Original Research Article

A comparative study of metoclopramide, dexamethasone and ondansetron in control of nausea and vomiting after spinal anesthesia for cesarean section

Dhanee Majhi[1], Mousumi Das[2*]

[1]Senior specialist anesthesiologist, Dept. of Anesthesia, TRL, Krosaki, Bel Pahar, Jharsuguda, Odisha, India
[2]Asst. Prof, Dept. of Anesthesia, Kalinga Institute of Medical sciences, KIIT University, Bhubaneswar, Odisha, India
[*]Corresponding author email: **mousumi.das1503@gmail.com**

International Archives of Integrated Medicine, Vol. 8, Issue 1, January, 2021.
Available online at http://iaimjournal.com/
ISSN: 2394-0026 (P) **ISSN: 2394-0034 (O)**
Received on: 05-01-2021 **Accepted on:** 12-01-2021
Source of support: Nil **Conflict of interest:** None declared.
How to cite this article: Dhanee Majhi, Mousumi Das. A comparative study of metoclopramide, dexamethasone and ondansetron in control of nausea and vomiting after spinal anesthesia for cesarean section. IAIM, 2021; 8(1): 50-57.

Abstract

Background: The etiology of intraoperative nausea and vomiting is complex; it may be attributed to surgical stimulation, hypotension, vagal stimulation and uterotonic drugs.
Aim: The aim of the present study was to evaluate efficacy of prophylactic anti-emetics in patients undergoing spinal anesthesia for cesarean section administered intravenously injection metoclopramide, dexamethasone, and ondansetron as antiemetic.
Materials and methods: The patients were randomly divided into 4 groups, Group M (Metoclopropamide), Group D (Dexamethasone), Group O (Ondensetron) and Group P (Normal Saline) and each group was having 20 patients. Incidence of nausea and vomiting, need for rescue antiemetic were monitored after spinal anesthesia, every 15 min during surgery and post-operatively every 30 min up to 4 hours. The statistical software namely SPSS 20.0, were used for the analysis of the data.
Results: Demographic profile of patients were comparable in all the three groups and were found to be statistically not significant ($p>0.05$). The intraoperative nausea and vomiting (IONV) was more in Group P (45% and 40%) in comparison to Group M (15% and 5%), Group D (40% and 30%) and Group O (10% and 5%) and IONV was more in Group D as compared with Group M and Group O. The post-operative nausea and vomiting was more in Group P than Group M, D, O but not statistically significant.

Conclusion: In our study, high incidence of IONV with dexamethasone 8 mg i.v. as compared to metoclopramide 10 mg and ondansetron 4 mg. However, all the study drugs were found to be effective in reducing the incidence of nausea and vomiting significantly, reducing the requirement of rescue anti-emetics during the observation period intra-operatively and post-delivery.

Key words

Metoclopramide, Dexamethasone, Ondansetron, Nausea, Vomiting, Cesarean Section, Spinal Anesthesia.

Introduction

Cesarean delivery under regional anesthesia has become increasingly popular due to increased patient acceptability, improved foetal condition at birth and greater maternal safety [1, 2].

The incidence of intraoperative nausea and vomiting (IONV) during spinal anesthesia for non-obstetric surgery ranges from 7% to 42% [3]. The overall incidence of intraoperative nausea and vomiting (IONV) during regional anesthesia for cesarean section is extremely variable, up to 80%.

The etiology of intraoperative nausea and vomiting is complex; it may be attributed to surgical stimulation, hypotension, vagal stimulation and uterotonic drugs.

Metoclopramide, a Dopamine (D2) receptor antagonist; Dexamethasone a corticosteroid and Ondansetron, a selective antagonist of the 5-hydroxytryptamine (5-HT3) receptors have antiemetic properties.

Aim and objectives

The aim of the present study was to evaluate efficacy of prophylactic anti-emetics in patients undergoing spinal anesthesia for caesarean section administered intravenously injection metoclopramide, dexamethasone, and ondansetron as antiemetic.

Materials and methods

The present study was conducted in Department of Anesthesiology, S.C.B Medical College, Cuttack after due approval by the department and hospital ethical committee. For the study, eighty adult ASA Grade I or Grade II patients of female sex in the age group 18 to 35, who underwent elective cesarean section under spinal anesthesia, were taken into consideration.

The following patients were not included in the study:

- Patients with ASA score III or IV.
- Patient with history of acid peptic disease or hepatic dysfunction.
- Patient with history of cardiac disease.
- Patients with history of motion sickness
- Patient with history of epilepsy.
- Previous history of PONV.
- Any anti emetic medication 24 hours prior to surgery.
- Pregnancy induced hypertension.
- Diabetes mellitus.
- Allergies to local anaesthetics and study drugs.
- Height <5ft.
- Emergency caesarean section.

Patients who were on steroid therapy or had received antiemetic or drugs known to produce emesis within 48 hours before surgery were also excluded.

Allocation of the groups

The patients were randomly divided into 4 groups of 20 patients each. The randomization was done using a computer generated random number table. Each consenting patient was given a consecutive randomization number.

- Group M (n =20) Inj metoclopramide 10 mg i.v.

- Group D (n =20) Inj dexamethasone 8 mg i.v.
- Group O (n =20) Inj ondansetron 4 mg i.v.
- Group P (n =20) normal saline (placebo) 2 ml i.v.

Anesthetic preparation

On arrival in the operation theatre, routine vital monitors like ECG, pulse oxymetry, non-invasive blood pressure were attached to the patient. Preoperative baseline study parameters were recorded. Intravenous access was secured with an 18G cannula & an infusion of ringer's lactate solution 20 ml/kg pre-loading was started. All the study drugs were introduced intravenously 10 min prior to administration of spinal anesthesia.

Spinal anesthesia was administered in the sitting position with 0.5% hyperbaric bupivacaine (2.5 ml) with 25 gauge Quincke's lumbar puncture needle at the interspace between L3-4 with midline approach. Following confirmation of spinal block by loss of sensation to cold and pinprick, to T6 -8 level, surgery started. After administration of spinal anesthesia, women were put in the supine position with a 15 degree wedge under the right hip for left uterine displacement and supplementation of oxygen 3L flow per minute were administered through facemask. Syntocinon was administered through intravenous infusion at the time of umbilical cord clamping.

Emetic episodes (nausea and/or vomiting) experienced by women were recorded intra-operatively and up to 4 hours post delivery period in the post – operative ward. If any episodes of emesis during observation were treated with 0.075 mg Inj. Palenosetron 75 mcg i.v. as rescue antiemetic to the patient.

Parameters noted:

Following parameters were recorded before and after giving the drugs at 5 min interval till the spinal anesthesia given.

- Incidence of nausea and vomiting
- Need for rescue antiemetic.

All parameters were monitored after spinal anesthesia, every 15 min during surgery and post operatively every 30 min during study period.

Statistical analysis

The statistical software namely SPSS 20.0, were used for the analysis of the data and Continuous data are presented as mean ± SD. ANOVA test were used for parametric data analysis and Chi-square test, Kruskal Wallis test and Mann Whitney U test were used to analyze non-parametric data (P<0.05= statistically significant).

Results

Table - 1 shows demographic profile of patients' age, weight and height were comparable in all the three groups and were found to be statistically insignificant (p>0.05).

Table - 1: Demographic variables.

Characteristics	Group M (n=20)		Group D (n=20)		Group O (n=20)		Group P (n=20)		P value
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
AGE (YRS)	23.5	2.8	24.8	2.7	23.7	2.8	23.7	2.8	0.413
WEIGHT (kg)	67.03	5.1	67.9	3.9	68.2	4.4	67.6	4.4	0.8
HEIGHT (cm)	152.2	4.06	157.9	4.09	158.5	3.3	157.4	3.1	0.335

Table - 2 shows the intraoperative nausea and vomiting was more in group P (45% and 40%) in comparison to group M (15% and 5%), group D (40% and 30%) and group O (10% and 5%).

Table - 3 shows comparison of incidence of PONV among four groups, P value <0.05= statistically significant (p value calculated by Kruskal – Wallis Test).

Table - 2: Incidence of intra operative nausea and vomiting (IONV).

Parameters	Group M	Group P	P value
Nausea	3(15%)	9(45%)	0.04
Vomiting	1(5%)	8(40%)	0.009
Total	4(20%)	17(85%)	<0.05

Parameters	Group D	Group P	P value
Nausea	8(40%)	9(45%)	0.752
Vomiting	6(30%)	8(40%)	0.513
Total	14(70%)	17(85%)	NS

Parameters	Group O	Group P	P value
Nausea	2(10%)	9(45%)	0.014
Vomiting	1(5%)	8(40%)	0.009
T total	3(15%)	17(85%)	<0.05

Parameters	Group M	Group D	P value
Nausea	3(15%)	8(40%)	0.08
Vomiting	1(5%)	6(30%)	0.04
Total	4(20%)	14(70%)	<0.05

Parameters	Group M	Group O	P value
Nausea	3(15%)	2(10%)	0.637
Vomiting	1(5%)	1(5%)	1.00
Total	4(20%)	3(15%)	NS

Parameters	Group D	Group O	P value
Nausea	8(40%)	2(10%)	0.03
Vomiting	6(30%)	1(5%)	0.04
Total	14(70%)	3(15%)	<0.05

NS= Not significant; Statistically significant, if<0.05(p value is calculated by Mann Whitney U Test)

Table - 4 shows the postoperative nausea and vomiting was more in group P than group M, D, O but not statistically significant in all four hours.

Table - 5 shows, need for rescue antiemetic was found statistically significant.3 (15%) patients in group M, 7(35%) patients in group D, 3(15%) patients in group O and 11(55%) patients in group P need rescue antiemetic.

Discussion

Spinal anesthesia is an easy, rapid and safe technique for caesarean section. The present study was undertaken to assess the magnitude of nausea and vomiting after spinal anesthesia for caesarean section and to evaluate and compare the antiemetic effects of i.v. metoclopramide 10 mg, dexamethasone 8 mg and ondansetron 4 mg on the same.

As an antiemetic, ondansetron has been used in a dose range of 4-8 mg and the minimum effective antiemetic dose of ondansetron is 4 mg, the usual dose for preventing PONV as mentioned in various clinical studies. Dershwitz, et al. studied 6 different doses of ondansetron for the prevention of PONV and they recommended the 4 mg dose [4]. Abouleish, et al. found that use of 4 mg ondansetron during CS decreased the occurrence of the emetic symptoms significantly when compared with the placebo [5]. In the present study we also used ondansetron at a dose of 4 mg and the emetic symptoms observed in Group O was similar to the previous studies.

Dexamethasone 8 mg iv is the minimum effective dose for the prevention of nausea and vomiting which is being supported by Lee Y, et al. [6] (2004) who designed his study on 240 female patients receiving different dose ranging dexamethasone 2, 4, 8, or 12 mg for preventing morphine administration patient- controlled analgesia- related nausea and vomiting vs droperidol with saline and suggested that dexamethasone 8 mg iv is the minimum effective dose for the reduction of PCA morphine-related nausea and vomiting.

In the study, it was found that total incidence of IONV was 85% in saline group as compared to 20%, 70% and 15% in the metoclopramide

group, the dexamethasone group and the ondansetron group respectively. Thus the frequency of intraoperative nausea and vomiting experienced by group M and group O were similar ($p>0.05$) whereas incidence of nausea &vomiting in group D is significantly high ($p<0.05$). This could be due to late onset of action(approximately 2 hours as compared to metoclopramide 1-2 min and ondansetron 30 min which is also correlated with the study conducted by Henzi I, et al. [7] (2002) who concluded in his study that late efficacy seems to be more pronounced cause of dexamethasone related intraoperative nausea and vomiting. In the present study it was found that total incidence of PONV was 55% in saline group, compared to 15%, 20% and 15% in the metoclopramide group, dexamethasone group and ondansetron group respectively during the first post-delivery of 4 hours which corroborates with the findings of Biswas BN, et al. [8] (2003).

Table - 3: Comparison of incidence of PONV in 4 groups.

Study period	Parameters	GROUP M (n=20)	GROUP D (n=20)	GROUP O (n=20)	GROUP P (n=20)	P value
1st HR	Nausea	0	1(5%)	0	2(10%)	0.288
	Vomiting	0	0	0	2(10%)	
2nd HR	Nausea	1(5%)	1(5%)	0	2(10%)	0.556
	Vomiting	1(5%)	0	1(5%)	1(5%)	
3rd HR	Nausea	0	0	1(5%)	1(5%)	0.567
	Vomiting	0	1(5%)	1(5%)	0	
4th HR	Nausea	1(5%)	0	0	3(15%)	0.101
	Vomiting	1(5%)	1(5%)	0	0	

Table - 4: Incidence of post-operative nausea and vomiting (PONV).

Study period	Parameters	Group M	Group P	P value
1sthr	Nausea	0	2(10%)	o.152
	Vomiting	0	2(10%)	O.152
2ndhr	Nausea	1(5%)	2(10%)	0.553
	vomiting	1(5%)	1(5%)	1.00
3rdhr	Nausea	0	1(5%)	0.317
	vomiting	0	0	1.00
4thhr	Nausea	1(5%)	3(15%)	0.298
	vomiting	1(5%)	0	0.317

Study period	Parameters	Group D	Group P	P value
1sthr	Nausea	1(5%)	2(10%)	0.553
	Vomiting	0	2(10%)	0.152
2ndhr	Nausea	1(5%)	2(10%)	0.553
	vomiting	0	1(5%)	0.317
3rdhr	Nausea	0	1(5%)	0.317
	vomiting	1(5%)	0	0.317
4thhr	Nausea	0	3(15%)	0.075
	vomiting	1(5%)	0	1.00

Study period	Parameters	Group O	Group P	P value
1st hr	Nausea	0	2(10%)	0.152
	Vomiting	0	2(10%)	0.152
2nd hr	Nausea	0	2(10%)	0.152
	vomiting	1(5%)	1(5%)	1.00
3rd hr	Nausea	1(5%)	1(5%)	1.00
	vomiting	1(5%)	0	0.317
4th hr	Nausea	0	3(15%)	0.075
	vomiting	0	0	1.00
Study period	**Parameters**	**Group M**	**Group D**	**P value**
1st hr	Nausea	0	1(5%)	0.317
	Vomiting	0	0	1.00
2nd hr	Nausea	1(5%)	1(5%)	1.00
	vomiting	1(5%)	0	0.317
3rd hr	Nausea	0	0	1.00
	vomiting	0	1(5%)	0.317
4th hr	Nausea	1(5%)	0	0.317
	vomiting	1(5%)	1(5%)	0.317

Study period	Parameters	Group M	Group O	P value
1st hr	Nausea	0	0	1.00
	Vomiting	0	0	1.00
2nd hr	Nausea	1(5%)	0	0.317
	vomiting	1(5%)	1(5%)	1.00
3rd hr	Nausea	0	1(5%)	0.317
	vomiting	0	1(5%)	0.317
4th hr	Nausea	1(5%)	0	0.317
	vomiting	1(5%)	0	0.317

Study period	Parameters	Group D	Group O	P value
1st hr	Nausea	1(5%)	0	0.317
	Vomiting	0	0	1.00
2nd hr	Nausea	1(5%)	0	0.317
	vomiting	0	1(5%)	0.317
3rd hr	Nausea	0	1(5%)	0.317
	vomiting	1(5%)	1(5%)	1.00
4th hr	Nausea	0	0	1.00
	vomiting	1(5%)	0	1.00

P value< 0.05 =statistically significant (p value calculated by Mann whitney u Test)

Table - 5: Comparison of rescue anti-emetics in different groups.

Rescue antiemetic	Group M	Group D	Group O	Group P	Chi square= 12.8 & P value 0.000
Required	3(15%)	7(35%)	3(15%)	11(55%)	
Not required	17(85%)	13(65%)	17(85%)	9(45%)	

At 1 hour the total incidence of PONV was 20% in control group, 0% in group M and group O and 5% in group D. There was highly significant reduction in the incidence of PONV in both metoclopramide and ondansetron group ($p<0.001$). Even there was no significant difference in dexamethasone group. This could be due to comparatively quicker onset of antiemetic action of both metoclopramide and ondansetron as compared to dexamethasone (approximately 2 hours which is almost 1 hour after the end of surgery).

At 2 hours the total incidence of PONV was 15% in the control group, 10% in metoclopramide group, 5% in dexamethasone group and 5% in ondansetron group. The incidence was significantly less in all the study drugs group. There was statistically no significant difference ($p>0.05$) in the incidence of PONV between group D and group O.

At 4 hours the total incidence of PONV was 15% in control group, 10% in group M, 5% in group D and 0% in group O. The incidence was significantly less in ondansetron and dexamethasone group ($p<0.05$) as compared to placebo group. In the present study the incidence of PONV carries no statistically significant difference between group M, group D and group O. Similar results also being given by the study conducted Tzeng JI, et al. [9] (2002), and Demirhan A, et al. [10] (2013) .

Cardoso MM, et al. [11] (2000) evaluated the hypothesis that dexamethasone reduces nausea and vomiting in patients undergoing caesarean section under spinal anesthesia.

Krobbuaban B, et al. [12] (2008) concluded that prophylactic use of ondansetron is more effective than metoclopramide for preventing PONV in patient undergoing gynecological surgery.

Tsssssshe need for rescue antiemetic i.e. inj Palenosetron 75 mcg was on total 24 patients out of 80.16 patient intraoperatively and 8 patients required postoperatively i.e3 patient in group M,7 patients in group D, 3 patients in group O and 11 patient in group P which is statistically significant in the present study.

Conclusion

Hence from the present study, we concluded that administration of antiemetic prophylaxis during caesarean section undergoing spinal anesthesia reduces the incidence of intraoperative as well as postoperative nausea and vomiting.

This study found that there was a high incidence of IONV with dexamethasone 8 mg i.v. as compared to metoclopramide 10 mg and ondansetron 4 mg. However, all the study drugs were found to be effective in reducing the incidence of nausea & vomiting significantly, reducing the requirement of rescue anti-emetics.

References

1. Ong BY, Cohen MM, Palahniuk RJ. Anesthesia for caesarean delivery - effect on neonates. Anesth Analg., 1989; 68: 270-5.
2. Reynolds F. Epidural analgesia in obstetrics. Pros and cons for mother and baby. BMJ, 1989; 299: 751-2.
3. Carpenter R L, Caplan R A, Brown D L. Incidence and risk factors for side effects of spinal anesthesia. Anesthesiology, 1992; 76: 906–916.
4. Dershwitz M, Conant JA, Chang Y, Rosow CE, Connors PM. A randomized, double-blind, dose-response study of ondansetron in the prevention of postoperative nausea and vomiting. Journal of clinical anesthesia, 1998; 10: 314-20.
5. Abouleish E I, Rashid S, Haque S, Giezentanner A, Joynton P, Chuang A Z. Ondansetron versus placebo for the control of nausea and vomiting during caesarean section under spinal anaesthesia. Anaesthesia, 1999; 54: 479–482.

6. Lee Y, Lai HY, Lin PC, Lin YS, Huang SJ, Shyr MH. A dose ranging study of dexamethasone for preventing patient-controlled analgesia-related nausea and vomiting: a comparison of droperidol with saline. Anesthesia and analgesia, 2004 Apr; 98(4): 1066-71.
7. Henzi I, Walder B, Tramèr MR. Dexamethasone for the prevention of postoperative nausea and vomiting: a quantitative systematic review. Anesth Analg., 2000 Jan; 90(1): 186-94.
8. B.N. Biswas, A. Rudra, S. K. Das, S. Nath, S. C. Biswas. A comparative study of glycopyrrolate, dexamethasone and metoclopramide in control of post-operative nausea and vomiting after spinal anaesthesiafot caesarean delivery. Indian J Anaesth., 2003; 47: 198–200.
9. Tang J, Wang B, Wender R, White PF. Effect of the timing of ondansetron administration on PONV after outpatient laparoscopy. Anesthesiology, 1996; 85 : A9.
10. Demirhan A, Tekelioglu YU, Akkaya A, Ozlu T, Yildiz I, Bayir H, Kocoglu H, Duran B. Antiemetic effects of dexamethasone and ondansetron combination during spinal anesthesia during caesarean sections under spinal anesthesia. African Health Science, 2013; 13(2).
11. Cardoso MM, Leite AO, Santos EA, Gozzani JL, Mathias LA. Effect of dexamethasone on prevention of postoperative nausea, vomiting and pain after caesarean section: a randomised, placebo-controlled, double-blind trial. Eur J Anaesthesiol., 2013 Mar; 30(3): 102-5.
12. Krobbuaban B, Pitakpol S, Diregpoke S. Ondansetron vs. metoclopramide for the prevention of nausea and vomiting after gynecologic surgery. Journal of the Medical Association of Thailand, 2008; 91(5): 669-74.