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Comparing the Effectiveness of Ondansetron and Dexamethasone on Nausea/Vomiting in Cesarean Section under Spinal Anesthesia

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ABSTRACT

Background: Nausea and vomiting are frequently witnessed for pregnant women who undergo C-sections under spinal anesthesia. The objective of this study was to determine the effectiveness of Ondansetron and Dexamethasone on nausea and vomiting in patients undergoing spinal anesthesia for cesarean section.

Methods: This was an experimental study conducted in the Department of Anesthesia and Department of Obstetrics and Gynecology, Hamdard University Hospital, from April 15, 2021-August 15, 2021. Pregnant women (n=93) with the age >18-<45 years with American Society of Anesthesiologists (ASA) class I and II were enrolled. Group-A (n=43) were given 8 mg of Ondansetron, while Group-B (n=50) received 8mg of Dexamethasone. Post-operative nausea and vomiting assessment was done by Apfel score and was measured at 1 minute, 5 minutes, 10 minutes and 30 minutes after spinal anesthesia. Chi-square and student *t*-tests were performed for analysis.

Results: There was an insignificant difference (p=0.029) in terms of the demographic factors and vital signs between both the groups while a significant difference (p=0.05) was reported only in systolic blood pressure between both the groups. Insignificant difference was observed in parity, use of intraoperative opioids, sedatives, use of vasopressors, postoperative vomiting and shivering (p>0.05). Post-operative 11(22.0%) cases reported nausea and 1.0(2.0%) cases of vomiting in the dexamethasone group with significant difference (p=0.001), however, participants of the Ondansetron group did not report any symptom.

Conclusion: Ondansetron 4mg/kg dose decreased the propensity of nausea and vomiting after cesarean section. However, dexamethasone 8mg/kg seemed to be effective in controlling postoperative vomiting only.

Keywords: Nausea; Vomiting; Ondansetron; Dexamethasone; Spinal Anesthesia.

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INTRODUCTION

Postoperative nausea and vomiting (PONV) are significant clinical trouble that still affects patients undergoing gynecologic surgery with general anesthesia[1]. The purpose of obstetric anesthesia is to ensure the safe delivery of the child along with the health of the mother. Thus, prime importance has to be given when selecting and managing anesthesia. Spinal anesthesia is performed easily with little effect on the fetus and has now become the ideal anesthesia in the case of cesarean section[2]. A study revealed that in cesarean section, the Apgar score of fetal tends to be higher under spinal anesthesia than under general anesthesia. Although spinal anesthesia is recommended in cesarean sections as the best choice, but has some adversative effects too[3]. It has also been observed that spinal anesthesia can cause hypotension and severe bradycardia during the period of puerperal time in some cases, particularly in those mothers who had unstable hemodynamics[4]. Another research reported that 85% of pregnant women who were injected epidural morphine post-operatively i.e., after C-section was tended to bring aboutitching[5]. It is reported that in the cesarean section, one of the most highly observed adversative effects is shivering which has been found in as high as 57 % of cases [6].

Intravenous patient-controlled analgesia (PCA) is a system of opioid delivery, which is used frequently in the post-cesarean section. As most of the analgesic medicines are opioids, they infrequently cause nausea and vomiting; in addition to other puerperal responses post-cesarean section[7]. It has been revealed in various published studies that the use of Ondansetron is very common in cases of C-sections. Ondansetron is a selective antagonist to 5-hydroxytryptamine 3 receptor; it has shown promising benefits in controlling and managing nausea and vomiting caused by intra and post-operative anesthesia and opioid analgesics[8]. On the other hand, it has been reported that ondansetron in conjunction with dexamethasone, causes a significant reduction in the occurrence of nausea and vomiting when compared to ondansetron alone[9]. Even though the complete system through which it happens is unclear, the proposed mechanism includes the effect of dexamethasone on prostaglandin inhibition and pro-anti-inflammatory action accompanied by lessening in the quantity of used opioids[10].

For this purpose, an appropriate quantity should be used as an anti-emetic drug that eases nausea or vomiting ranging from 2.5 mg to 10 mg per day. As ondansetron and dexamethasone have diverse mechanisms to control nausea and vomiting, consequently the use of both the drugs as a combination may have synergistic result[11]. Another study stated that mothers undergoing C-sections under epidural anesthesia were managed with 4mg of intravenous ondansetron as prophylaxis and presented a significant decrease in the occurrence of nausea and vomiting intra and post-operatively[12]. Correspondingly, one more study revealed the synergistic effect of the combination of ondansetron and dexamethasone, which has shown a significant reduction in the frequency of vomiting post-operatively[13]. Therefore, the objective of this study was to compare the effectiveness of Ondansetron and Dexamethasone on nausea and vomiting in patients undergoing spinal anesthesia for cesarean section.

METHODS

This was an experimental study conducted in the Department of Anesthesia with the collaboration of the Department of Obstetrics and Gynecology, Hamdard University Hospital Karachi, from April 15, 2021 to August 15, 2021. A total of n=93 pregnant women were recruited in the study through consecutive sampling techniques the sample size was calculated by using the prevalence of nausea and vomiting among women who experienced spinal anesthesia for cesarean section. The ERC of Hamdard University had approved the study and protocol number ERC/MBBS/001/2020 allotted.

Group-A with 43 females was given 4 mg of Ondansetron, while Group-B with 50 females received 8 mg of Dexamethasone. As inclusion criteria, pregnant women aged >18 years and <45 years, consenting for elective cesarean section at term with Class I and II according to ASA (American Society of Anesthesiologists) were included in the study. Wherein, mothers with a history of gastrointestinal disorders, Drug hypersensitive mothers, Mothers having motion disorders, Pre-eclampsia, Eclampsia, Mental illness, Glaucoma, History of anti-emetic ingestion within 24 hours before cesarean section, Patients refused to participate, were excluded from the study. Data were collected by recording baseline demographics of the pregnant women. All the collected data were recorded on self-administered proforma. Demographic data includes the patient's name, date of surgery, maternal age, height, weight, gestational age and parity. Patient hemodynamics includes systolic and diastolic blood pressures, mean arterial pulse, pulse rate, respiratory rate and oxygen saturation. Anti-emetic medicines were managed through syringes in intravenous lines. Duration of surgery, mode of anesthesia, a dose of an intrathecal drug, duration of anesthesia, a dose of intravenous Ondansetron and Dexamethasone, use of intraoperative opioids, sedatives and vasopressors (ephedrine or phenylephrine). To determine the outcomes, postoperative nausea and vomiting estimation was done by Apfel score where postoperative nausea, vomiting and shivering were assessed at 1 minute, 5 minutes, 10 minutes and 30 minutes intervals after spinal anesthesia and during recovery till 30 minutes. The collected data were analyzed using SPSS version 20. Demographic variables like maternal age, height, weight, gestational age and parity, were shown in the table as categorical variables. Qualitative data were shown as frequency and percentages, whereas quantitative data were presented as mean and standard

deviation in the tables. Chi-square and student *t*-tests were performed for analysis and *p*-value less than 0.05 were considered statistically significant.

RESULTS

The mean age of participants in the ondansetron group was 27.37±1.92 and in the dexamethasone group was 27.92±2.62. There was no significant difference in demographic findings of both the groups. Figure 1 displays the demographic data of participants of both groups. Furthermore, the comparison of vital signs, surgery duration and Apfel score of study participants of both the groups was insignificant as shown in Table 1.

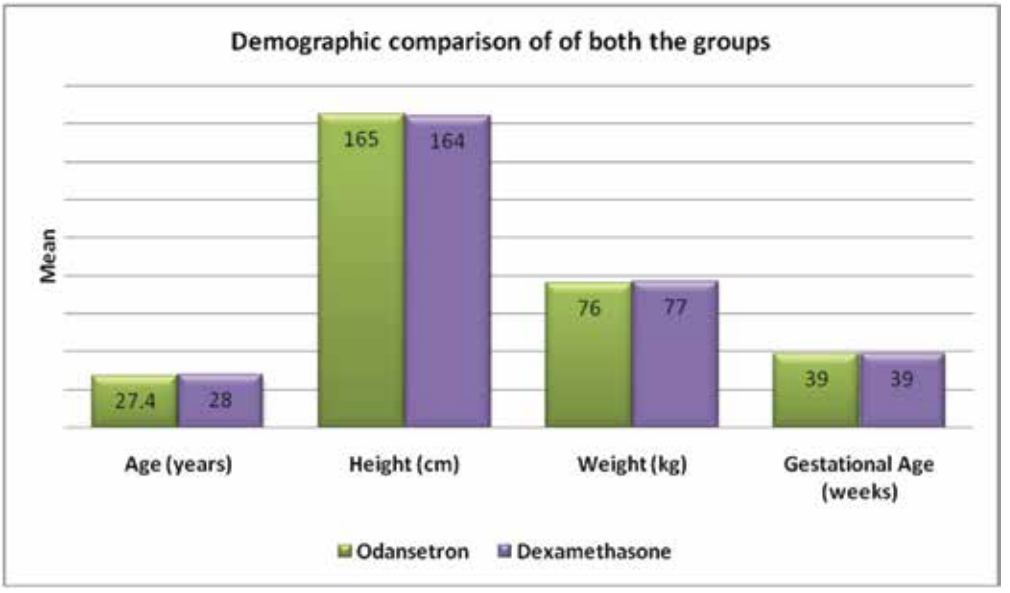

Figure 1: Demographic comparison of both the groups.

Table 1: Comparison of vital signs, surgery duration and Apfel Score of study participants of both groups.

Variables	Ondansetron Mean±SD n=43	Dexamethasone Mean±SD n=50	*p*-Value
Systolic Blood Pressure (mmHg)	121.58±6.27	118.32±7.66	0.029*
Diastolic Blood Pressure (mmHg)	75.58±5.61	74.82±5.25	0.501
Mean arterial pressure (mmHg)	91.33±5.92	89.42±6.18	0.134
Pulse Rate (minutes)	86.37±6.321	84.24±5.46	0.084
Respiratory Rate (minutes)	12.69±1.14	12.40±0.80	0.147
Oxygen Saturation SPO2 (%)	99.62±0.488	99.52±0.50	0.300
Duration of Surgery (minutes)	40.30±6.87	39.84±8.22	0.772
Duration of Anesthesia (Minutes)	129.06±5.14	127.62±5.06	----
Postoperative Nausea and Vomiting (PONV) Risk Estimation Apfel Score	2.27±0.45	2.22±0.41	0.516

**Significant p-value.*

An insignificant difference was observed between both the groups in terms of parity, use of intraoperative opioids, sedatives, use of vasopressors, postoperative vomiting and shivering ($p>0.05$) whereas a significant difference was found between both the groups in terms of postoperative nausea ($p=0.001$), as shown in Table 2.

Regarding the incidence of postoperative nausea and vomiting, 11(22.0%) cases were reported for nausea and 1(2.0%) case of vomiting was reported in the dexamethasone group (Figure 2) however, participants of the ondansetron group did not report any symptom as shown in Table 2.

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Table 2: Frequency and association of intraoperative drugs and emetic symptoms associated with a postoperative period in both groups.

Variable s and Characteristics		Ondansetron n (%)	Dexamethasone n (%)	p-Value
Parity	Nulliparous	16(37.2%)	27(5 4.0%)	0.105
	Multiparous	27(62.8%)	23(46.0%)	
Intraoperative Opioids	Administered	1(2.3%)	1(2.0%)	0.914
	Not Administered	42(97.7%)	49(98.0%)	
Intraoperative Sedatives	Administered	6(14.0%)	11(22.0%)	0.317
	Not Administered	37(86.0%)	39(78 .0%)	
Vasopressors	Administered	2(4.7%)	0(0.0%)	0.123
	Not Administered	41(95.3%)	50(100.0%)	
Post-Operative Nausea	Observed	0(0.0%)	11(22.0%)	0.001*
	Not observed	43(100.0%)	39(78.0%)	

**Significant p-value.*

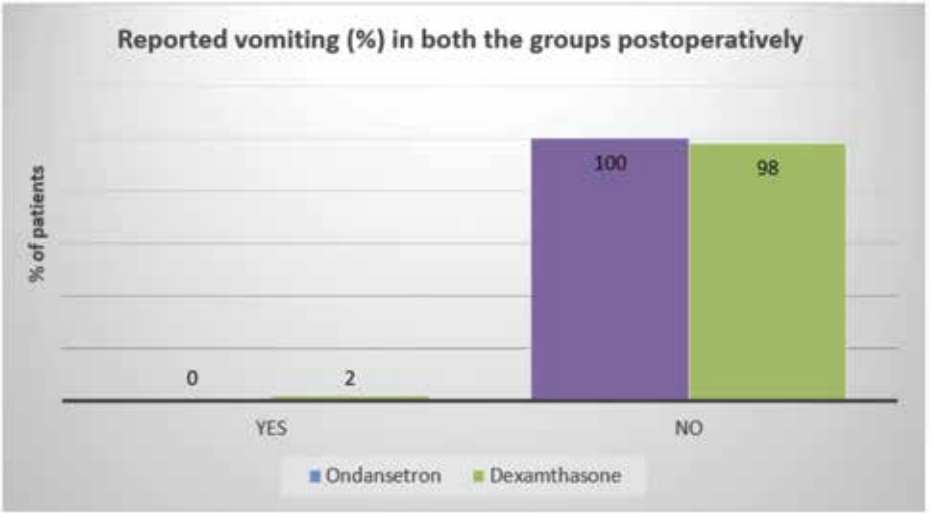

Figure 2: Graphical presentation of frequency of vomiting in both groups.

DISCUSSION

In this study, the incidence of postoperative nausea was observed in the dexamethasone group (p=0.001) furthermore, only one case in the dexamethasone group reported vomiting. Similar to this study, the frequency of retching, nausea, and vomiting in the intra-operative post-delivery time was compared between three groups i.e., Ondansetron group, Dexamethasone group and Dexamethasone and Propofol group. The results of that study showed significant differences among the three groups and reported the effectiveness of ondansetron i.e., parallel to the study findings[14].

In a study, the effectiveness of 8mg ondansetron was compared with midazolam, and midazolam 30mg/kg combined with 8mg ondansetron for the treatment of nausea and vomiting. They reported that the incidence of postoperative nausea was significantly less in a combination of midazolam with ondansetron (p = 0.01) [15]. The present study was inconsistent with the above-mentioned research and reported that the frequency of postoperative nausea and vomiting was not observed in the ondansetron group however, 11(22.0%) cases reported nausea in the dexamethasone group.

Similarly, one of the studies proved that dexamethasone 8mg by intravenous route and IV Propofol 10mg bolus subsequently infusion of propofol 1mg/kg/h is superior to Ondansetron 4mg IV for decreasing the frequency of retching, nausea, and vomiting in the cesarean section under spinal anesthesia[14]. This study was inconsistent with the above-reported study and proved that IV Ondansetron 4mg alone significantly reduced nausea and vomiting symptoms in the cesarean section under spinal anesthesia.

Another study compared the antiemetic effectiveness of ondansetron and dexamethasone combination with that of the use of each agent

alone to reduce the chances of intra- and post-operative nausea and vomiting in CS under spinal anesthesia. Postoperative nausea was observed lesser in the combination group as compared to the other two groups. Thus, combined use of dexamethasone and ondansetron increase the antiemetic efficacy[16]. The current study showed inconsistency with the above-reported study and revealed that 4mg ondansetron alone had more anti-emetic effect than the dexamethasone alone.

Ondansetron at 8mg/kg dose has been reported in different studies as an effective dose with other antiemetic drugs, however, it is used clinically at a dose of 4mg intravenously[15,17]. Similar results were observed in the study that highlighted the administration of 4mg ondansetron during C-section significantly alleviated post-operative nausea and vomiting as compared to 8mg dexamethasone.

Another research determined the most favorable dosage of 4mg ondansetron for controlling maternal hypotension during cesarean delivery. They observed minimal changes in systolic blood pressure ($p < 0.05$)[18]. This study is consistent with the above-reported study and revealed significant changes in systolic blood pressure observed between ondansetron and dexamethasone (p=0.029).

A meta-analysis by Wang et al. assessed the efficacy of dexamethasone and ondansetron in controlling postoperative nausea and vomiting (PONV) in women with laparoscopic surgery. They observed that dexamethasone had an equivalent efficacy in preventing PONV (p= 0.039) with that of ondansetron in 24 hours of laparoscopic surgery. Therefore, it was proved that dexamethasone was as effective and as safe as ondansetron in preventing PONV[19]. The current study was not in accordance with the above-cited study and revealed that the use of 4 mg ondansetron alone had more anti-emetic efficacy than dexamethasone alone.

Research by D'souza et al. showed the effectiveness of dexamethasone when used as a single drug to control PONV after laparoscopic C-section and witnessed that dexamethasone drug reduced the occurrence of PONV alone and was found safe with low cost[20]. The current study was not consistent with the above study. The study showed that ondansetron alone was more effective in controlling postoperative nausea and vomiting than dexamethasone alone.

Other studies also reported that the combination of ondansetron and dexamethasone was also found harmless, safe, and well accepted by pregnant women. Numerous studies likewise confirmed that the use of dexamethasone in combination with other anti-emetics reduces the frequency of PONV[21,22]. This study was discordant with the above-cited studies and revealed that the use of 4mg ondansetron alone had more anti-emetic efficacy than dexamethasone alone.

Likewise, one more research showed that Dexamethasone and Ondansetron were revealed to diminish the frequency of nausea and vomiting in spinal anesthesia in the same way and can be suggested as a better alternative for anticipation of nausea and vomiting in surgical interventions[23]. However, this study was inconsistent with the previous reported study that ondansetron intravenously effectively alleviates nausea and vomiting following cesarean section as compared to dexamethasone[23]. Thus, the present study showed that blockade of 5HT3 receptors by ondansetron has superior effects than dexamethasone hence; it can be used as a portent drug to control PONV during C-Section. However, the study might not be immune from selection bias due to the sampling technique.

CONCLUSION

Ondansetron 4mg/kg dose decreased the propensity of nausea and vomiting after cesarean section. However, dexamethasone 8mg/kg seemed to be effective in controlling postoperative vomiting only. The combined effect of both drugs was not observed.

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CONFLICT OF INTEREST

The authors declared no conflict of interest.

ETHICS APPROVAL

The ERC of Hamdard University had approved the study and protocol number: ERC/MBBS/001/2020.

PATIENT CONSENT

The data was collected after the consent from the patients.

AUTHORS' CONTRIBUTION

All authors equally contributed to this research write-up.

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