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Original Research Article

"A comparative study on the efficacy of ondansetron-dexamethasone combination with ondansetron alone in the prevention of PONV in the patients undergoing middle ear surgery"

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ABSTRACT:

Background: In the absence of antiemetic treatment, the estimates put the incidence of PONV at 25 – 30 % of all surgical interventions and patient population. Of these, 0.18 % suffer severe, intractable PONV.[6] There have been volleys of systemic reviews in the world literature on PONV.[7, 8, 9.] However there is no consensus on the specific treatment of PONV.

Primary Objective: To compare the effectiveness of Ondansetron and Ondansetron - Dexamethasone combination for prevention of postoperative nausea and vomiting in adult patients (18 to 55 years) undergoing middle ear surgery.

MATERIAL & METHODS: Study Design: A prospective, randomized, comparative study.

Study area: Department of Anaesthesiology, N K P Salve Institute of Medical Sciences and Research Centre, Nagpur, Maharashtra. **Study Period:** 1 year. **Study population**: Patients, of both sexes in the age group of 18 to 55 years, who were scheduled for Middle Ear Surgery under General Anaesthesia, belonging to ASA CLASS I & II. **Sample size:** study consisted of 60 cases. **Sampling method:** Simple random method. **Study tools and Data collection procedure:** The study was conducted in 60 patients, of both sexes in the age group of 18 to 55 years, who were scheduled for Middle Ear Surgery under General Anaesthesia, belonging to ASA CLASS I & II. To allow for sufficient time for informed consent, the patients were provided with written information at the outpatient preoperative evaluation clinic a few days before the actual operation. Patients were explained about Nausea, Vomiting and Retching. They were also taught about Visual analogue scale (VAS) and were taught how to express the degree of pain on the scale.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE07, 2022

Results: In group A, 60%(18 out of 30) patients had nausea whereas in group B, 36.66%(11 out of 30) patients complained nausea The difference in incidence of nausea was statistically significant (P<0.0001).

CONCLUSION: Thus we can conclude that ondansetron with combination of dexamethasone has better prophylactic and antiemetic effect than ondansetron alone to prevent postoperative nausea and vomiting after middle ear surgery, considered as high risk for PONV.

Keywords: Postoperative nausea and vomiting, antiemetic, Ondansetron,

INTRODUCTION:

Postoperative nausea and vomiting (PONV) are distressing and most common adverse events after general anaesthesia and surgery[1, 2, 3] and PONV has been aptly called the "big little problem".[4] The determination of true incidence of PONV is difficult due the lack of a single stimulus of onset and multiple etiologies. In addition, PONV, although being common but thought to be not serious in its nature, has been associated with various complications ranging from minor incisional pain to more severe hematoma, wound dehiscence, esophageal rupture, bilateral pneumothorax, and increased risk for aspiration. Furthermore, discharge from the postanaesthesia care unit (PACU) may be delayed, and hospital admission (or readmission) in ambulatory patients often occurs due to PONV, which increases the overall medical cost.[5] Hence, prophylactic antiemetic therapy is needed for these patients.

In the absence of antiemetic treatment, the estimates put the incidence of PONV at 25 – 30 % of all surgical interventions and patient population. Of these, 0.18 % suffer severe, intractable PONV.[6] There have been volleys of systemic reviews in the world literature on PONV.[7, 8, 9.] However there is no consensus on the specific treatment of PONV.

Middle ear surgery is a high risk for PONV, as the vestibular apparatus is in close vicinity to the site of surgery[10]. Between 50% and 80% of patients who undergo these surgical procedures experience PONV. These operations stimulate the vestibular labyrinth, which, in turn, activates the chemoreceptor trigger zone [11]. The trigger zone is located in the area postrema (near the trigonum of the vagus nerve), which contains a high concentration of 5-HT3 receptors [12]. The vomiting reflex may be activated when serotonin stimulates the vagal afferents through the 5-HT3 receptors. This response leads to activation of the parvicellular reticular formation, which will produce emesis.

Ondansetron, a 5-HT3 antagonist, is the "gold standard" antiemetic because of its safety and efficacy compared with alternatives. Most studies regarding ondansetron and PONV have reported only surrogate measures, such as the incidence of PONV and the number of emetic episodes per patient, rather than the more clinically meaningful "true" (non surrogate) outcome measures, such as patient satisfaction, duration of hospital stay, and incidences of unanticipated hospital admissions. Ondansetron, the prototype serotonin 5-HT3 antagonist, is safe and effective in the prophylaxis of PONV after high-risk procedures, such as otolaryngological (ENT) surgery[14].

Dexamethasone, a corticosteroid with anti-emetic action by an unknown mechanism, has been effective in the prevention of postoperative nausea and vomiting only when given near the beginning of surgery, probably by reducing surgery-induced inflammation, but it has higher efficiency in combination with other anti-emetics[15].

ISSN: 0975-3583,0976-2833 VOL13, ISSUE07, 2022

Hence the present study was undertaken to compare the efficacy of ondansetron-dexamethasone combination with ondansetron alone in the prevention of PONV in the patients undergoing middle ear surgery.

Primary Objective: To compare the effectiveness of Ondansetron and Ondansetron - Dexamethasone combination for prevention of postoperative nausea and vomiting in adult patients (18 to 55 years) undergoing middle ear surgery.

Secondary Objectives:

1. To correlate occurrence of PONV with factors like gender, duration of surgery, degree of postoperative pain in both the study groups.
2. To assess the requirement of rescue antiemetic in both the groups.
3. To assess patient satisfaction in both the groups.
4. To study any side effects of the study drugs in both the groups.

MATERIAL & METHODS:

Study Design: A prospective, randomized, comparative study.

Study area: Department of Anaesthesiology, N K P Salve Institute of Medical Sciences and Research Centre, Nagpur, Maharashtra.

Study Period: 1 year.

Study population: Patients, of both sexes in the age group of 18 to 55 years, who were scheduled for Middle Ear Surgery under General Anaesthesia, belonging to ASA CLASS I & II.

Sample size: study consisted of 60 cases.

Sampling method: Simple random method.

Inclusion criteria:

• Age 18 to 55 years.
• ASA Grade I – II.
• No history of medical illness in past.
• Normal liver and renal functions.

Exclusion criteria:

• Previous history of motion sickness.
• History of Gastro-oesophageal reflux.
• History of Previous PONV.
• Anti-emetic therapy within 24 hours before surgery.
• Patient's refusal.

Ethical consideration: Institutional Ethical committee permission was taken prior to the commencement of the study.

Study tools and Data collection procedure:

The study was conducted in 60 patients, of both sexes in the age group of 18 to 55 years, who were scheduled for Middle Ear Surgery under General Anaesthesia, belonging to ASA CLASS I & II. To allow for sufficient time for informed consent, the patients were provided with written information at the outpatient preoperative evaluation clinic a few days before the actual operation. Patients were explained about Nausea, Vomiting and Retching. They were also taught about Visual analogue scale (VAS) and were taught how to express the degree of pain on the scale. Pre-anaesthetic assessment was done in participated subjects and a detailed history was taken. Investigations like Hb%, complete blood count, blood group, cross match,

ISSN: 0975-3583,0976-2833 VOL13, ISSUE07, 2022

blood sugar, urine analysis, bleeding time, clotting time, kidney function test, ECG (where indicated) were advised. Procedure to be performed was explained to the patient and their written consent was taken in their own language.

After induction and prior to the surgical procedure, the study drug was administered intravenously diluted with normal saline to a total volume of 10 ml in each group.

Group A : Ondansetron 0.1mg/kg i.v.

Group B : Ondansetron 0.1mg/kg + Dexamethasone 150 mcg/kg (With maximum dose of 8mg)

Patients who experience 2 or more emetic episodes received inj. Metoclopromide 0.2 mg/kg intravenously as rescue antiemetic. Those who received rescue antiemetic were classified as treatment failure, and were considered to experience both nausea and vomiting. Complete response was defined as no PONV and no need for another rescue anti-emetic medication in the 24-hour observation period. Pain was also evaluated on a visual analogue scale (VAS) of 0-10 as pain gives rise to anxiety and is likely to contribute to PONV.

Patient's satisfaction was assessed at the end of 24 hrs and rated as poor, good and excellent. Patients were assessed for any side effects like headache, dizziness, itching, etc.

STATISTICAL ANALYSIS:

All the data were entered into the excel database from paper pro-forma. During the data entry, data was checked for any error or missing data. After resolution of all issues, the database was analyzed. Following analyses were performed. Results are expressed as the number, percentages, mean ± SD as appropriate. Statistical analysis was done by using descriptive statistics and inferential statistics using Chi square test, Mann Whitney U test and Student's t-test. Nominal categorical data among study groups were compared using the chi-square test. $P < 0.05$ was considered to be statistically significant. The statistical software used in the analysis was SPSS17.0 version and graph pad prism 5 version and results were tested at 5% level of significance.

OBSERVATIONS & RESULTS:

Table 1: Age wise distribution of patients in both the groups

Age Group(yrs)	Group A	Group B	ϰ2-value	p-value
11-20	0(0%)	2(6.67%)	3.24	0.51 NS, p>0.05
21-30	12(40%)	10(33.33%)		
31-40	10(33.33%)	10(33.33%)		
41-50	8(26.67%)	7(23.33%)		
>50	0(0%)	1(3.33%)		
Total	30(100%)	30(100%)		
Mean	33.93	33.83		
SD	9.09	9.01		

Analysis of Variance is used. The age of the patients in both the groups were comparable (p>0.05). The difference was not statistically significant.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE07, 2022

Table 2: Gender wise distribution of patients in both the groups

Gender	Group A	Group B	א2-value	p-value
Male	14(46.67%)	13(56.67%)	0.06	0.79 NS, p>0.05
Female	16(53.33%)	17(43.33%)		
Total	30(100%)	30(100%)		

Gender wise distribution of the patients in both the groups were comparable (p>0.05). The difference was not statistically significant.

Table 3: Incidence of nausea in both the groups

	No of patients with nausea	Percent (%)	א2-value	p-value
Group A	18	60	14.65	P<0.0001 S
Group B	11	36.66		

In group A, 60%(18 out of 30) patients had nausea whereas in group B, 36.66%(11 out of 30) patients complained nausea The difference in incidence of nausea was statistically significant (P<0.0001).

Table 4: Incidence of vomiting in both the groups

	No of patients with vomiting	Percent (%)	א2-value	p-value
Group A	12	40	5.45	0.019 S, p<0.05
Group B	4	13.33		

The incidence of vomiting in group A was 40% (12 in 30) and in group B the incidence was 13.33% (4 in 30). The difference was statistically significant (P<0.019)

Table 5: Number of patients requiring rescue antiemetic in both the groups

	No of patients requiring rescue antiemetic	Percent(%)	א2-value	p-value
Group A	3	10	1.07	0.30 NS, p>0.05
Group B	1	3.33		

The requirement of rescue antiemetic in group A was seen with 3 patients (10%), whereas in group B, only 1 patient (3.33%) required rescue antiemetic. The difference was statistically insignificant (P=0.30).

ISSN: 0975-3583,0976-2833 VOL13, ISSUE07, 2022

Table 6: Comparison of mean duration of surgery in both the groups

Mean Duration (minutes)	Group A	Group B	t-value	p-value
Total	191.50	196.50	0.45	0.64 NS, p>0.05

Mean duration of surgery was compared in both the groups. In group A, the mean duration of surgery was 191.50 minutes and in group B, it was 196.50 minutes, which were comparable.

Table 7: Comparison of mean duration of surgery in PONV (+) and PONV (–) patients in both the groups

		Mean Duration of Surgery (minutes)	t-value	p-value
Group A	PONV +	206.38	3.51	0.002 S, p<0.05
	PONV -	160.83		
Group B	PONV +	214.54	1.37	0.18 NS, p>0.05
	PONV -	189.73		

The difference of mean duration of surgery between PONV (+) and PONV (-) patients in group was statistically significant (P=0.002). In group B, it was comparable.

Table 8: Comparison of pain on VAS at various time intervals in group A and B

Time Interval(hours)	Group A	Group B	z-value	p-value
0-2	0.76±1.00	0.50±0.86	1.103	0.275,NS,p>0.05
2-4	1.23±0.89	1.46±1.07	0.913	0.365,NS,p>0.05
4-8	2.96±1.15	3.20±1.18	0.771	0.444,NS,p>0.05
8-12	0.56±0.62	1.26±1.17	2.885	0.005,S,p<0.05
12-16	0.03±0.18	0.16±0.46	1.472	0.146,NS,p>0.05
16-20	0.00±0.00	0.06±0.36	1.000	0.321,NS,p>0.05
20-24	0.53±0.62	1.00±1.08	2.041	0.046,S,p<0.05

Analysis of Variance is used for comparison. P value less than 0.05 is considered as statistically significant. The table shows mean VAS scores in the 2 groups at different pre-designed time intervals.

The mean VAS at 0-2, 2-4, 4-8, 8-12, 12-16, 16-20 and 20-24 hours in group A were, 0.76, 1.23, 2.96, 0.56, 0.03, 0.00 and 0.53 respectively. The mean VAS at 0-2, 2-4, 4-8, 8-12, 12-16, 16-20 and 20-24 hours were, 0.50, 1.46, 3.20, 1.26, 0.16, 0.06 and 1.00, respectively.

These scores were comparable in both the groups when compared at different pre-designed time intervals.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE07, 2022

Table 9: Patient's Satisfaction Score in both the groups

Patient's Satisfaction	Group A	Group B	א2-value	p-value
Poor	7(23.33%)	3(10%)	2.88	0.23
Good	8(26.67%)	6(20%)		
Excellent	15(50%)	21(70%)		
Total	30(100%)	30(100%)		

Patient's satisfaction score was evaluated as poor, good and excellent in both the groups and Chi square test was applied. In group A, 7(23.33%), 8(26.67%), 15(50%) patients rated postoperative course as poor, good and excellent, respectively. In group B, 3(10%), 6(20%) and 21(70%) patient's rated postoperative course as poor, good and excellent, respectively. These results were comparable and the P value was 0.23.

Table 10: Comparison of mean VAS score at different time interval of PONV (+) and PONV (–) patients in Group A

Time Interval(hours)	PONV +	PONV -	z-value	p-value
0-2	18/8(2)	7/22(0.31)	13.07	0.0003,S,p<0.05
2-4	25/16(1.56)	12/14(0.85)	0.26	0.60,NS,p>0.05
4-8	43/14(3.07)	46/16(2.87)	0.26	0.60,NS,p>0.05
8-12	8/8(1)	9/22(0.40)	13.07	0.0003,S,p<0.05
12-16	0/0(0)	1/30(0.03)	60.00	P<0.0001,S
16-20	0/0(0)	0/30(0)	60.00	P<0.0001,S
s20-24	0/0(0)	16/30(0.53)	60.00	P<0.0001,S

Analysis of Variance is used for comparison. P value less than 0.05 is considered as statistically significant. The table shows mean VAS scores in PONV (+) and PONV (-) patients in group A at different pre-designed time intervals. The difference in mean VAS is statistically significant in time interval 0-2 and 8-12 (P=0.003 and P=0.003, respectively). The difference in mean VAS is comparable in time interval 2-4 and 4-8(P>0.05). In 12-24 hours' period P value is significant, but this cannot be commented as no patients during this period had PONV.

Table 11: Comparison of mean VAS score at different time interval of PONV (+) and PONV (–) patients in Group B

Time Interval (hours)	PONV +	PONV -	z-value	p-value
0-2	10/6(1.66)	5/24(0.20)	21.60	P<0.0001,S
2-4	12/6(1.75)	32/24(1.33)	21.60	P<0.0001,S
4-8	33/9(3.66)	63/21(3.00)	9.60	0.001,S,p<0.05
8-12	8/6(1.33)	30/24(1.25)	21.60	P<0.0001,S
12-16	0/0(0)	5/30(0.16)	60	P<0.0001,S
16-20	0/0(0)	2/30(0)	60	P<0.0001,S

ISSN: 0975-3583,0976-2833 VOL13, ISSUE07, 2022

20-24	0/0(0)	30/30(1)	60	P<0.0001,S

Analysis of Variance is used for comparison. P value less than 0.05 is considered as statistically significant. The table shows mean VAS scores in PONV (+) and PONV (-) patients in group B at different pre-designed time intervals. The difference in mean VAS is statistically significant in time interval 0-12 (P<0.0001 in 0-2, 2-4 and 8-12 hours and P=0.001 in 4-8 hours). In 12-24 hours' period P value is significant, but this cannot be commented as no patients during this period had PONV.

DISCUSSION:

There are different types of drugs, which have been used to prevent PONV. In a recent meta-analysis, it was concluded that, it is very likely that the best prophylaxis of postoperative nausea and vomiting (PONV) currently available is by combining dexamethasone with a selective 5-hydroxytryptamine type 3 (5-HT3) receptor antagonist. Such combinations are both safe and efficacious in paediatric, obstetric, breast, middle ear, and other surgery associated with a high risk of PONV [16].

In our study we have compared the efficacy of ondansetron 4 mg alone with the combination of ondansetron 4 mg and dexamethasone 8 mg i.v. given prophylactically just after induction of anaesthesia in 60 adult patients (18 – 55 years) undergoing elective middle ear surgery under general anaesthesia. The general characteristics of patients in relation to age and sex, type of surgery, duration of surgery and anaesthesia, total amount of opioid used, pain, intraoperative and postoperative haemodynamics which may modify PONV were not significantly different in these two study groups.

In our study, 18 patients out of 30 in group A felt nauseated, making the incidence of nausea 60% compared to incidence in group B, 36.66%, that is 11 patients out of 30 reporting episodes of nausea. The result is statistically significant (P<0.0001). Incidence of vomiting in group A was 40% (12 out of 30 patients) compared to13.33% (4 out of 30 patients) in group B which is also statistically significant (P=0.019). Our results are in line with the study by Bhattarai B et al 2011[17], where they found that the total incidence of PONV was reduced from 24% in ondansetron group to 8% in ondansetron and dexamethasone combination group. Similar results are reported by Mendes MN et al 2009 [18], Gautam B et al 2008 [19] who also found that the incidence of nausea and vomiting is less with combination of ondansetron with dexamethasone compared to ondansetron alone.

In our study, 16 and 14 patients felt nauseated (88.88% and 77.77%) in early and late postoperative period respectively in group A compared to 7 and 9 (63.63% and 81.81%)in group B. The difference was statistically significant for early postoperative period (P<0.0001). Similarly, the difference in incidence for vomiting in early postoperative period between both the groups is statistically significant (P=0.01). In group A, 7 and 7 patients (58.33% and 58.33%) experienced vomiting in early as well as late postoperative period, whereas in group B, 3 patients had vomiting in early period compared to 2 patients in late period (75% and 50%).

In our study, the mean duration of surgery in both groups was more than 3 hours. The study drugs were administered soon after induction. Hence early period which is upto 4 hours postoperatively was better for combination group as compared to Ondansetron alone group.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE07, 2022

Though dexamethasone has long duration of action, our data for late postoperative period does not reflect this fact.

Gautam B et al 2008 [19] in their study compared ondansetron, dexamethasone and combination of both for prevention of PONV. They found that incidence of vomiting was significantly high and failure of prophylaxis (19.1%) occurred in group dexamethasone during the first six hours (P=0.023 versus Ondansetron & 0.008 versus Ondansetron Dexamethasone). They concluded that dexamethasone alone is significantly less effective in preventing early vomiting compared to its combination with ondansetron; whereas ondansetron alone is less effective against late PONV as compared with combination therapy.

Bhardwaj N et al 2004 [20] found ondansetron and its combination with dexamethasone to be more effective in preventing early (0 to 4 hours) nausea and vomiting compared to placebo, however, Group Ondansetron and group Ondansetron + Dexamethasone were comparable. No difference was seen in the late postoperative period in between the groups. Our study results are in accordance with this result.

In our study, PONV scoring was done in every time interval specified. The cumulative scores of PONV over 24 hours in both the groups were comparable. The total mean PONV score over 24 hours in group A and group B was 3.44 and 2.90 respectively, which was not significant statistically (P=0.42). This can be explained, as the patients who had 2 episodes of vomiting in the early time intervals, received rescue antiemetic and their PONV scores remained 0 thereafter, till 24 hours. For those patients who experienced only nausea or had a single episode of vomiting, did not receive any rescue antiemetic and their scores either remained 1 or 0, in 24 hours' period.

In our study, rescue antiemetic was required in 3 patients (10%) in group A and 1 patient (3.33%) in group B. In group A, 2 patients required rescue antiemetic in late postoperative period. In group B, rescue antiemetic requirement was in late postoperative period. The difference is not statistically significant (P=0.3). However, Bhattarai B et al 2011 [17] in their study found 12 patients in group 1 (ondansetron group) who complained of PONV, 11 patients received rescue antiemetic, whereas 1 patient who had mild nausea did not need rescue antiemetic. In Group 2, (ondansetron + dexamethasone), all the 4 patients who complained of PONV, received rescue antiemetic. This was found to be statistically significant ($P<0.050$).

Rescue antiemetic requirement as seen in the study by Usmani H et al 2003 [21] was 17%, 20% and 0% in ondansetron, dexamethasone and ondansetron + dexamethasone groups, respectively. But these results are not analyzed for statistical significance.

Another well-established risk factor for occurrence of PONV is duration of surgery. Sinclair D et al. 1999 [22], found that there was a direct association between the duration of anaesthesia and the incidence of PONV. The frequency increased from 2.8% among patients with surgical duration of 30 minutes to 27.7% among patients with surgery lasting 151-180 minutes. Cohen M et al 1994 [23], in their study, have stated that increased nausea vomiting scores and increased incidence are associated with increased duration of surgery.

The mean duration of surgery was comparable between the groups (191.50 in group A and 196.50 in group B). So we decided to analyze our results further and compared the durations of surgery in group A, between those who suffered PONV (206.38 minutes) to those who did not suffer PONV (160.83 minutes) and similarly for group B, those with PONV (214.54

ISSN: 0975-3583,0976-2833 VOL13, ISSUE07, 2022

minutes) versus those without PONV (189.73 minutes). The difference in group A was found to be statistically significant (P=0.002). Hence we feel that PONV is associated with longer duration of surgery in our study as well.

Mean time for analgesic administration was 302.50 minutes in group A and 313.83 minutes in group B. Statistically the difference is insignificant (P=0.73). Our results are corresponding with Lopez-Olaondo L et al 1996 [24] and McKenzie R et al 1994 [25] who did not find difference in pain intensity and requirement of postoperative analgesic amongst their study groups.

Panda NB et al 2004 [16], studied effect of ondansetron and ondansetron + dexamethasone combination in middle ear surgery patients and found that patients were more satisfied significantly in the combination group compared to ondansetron group. Lopez-Olaondo L et al 1996 [24] studied ondansetrone and dexamethasone alone and in combination with placebo group in major gynaecological surgeries. No patient in their study scored postoperative comfort as bad. Comfort found was greater in combination group than in placebo group ($P<0.05$). Our results do not match the results of the above mentioned studies as patient satisfaction is comparable in both of our study groups.

CONCLUSION:

Thus we can conclude that ondansetron with combination of dexamethasone has better prophylactic and antiemetic effect than ondansetron alone to prevent postoperative nausea and vomiting after middle ear surgery, considered as high risk for PONV.

REFERENCES:

1. Watcha MF, White PF. Postoperative nausea and vomiting. Its etiology, treatment, and prevention. Anesthesiology 1992; 77: 162-84.

2. Rudra A, Roy A. Postoperative nausea and vomiting – Review Article. Indian J Anaesth 1996; 44: 226-36.

3. Rudra A, Mandal, Rudra P, Kumar. Droperidol and Metoclopramide in PONV of Laparoscopy. Indian J Anaesth 2005; 49 (2) : 109 - 112.

4. Fisher DM. The “big little problem” of postoperative nausea and vomiting : do you know the answer yet ? Anesthesiology 1997; 87: 1271-3.

5. Tramer MR. Treatment of postoperative nausea and vomiting. BMJ 2003; 327:762.

6. Kovac AL. Prevention and treatment of postoperative nausea and vomiting. Drugs 2000; 59: 213-243.

7. McKay WP, Yip RW. Distribution of randomised controlled trials of drugs for postoperative nausea and vomiting. Can J Anaesth 2000; 47(5): 421-26.

8. Watcha MF. Postoperative nausea and emesis : Anesth Clin North America 2002; 20(3): 471-84.

9. Kazemi-Kjellberg F, Henzi I, Tramer MR. Treatment of established postoperative nausea and vomiting. A quantitative systemic review. BMC Anaesthesiol 2001; 1(1): 2. This article is available from: http://www.biomedcentral.com/1471-2253/1/2

10. Honkavaara P, Saarnivaara L, Klemola UM. Prevention of nausea and vomiting with transdermal hyoscin in adults after middle ear surgery during general anaesthesia. Br J Anaesth 1994; 73(6):763-766.

11. Habib AS, Gan TJ. Evidence-based management of post-operative nausea and vomiting. Can J Anaesth 2004; 51:326-341.

ISSN: 0975-3583,0976-2833 VOL13, ISSUE07, 2022

12. Bunce KT, Tyers MB: The role of 5-HT in postoperative nausea and vomiting. Br JAnaesth 1992;69:(7 Suppl 1):60S-62S.
13. McGoldrick KE: Anesthesia for elective ear, nose and throat surgery. In: McGoldrick KE (ed): Anesthesia jr Ophthalmic and Otolayngologic SurgeT, Philadelphia: W.B. Saunders, 1991:101-5.
14. Sun R, Klein KW, White PF. The effect of timing of ondansetron administration in outpatients undergoing otolaryngologic surgery. Anesth Analg 1997; 84:331– 6.
15. Lages N, Fonseca C, Neves A et al. –Postoperative Nausea and Vomiting: A review of the "Minor-Major" Problem. Rev Bras Anestesiol, 2005;55:575-585.
16. Panda NB, Bharadwaj N, Kapoor P et al. Prevention of nausea and vomiting after middle ear surgery: Combination of ondansetron and dexamethasone is the right choice. J Otolaryngol 2004;33(2):88-92.
17. Bhattarai B, Shrestha S, Singh J. Comparison of ondansetron and combination of ondansetron and dexamethasone as a prophylaxis for postoperative nausea and vomiting in adults undergoing elective laparoscopic surgery. J Emerg trauma Shoch 2011;4(2):168-172.
18. Mendes M, Monteiro R, Martins F. Prophylaxis of postoperative nausea and vomiting in morbidly obese patients undergoing laparoscopic gastroplasties. A comparative study among three methods. Rev Bras Anestesiol 2009; 59: 5: 570-576.
19. Gautam B, Shrestha BR, Lama P et al. Antiemetic prophylaxis against postoperative nausea and vomiting with ondansetron-dexamethasone combination compared to ondansetron or dexamethasone alone for patients undergoing laparoscopic cholecystectomy. KUMJ.2008;6(23):319-28.
20. Bhardwaj N, Bala I, Kaur C et al. Comparison of ondansetron with ondansetron plus dexamethasone for antiemetic prophylaxis in children undergoing strabismus surgery. J Pediatr Ophthalmol Strabismus 2004;41(2):100-4.
21. Usmani H, Quadir A, Siddiqui R et al. Ondansetron and dexamethasone in middle ear procedures. Indian J otolaryngology and Head and neck Surgery 2003;55(2):97-99.
22. Sinclair DR, Chung F, Mezei G. Can Postoperative Nausea and Vomiting Be Predicted? Anesthesiology1999; 91:109-18.
23. Cohen M, Duncan PG, DoBoer DP et al. The postoperative interview: Assessing risk foctors for Nausea and Vomiting. Anesth Analg 1994;78: 7-16.
24. Lopez-Olaondo L, Carrascosa F, Pueyo F. Combination of ondansetron and dexamethasone in the prophylaxis of postoperative nausea and vomiting. BJA 1996; 76:835-40.
25. McKenzie R, Tantisira B. Comparison of Ondansetron with Ondansetron Plus Dexamethasone in the Prevention of Postoperative Nausea and Vomiting. Anesth Analg 1994; 79:961-4.