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ORIGINAL RESEARCH ARTICLE

PROPHYLACTIC ADMINISTRATION OF DEXAMETHASONE VERSUS MEPERIDINE FOR PREVENTION OF POST-SPINAL SHIVERING AMONG PARTURIENTS UNDERGOING CESAREAN SECTION

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ABSTRACT

Background: Perioperative shivering is defined as an involuntary, oscillatory muscular activity lasting for longer than 15 seconds. Studies have shown that its prevalence of 50%-80% in neuraxial anesthesia causing. It leads to increased metabolic activity, oxygen consumption, intracranial, and intraocular pressure, cardiac output, peripheral resistance, carbon dioxide production, and lactic acidosis and causes unpleasant experiences to the patients.

Methods: This is a hospital based, prospective, comparative study conducted at Chitwan Medical College from June 2023 to Feb 2024 among parturients between 18-35 years, undergoing caesarean section (C/S), under spinal anaesthesia aimed to compare the effectiveness of prophylactic administration of meperidine, dexamethasone in prevention of perioperative shivering. Total 158 patients of ASA physical status II were included and with alternate randomization, were allocated into two groups with 79 participants in each. Patients who were allocated in group D received 4mg of IV Dexamethasone and those allocated in group M received 25mg of IV Meperidine after delivery of baby.

Results: The overall incidence of post spinal shivering in our study was 14.6% of which, 11.4% belonged to Group M and 3.2% belonged to Group D ($p < 0.05$). The intensity of shivering was significantly less in Group D as compared to Group M ($p < 0.001$) at T1, T6, T7 and T8 point of observation.

Conclusions: It was concluded that Dexamethasone is superior to Meperidine in alleviating post-spinal shivering in parturients undergoing elective cesarean section under subarachnoid block with additional benefits of less occurrence of sedation, nausea and vomiting.

INTRODUCTION

Subarachnoid block is commonly practiced anesthetic technique for cesarean section as it has lower maternal morbidity and mortality rates and causes less neonatal depression as compared to general anesthesia.[1] Perioperative shivering is defined as an involuntary, oscillatory muscular activity lasting for longer than 15 seconds.[2]

Studies have shown that the prevalence of shivering is 50%-80% in neuraxial anesthesia causing unpleasant experience especially among parturients. It leads to increased metabolic activity, oxygen consumption, intracranial, and intraocular pressure, cardiac output, peripheral resistance, carbon dioxide production, and lactic acidosis.[3]

Various methods have been advocated for attenuation of post-spinal shivering like keeping the patients warm before and during surgery, use of drugs like opioids, anti-inflammatory drugs, alpha-blockers, ketamine and many more but these are not without their side effects.[4]

Meperidine, a phenylpiperidine derivative, is one of the most commonly used drugs for prevention and attenuation of shivering. It's mechanism of anti-shivering is postulated to be a direct action on the thermoregulatory center. It has been found to be associated with side effects such as hypotension, sedation, nausea and vomiting.[5, 6]

Due to the anti-inflammatory properties, dexamethasone reduces the frequency of the shivering by lowering the gradient between the core and the body temperature. It has been found to be effective for prevention for perioperative shivering with benefits like less postoperative nausea and vomiting.[7]

This study, therefore aimed to compare the effectiveness of prophylactic administration of meperidine versus dexamethasone in prevention of perioperative shivering in patients undergoing cesarean section under spinal anesthesia in our center.

METHODS

This hospital based, prospective, comparative study was

conducted from June 2023 to Feb 2024 in the operation theatre at Chitwan Medical College. The ethical clearance of the study was obtained from Chitwan Medical College Institutional Review Committee (Ref: CMC-IRC/079/080-158),

Based on a previous study by Destaw B et al.[8] with Incidence of shivering in pethidine group (p1) of 21.9%, incidence of shivering in dexamethasone group (p2) = 43.8%, Power = 80%, α-error rate = 5%, and allocation ratio of two groups: 1, for a two tailed test, at 95% confidence level, using a sample size formula for testing inequality in proportions between two independent groups, using GPower 3.1.9.7 software, the calculated total sample size was 158 with 79 patients in each group.

The day prior to the date of surgery, a detailed preoperative history and physical examination was done for each parturient planned for elective cesarean section between 18-35 years of age belonging to ASA physical status II. The study procedure with risks and benefits were explained to the understanding of the patients and informed written consent was taken from each patient. Patients with known allergy to the study drugs, diabetic patients, parturient with pre eclampsia or eclampsia and patients who developed shivering before administration of study drugs were excluded from the study. Patients were kept nil per oral for 8 hours for solid meal and 2 hours for clear liquid prior to the surgery.

On the day of the surgery, the operation theatre was maintained at a temperature of 25 degree Celsius. In the preoperative area, peripheral venous access was secured at the dorsum of the non-dependent hand with 18 gauze IV cannula and preloading with room temperature maintained ringer's lactate infusion was started at 10 ml per kg of body weight following which alternate randomization of the participants was done where they were divided into either Group D or Group M.

In the operating room, routine monitors according to ASA standards were attached and baseline vital parameters were recorded. The axillary body temperature was computed for core body temperature by adding 0.5 degree Celsius. Maintenance fluid infusion with ringer's lactate was started as per Holliday-Segar formula. Then under aseptic precaution subarachnoid block was administered using 25 gauge Quincke needle at L3-L4 or L4-L5 interspace in sitting position. Once subarachnoid space was confirmed, 2 ml of 0.5% hyperbaric bupivacaine was injected at the rate of 0.2 ml per second. After completion of administration of spinal anesthesia patient was placed supine and was covered by a single layer of surgical drapes, exposing only the surgical site. Surgery commenced when the level of autonomic block was T6.

After delivery of the baby, 10 units of oxytocin (increased dose as per requirement) were added to 100 mL of intravenous normal saline, which was followed by intravenous administration of the study drug. Patients who were allocated to group D received 4mg of IV dexamethasone and those allocated to group M received 25mg of IV meperidine. Parameters like HR, BP, SpO2, temperature, grade of shivering, grade of sedation and occurrence of IONV/PONV were recorded immediately after administration of study drug (T0) followed by every 5 minutes for first 15 minutes (T1, T2, T3) then every 15 minutes up to 90 minutes post drug administration (T4, T5, T6, T7, T8) .

Grading of shivering was done on a four point scale which included Grade 0: No shivering, Grade 1: One or more of the following: Piloerection, peripheral vasoconstriction, peripheral cyanosis, but without visible muscle activity, Grade 2: Visible muscle activity confined to one muscle group, Grade 3: Visible muscle activity in more than 1 muscle group and Grade 4: Gross muscle activity involving the whole body.[9] Similarly, sedation was graded as Grade 1: Awake and alert, Grade 2: Drowsy, responsive to verbal stimuli, Grade 3: Drowsy, arousable to physical stimuli, Grade 4: Unarousable.[10]

In the event of IONV/PONV, Ondansetron, 4mg was administered to the parturient intravenously.

All analyzes were performed using Statistical Package for Social Sciences (SPSS) version 23. Categorical predictor variables were compared using Chi-square test. Means were compared using independent t- test. A p-value equal to or less than 0.05 was considered statistically significant.

RESULTS

A total of 158 parturients of ASA physical status II were included in this study. The parturients in both the groups were comparable in respect to their demographic and baseline parameters with no statistical significance (Table 1).

Table 1: Demographic and baseline parameters

Variables	Dexamethasone group (n = 79)	Meperidine group (n = 79)	P-value
Age (years)	27.5 ± 4.7	27.9 ± 5.0	0.57
Weight (kg)	66.92 ± 6.83	68.48 ± 7.80	0.18
Baseline			
HR (bpm)	85.5 ± 8.2	85.6 ± 7.0	0.92
MAP (mm hg)	82.1 ± 6.4	81.2 ± 5.9	0.40
SpO2 (%)	97.7 ± 1.3	96.4 ± 10.9	0.30
Temperature (^{0}C)	97.3 ± 1.0	97.5 ± 0.9	0.23

The overall incidence of post spinal shivering in patients who underwent cesarean section in our study was 14.6% of which 11.4% belonged to Group M and 3.2% belonged to Group D ($p < 0.05$). The result showed that the intensity of shivering was significantly less in Group D as compared to Group M ($p < 0.001$) at T1, T6, T7 and T8 point of observation (Table 2). None of the study population developed shivering of grade 3 or 4. In regard to temperature variation among the participants of the study groups, no statistically significant difference was noted at any point of observation ($p = 0.87$).

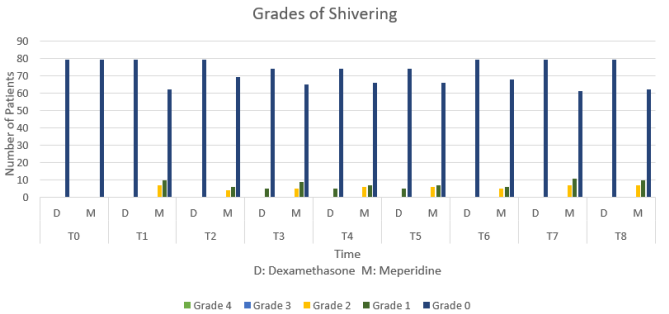

Figure 1: Grades of shivering

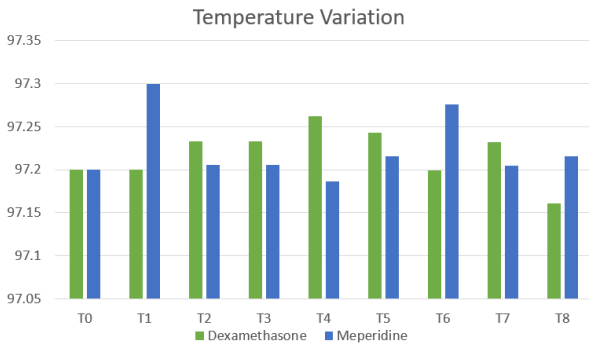

Figure 2: Temperature Variation

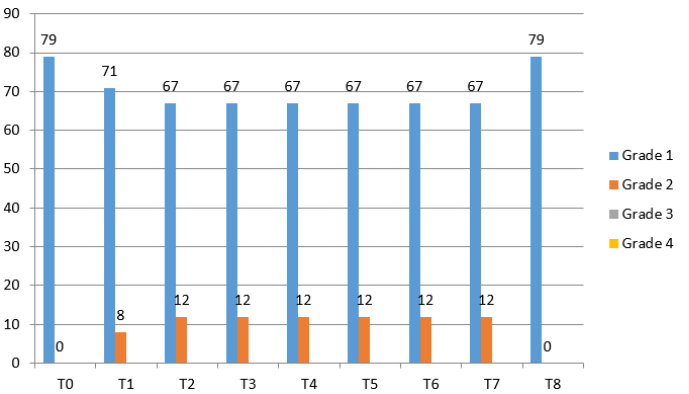

Figure 3: Grade of Sedation; Dexamethasone Group

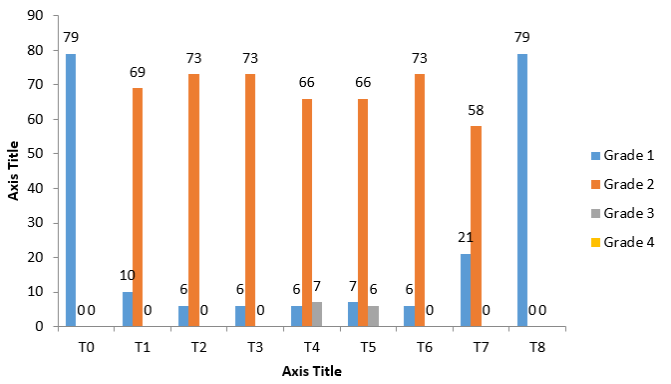

Figure 4: Grade of Sedation; Meperidine Group

In regard to the sedation scale, this study exhibited that with statistically significant difference parturients in Group M were drowsy but responsive to verbal stimuli i.e. Grade 2 sedation scale when compared to patients in Group D at all-time points except for T0 and T8 ($p < 0.001$). No any participant developed sedation of grade 3 or 4.

As per the haemodynamic parameters, mean HR was found to be higher in Group D as compared to Group M at T0, T3 and T4 point of observation with statistical significance ($p < 0.001$). No significant difference was noted in terms of mean MAP in between the two study groups ($p > 0.05$) at any of the observation points.

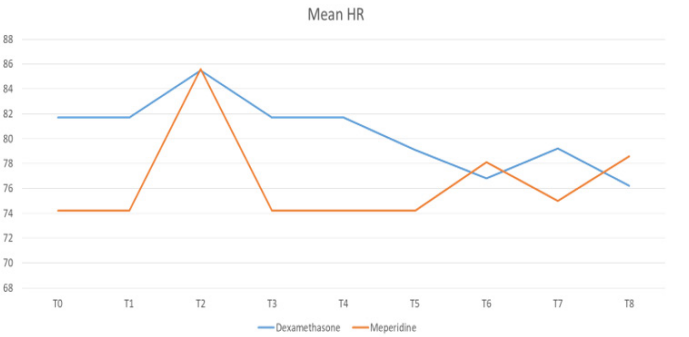

Figure 5: Mean Heart Rate Variation

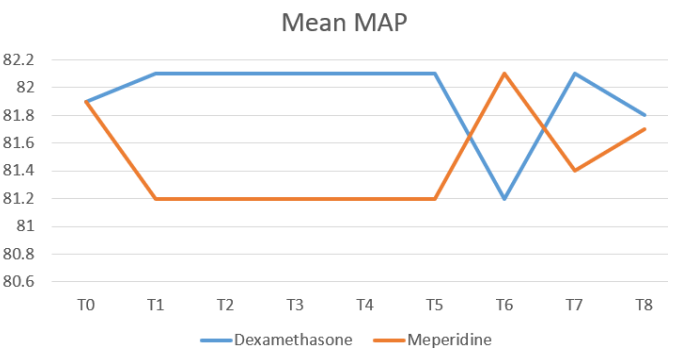

Figure 6: Mean MAP Variation

Occurrence of nausea and vomiting observed till T8 observation point was found to be more in meperidine group than the dexamethasone group with statistical significance ($p = 0.003$).

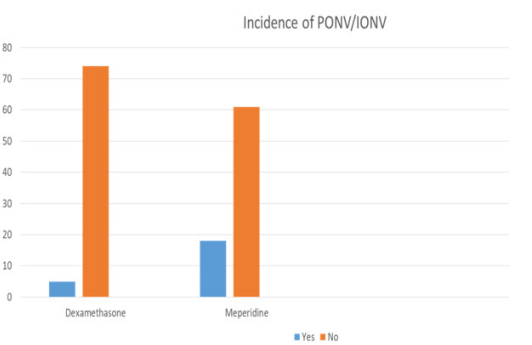

Figure 7: Incidence of PONV/IONV

DISCUSSION

This study was conducted to compare the effectiveness of prophylactic administration of intravenous meperidine versus dexamethasone in prevention of perioperative shivering in patients undergoing cesarean section under spinal anesthesia. The treatment groups were similar in terms of sex, age, weight and baseline HR, MAP, SPO2 and temperature.

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The overall incidence of post-spinal shivering in patients who underwent elective cesarean section in our study was 14.6% of which 11.4% belonged to Group M and 3.2% belonged to Group D ($p<0.001$). This research finding demonstrated that the intensity of shivering was significantly less in Group D as compared to Group M ($p < 0.001$). In regard to temperature variation among the participants of the study groups, no statistically significant difference was noted at any point of observation ($p > 0.05$). In pethidine group, increased number of patients were drowsy but responsive to verbal stimuli and had increased rate of nausea and vomiting than the study population of dexamethasone group with statistical significance ($p < 0.05$).

Similar to our study findings, Entezariasl M et al. showed that incidence rate of shivering was lower in dexamethasone group as compared to pethidine and the control group. In addition, they concluded that dexamethasone prevents nausea and vomiting that are associated with pethidine.[11] Likewise, Destaw B et al. reported that among patients undergoing TURP under spinal anesthesia, the incidence of shivering was comparable in the dexamethasone and pethidine group. Even though the Dexamethasone group reported less severe shivering, the difference was not statistically significant.[8]

Abd El Azeem A et al. research exhibited that alike our study the core body temperature changes were non-significant at all times of measurement among control, dexamethasone and pethidine groups. In their study, the incidence and intensity of shivering was significantly high in the control group compared to the study groups whereas dexamethasone and pethidine group were found comparable. The number of patients with nausea was reduced in dexamethasone group as compared to the other groups but it did not carry any statistical significance.[12]

In contrary to our study, Maleki MS et al. demonstrated that there was no significant difference between dexamethasone, pethidine, and ketamine in the prevention of perioperative shivering and equally recommended these agents for the prevention of perioperative shivering.[13] On the other hand, in a study by Zavareh SM et al. where the compared the same three drugs they found that pethidine was superior to dexamethasone which was in turn superior to ketamine to attenuate postoperative shivering. They recommended that dexamethasone can be used as an alternative to pethidine to reduce incidence of nausea and vomiting.[14]

The limitations of this study were failure to measure core temperature of the study population and a lack of control group.

CONCLUSION

Based on the findings of this study we concluded that Dexamethasone is superior to Meperidine in alleviating post-spinal shivering in parturients undergoing elective cesarean section under subarachnoid block with additional benefits of less occurrence of sedation, nausea and vomiting.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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