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Original Research Article

Evaluation of Prevalence and Risk Factors of Nausea and Vomiting in the Postoperative ENT Surgery Patients

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Abstract

Background: Incidence of nausea and vomiting is high among the post-operative patients undergoing ENT surgeries. In spite of advancement in the anaesthetic drugs and techniques understanding the mechanism of post-operative nausea and vomiting (PONV) remains a dogma to both the surgeon and the anaesthetist alike. Management of such patient in the post operative ward remains as a challenge to the participants of Post-operative unit.

Aim of the Study: To find out the incidence, risk factors and management of PONV among the patients undergoing ENT surgeries.

Materials: 218 postoperative ENT patients were monitored for the presentation of PONV in a tertiary Hospital for during October 2020 and October 2022. Patients belonging to both genders and aged between 03 and 65 years were included. Demographic factors and risk factors were analyzed based on their contribution to produce PONV.

Results: Among the 218 patients there were 69/218 (31.65%) in the paediatric age group between 03 and 15 years. The mean age was 19.25±2.35 years. The remaining 149/218 (68.34%) patients were aged above 15 years. The mean age was 38.15±3.11 years. The distribution of patients in the age groups selected were not significantly different; p value was 0.211 (p value more than 0.05). Intravenous induction of anaesthesia was significantly more prone to produce PONV than inhalational induction, (p value 0.025; p significant at <0.05).

Conclusions: The overall incidence of PONV among the patients undergoing ENT surgeries was 41.74%. The risk factors of PONV were age, gender, motion sickness, previous history of PONV, smoking, thiopental induction, use of opioids pre and post operatively and presence of pain. PONV could be assessed and treated judiciously when a definite protocol is developed in every Hospital. The nature of surgery contributing to PONV was inconclusive from the study.

Keywords: Nausea, Vomiting, PONV, Anaesthesia, ENT surgeries, Tonsillectomy and Mastoidectomy.

Introduction

During the recovery period from surgery under various types of anesthesia nausea and vomiting (PONV) are the common, unpleasant experiences sometimes distressing feeling expressed by the patients, [1] PONV could be due to the

surgery proper, anaesthesia and opioid therapy used before, during or after the surgery [2]. Nausea and vomiting are not the similar and few drugs are anti-nausea and few are antiemetic [3]. Nausea is an unpleasant feeling or sensation to vomit but may not be always resulting in vomiting, but vomiting is forceful expulsion of stomach contents. [4] There are various causes enumerated for PONV and are classified as patient related, anesthetic and surgical factors. [5] Among the patient related factors female gender is a strong risk factor and consistent in encountering PONV with an odds ratio (OR) of approximately 3 times more common. [6-8] The other patient related risk factors seen were non-smoking status and previous history of motion sickness and/or PONV. [9] Increasing age of the patient decreased the incidence of PONV. [10] Among the pediatric age groups, children aged above 3 years are more prone for PONV. [11] Volatile anesthetic drugs used during anesthesia were observed to be a risk factor causing two-fold increased incidence of the PONV. [6,8] Use of narcotic analgesics (opioid drugs) administration in the intra-operative or immediate postoperative period was shown to higher incidence of PONV [6,8-10] The nature of surgeries also remains risk factors in producing PONV, the common ENT procedures were Tonsillectomy, Micro laryngeal surgeries, Mastoiodectomy and FESS. [12] Many authors use Apfel's risk factor tool [4] in assessing the risk factors which require release of 5-hydroxytryptamine (5-HT) in a cascade of neuronal events involving both the central nervous system and gastrointestinal tract. The 5-HT subtype 3 receptor (5-HT3) participates selectively in the emetic response. [13] PONV is not a simple adverse effect of Anesthesia or surgery but may lead to many physiological and economic problems. The prevalence of PONV In the general population is about 0.2% of total patients undergoing surgeries. PONV also causes delayed Hospital discharges, sometimes requires re-admission which ultimately results in reduced satisfaction by the patient and increases the cost of surgeries. [14] The severe complications which may result due to PONV are suture dehiscence, Hemetemesis due to esophageal rupture, aspiration pneumonia, retching of vomiting, dehydration, fluid and electrolyte imbalance, and raised intracranial pressure. [15] The incidence in the post operative ward may sometimes be as high as 20-30%, calling for close observation, attention and treatment by the ward staff with advanced modern equipment. [16] The PONV incidence among the children above 03 years and below 18 years was reported to be as high as 40%. [17] In higher risk populations as mentioned above, undergoing ENT surgeries may result in higher incidence approximately 80%. [18] Furthermore, it was reported that prophylactic antiemetic drugs have a beneficial effect in preventing PONV especially in ENT surgeries such as Adeno-tonsillectomy and Middle ear otherwise he incidence of PONV would raise up to 36-76% and 80% respectively. [19] Hence it was concluded that ENT surgeries are relatively less prone to produce PONV and that makes the patients sick and delayed discharges. In this background and context, a cross sectional study was conducted to assess the incidence and risk factors of PONV in patients ENT surgeries and their management.

Type of study: A cross sectional prospective, quantitative hospital-based study.

Duration of Study: 2 years: October 2020 and October 2022.

Institution of Study: PVS Hospital, Kozhikode, Kerala

Study population: 218 patients admitted in the wards of department of ENT, PVS Hospital, Kozhikode, Kerala for different elective ENT surgeries were included. All the patients with ASA classification I and II were included.

Sampling Method: The total number of subjects was chosen as 218 (n-218) based on the previous studies in the institute and sampling formula:

Data collection tool and techniques: The data was collected from the patients, nurses', treating surgeons and anaesthetists about preoperative, intra-operative and postoperative complains of PONV by the patients. The method of scaling the severity of PONV was done by using Apfel's risk factor tool; (risk factors for PONV onset included age, gender, PONV history, motion sickness, smoking status, postoperative opioid use, and duration and type of surgery).

An institutional ethics committee clearance was obtained and its approved data collection proforma was used in this study.

Inclusion Criteria: Patients of both genders and aged between 03 and 65 years were included. Patients willing to submit the proforma after due consent were included. Patients undergoing elective ENT surgeries were included. Patients admitted for the ENT surgeries and staying for more than 48 hours were included, Pre anesthetic examination showing ISA classification grade I and II patients were included.

Exclusion Criteria: Patients Aged below 03 years and above 65 years were excluded. Patients who were not willing to participate or submit the data were not included. Patients with Diabetes, Hypertension and immuno-deficiency disease were not included. Patients undergoing cancer treatment were not included. Patients undergoing treatment as day care surgery were not included. All the patients were subjected to thorough ENT examination and Pre Anaesthetic check-up before confirming the time and date of surgery. Laboratory investigations to included surgical profile were done in all the patients. Pre anaesthetic check up was done by the same anaesthetists for all the patients and given ISA classification grade I and II patients were included. The ENT surgeries included were Tonsillectomy, Micro laryngeal surgeries, Mastoiodectomy and FESS. The questionnaire contained three parts:

1. The fixed patient findings predictive of PONV.
2. The preoperative assessment giving features of ENT surgery, method of induction of anesthesia.
3. Postoperative observational findings like nausea, outcomes during observation using Apfel's risk factor. Fixed time intervals for clinical assessment were used to note the parameters at 0-02 hours, 02 to 12 hours and 12 to 24 hours. The first 6 hours were spent by the patients in the Postoperative ward attached to the operation theatre and later they were shifted to the wards. All the data was recorded by the same ENT anesthetists who administered the anesthesia. Overall supervision and cross checking were done by the corresponding author, nursing matron and the senior professor of anesthesiology. The patents were interrogated before surgery, followed by intra-operative anesthetic techniques and drugs used were noted.

Anesthesia procedure

All patients were subjected to General anesthesia. Pre-anesthetic medication included Inj. Atropine and antiemetic Inj. Ondoncetron. Adult patients were not given

opioids but few children received it. Induction of anesthesia was done by Inj. sodium thiopental or Inj. Propofol. Inj. Fentanyl was administered at appropriate doses in both adults and children. Certain children received induction by halothane. Muscle relaxant used was Inj. suxamethonium or Inj. vecuronium. Anesthesia was maintained with nitrous oxide, O2 mainly. In some patients Air and isoflurane or halothane were used. IPPV was used for ventilation and in some patients spontaneous breathing was allowed. Reversal of muscle relaxation was done by using Inj. Neostigmine and atropine in required doses. Endotracheal tube was extubated once the patients are fully awake. PNOV symptoms were treated with Inj. metochlopramide or Inj. Ondoncetron in appropriate doses.

Variables: The socio-demographic variables were; age, Gender, BMI, smoking. The clinical parameters were; Drugs, site of surgery, duration of surgery, NGT presence, pain, fasting time, early feeding, and anesthetic techniques. The outcome variable was postoperative nausea and vomiting.

Validity and reliability: The content validity of the points mentioned in the proforma was judged by the Anesthetists who were involved in the surgeries along with the ENT surgeons who operated.

Data entry and statistical analysis

Data was collected in Excel sheet and computer software SPSS version 22 was used to analyze it. Percentage and mean (SD) or median (IQR) depending on normality were used as analysis tools for socio-demographics. Frequency and percentage were used to analyze the background information, preoperative, intra-operative and postoperative variables. Comparing the duration of fasting, duration of ventilation via face mask, and time of first oral intake with PONV was analyzed using the Mann Whitey U test. Significance of association between the occurrence of PONV and its identified risk factors was done by using chi-square test; risk factors found to be significant at univariate level. P $\leq$ 0.05 was taken as significant value.

Results

Among the 218 patients included in the study there were 69/218 (31.65%) in the pediatric age group between 03 and 15 years. The mean age was 19.25±2.35 years. The remaining 149/218 (68.34%) patients were aged above 15 years. The mean age was 38.15±3.11 years. The distribution of patients in the age groups selected were not significantly different; p value was 0.211 (p value more than 0.05), (Table 1). There were 116/218 (63.21%) males and 92/218 (42.20%) females with a male to female ratio of 1.26:1. There were 71/218 (32.56%) non-smokers and 137/218 (62.84%) smokers in the study. The p value was significant with p value at 0.001 (p value taken as significant at 0.05). The BMI was calculated for patients below 15 years and above 15 years separately to avoid gross misrepresentation.

It was observed that there were 18/69 children who were under weight, 34/69 normal and 11/69 and 05/69 children were overweight and obese respectively (Table1). The BMI was calculated for patients above 15 years and it was observed that there were 28/149 patients who were under weight, 64/149 normal and 135/149 and 22/69 patients were overweight and obese respectively (Table1). Motion sickness was present in 29/218 (13.30%) patients and not present in 189/218 (86.69%) patients which was significant as the p value was 0.001 (Table 1). PONV in the previous surgeries was elicited in the subjects and it was found that it was present in 58/218 (26.60%) patients and absent in 160 (73.39%) patients

which was a significant association with p value at 0.001 (Table 1).

Table 1

Demographic variables	Number	Percentage	P value
Age in years			
03 to 15	69	31.65	
16 to 25	43	19.72	
26 to 35	32	14.67	0.211
36 to 45	30	13.76	
46 to 55	24	11.00	
56 to 65	20	09.17	
Gender			M: F
Male	116	63.21	1.26
Female	092	42.20	
Smoking			
Yes	071	32.56	**0.001**
No	137	62.84	
BMI			
Less than 15 years			
Low weight	18	08.25	
Normal	34	15.59	
Over weight	11	05.04	
Obese	05	02.29	
Less than 13 years			0.325
Low weight	28	12.84	
Normal	64	29.35	
Over weight	35	16.05	
Obese	22	10.09	
Motion sickness			
Yes	029	13.30	**0.001**
No	189	86.69	
History of PONV			
Yes	058	26.60	**0.001**
No	160	73.39	

Preoperative assessment of the subjects in regards to the type of surgery, ASA grade, co-morbidities, fasting time and opioids used, showed that 49.54% of them underwent ear surgeries, 24.31% underwent nose surgeries and 24.31% of them underwent throat surgeries. 26.60% of them were grade ASA I and 73.39% were ASA grade II type patients. 12.30% of the patients had co-morbidities like diabetes mellitus, hypertension, COPD and renal diseases. 55.96% of the patients have fasting time less than 12 hours and 44.03% of them had fasting time more than 12 hours. Opioids were used before surgeries in 19.72% and not used in 75.68% of the subjects. (Table 2) There was significant association in cases of ASA types, fasting time and opioids used in the study (Table 2).

Table 2: Showing the Pre anaesthetic information of the subjects (n-218).

Preoperative assessment	Number	Percentage	P value
Type of ENT surgery			
Ear- 108- (49.54%)			
Grommet insertion	14	6.42	
Curettage for keratosis obturans	10	4.58	
Perichondritis' curettage	08	3.66	
Mastoid abscess I&D	12	5.50	
Myringoplasty	21	9.63	
Mastoidectomy	23	10.55	
MRM	10	4.58	0.381
Stpedotomy	08	3.66	
Osteoma EAM	02	0.91	
Nose-53- (24.31%)			
FESS	15	06.88	
Ethmoidal polypectomy	13	05.96	
MMA	25	11.46	
Throat-57- (26.14%)			
Tonsillectomy	18	08.25	
Adeno-tonsillectomy	11	05.04	
I&D for retropharyngeal abscess	03	01.37	
I&D parapharyngeal Abscess	04	01.83	
MLS	13	05.96	
Cyst Epiglottis excision	02	0.91	
Thyroplasty type II and III	06	02.75	
ASA types			
Class I	058	26.60	**0.001**
Class II	160	73.39	
Co morbidities- 29 (12.30%)			
Diabetes	14	06.42	
Hypertension	05	02.29	0.224
Renal diseases	06	02.75	
COPD	04	01.83	
Nil orally			
Less than 12 hours	122	55.96	**0.001**
More than 12 hours	096	44.03	
Opioids premedication			
Used	043	19.72	**0.001**
Not used	165	75.68	

A multivariate analysis of PONV in this study across many variables was done using Chi square test to calculate the significance and it was observed that Intravenous induction of anaesthesia was significantly more prone to produce PONV than inhalational induction, (p value 0.025; p significant at <0.05). Ventilation time had an effective role in preventing the PONV in this study as the patients ventilated for more than 10 minutes accounted for lesser PONV in the post operative period (133/218 patients were ventilated more than 10 minutes out of which 49 patients developed

PONV; the p value was at 0.014). Muscle relaxants used had no role in the patients to develop PONV (p value at 0.157). Maintenance of anaesthesia with inhalational gases like halothane and isoflurane or patients on spontaneous anaesthesia or IPPV had no significant association with PONV (p values more than 0.05. (Table 3) Reversal of muscle relaxants used also had no significant association with PONV (p value at 0.411). Duration of surgeries had no significant association with the incidence of PONV in this study (p value at 0.355). Patients developing pain in the post operative period had a higher incidence of PONV with p value at 0.001 (Table 3). Oral intake of liquids either before or after 10 hours had no significant association with the PONV (p value at 0.511). Risk factors like age, gender, smoking, previous history of PONV, motion sickness and type of surgery had statistical significant association with PONV in the study with p value at 0.001 (Table 3).

Table 3: Showing the different variable during the study (n-218).

Observation	Total	%	PONV-97		P value
			Positive N, %	Negative N, %	
Induction					
Intravenous					
Pentothal sodium	144	84.40	79, (36.23)	65, (29.81)	
Propofol	40	18.34	18, (08.25)	22, (10.09)	**0.025**
Fentanyl	218	100	97, (44.49)	121, (55.50)	
Inhalation Induction					
Halothane	064	29.35	11, (05.04)	53, (24.31)	**0.025**
Ventilation Time					
< 5 minutes	28	12.84	15, (06.88)	13, (05.96)	
5 to 10 minutes	57	26.14	33, (15.13)	24, (11.00)	**0.014**
10 to 15 minutes	81	37.15	36, (16.51)	45, (20.64)	
More than 15 minutes	52	23.85	13, (05.96)	39, (17.88)	
Muscle relaxant used					
Succinylcholine	172	78.89	73, (33.48)	99, (45.41) 13, (05.96)	
Vecuronium	025	11.46	12, (05.50)	15, (06.88)	0.157
Both	021	09.63	12, (02.75)		
Antiemetic used				38, (17.43)	
Dexamethasone	051	23.39	13, (05.96)	68, (31.19)	
Ondoncetron	122	55.96	54, (24.77)	30, (13.76)	**0.001**
Nil	045	20.64	30, (13.76)		
Maintenance					
Inhalation gases used					
Halothane	84	38.53	25, (11.46)	59, (27.06)	0.291
Isoflurane	22	10.09	06, (02.75)	18, (08.25)	
Type of ventilation					
Spontaneous	134	61.46	61, (27.98)	73, (33.48)	0.356
IPPV	084	38.53	36, (16.51)	48, (22.01)	
Reversal					
Neostigmine and Atropine	218	100	97, (44.49)	121, (55.50)	0.411
Duration of surgeries					
0 to 30 minutes	11	05.04	02, (0.91)	09, (04.12)	

30 to 60 minutes	47	21.55	19, (08.71)	28, (12.84)	0.355
60 to 120 minutes	68	31.19	23, (10.55)	45, (20.64)	
120 minutes and above	92	42.20	53, (24.31)	39, (17.88)	
Postoperative assessment					
Pain	91	41.74	73, (33.48)	18, (08.25)	
Oral intake					**0.001**
Before 10 hours	110	50.45	66, (30.27)	44, (20.18)	
After 10 hours	108	49.54	31, (14.22)	77, (25.22)	0.298
PONV					
Nausea	46	44.03	46, (21.10)	00	
Vomiting	27	38.53	27, (12.38)	00	
Retching	24	17.43	24, (11.00)	00	
Risk factors					
Age					
Below 15 years	69	31.65	48, (22.01)	21, (09.63)	
Above 15 years	149	68.34	49, (22.47)	100, (45.87)	
Gender					
Male	116	63.21	63, (28.89)	53, (24.31)	
Female	92	42.20	34, (15.59)	58, (26.16)	
Smoking					
Yes	71	32.56	51, (23.39)	20, (09.17)	
No	137	62.84	46, (21.10)	91, (41.74)	**0.001**
Previous PONV					
Yes	160	73.39	65, (29.81)	95, (43.57)	
No	58	26.60	32, (14.67)	26, (11.92)	
Motion Sickness					
Yes	189	86.69	79, (36.23)	110, (50.45)	
No	29	13.30	18, (08.25)	11, (05.05)	
Type of surgery					
Ear	108	49.54	51, (23.39)	57, (26.14)	
Nose	53	24.31	31, (14.22)	22, (10.09)	
Throat	57	26.14	15, (06.88)	32, (14.67)	

Discussion

PONV (Postoperative nausea and vomiting) are the commonest complaints received in the post operative ward by the health personnel either by the patients or their attendants. Untreated PONV could result in patients' distress, prolonged hospital stays and increased cost. [20] The prevalence of PONV is high in spite of advanced anesthetic agents, both intravenous and inhalational and anti-emetic drugs, advanced multi discipline approach. Adequate hydration, judicious use of less emetic anesthetic drugs, anti-emetics, analgesics, minimizing the duration of surgery are key points in reducing the PONV incidence. [21] The overall incidence of PONV in this study was 44.49%. This could be due to inclusion of 69/218 (31.65%) pediatric age group patients in the study; tonsillectomy and adenoidectomy accounting for 29/69 (42.02%) of the total pediatric patients. In a

similar study by Caminero JM (2016), (20) and Chau DF, Reddy A, Breheny P, Young AR et al [21] reported a higher incidence of PONV among the children but they commented that the ENT surgeries caused lesser PONV among the children. Reports from Thailand, India, and USA also support these findings. [22,23] Even though many risk factors and other factors' influence on PONV among the ENT post operative surgical patients was observed in this study, but the actual influence of those factors on PONV is still debatable. Multiple factors may be playing their role in its causation. A multivariate analysis of PONV in this study across many variables was done using Chi square test to calculate the significance and it was observed that Intravenous induction of anaesthesia was significantly more prone to produce PONV than inhalational induction, (p value 0.025; p significant at <0.05). Ventilation time had an effective role in preventing the PONV in this study as the patients ventilated for more than 10 minutes accounted for lesser PONV in the post operative period (133/218 patients were ventilated more than 10 minutes out of which 49 patients developed PONV; the p value was at 0.014). Muscle relaxants used had no role in the patients to develop PONV (p value at 0.157). Maintenance of anaesthesia with inhalational gases like halothane and isoflurane or patients on spontaneous anaesthesia or IPPV had no significant association with PONV (p values more than 0.05. (Table 3) The causes of increased PONV in patients are classified as 1. Patient's risk factors 2. Pre-operative. 3. Intra-operative. 3. Post –operative, anaesthetic, surgical and duration of stay, pain after surgeries. [24,25] In this study there were 116/218 (63.21%) males and 92/218 (42.20%) females with a male to female ratio of 1.26:1. In studies conducted by Lubis and Kristiantian showed higher percentage of PONV which was 62.3% in males and 37.7% in females. [26] In this study motion sickness, BMI, cigarette smoking, opioids used preoperatively, history of previous PONV and uses of muscle relaxants were found to be risk factors for PONV. But the study by Yosief PK, Beraki GG *et al* showed that there was no significant correlation with PONV. [6] This study was found to be similar to studies which showed greater incidence of PONV in patients with history of motion sickness. In the study conducted by Yosief PK, Beraki GG *et al* patients who underwent throat surgery (37.1%) had higher incidence of PONV followed by the nose surgeries (23.3%) and Lastly the Ear surgeries (16.7%). [6] In the present study however the ear surgery patients showed higher degree of PONV followed by the nose and the least with throat surgeries. In this study there was no significant increase in the incidence of PONV with the duration of fasting, which was similar to the study of Yosief PK, Beraki GG *et al*. [6] In a study by Kovac AL showed that long duration of fasting resulted in dehydration which predisposed to PONV. [26] In this study Ventilation time had an effective role in preventing the PONV in this study as the patients ventilated for more than 10 minutes accounted for lesser PONV in the post operative period (133/218 patients were ventilated more than 10 minutes out of which 49 patients developed PONV; the p value was at 0.014). However, Yosief PK, Beraki GG *et al* showed that the longer time of ventilation via face mask is the higher the risk of PONV. [6] It was observed in this study that that Intravenous induction of anaesthesia was significantly more prone to produce PONV than inhalational induction, (p value 0.025; p significant at <0.05). Yosief PK, Beraki GG *et al*. [6] also observed that the use of sodium thiopental as induction agents had significant increase in the incidence of PONV (RR = 1.72, 95%

CI 1.03-2.87) as compared to Propofol. Whereas Propofol was used in their study for day care procedures as it promoted fast recovery and had anti-emetic property. In a similar study by Mishra AR [19] it was observed that PONV was less common during the first 24 hours following surgeries than by Inj. Pentathal sodium. In this study volatile anesthetic gases used in the maintenance of anesthesia had shown lesser incidence of PONV. But Volatile agents had resulted in increased PONV incidence in the study by Yi MS, Kanq H *et al* [27] decreasing serum level of cannabinoids neurotransmitters that act on cannabinoid-1 and transient receptor potential vanilloid-1 receptor to suppress nausea and vomiting. In this study IPPV and spontaneous respiration were used during the surgical procedures and there was no significant difference in the causation of PONV. In the study by Yosief PK, Beraki GG *et al*, IPPV was the common mode of ventilation (93.6%) used for maintenance of anesthesia and had a higher occurrence of PONV (33.3% versus 25%) than spontaneous mode of ventilation. In contrary to the above study Weibel S, Jelting Y, Pace NL, *et al*. [28] showed that the use of spontaneous ventilation had a higher incidence of PONV. In this study neuromuscular relaxation was reversed by Inj. Neostigmine and Inj. Atropine and it had no effect on the increased risk of patients developing PONV. But in the study by Yosief PK, Beraki GG *et al*. [6] administration of Inj. Neostigmine and atropine was found to produce statistically significant incidence of PONV (RR = 1.80, 95%CI 1.07-3.03). In the present study the ppatients' developing pain in the post operative period had a higher incidence of PONV with p value at 0.001 (Table 3). Out of 41.74% of the patients in the study who experienced pain 33.8% had PONV. Pain is a risk factor causing PONV in the patients who had pain was 2.38 times higher than those without. This study was supported by similar results published in Kenyatta Hospital wherein 60% of the patients experienced pain and showed statistically significant outcome of PONV. [29] When the postoperative pain is not treated the chances of PONV increases. Alleviation of pain results in relief from nausea, but opioid drugs when used to relieve pain themselves may cause nausea and vomiting. Pain if not managed properly may produce similar change in the area postrema and chemoreceptor trigger zone (CTZ) thereby lowering the threshold for vomiting. [30]

Limitation of the study: Assessing the nausea and vomiting in pediatric age group patients was difficult and relief obtained using antiemetics was also not adequate.

Conclusion

The overall incidence of PONV among the patients undergoing ENT surgeries was 41.74%. The risk factors of PONV were age, gender, motion sickness, previous history of PONV, smoking, thiopental induction, use of opioids pre and post operatively and presence of pain. PONV could be assessed and treated judiciously when a definite protocol is developed in every Hospital. The nature of surgery contributing to PONV was inconclusive from the study.

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