Section: Anaesthesiology

Original Research Article

COMPARISON OF HEIGHT ADJUSTED DOSE VERSUS FIXED DOSE OF 0.5% HYPERBARIC BUPIVACAINE FOR CAESAREAN DELIVERY UNDER SPINAL ANAESTHESIA - A PROSPECTIVE RANDOMISED STUDY

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ABSTRACT

Background: Spinal anaesthesia is the preferred, rapid, reliable and safe form of surgical anaesthetic technique for both elective and emergency caesarean delivery. Various factors influence the appropriate level of sensory nerve block for surgical anaesthesia. The dose of local anaesthetic when adjusted according to patient characteristics results in lowering the dose of spinal anaesthetic. We thus conducted this study to compare the incidence of hypotension, in parturient receiving height adjusted dose and fixed dose of 0.5% hyperbaric bupivacaine for caesarean delivery under spinal anaesthesia and to compare Sensory and motor block characteristics, total dose of inj.mephentermine used, Incidence of bradycardia, nausea, vomiting, Neonatal outcome (APGAR score).

Materials and Methods: This prospective, randomized, comparative, double-blind study included 110 parturient posted for elective and emergency LSCS under spinal anaesthesia. Parturients were allocated in two groups. Group H: Patients received height adjusted dose (0.06 mg/ cm height) of 0.5% bupivacaine heavy with 10µg fentanyl. Group F: Patients received fixed dose 2 ml of 0.5% bupivacaine heavy with 10µg fentanyl. The study done to compare the height adjusted dose versus fixed dose of 0.5% hyperbaric bupivacaine for caesarean delivery under spinal anaesthesia.

Results: All patients in the two study groups were comparable with respect to age, weight, height, gestational age and diagnosis The mean heart rate was significantly higher in group F as compared to group H, at timepoints T6, T8, T10, T12 and T14. The mean systolic blood pressure at timepoints T2 till T40 except at T16 was significantly lower in group F as compared to group H. The mean diastolic blood pressure in group F was significantly lower than in group H, at timepoints T4 till T40.The mean arterial pressure in group F was significantly lower than in group H, at timepoints T2 till T40. The incidence of hypotension, requirement of mephentermine is statistically significant. There was no statistically significant difference in nausea and vomiting episodes, maternal satisfaction score in the two groups. Time from study drug injection to skin incision, Time from study drug injection to uterine incision, Time from study drug injection to delivery of baby was statistically significant. There was no significant difference in the two groups in time from skin to uterine incision (p=0.054) and time from uterine incision to delivery of baby (p=0.636). There was no significant difference in APGAR score in the two groups, p = 1.000 and p = 0.562 at 1 and 5 min, respectively.

Conclusion: In parturient undergoing caesarean delivery under spinal anaesthesia, the height adjusted dose of 0.5% hyperbaric bupivacaine is

associated with a lower incidence of hypotension and vasopressor requirement. It is associated with a lower level of sensory block with greater number of patients requiring a head down tilt, supplemental analgesia and conversion to general anaesthesia. The time from study drug injection to skin incision, uterine incision and delivery of baby are also longer. On the basis of our results, parturient undergoing caesarean delivery under spinal anaesthesia receiving height adjusted dose in comparison to those receiving a fixed dose of 0.5% hyperbaric bupivacaine have better hemodynamic stability, comparable maternal satisfaction and neonatal outcome.
Keywords: Height adjusted and Fixed dose, Bupivacaine, Spinal anaesthesia.

INTRODUCTION

Spinal anaesthesia is the preferred, rapid, reliable and safe form of surgical anaesthetic technique for both elective and emergency caesarean delivery.[1] It requires a much smaller local anaesthetic dose as compared to epidural anaesthesia and may even produce a denser block with less systemic drug toxicity.[2] It offers several advantages over general anaesthesia, as it avoids the hazards of difficult airway, risk of regurgitation and aspiration and neonatal depression.[3] However, it is often associated with hypotension resulting from sympathetic blockade.[4]

Although, various factors influence the appropriate level of sensory nerve block for surgical anaesthesia, the local anaesthetic dose is the main determinant. The parturient characteristics that determine the dose of local anaesthetic for caesarean section include height, weight, body mass index, vertebral column length, abdominal circumference and twin pregnancies. Despite a number of studies, there is still no consensus and it remains a challenge to calculate the optimal intrathecal bupivacaine dose for caesarean section. As a result, several dosage regimens are in use for spinal anaesthesia for caesarean section.

The dose of local anaesthetic when adjusted according to patient characteristics results in lowering the dose of spinal anaesthetic.[1] We thus conducted this study to compare the incidence of hypotension, in parturient receiving height adjusted dose and fixed dose of 0.5% hyperbaric bupivacaine for caesarean delivery under spinal anaesthesia and to compare Sensory and motor block characteristics, total dose of inj.mephentermine used, Incidence of bradycardia, nausea, vomiting, Neonatal outcome (APGAR score).

MATERIALS AND METHODS

Prospective, randomized, comparative, double-blind study was conducted after obtaining approval from the Institutional Ethical and Scientific Committee and written informed consent of 110 parturient. Parturient undergoing Elective and emergency LSCS with Age > 18 years, American Society of Anesthesiologists physical status I or II women, Term pregnancy (> 37 weeks gestation), Singleton pregnancy are included in the study.

Group H: Patients received height adjusted dose (0.06 mg/ cm height) of 0.5% bupivacaine heavy with 10µg fentanyl

Group F: Patients received fixed dose 2 ml of 0.5% bupivacaine heavy with 10µg fentanyl

Patient refusal, pre-existing or pregnancy induced hypertension, Diabetes mellitus, cardiovascular or cerebrovascular disease, Spine deformities or history of spine surgery, Fetal abnormality, fetal distress, complicated pregnancy, Allergy to any of the study medication, Weight less than 40 kg or more than 90 kg, Height less than 140 cm and more than 170 cm, Absolute or relative contraindication to spinal anaesthesia were excluded from study.

Patients fulfilling the inclusion criteria, scheduled for elective or emergency caesarean delivery under spinal anaesthesia, were enrolled in the study. All patients underwent pre-anaesthetic evaluation that included a detailed history, examination and relevant investigations. Patients scheduled for elective surgery were advised to fast overnight and received tablet ranitidine (150 mg) and tablet metoclopramide (10 mg) night prior to surgery and two hours preoperatively. In patients scheduled for emergency caesarean delivery, detailed history was taken and relevant investigations were done if time permitted, otherwise patient was scheduled for surgery, fasting status was noted and they were given inj. ranitidine 50 mg IV and metoclopramide 10 mg IV for gastric aspiration prophylaxis.

Patients were shifted in left lateral position to the operation theater and were positioned supine, with 15 degree left lateral tilt, on the operating table with table being parallel to ground. Standard monitors that include ECG, noninvasive blood pressure and pulse oximeter were applied. Baseline readings of heart rate, blood pressure (systolic, diastolic and mean) and oxygen saturation were noted.

Vascular access was secured using 18-gauge intravenous cannula and co-loading with rapid intravenous fluid with (10 ml/kg) over 10 minutes of Ringer's lactate solution was commenced after which the flow was reduced to maintenance rate. After explaining the procedure to the patient, spinal anaesthesia was administered. Patients were placed for spinal anaesthesia in the left lateral position, with head, neck and back flexed. Antiseptic skin preparation and sterile draping was done under strict aseptic precautions. After skin infiltration with (1 to 2 ml) 2% lignocaine, 25-gauge Quincke spinal needle was inserted using midline approach, at the L3-4

intervertebral level in subarachnoid space. After confirming free flow of CSF, height adjusted dose or fixed dose of 0.5% bupivacaine heavy without aspiration or barbotage was administered as per the group allocation. Patients in the fixed dose group (Group F) received 2 ml of 0.5% hyperbaric bupivacaine plus 10µg fentanyl and patients in the height-adjusted dose group (Group H) received a height adjusted dose calculated as 0.06 mg/cm height of 0.5% hyperbaric bupivacaine plus 10µg fentanyl.

After administration of study drug, patients were immediately turned into the supine position with a wedge under the right hip causing left uterine displacement. Supplemental oxygen at 6 L/min was given to all patients via face mask.

The sensory level of block was assessed by pin prick using a 25 G hypodermic needle at the midclavicular line bilaterally, using the Hollmen scale (0=an ability to appreciate a pin prick as sharp, 1=the perception of a pinprick in blocked areas as less sharp than in unblocked areas, 2=the perception of a pinprick as a touch but not as sharp (analgesia), and 3 =an inability to feel a pinprick(anesthesia). The lower block level was selected if the sensory block level was different on both sides. The motor block was evaluated using the modified Bromage scale (0 = no motor block, 1 = inability to raise extended leg, 2 = inability to flex the knee and 3 = inability to flex the ankle and foot), respectively.

Assessment of the level of sensory block was made at multiple time points as clinically indicated. However, the level of sensory block assessed at 5 min and 15 min after study drug injection was recorded for the purpose of comparison. Maximum level of sensory block achieved was also noted. Sensory block to T5 dermatome was considered adequate for surgery. If the level attained at 5 minute is not T6 then a 10-degree head down tilt was employed to improve block height. If patient required supplemental analgesia or conversion to general anaesthesia for the conduct of surgery, it was noted. Time to achieve motor block of modified Bromage scale 3 was checked every minute from time of study drug injection.

Heart rate, blood pressure (systolic, diastolic and mean) and oxygen saturation were noted at time of injection of study drug, every two minutes for the first 20 minutes after study drug injection and every 5 minutes thereafter, till 40 minutes or till the end of surgery whichever is later.

Hypotension, defined as ≥ 20% decrease in baseline systolic blood pressure, was treated with rapid infusion of intravenous crystalloid fluid and inj.mephentermine 6 mg bolus. If hypotension persisted after two minutes of mephentermine bolus dose, a repeat mephentermine bolus dose was given. The period from onset of hypotension until its correction was considered as one hypotensive episode. Recurrence of hypotension after one or more normal systolic blood pressure values was considered as the next hypotensive episode. The number of hypotensive episodes, total number of mephentermine bolus doses administered and requirement of atropine was noted.

Atropine 0.6 mg IV was administered if there was bradycardia (HR<60 beats/min) associated with hypotension or if heart rate was less than 50 beats/min regardless of systolic blood pressure.

The occurrence of nausea (none, mild, moderate, or severe) and vomiting was noted. If nausea or vomiting was not associated with hypotension, it was treated with 4 mg inj.ondansteron IV. If there was associated hypotension, then treatment for hypotension was given.

After the delivery of baby, oxytocin 2 U iv bolus followed by 10 U as maintenance infusion over one hour was given. Apgar score at 1 and 5 minutes as assessed by neonatologist was noted.

Time to regression of complete motor block to modified Bromage scale of 0 was noted every 30 minutes for first hour then 15 minutes thereafter.

Time to regression of sensory block to S2 every 30 minute for first 2 hour then every 15 minute thereafter from time of study drug administration.

Time intervals from study drug injection to start of surgery (skin incision), uterine incision and delivery of baby were also recorded. Readings of vital parameters were noted for 40 minutes. Maternal satisfaction score was noted on VAS scale (0 is least and 10 being most satisfactory) at the end of surgery. The patients were given 1 g paracetamol IV every six hourly for postoperative analgesia.

Statistical Analysis

The data was collected and entered in Microsoft excel and analyzed using IBM SPSS. Statistics 20.0 The quantitative data was expressed in terms of mean and standard deviation. The qualitative data was expressed in terms of numbers and percentages. Independent t test was used to compare mean between two independent group. Fisher exact test was applied to determine the association between the two categorical variables. p value < 0.05 was considered significant

RESULTS

Table 1: Distribution of patients according to Age, Height, Weight and Gestational age

Parameter	Group H	Group F	p value
	Mean ± SD	Mean ± SD	
Age (years)	25.53 ± 4.12	25.18 ± 3.15	0.622
Height (cm)	154.49 ± 5.08	154.78 ± 4.78	0.758
Weight (kg)	61.25 ± 9.09	62.42 ± 7.37	0.462
Gestational Age (weeks)	38.00 ± 0.82	38.24 ± 0.92	0.158

Table 2: Intergroup comparison of volume and total volume of drug bupivacaine(ml) administered:

Study Drug	Group H	Group F	p value
	Mean ± SD	Mean ± SD	
Bupivacaine(ml)	1.89 ± 0.67	2.00 ± 0.00	**<0.001**
Bupivacaine (ml) Fentanyl (ml) Total	1.89 ± 0.67 0.2(10µg) 2.09	2.00 ± 0.00 0.2(10µg) 2.20	**<0.001**

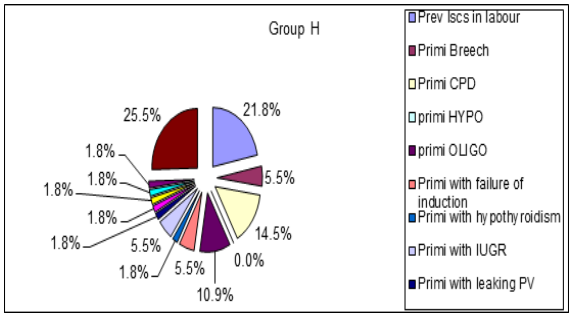
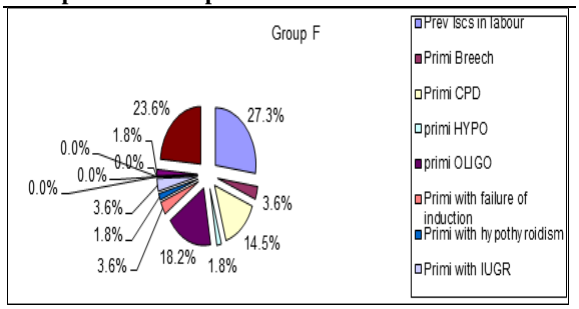
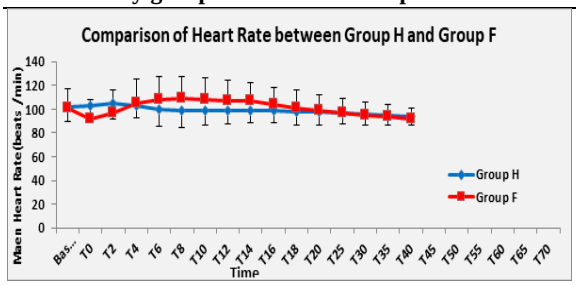


Figure 1: Distribution of patients as per diagnosis in Group H and Group F:



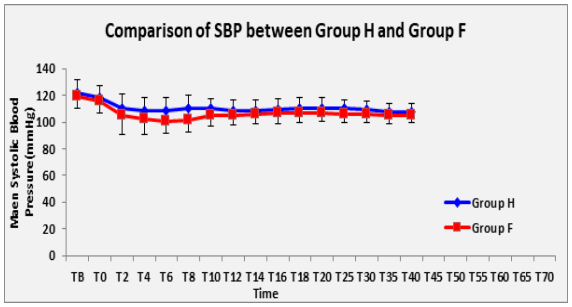
The distribution of patients as per diagnosis in the two group is comparable and not statistically significant.

Figure 2: Intergroup comparison of mean heart rate in the two study groups at different time points:



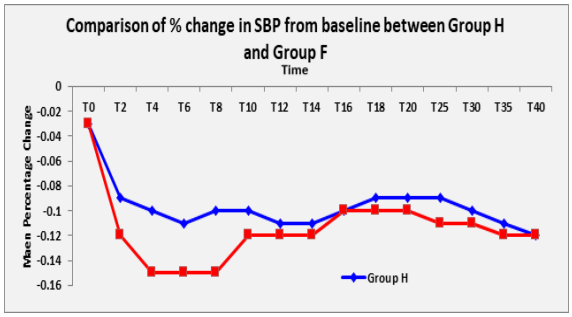
The baseline mean heart rate in the two study groups was comparable. It was observed that there was a statistically significant difference in the mean heart rate at timepoints T6, T8, T10, T12, and T14. The difference in mean heart rate between the study groups at all other time points was statistically not significant.

Figure 3: Intergroup comparison of Systolic blood pressure in both the study groups at different time points.



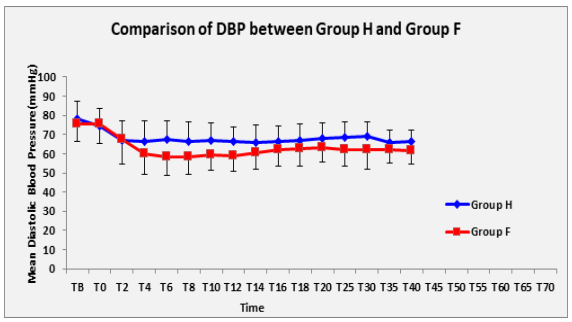
The baseline mean systolic blood pressure in the two groups was comparable. However, it was observed that there was a statistically significant difference in mean systolic blood pressure at all other timepoints except at TB, T0 and T16. The mean systolic blood pressure in the fixed dose group (Group F) was significantly lower than that observed in the height adjusted group (Group H) at most of the timepoints.

Figure 4: Intergroup comparison of percentage change in systolic blood pressure from baseline in both the study groups at different timepoints



There was a statistically significant difference in mean percentage change in systolic blood pressure from baseline at T4, T6, T8 and T10. The mean percentage change in systolic blood pressure at T0, T2 and T12-T40 in the two groups was comparable.

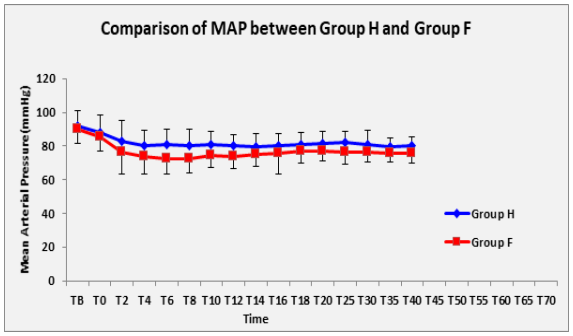
Figure 5: Intergroup comparison of mean diastolic blood pressure in the two study groups at different time points:



It was observed that there was a statistically significant difference in mean diastolic blood pressure at timepoints T4 to T40.The difference in

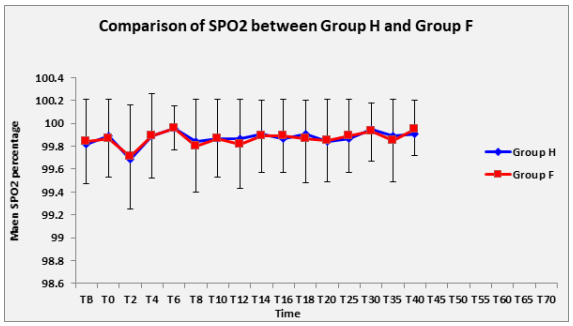
diastolic blood pressure between the study groups at baseline and time points T0 and T2 was statistically not significant.

Figure 6: Intergroup comparison of mean arterial blood pressure of the study group at different time points



It was observed that there was a statistically significant difference in mean arterial blood pressure from timepoints T2 to T40. The difference in mean arterial blood pressure between the study groups at baseline and at T0 was statistically not significant.

Figure 7: Intergroup comparison of mean peripheral oxygen saturation (SpO2) of patients in the two study groups at different time points:



The SpO2 values, at all-time points were within the normal range. The difference in mean peripheral oxygen saturation between the study groups was statistically not significant and mean peripheral oxygen saturation was comparable in both the study groups.

Number of hypotensive episodes in the study groups:

In group H one episode of hypotension was present in 9 patients (16.4%), two episodes of hypotension was present in 2 patients (3.6%), three episodes of hypotension was present in 0 patients and zero episode of hypotension was present in 44 patients (80%).

In group F one episode of hypotension was present in 21 patients (38.2%), two episodes of hypotension was present in 15 patients (27.3%), three episodes of hypotension was present in 2 patients (3.6%) and zero episode of hypotension was present in 17 patients (30.9%)

It was observed that there was a statistically significant difference in number of hypotensive episodes in between both study group. P value is <0.001 by Chi-square test.

It was observed that there was a statistically significant difference in number of hypotensive episodes in between both study groups.

Number of mephentermine bolus doses:

In group H one bolus dose of mephentermine was given in 9 patients (16.4%), two bolus doses of mephentermine were given in 2 patients (3.6%), three bolus doses of mephentermine was given in 0 patients and none was given in 44 patients (80%).

In group F one bolus dose of mephentermine was given in 21 patients (38.2%), two bolus doses of mephentermine was given in 15 patients (27.3%), three bolus doses of mephentermine was given in 2 patients (3.6%) and none was given in 17 patients (30.9%)

It was observed that there was a statistically significant difference in number of mephentermine bolus doses required between both study group. P value is <0.001 by Chi-square test.

It was observed that there was a statistically significant difference in number of mephentermine bolus doses required between both study groups.

Percentage of patients requiring atropine bolus doses in both groups:

In group H none of the patients required atropine bolus doses whereas in group F, 2 (3.6%) patients required atropine bolus doses. It was observed that there was no statistically significant difference in number of atropine bolus doses required between both study group. P value is 0.495 by Chi-square test.

Table 3: Intergroup comparison of time parameters of the study groups

Parameters	Group H	Group F	p value
	Mean ± SD	Mean ± SD	
Time(min) to achieve motor block of modified Bromage scale 3 (min)	3.00 ± 0.75	2.45 ± 0.60	**<0.001**
Time (min) to regression of sensory block to S2(min)	186.82 ± 19.94	197.55 ± 23.09	**0.01**
Time (min) to regression of complete motor block (modified bromage scale0)	140.20 ± 9.84	149.82 ± 13.14	**<0.001**

Percentage of patients achieving sensory block levels at 5 minutes in both groups: In group H, at 5 minutes, percentage of patients achieving block height of T4, T5, T6, T7, T8 and T9 was 0, 1.8%, 32.7%, 18.2%, 40%, 7.3% respectively.

In group F at 5-minute, percentage of patients achieving block height of T4, T5, T6, T7, T8 and T9 was 14.5%, 14.5%, 25.5%, 23.6%, 21.8% and 0% respectively. P value is 0.001, the difference between the two group was statistically significant.

Percentage of patients achieving sensory block level at 15 minutes in both groups:

The difference between the two group was statistically significant. In group H at 15-minute, percentage of patients achieving block height of T4, T5, T6 and T7 was 9.1%, 43.6%, 36.4%, 3.6% respectively.

In group F at 15-minute, percentage of patients achieving block height of T2, T3, T4, T5 and T6 was 3.6%, 18.2%, 30.9%, 43.6% and 3.6% respectively.

P value is <0.001, the difference between the two group was statistically significant.

Percentage of patients achieving maximum sensory block level in both groups:

In group H, percentage of patients achieving maximum block height of T4, T5, T8 and T9 was 23.6%, 69.1%, 1.8% and 5.5% respectively.

In group F, percentage of patients achieving maximum block height of T2, T3, T4, T5 and T8 was 7.3%, 16.4%, 38.2%, 36.4% and 1.8% respectively.

P value is <0.001, the difference between the two group was statistically significant.

Table 4: Intergroup comparison of time parameters between the both groups

Parameters	Group H	Group F	p value
	Mean ± SD	Mean ± SD	
Time (min)from study drug injection to skin incision	4.89 ± 0.85	4.18 ± 0.95	**<0.001**
Time (min)from study drug injection to uterine incision	9.15 ± 1.08	8.04 ± 1.29	**<0.001**
Time (min)from study drug injection to delivery of baby	11.09 ± 1.22	10.00 ± 1.61	**<0.001**
Time from skin incision to uterine incision	4.25 ± 1.11	3.85 ± 1.04	0.054
time from uterine incision to delivery of baby	1.95 ± 0.78	2.02 ± 0.83	0.636

Percentage of patients given head down tilt in both groups: In group H number patients requiring head down tilt was 36(65.5%) whereas in group F number of patients requiring head down tilt was 25(45.5%). It was observed that there was no statistically significant difference in head down tilt required between both study group. P value is 0.055 by Chi-square test.

Percentage of patients requiring supplemental analgesia in both groups: In group H number of patients required supplemental analgesia was 16(29.1%), Group F, none of the patients required supplemental analgesia. It was observed that there was statistically significant difference in supplemental analgesia required between both study group. P value is <0.001 by Chi-square test.

Patients requiring conversion to general anaesthesia: In group H, number of patients required conversion to general anaesthesia was 4 whereas none of the patients in group F required conversion to general anaesthesia. It was observed that there was no statistically significant difference between both study group. P value is 0.118 by Chi-square test.

Percentage of patients with nausea in both groups:

In group H, number of patients with mild nausea was 7(12.7%) and in group F number of patients with mild nausea in group was 7(12.7%).

In group H, number of patients with moderate nausea was 2(3.6%) and number of patients with moderate nausea in group F was 8(14.5%).

In group H, number of patients with severe nausea was 0 and number of patients with severe nausea in group F was 2(3.6%).

There was no statistically significant difference in mild, moderate and severe nausea with p values of 1.000, 0.093, 0.495 respectively.

Incidence of vomiting in both study groups: In group H, there was no episodes of vomiting seen whereas in group F number of episodes of vomiting was 3(5.5%). It was observed that there was no statistically significant difference in episodes of vomiting between both study group. P value is 0.243 by Chi-square.

Maternal satisfaction score and APGAR score at 1min and 5 min: In group H maternal satisfaction score of 7, 8, 9 and 10 was present in 4(7.3%), 19(34.5%), 24(43.6%) and 8(14.5%) patients respectively. In group F maternal satisfaction score of 7, 8, 9 and 10 was present in 3(5.5%), 18(32.7%), 28(50.95) and 6(10.9%) patients respectively. It was observed that there was no statistically significant difference. P value is 0.858 by Chi-square.

In group H, APGAR score at 1 minute was 9.58± 0.60 whereas in group F, APGAR score was 9.58± 0.63. It was observed that there was no statistically significant difference in e between both study group. P value is 1.000 by Chi-square.

In group H APGAR score at 5 minute was 9.96± 0.19 whereas in group F APGAR score was 9.98± 0.14. It was observed that there was no statistically significant difference in between both study group. P value is 0.562 by Chi-square.

DISCUSSION

Spinal anaesthesia is the preferred anaesthetic technique for the conduct of emergency and elective caesarean section in parturients, as it is a simple, rapid and safe technique. However, the occurrence of hypotension during spinal anaesthesia for caesarean section is a major problem. Maternal hypotension may be associated with distressing unpleasant symptoms like dizziness, nausea, vomiting. In severe cases, hypotension can result in unconsciousness, apnoea, and cardiac arrest in parturients and may also impair placental perfusion and compromise foetal outcome.[5]

Left uterine displacement, leg elevation, preloading / co-loading with intravenous fluids, prophylactic administration of vasopressors, are some of the frequently employed strategies to prevent hypotension.[6]

The present study entitled "Comparison of height adjusted dose versus fixed dose of 0.5% hyperbaric bupivacaine for caesarean delivery under spinal anaesthesia - A prospective randomised study" was conducted to compare height adjusted dose versus fixed dose of 0.5% hyperbaric bupivacaine in parturient for caesarean delivery under spinal anaesthesia.

In our study the age (p=0.622), weight (p=0.462), height (p=0.758) and gestational age (p=0.158) of all patients were comparable and statistically significant. These findings correlate with study conducted by Gupta et al.[7]

The difference between the two groups in study drug administration was statistically significant.

There was no significant difference between the study groups in the mean heart rate at timepoints: TB, T0, T2 and T4. However, a significant difference was seen in the mean heart rate between the study groups at T6, T8, T10, T12 and T14. The mean heart rate was significantly higher in the fixed dose group (group F) as compared to height adjusted group (group H). From timepoint T16 till T40, the mean heart rate was comparable in the two groups. The significantly higher values of mean heart rate in fixed dose group at timepoints T6 to T14 were perhaps due to a compensatory response to hypotension seen in these patients during this period.

The two groups were comparable for baseline systolic blood pressure (P = 0.169). The mean systolic blood pressure at timepoints T2 till T40 except at T16 was significantly lower in the fixed dosage group (group F) as compared to height adjusted group (group H). The mean percentage change in systolic blood pressure from baseline at timepoints T4, T6, T8 and T10 was significantly more in group F as compared to group H. The comparison of mean diastolic blood pressure from timepoint TB till timepoint T2 was not significant in the two groups. The mean diastolic blood pressure in group F was significantly lower than in group H, at timepoints T4 till T40, ($p<0.05$). The two groups were comparable for mean arterial pressure at timepoint at baseline and T0. The mean arterial pressure in group F was significantly lower than in group H, at timepoints T2 till T40, ($p<0.05$). these findings are similar to the studies done by Harten et al.[6] in the present study, significantly lower systolic, diastolic and mean arterial pressure was observed at several timepoints in the fixed dose group (group F) as compared to height adjusted group (group H). Similar results were seen in study conducted by Harten et al,[6] Subedi et al,[8] Gupta et al[7].

The incidence of hypotension between the two groups was statistically significant. These findings were similar to the studies done by Harten et al,[6] Subedi et al,[8] Jain et al.[9]. The mephentermine requirement between the groups was statistically significant. A significantly greater number of patients had higher sensory block levels in group F as compared to group H. This explains the increased incidence of hypotension as well as mephentermine requirement in this group F. These findings were similar to the studies done by Harten et al,[6] Gupta et al,[7] Jain et al.[9]. The difference in atropine requirement in the study groups was not statistically significant. Similar results were found in a study by Subedi et al,[8] Baysal et al.[9] Oxygen saturation was within the normal range in all patients in both the study groups at all timepoints. There was no statistically significant difference between the two groups at any time point.

The motor block of modified Bromage scale 3 was achieved significantly faster in group F as compared to group H, $p < 0.001$. The number of patients achieving a higher sensory level at 5 minutes and at 15 minutes was significantly more in group F as compared to group H. At 15 minutes from injection of spinal drug, in group F, 2 (3.6%) patients had level of sensory block to T2 and 10 (18.2%) patients had level of sensory block to T3. While, no patient in group H had a block level above T4. The maximum level of sensory block achieved in patients in group F was T2 and in patients in group H was T4. In a study by Gupta et al,[7] the maximum level of sensory block was extended up to T1 dermatome (4.95%) in fixed dose group while in parturient in adjusted dose group, block did not exceed beyond T3. Subedi et al,[8] in their study found that the spinal block level extended above T3 level in a significantly larger number of patients 12 (24 %) in fixed group compared to 1(2%) patient in adjusted group, ($p < 0.05$). Our study results are in accordance with results of the study by Harten et al.[6]

The sensory block and motor block lasted significantly longer in patients in group F as compared to group H. This finding is similar to study done by Chung et al.[4]

In the present study number of patients requiring a head down tilt to achieve desired level of sensory block to T5 was not statistically significant, p=0.055. Perhaps, due to a higher sensory level achieved in patients who received a fixed dose, a comparatively lesser number of patients had required a head down

tilt. This finding is similar to study done by Subedi et al,[8] and Gupta et al.[7] There was a significant difference in requirement of supplemental analgesia in the two groups, p<0.001. Even in a study conducted by Harten et al6 none of the patients in fixed dose group required supplemental analgesia but supplemental analgesia was required in 4.4% patients in adjusted group. Unlike our results, Subedi et al,[8] did not find a significant difference in requirement of supplemental analgesia in fixed and adjusted dose groups but the number of patients requiring supplemental analgesia was higher in adjusted dose group as compared to fixed dose group. (p=0.181). In the present study, no patient required conversion to general anaesthesia in group F as compared to 7.3% patients in group H. However, this difference was not statistically significant, p = 0.118. This finding is similar to the study done by Harten et al,[6] Gupta et al.[7]

The present study found that there was no statistically significant difference in nausea and vomiting episodes in the two groups. This finding is similar to the study done by Harten et al,[6] Subedi et al8. The present study found that there was no statistically significant difference in maternal satisfaction score. This finding is similar to the study done by Nofal et al.[11] However, there was no significant difference observed in the two groups in time from skin to uterine incision and time from uterine incision to delivery of baby. Longer uterine incision-to-delivery times are associated with increased neonatal morbidity and this time was comparable in both the groups of our study. This finding is similar to study done by Chung et al,[4] Jain et al.[1]

We found APGAR score of more than 8 in both the groups, at all times and found no effect on the APGAR score between the study groups. APGAR score at 1 minute and 5 minutes, there was no statistically significant difference in between both study groups. Similar findings were observed in studies done by Harten et al,[6] Subedi et al,[8] Gupta et al.[7]

CONCLUSION

In parturient undergoing caesarean delivery under spinal anaesthesia, the height adjusted dose of 0.5% hyperbaric bupivacaine is associated with a lower incidence of hypotension and vasopressor requirement. It is associated with a lower level of sensory block with greater number of patients requiring a head down tilt, supplemental analgesia and conversion to general anaesthesia. The time from study drug injection to skin incision, uterine incision and delivery of baby are also longer. On the basis of our results, parturient undergoing caesarean delivery under spinal anaesthesia receiving height adjusted dose in comparison to those receiving a fixed dose of 0.5% hyperbaric bupivacaine have better hemodynamic stability, comparable maternal satisfaction and neonatal outcome.

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