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Original Article

Evaluation of Post-Operative and Post-Discharge Nausea Vomiting and Associated Risk Factors Among Patients Undergoing Ambulatory Laparoscopic Cholecystectomy in Tertiary Care Hospital

Komal Faheem[1], Farhan Zaheer[1], Sumbla Salman[1], Hassan Shahab[1], Bushra Jawaid[1], Bushra Shakeel[1] and Mohammad Hasan[2*]

[1]Surgical Unit-5, Civil Hospital, Dow University of Health Sciences, Karachi, Pakistan
[2]Department of Internal Medicine, Jinnah Postgraduate Medical Center, Karachi, Pakistan

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***Corresponding Author:**
Mohammad Hasan
Department of Internal Medicine, Jinnah Postgraduate Medical Center, Karachi, Pakistan
m_hasan_96@yahoo.com

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ABSTRACT

Post-operative nausea and vomiting (PONV)may lead to dehydration, bleeding, wound dehiscence, aspiration pneumonitis, and esophageal rupture. Post-discharge nausea and vomiting (PDNV) is acondition occurred during 24-72 hours of discharge. Both conditions have almost the same risk factors. **Objective:** To determine the frequency of post-operative and post-discharge nausea and vomiting and its associated factors among patients undergoing ambulatory laparoscopic surgery in a Tertiary Care Hospital. **Methods:** Total 106 patientsrequiring ambulatory laparoscopic surgery were included. Patient was kept under observation for at least 12 hourstill discharge. Post-discharge time of first incidence of nausea and/or vomiting was recorded. Normality was checked through Shapiro-Wilk test. To compare qualitative variables, chi-square test was used. If following Gaussian distribution, quantitative variables were compared using t-test; otherwise, Mann-Whitney U test was used. Logistic regression was applied to get Odd ratios. P-value ≤0.05 was taken as statistically significant. **Results:** Ketorolac was given to 104(98.1%) patients and only 2(1.9%) received tramadol. The most common complication was excessive bleeding 4(3.8%). Intraoperative opioids were given to 22(20.8%) patients. Post-operative vomiting and nausea among patients were found as 42(39.6%) and 20(18.9%) respectively. Post-discharge nausea and vomiting in patients were found as 14(13.2%) and 6(5.7%) respectively. **Conclusions:** Highprevalence of PONV and low prevalence of PDNV among patients who underwent ambulatory surgeries were reported. After ambulatory surgery the risk factors for PONV are observed as operation time>1h, female gender, postoperative pain during activitie, and postoperative pain at rest.

INTRODUCTION

Due to ongoing advancements in anaesthesia procedures, such as regional anaesthesia, and the availability of ultrashort-acting anaesthetics with fewer side effects, the rate of ambulatory surgery utilisation has continuously grown [1]. After surgical procedures, occuranve of nauseaand vomiting is very are common [2]. Post-operative nausea and vomiting (PONV) is the incidence of either nausea or vomiting or both during initial 24 hours, which is a frequently occurring condition following anesthesia leading to patient dissatisfaction and discomfort [3]. Globally, more than 100,000,000 patients undergo surgery and approximately 30% of them experience PONV [4]. Although there is no accurate information on the prevalence of PONV worldwide, individual studies indicate a prevalence of 20%–30% in normal populations [1, 2]. The clinical state of the patient, the anaesthetic treatment, and the kind of operation have all been connected as risk factors for the development of

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PONV [5]. PONV has several negative effects on patients, which result in dehydration, electrolyte imbalance, and prolonged hospital stays, as well as a reduction in quality of life and general contentment [6]. The occuranve of nausea and/or vomiting during 24-72 hours of discharge is considered as Post-discharge nausea and vomiting (PDNV). PDNV may be occurred in 35-49% of patitnes and can be continue for one week [7]. In literature the occurance of PDNV was found in at least 30% of patients who leave the hospital, especially after daycare surgery. Post discharege nausea and vomiting significantly develop among number of ambulatory patients whihch is associated with the use of analgesics for postsurgical pain. A predischarge PDNV risk assessment and the use of tailored pharmaceutical interventions (a combination of long- and short-acting antiemetics and access to antiemetics at home) are beneficial for high-risk patients [8]. Due to the variety in the research' methodologies, the incidence of PDNV varies. Between 37% and 57% of incidents have been reported [9]. The first three days following discharge are the most crucial for determining the severity of PDNV and distinguishing between nausea and vomiting [1]. Therefore, we planned the current study to separately jot down the frequency of PONV and PDNV and the associated risk factors in patients undergoing ambulatory laparoscopic surgery in a tertiary care hospital.

METHODS

After getting approval from the institutional ethical review committee, this prospective observational study was conducted from 25th August 2022 to 27th February 2023 at the Department of General Surgery, Ruth Pfau Civil Hospital, Dow University of Health Sciences, Karachi, Pakistan. Beforethe enrolment of patients in the study, participants were briefed about the purpose of the research and its benefits and written consent was taken. By considering the reported frequency of 21.3% and 49.0% of PONV and PDNV respectively among patients who underwent laparoscopic procedures with a 5% margin of error and 95% confidence interval the calculated sample size was 106 patients [10]. Sample size calculation was performed using the online available calculator Open-Epi. Patients of both genders with ages ranging from 20 to 60 years having ASA grade I and III were included. Patients with known gastrointestinal diseases, kidney diseases, liver diseases, and malignancies were not part of the current study. Patients with uncontrolled diabetes, hypertension, having a history of alcoholconsumption, drug addiction, menstruating women, pregnant women, and who were receiving antiemetic medications within the last 24-hours before surgery were also not included in the study. Postoperative nausea and vomiting (PONV) were considered positive if the incidence of either nausea or vomiting or both occurred during the initial 24-hours.Post-discharge nausea and vomiting (PDNV) were considered positive if the incidence of nausea and/or vomiting or both has occurred during 24-72 hours of discharge. The postoperative pain severity was observed at 0, 4, and 8 hours using the visual analog scale (VAS), which is a ten-point scoring tool with scoring ranging from 0 to 10, showing 0 being no pain and 10 being unbearable pain [11]. Comorbidities such as diabetes, hypertension, asthma, and ischemic heart diseases were also identified based on self-reported history of the previous year, previous medical records, and evidence of medication to treat these conditions. The confidentiality of the study subjects was assured throughout the study and their medical record was tagged with another serial number to conceal their identity. All the collected data were kept saved password-protected computer that was only accessible to the principal investigator. The data were recorded in a pre-designed structured performa. Detailed physical examination was done upon admission and history was taken by the assigned duty doctor. The pre-anesthetic examination was done for confirming the medical fitness for undergoing the procedure. The duration of surgery (in minutes) was documented. After the procedure, the patient shifted to the recovery room for 30 minutes as per the hospital protocol. The patient was kept under observation in the ward for at least 12 hours according to the hospital practice. During their stay, patient was followed for incidence of nausea and vomiting till their discharge and their pain status was also assessed at 0, 4 and 8 hours post-operatively. Ketorolac 10 mg was administered to patients to rescue analgesia. After confirming the stability of patients, a discharge was given with a follow-up appointment in out-patient department. Patient and/or their care givers were explained to document time of first incidence of nausea and/or vomiting post-discharge. After 72 hours, telephonic calls were made to record the incidence of PDNV. Further patients were called for a follow-up visit on post-discharge day 7 and their final status was noted and documented in out-patient department. SPSS version 21.0 was used for data collection and complication. Frequencies and percentages were determined to present Qualitative variables. For quantitative ariables who followed normal distribution, mean ± standard deviation were calculated. For quantitative variables who did not follow normal distributon were preseted by median and inter-quartile range. The assumption of normality was tested with the Shapiro-Wilk test. The chi-square test was applied to compare qualitative variables among patients with and without PONV and PDNV. Quantitative variables were compared between two groups using an independent t-

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testif following Gaussiandistribution otherwise Mann-Whitney U test was applied. Univariate logistic regression was applied to compute the odd ratio and 95% confidence interval. Variables with p<0.25 were put up in a final regression model to determine the factors associated with PONV and PODNV. P-value ≤0.05 was taken as statistically significant on the final regression model.

RESULTS

The study results showed that there were 84(79.2%) males and 22(20.8%) females. The distribution of American Society of Anesthesiologists (ASA) grades wasnoted as 84(79.2%) had grade I and 22(20.8%) had grade II.It was observed that 12(11.3%) were smokers, 12(11.3%) were hypertensive, 8(7.5%) were diabetic. As far as comorbidities are concerned it was observed that, 2(1.9%) had asthma, 4(3.8%) had hepatitis C, and 2(1.9%) had hepatitis B. There were 8(7.5%) had a history of prior surgery while 8(7.5%) had a history of postoperative nausea and vomiting. All of the patients in the study required rescue analgesics (Table 1).

Table 1: Frequency distribution of demographics and clinical history findings

Variable	Frequency (%)
Gender	
Male	84(79.2)
Female	22(20.8)
ASA Classs	
Grade I	84(79.2)
Grade II	22(18.9)
Smoking	
Yes	12(11.3)
No	94(88.7)
Hypertension	
Yes	12(11.3)
No	94(88.7)
Diabetes	
Yes	8(7.5)
No	98(92.5)
Comorbid	
Asthma	2(1.9)
Hep atitis B	2(1.9)
Hepatitis C	4(3.8)
Prior Surgery	
Yes	8(7.5)
No	98(92.5)
History of PONV in previous surgery	
Yes	8(7.5)
No	98(92.5)
Post op rescue analgesia required	
Yes	106(100)
No	0(0)

The mean age of the patients was 41.37 ± 10.11 years. The duration of the surgery was noted as 47.50 ± 11.97 minutes. The pain score was noted as 2.58 ± 0.67 at 0 hours, 6.34 ± 0.99 at 4 hours, and 3.52 ± 1.15 at 8 hours. The post-operative length of stay was 12.36 ± 1.34 hours (Table 2).

Table 2: Descriptive statistics of Demographic and operative findings

Demographic and operative findings	Mean ± SD	Minimum	Maximum
Age (years)	41.37±10.11	23	70
Duration of surgery (min)	47.50±11.97	30	80
Anesthesia time (min)	59.95±13.19	40	100
Pain score at 0 hour	2.58±0.67	1	4
Pain score at 4 hour	6.34±0.99	4	8
Pain score at 8 hour	3.52±1.15	2	6
Time to rescue analgesia from surgery	3.94±0.92	1	6
Total no. of analgesia from surgery to discharge	3.08±0.93	1	5
Systolic blood pressure	144.43±18.41	120	180
Diastolic blood pressure	78.86±9.66	60	90
Heart rate at recovery room	90.60±5.21	80	100
Sats at recovery room	97.44±1.31	95	99
Post op length of stay (hours)	12.36±1.34	10	16

Ketorolac was given to 104(98.1%) of the patients and only 2(1.9%) received tramadol. Intraoperative complications were found in 4(3.8%) patients. The most common complication was observed as excessive bleeding which was found in 4(3.8%). Intraoperative opioids were given to 22(20.8%) patients. Post-operative nausea and vomiting in patients were found as 42(39.6%) and 20(18.9%) respectively. Post-discharge nausea and vomiting in patients were found as 14(13.2%) and 6(5.7%) respectively (Table 3).

Table 3: Frequency distribution of intra-operative and postoperative findings

Intra-operative and postoperative findings	Frequency (%)
Rescue analgesia	
Ketorolac	104(98.1)
Tramadol	2(1.9)
Intra operative complication	
Yes	4(3.8)
No	102(9.2)
Excessive bleeding	
Yes	4(3.8)
No	102(96.2)
Intra operative analgesia	
Yes	106(100)
No	0(0)
Intra operative opioids	
Yes	22(20.8)
No	84(79.2)
Post operative nausea	
Yes	42(39.6)
No	64(60.4)
Post operative vomiting	
Yes	20(18.9)
No	86(81.1)

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Intra-operative and postoperative findings	Frequency (%)
Post-discharge nausea	
Yes	14(13.2)
No	92(86.8)
Post-discharge vomiting	
Ketorolac	6(5.7)
Tramadol	100(94.3)

We found the association of post-operative and post-discharge nausea and vomiting with gender, smoking, hypertension, diabetes, hypertension, ASA grades, history of postoperative nausea and vomiting in previous surgery, intraoperative complication, intraoperative opioids, and excessive bleeding complication. Post-operative nausea is insignificantly associated with all the factors (p>0.05). Post-operative vomiting is significantly associated with diabetes (p=0.040) and ASA grades (p=0.039). More cases of diabetes were found in those who had postoperative vomiting as compared to those who had not postoperative vomiting. The ASA grading in those who had post-operative vomiting was observed as 12(60%) had grade 1 and 8(40%) had grade 2 while 72(83.7%) had grade 1 and 12(14%) had grade 2 and 2(2.3%) had grade 3 in those patients who had not postoperative vomiting. Post-discharge nausea is significantly associated with a history of PONV in previous surgery (p=0.010). History of PONV in previous surgery was noted as 4(28.6%) in those who had post-discharge nausea while 4(4.3%) in those who had no post-discharge nausea. Our study showed more consumption of intra-opioids in those who had post-discharge vomiting as compared to those who donot have post-discharge vomiting. Post-discharge vomiting is significantly associated with intraoperative opioids (p=0.016). The detailed frequency distribution of post-operative and post-discharge nausea and vomiting is presented in Table 4 and Table 5.

Table 4: Association of postoperative nausea and vomiting with risk factors

Variables	Post-Operative Nausea n(%)		p-value	Post-Operative Vomiting n(%)		p-value
	Yes (n=42)	No (n=64)		Yes (n=20)	No (n=86)	
Gender						
Male	8(19)	14(21.9)	0.810**	2(10)	20(23.3)	0.235**
Female	34(81)	50(78.1)		18(90)	66(76.7)	
ASA Classs						
Grade I	32(76.2)	52(81.3)	0.415**	12(60)	72(83.7)	0.039*
Grade II	10(23.8)	12(18.7)		8(40)	14(16.3)	
Smoking						
Yes	2(4.8)	10(15.6)	0.119**	2(10)	10(11.6)	1.000**
No	40(95.2)	54(84.4)		18(90)	76(88.4)	
Hypertension						
Yes	6(14.3)	6(9.4)	0.535**	4(20)	8(9.3)	0.234**
No	36(85.7)	58(90.6)		16(80)	78(90.7)	
Diabetes						
Yes	6(14.3)	2(3.1)	0.056**	4(20)	4(4.7)	0.040*
No	36(85.7)	62(96.9)		16(80)	82(95.3)	
History of PONV in previous surgery						
Yes	6(14.3)	2(3.1)	0.056**	2(10)	6(7)	0.644**
No	36(85.7)	62(96.9)		18(90)	80(93)	
Intra operative complication						
Yes	2(4.8)	2(3.1)	0.648**	2(10)	2(2.3)	0.161**
No	40(95.2)	62(96.9)		18(90)	84(97.7)	
Intra operative opioids						
Yes	10(23.8)	12(18.8)	0.530**	6(30)	16(18.6)	0.357**
No	32(76.2)	52(81.3)		14(70)	70(81.4)	
Excessive bleeding from liver bed						
Yes	2(4.8)	2(3.1)	0.648**	2(10)	2(2.3)	0.161**
No	40(95.2)	62(96.9)		18(90)	84(97.7)	

Chi-square/fisher exact test was applied
P-value<0.05 was considered as significant
*Significant at 0.01 levels

Table 5: Association of post-discharge nausea and vomiting with risk factors

Variables	Post-Discharge Nausea n(%)		p-value	Post-Discharge Vomiting n(%)		p-value
	Yes (n=14)	No (n=92)		Yes (n=6)	No (n=100)	
Gender						
Male	2(14.3)	20(21.7)	0.729**	2(33.3)	20(20)	0.602**
Female	12(85.7)	72(78.3)		4(66.7)	80(80)	
ASA Classs						
Grade I	12(85.7)	72(78.3)	1.000**	6(100)	78(78)	0.638**
Grade II	2(14.3)	20(21.7)		0(0)	22(22)	
Smoking						
Yes	0(0)	12(13)	0.360**	0(0)	12(12)	1.000**
No	14(100)	80(87)		6(100)	88(88)	
Hypertension						
Yes	0(0)	12(13)	0.360**	0(0)	12(12)	1.000**
No	14(100)	80(87)		6(100)	88(88)	
Diabetes						
Yes	2(14.3)	6(6.5)	0.285**	0(0)	8(8)	1.000**
No	12(85.7)	86(93.5)		6(100)	92(92)	
History of PONV in previous surgery						
Yes	4(28.6)	4(4.3)	0.010*	0(0)	8(8)	1.000**
No	10(71.4)	88(95.7)		6(100)	92(92)	
Intra operative complication						
Yes	0(0)	4(4.3)	1.000**	0(0)	4(4)	1.000**
No	14(100)	88(95.7)		6(100)	96(96)	
Intra operative opioids						
Yes	6(42.9)	16(17.4)	0.069**	4(66.7)	18(18)	0.016*
No	8(57.1)	76(82.6)		2(33.3)	82(82)	
Excessive bleeding from liver bed						
Yes	0(0)	4(4.3)	1.000**	0(0)	4(4)	1.000**
No	14(100)	88(95.7)		6(100)	96(96)	

Chi-square/fisher exact test was applied
P-value<0.05 was considered as significant
*Significant at 0.01 levels

The logistic regression was also applied to calculate the odds ratio. There is a lesser risk of having post-operative nausea and vomiting in females as compared to males.

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Diabetic and hypertensive patients have a lesser riskof having post-operative nausea and vomiting as compared to non-diabetic and nonhypertensive respectively. Patients who received opioids have a 0.738 times lesser risk of postoperativenausea and 0.533 times lesser risk of vomiting as compared to those who received opioids. All the detailed results of the odds ratio among patients to identify predictors for post-operative and post-discharge nausea and vomiting is presented in Table 6 and Table 7.

Table 6: Hazard ratio among patients to identify predictors for post operative nausea and vomiting

Variables	Post-Operative Nausea			p-value	Post-Operative Vomiting			p-value
	Odds	(95% CI)			Odds	(95% CI)		
Gender								
Male ↑	-	-	-	0.726**	-	-	-	0.203**
Female	0.840	0.318	2.221		0.367	0.078	1.717	
Smoking								
Yes	3.704	0.769	17.84	0.103**	1.184	0.238	5.882	0.836**
No ↑								
Hypertension								
Yes	0.621	0.186	2.072	0.438**	0.410	0.110	1.528	0.184**
No ↑								
Diabetes								
Yes	0.194	0.037	1.01	0.051**	0.195	0.044	0.862	0.031*
No ↑								
History of PONV in previous surgery								
Yes	0.194	0.037	1.01	0.051**	0.675	0.126	3.622	0.647**
No ↑								
Intra operative complication								
Yes	0.645	0.087	4.766	0.668**	0.214	0.028	1.623	0.136**
No ↑								
Intra operative complication								
Yes	0.738	0.29	1.91	0.531**	0.533	0.178	1.602	0.263**
No ↑								

↑ Reference Group
Logistic regression was applied
p≤0.05 considered as significant

Table 7: Hazard ratio among patients to identify predictors for post discharge nausea and vomiting

Variable	Post-Discharge Nausea			p-value	Post-Discharge Vomiting			p-value
	Odds	(95% CI)			Odds	(95% CI)		
Gender								
Male ↑	-	-	-	0.525**	-	-	-	.442**
Female	0.600	0.124	2.904		2.000	.342	11.703	
Smoking								
Yes	25007361.6	0.000	-	0.999**	110146003.6	.000	-	.999**
No ↑								
Hypertension								
Yes	282708116	0.000	-	0.999**	110146006.7	.000	-	.999**
No ↑								
Diabetes								
Yes	0.419	0.076	2.316	0.318**	105357046.1	.000	-	.999**
No ↑								
History of PONV in previous surgery								
Yes	0.114	0.025	0.526	0.005*	105357047.5	.000	-	.999**
No ↑								
Intra operative complication								
Yes	25007361.6	0.000	-	0.999**	100967170.1	0	-	.999**
No ↑								
Intra operative opioids								
Yes	0.281	0.086	0.921	0.036*	0.110	0.019	0.646	0.015*
No ↑								

↑ Reference Group
Logistic regression was applied
p≤0.05 considered as significant

DISCUSSION

Although there are several literature on definitions, causes, and treatment suggestions for PONV, one of the most frequent consequences following a range of surgical procedures, there are far less research on the global frequency and severity of this condition (PONV) [7]. The findings of a study indicated that 27.7% of people globally have PONV. Post operative nausea and vomiting prevalence was reported to be 25% in a research conducted in earlier years, this indicat increasing frequency and variety of surgical operations, sophisticated surgical procedures, treatment approaches, and PONV control guidelines all point to a rise in PONV prevalence. In previous research by Stadler *et al.*, that focused on nausea and vomiting, the prevalence was reported as 31.4% and 16.8%, respectively [12]. In comparison to other studies our study also observed 39.6% nausea and 18.9% vomiting postoperatively. Europe had a higher PONV prevalence rate. The demographics of the studied populations, the types of surgeries, the various PONV treatment techniques employed in the nations, and the methods used to record and quantify it in these countries can all be used to explain differences in PONV prevalence between continents. Age and gender had no discernible impact on the prevalence of PONV. In contrast to prior research that suggested that women's age and gender had an impact on the occurrence of PONV. The increased frequency of PONV in younger people and women may be related to variations between the methods utilised in earlier investigations and the current research [13-15]. As of the other studies in literature, our study also observed that female has higher prevalence of postoperative nausea and vomiting but the this the difference in gender is not significant. An approach that is frequently utilized for preoperative assessment is the Apfel simple risk score [16, 17]. Women, nonsmokers, history of PONV or motion sickness, and postoperative painkillers were among the assessment criteria. The study shown that the incidence of PONV may be greatly

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decreased by using a straightforward risk score for hierarchical evaluation and prevention [18]. However, other research contend that the four characteristics listed above may not be the only ones influencing the occurrence of PONV. 10% of patients having ambulatory surgery still develop PONV after utilizing the risk score [19]. In our study, patients with ASA class I has higher pervelance of postoperative nausea and vomiting as compared to patients with ASA class II. In a retrospective case-control analysis, women were three times more likely than men to acquire PONV, which is consistent with the risk factors that have traditionally been discussed in the literature [20, 21]. Due to variations in demographic, age distribution, surgery type, and anaesthesia procedure, the results of each trial are unique. As a result, several research have suggested that although women are a significant factor causing PONV, there may or may not be a connection [22]. The major limitation of our study was that it was a single-centered study and for a shorter period. If such a study would be conducted in multiple institutes, more variables could have been assessed.

CONCLUSIONS

The prevalence of PONV was high but the prevalence of PDNV was low among patients who underwent ambulatory laparascopic surgeries. Further it can be concluded that surgery time >1h, with female gender, postoperative pain at rest, and postoperative pain during activities were found as independent risk factors that causing PONV after any ambulatory laparoscopic surgery.

Authors Contribution

Conceptualization: KF, FZ, BJ
Methodology: KF, SS, HS, BS
Formal analysis: FZ, MS
Writing-review and editing: MS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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