quality of care and life of the patients through addressing the possible problems and errors.

Methods

This cross-sectional study was conducted after obtaining ethical clearance from the Ethics Committee of Imam Khomeini Hospital Complex (IR.TUMS.IKHC.REC.1397.103). The study population included 300 patients admitted to male and female orthopedic wards of Imam Khomeini Hospital complex that had undergone surgery within the past 48 hours and were willing to participate in the study. The variables were age, sex, type of surgery, type of anesthesia, duration of anesthesia, drugs used for anesthesia, drugs administered in the recovery and ward, history of PONV, history of motion sickness, history of using conventional and unconventional drugs, and history of smoking.

Exclusion criteria: The patients that were not willing to be interviewed or join the study were excluded from the study. Moreover, patients that underwent surgical operations other than orthopedic surgery (like abdominal surgery, neurosurgery, etc.) were excluded from the study.

Face-to-face interviews were conducted with the patients to gather demographic characteristics such as age, sex, height, weight, and type of drug or substance used. Data related to interventions before, during, and after surgery were collected from the medical records of the patients, including the anesthesiology report, order, and nurse report sheets. Consecutive sampling was applied. According to the following formula and considering a prevalence of 52% and 25% for nausea and vomiting within 24 hours after surgery and a loss to follow-up of 10%, 300 patients were required. (p= total prevalence of postoperative vomiting and q=1-p)

The SPSS version 22 was used for data analysis. The quantitative data are presented as mean ± standard deviation (SD) and qualitative data are reported as frequency. P values less than 0.05 were considered significant. Parametric tests were used to analyze the variables with a normal distribution and non-parametric tests were administered to analyze the data with a non-normal distribution. No restrictions were applied since there were no interventions. Informed consent was obtained from the participants and the data were confidential.

Results

A total of 300 patients that had undergone orthopedic surgery were included in the study. The mean age of the patients was 35.3 years (range: 1-92 years). Of 300 patients, 161 (53.7%) were male and 139 (46.3%) were female, 177 (59%) did not have a job and the rest had a job, 215 (71.6%) had a high school education or high school diploma, and 28.4% had an academic education.

The prevalence of postoperative nausea and vomiting was 28.3% and 17% in subjects under 15 years and 18.6% and 12.1% in patients over 15 years respectively, indicating no significant correlation (p>0.05). According to age, a significant correlation was found between PONV and female gender in patients aged over 15 years (Chi square, P=0.036).

According to sex, the prevalence of PONV was 27.3% and 18.7% in women and 14.3% and 8.1% in women, respectively. Although the correlation between sex and PONV was not significant, a significant relationship was found between female gender and PONV in subjects above 15 years (Chi square, p=0.036).

Of 300 patients, 61 (20.3%) had postoperative nausea and 39 (13%) had postoperative vomiting. Three patients (1%) experienced recurrence after treatment.

(Table 1) presents the prevalence of PONV according to body mass index (BMI). The relationship between PONV and BMI was not statistically significant (ANOVA, p=0.09).

Table 1- Distribution of BMI and PONV incidence

	BMI<18	18≤BMI<25	25≤BMI<35	35≤BMI<45
Number	31	137	129	3
Postoperative nausea	38.7%	22.6%	17%	1%
Postoperative vomiting	22.6%	17.5%	8%	0%
ANOVA; P:0.09				

BMI: Body Mass Index ANOVA: Analysis of Variances

The prevalence of PONV according to the type of anesthesia regardless of sex was 24.8% in general anesthesia, 8.1% in neuraxial anesthesia (spinal and epidural), 0% in regional block, 30.8% in general+spinal anesthesia, and 36.3% in general+epidural anesthesia, indicating a significant relationship between PONV and type of anesthesia (Fisher test, p<0.05). (Table 2) presents the prevalence of PONV according to the type of anesthesia, type of surgery, and sex.

Table 2- Distribution of PONV in men and women according to type of anesthesia and surgery

Type of anesthesia	Total number	Prevalence of nausea in women (%)	Prevalence of nausea in men (%)	Prevalence of vomiting in men (%)	Prevalence of vomiting in women (%)	Fisher test; P: 0.00
General	158	33.8	17.2	11.5	23.9	
Neuraxial	94	13.9	13.8	5.2	2.8	
Regional block	26	0	0	0	0	
Mixed Anesthesia technique	22	50	0	0	44.4	
Trauma surgery	158	15	18	9	8	
Non-trauma surgery	142	23	5	1	5	

No significant correlation was found between PONV and occupation and education level (Chi square p= 0.7 and 0.15).

Of 14 patients with a positive history of PONV, 9 experienced both nausea and vomiting, 3 had nausea, and 3 had neither, that was statistically significant (Chi square p=0.00).

The duration of anesthesia was 2 hours in 64 patients, of whom 15.7% had nausea and 6.3% had vomiting, 2-4 hours in 204 patients, of whom 18.2% had nausea and 11.8% had vomiting, and more than 4 hours in 32 patients, of whom 43.8% had nausea and 34.4% had vomiting, indicating a significant difference (Chi square p=0.002).

A significant correlation was found between the recovery time and PONV (ANOVA, p=0.00).

Of 29 participants with a positive history of motion sickness, 15 did not experience nausea or vomiting, 12 had both nausea and vomiting, and 2 only had nausea, indicating a significant correlation (Fisher test, p=0.00).

No significant correlation was found between PONV and smoking, type of surgery, and surgical site (Chi square, p>0.05).

Among anesthetic drugs, administration of IV lidocaine (Fisher test, p=0.023), sodium thiopental (Fisher test, p=0.029), muscle relaxants (atracurium/cisatracurium and succinylcholine), volatile anesthetics (isoflurane/ sevoflurane), reversal drugs, and ciprofloxacin (of 17 patients that received ciprofloxacin, 8 had both nausea and vomiting and 2 had nausea) had a significant correlation with PONV (Chi square, p<0.05).

Other descriptive results are presented in (Table 3).

Table 3- Frequency of numeric variables in patients

	Number	Min	Max	Mean ±SD
Age (year)	300	1	92	35.3±19.2
Height (cm)	300	74	195	160.5±23.8
Weight (kg)	300	10	130	64.2±22.4
BMI	300	10.4	41.3	24.3±4.6
Duration of anesthesia (hour)	300	1	10	3.1±1.3
Duration of recovery (hour)	300	0.5	2	0.7±0.3

Discussion

According to the results, of 300 patients, 61 had nausea and 39 had vomiting. The total prevalence of postoperative nausea and vomiting was 20.3% and 13% in the orthopedic ward, respectively. Three patients (1%) experienced recurrence of PONV after treatment. The prevalence of nausea and vomiting was 27.3% and 18.7% in women and 14.3% and 8.1% in men respectively, which was lower than previous studies, indicating better management of the patients [2-4]. The use of regional techniques can be effective in lowering the prevalence of PONV since it reduces the exposure to anesthetic agents and opioids. On the other hand, administration of proper sedation during surgery (like propofol) reduces the possibility of nausea.

The age range of the participants was very wide, which could be a reason for the prevalence difference with previous studies. For example, no correlation was found

between sex and PONV in general; however, after categorizing the patients to above and under 15 years, this relationship was significant in subjects above 15 years (p=0.036) which is concordant with previous studies indicating that female gender is a risk factor for PONV [6,11].

There is controversy regarding the effect of age on PONV. Some studies found that young age was a risk factor for PONV [6,11] while a study reported that advanced age was a risk factor for PONV (12). In the present study, the prevalence of postoperative nausea and vomiting was 28.3% and 17% in subjects under 15 years and 18.6% and 12.1% in patients over 15 years respectively, though no significant difference was found (p>0.05).

The prevalence of PONV was 24.7% in general anesthesia, 17.1% in IV sedation, 13.8% in spinal anesthesia, 4.3% in epidural anesthesia, 0% in regional block, and 40.9% and 36.4% in combined anesthesia (general + spinal and general + epidural), indicating a significant difference based on the type of anesthesia (p<0.05). Previous studies also confirmed a significant relationship between the type of anesthesia and PONV [6,12].

According to sex, the prevalence of postoperative nausea and vomiting was 17.2% and 11.5% in men receiving general anesthesia, 13.8% and 5.2% in men receiving spinal or epidural anesthesia, 0% in men receiving regional block, and 0% in men receiving combined anesthesia respectively, indicating no significant difference (p=0.519). The prevalence of postoperative nausea and vomiting was 33.8% and 23.9% in women undergoing general anesthesia, 13.9% and 2.8% in women undergoing spinal or epidural anesthesia, 0% in women receiving regional block, and 50% and 44.4% in women receiving combined anesthesia respectively, denoting a significant difference (p=0.002). In other words, the prevalence of PONV was higher in women and in general anesthesia, which is consistent with previous studies [6, 11-12].

No significant correlation was found between PONV and occupation or education level (p>0.05), which was in line with previous studies [6, 11-12].

Of 14 patients with a positive history of PONV, 9 experienced both nausea and vomiting, 3 had nausea, and 3 had neither, indicating a significant difference (p=0.00). Previous studies also reported a significant relationship between PONV in the present admission and a positive history of PONV in previous admissions [11-12].

Of 29 participants with a positive history of motion sickness, 15 did not experience nausea or vomiting, 12 had both nausea and vomiting, and 2 only had nausea, indicating a significant correlation (p=0.00). This finding was consistent with previous studies [11].

In the present study, 64 patients were smokers, of whom 14.1% had nausea and 6.3% had vomiting, and 236 were non-smokers, of whom 22% had nausea and 14.8% had vomiting, indicating no significant difference (p=0.19). In other words, no significant correlation was found between being a non-smoker and PONV in the present study while this relationship was significant in previous studies [6, 11].

Recent studies have shown that BMI has no association with increased risk of PONV [13]. The relationship between BMI and PONV was not significant in the present study (p=0.083).

The duration of anesthesia was 2 hours in 64 patients, of whom 15.7% had nausea and 6.3% had vomiting, 2-4 hours in 204 patients, of whom 18.2% had nausea and 11.8% had vomiting, and more than 4 hours in 32 patients, of whom 43.8% had nausea and 34.4% had vomiting, indicating a significant difference (p=0.002). This finding was consistent with previous studies [6, 12].

No significant correlation was found between the type of surgery (trauma or non-trauma) and PONV (p=0.88) although the author expected a higher prevalence of PONV in trauma patients due to the painful nature of trauma and the need for administration of opioid drugs. A higher prevalence of traumatic injuries in male patients and a higher prevalence of non-trauma surgery in female patients may create a balance between two sex groups as a possible reason for difference with previous studies. On the other hand, the use of regional techniques may have reduced the need for opioid drugs in trauma patients resulting in a non-significant correlation between the type of surgery and PONV [12].

Among anesthetic drugs, the use of IV lidocaine, sodium thiopental, muscle relaxants, volatile agents (isoflurane), reversal drugs, and ciprofloxacin (which was administered to some patients in the wards) had a significant correlation with PONV, which was not reported in the literature. Previous studies confirmed a significant relationship between volatile anesthetics and PONV [6]. However, contrary to previous studies, we found no correlation between PONV and the administration of opioids and ketorolac [14].

PONV had a significant correlation with the administration of corticosteroids and serotonin antagonists in previous studies [15-21] while this correlation was not significant in the present study (p=0.4). A possible reason for this finding is that these drugs are not used in all patients in our hospital; moreover, antiemetics are administered to selected patients with a high risk of nausea and vomiting.

No significant correlation was found between drugs used in recovery room and PONV, which could be due to erroneous recording of drugs.

Conclusion

PONV had a significant association with female sex, a positive history of PONV, motion sickness, type and

duration of anesthesia, and administration of IV lidocaine, sodium thiopental, reversal agents, volatile anesthetics, and muscle relaxants. On the other hand, general anesthesia, especially combined regional and general techniques, increased the prevalence of PONV. However, the use of regional techniques in the orthopedic operating room has been effective in reducing the prevalence of PONV.

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