Assessment of Spinal Anesthesia in Sitting and Lateral Positions on the Onset Time of Sensory Block and Hemodynamic Condition in Cesarean Section: A Prospective Comparative Observational Study

Dr. Neha Vyas [1], Dr. Hitesha Gurtoo[2], Dr. Ajay Gupta [3] and Dr. Mukta Jitendra[4]
Corresponding Author: Dr. Hitesha Gurtoo
Email ID: hgurtoo93@gmail.com

[1,2,3,4]Department of Anesthesiology and Critical Care, GMC Jammu

Abstract

Background: Today, the most popular anaesthetic method for caesarean deliveries is spinal anaesthesia. Technically speaking, it is a simpler and more dependable procedure, reducing the need for additional intravenous analgesics or switching to general anaesthesia. The present study has been aimed to compare the effect of spinal anesthesia in the sitting and lateral positions on the onset time of sensory block and hemodynamic condition in cesarean sections.

Methods: The present prospective comparative study has been conducted in the Department of Anaesthesiology and Intensive care, Government Medical College, Jammu, for the period of 6 months in the year 2020. After attaining approval of the Ethical committee of the institute, present study included 50 pregnant full term patients, with age more than 18 years, belonging to ASA 1 and 2, scheduled for elective caesarean section under spinal anaesthesia.

Results: The vitals SBP, DBP and MAP were significantly higher in sitting position group compared to lateral group of patients at 2 min, 4 min, 6 min, 8 min and 10 minutes after the spinal anesthesia. However, the difference became insignificant from 15 minutes onwards to 90 minutes. The mean time to reach T4 blockade was significantly lower (8.56±0.92) mins in lateral group compared to (10.64±2.02)mins in sitting group. The mean time to reach grade 3 blocks was significantly lower (10.84±2.19) minutes in lateral group compared to (15.60±2.63) minutes in sitting group.

Conclusion: The present study demonstrated that both sitting and left lateral positions can be used for induction of spinal anesthesia in caesarean section. Although sensory and motor blockade are faster in left lateral group but sitting position is associated with more haemodynamic stability, less incidence of hypotension and less vasopressor requirement.

Keywords: **Cesarean Section, Spinal Anesthesia, Hemodynamic Changes, Sitting Position, Lateral Position, Sensory Block.**

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Introduction

Today, the most popular anaesthetic method for caesarean deliveries is spinal anaesthesia. Technically speaking, it is a simpler and more dependable procedure, reducing the need for additional intravenous analgesics or switching to general anaesthesia.[1]When used on caesarean birth patients, it provides a quick, powerful, and high-quality sensory and motor block. To create a functional spinal blockade, a very minimal amount of local anaesthetic is needed. Therefore, spinal anaesthesia has a negligible effect on the fetus's exposure to drugs and poses a negligible risk to the mother's health.[2,3] Pregnant women are more likely to experience hypotension after spinal anaesthesia, which is partly due to the cephalad distribution of topical analgesics in the subarachnoid space and partially due to the pressure the pregnant woman's uterus places on the aortocaval.[4-6]Spinal anaesthesia is only performed in the lumbar spine and is used for surgical procedures involving the lower abdomen, pelvis, and lower extremities.The administration of spinal anaesthesia requires appropriate positioning and understanding of neuraxial anatomy. The goal is to deliver appropriately dosed anaesthetic drug into the intrathecal (subarachnoid) space.Spinal anaesthesia can be induced in patient in either the sitting or lateral decubitus position, each of which has advantages and disadvantages.[7,8]Spread of local anaesthetic solution in cerebrospinal fluid (CSF) depends upon patient's posture (Hwang JW *et al*., 2012).[9] This may have an impact on the incidence and severity of hypotension after intrathecal injection of the local anaesthetic. The sitting position appears to be optimal for the spinal anaesthesia as identification of landmarks, particularly in the midline, is much easier. However, for pregnant women, sustaining the sitting position is sometimes challenging and painful. Lateral position is generally considered comfortable and easy to maintain for the pregnant patients. But the identification of anatomical landmarks is difficult.Therefore, it is important to know how the patient's hemodynamic status changes after spinal anesthesia in the lateral position.[10]Sitting causes significant hypotension due to sympathectomy brought on by spinal anaesthesia, which also amplifies the effects of gravity-induced peripheral blood edema.[11]Acidemia in the foetus and vomiting, nausea, and dizziness in the mother are all issues brought on by hypotension for the mother and the unborn child.[11] According to the rationale above, spinal anaesthesia in the lateral position may theoretically be associated with reduced hypotension. Regarding the prevalence of hypotension and the duration of anaesthesia in the sitting and lateral postures during caesarean sections, various studies have been done in this field with varying findings.[8,10]

Methods

The present prospective comparative study was conducted in the Department of Anaesthesiology and Intensive care, Government medical college, Jammu, for the period of 6 months in the year 2020. After attaining approval of the Ethical committee of the institute, present study included 50 pregnant full term patients, with age more than 18 years, belonging to ASA 1 and 2, scheduled for elective caesarean section under spinal anaesthesia. Preanaesthetic check-up was done one day prior to the surgery and included a detailed history, thorough physical and systemic examination along with routine and relevant investigations. The procedure to be done was explained to the patient and written informed consent was obtained. Preoperatively, airway was assessed using Mallampati Grade, Thyromental distance and neck mobility. Spine

was examined for any local infection and deformity.

Exclusion criteria:

- Patient's refusal to give consent.
- Hypersensitivity to bupivacaine.
- Age <18 years
- Patient with infection at the site of injection.
- Coagulopathy
- Increased intracranial tension.
- Pre-existing neurological deficits.
- Severe hypovolemia.

Patients were randomly allocated into 2 groups with 25 patients in each group. Group A patients had induction in the sitting position and Group B patients had induction in left lateral position

PREPARATION:

All the patients were kept fasting overnight prior to surgery. On the day of surgery investigations and informed consent were rechecked. General anaesthesia trolley, spinal anaesthesia trolley, resuscitation drugs were prepared and checked. In the operation theatre, a large bore IV line was secured on the dorsum of non-dominant hand with 18G cannula. Patients then received injection ranitidine 50 mg and injection metoclopramide 10 mg intravenously. Monitors were attached to the patient – ECG, pulse oximeter, non-invasive blood pressure monitors (NIBP). Baseline heart rates, oxygen saturation (SPO2), blood pressure (B.P.) were recorded. All patients were preloaded with 10ml/kg of (i.v) Ringer lactate solution.Patient was given position for spinal anaesthesia. The position of spinal anaesthesia was decided by the anaesthesia- in-charge of the theatre based on randomization chart table.

Sitting position: Patient was sitting where a stool was provided as a footrest and a pillow placed in the lap. The assistant then maintained the patient in a vertical plane while flexing the patient's neck and arms over the pillow to open up the lumbar vertebral space.

Lateral position: For lateral position, a patient was lying in left lateral position on the operating table with the knees and hips in flexion.

Spinal anaesthesia was performed with the patient in sitting or lateral position at L3-L4 level via mid-line approach using a 27 gauge Quincke's spinal needle. 0.5% hyperbaric bupivacaine was injected after clear and free flow of CSF and after confirming negative aspiration for blood. Inj. bupivacaine was given in the dosage of 2-2.2ml depending upon the height of the patient. Immediately after withdrawing the spinal needle, patient was placed in supine position with a wedge under right hip.Level of motor block was assessed using Modified bromage scale and time to reach grade 3 blocks was noted. Level of sensory block was assessed by using pin-prick sensation. An upper level of T4 was noted and was considered adequate for surgery.

Modified Bromage scale:

0: No motor block

1: Inability to raise extended leg; able to move knees and feet

2: Inability to raise extended leg and move knee; able to move feet

3: complete block of motor limb

Thereafter assessments were made for heart rate, oxygen saturation, systolic blood pressure, diastolic blood pressure, and mean blood pressure every 2 minutes after the injection of drug for first 10 minutes then every 5 minutes. After delivery of the baby slow infusion of oxytocin 10 U in 500 ml of ringer lactate was infused over 1 hour.A decrease in mean arterial blood pressure of >20% of the baseline level was treated with fluid boluses followed by incremental doses of intravenous mephenteramine 6mg. Occurrence of clinically relevant bradycardia (defined as HR<50bpm) was treated with increments of 0.3mg atropine intravenously. Nausea and vomiting were treated with inj. Ondansetron 4mg intravenously.

At the end of surgery, patients were asked about their satisfaction for overall comfort level for position during spinal anaesthesia in terms of three-point scale.

0-Not comfortable
1-Comfortable
2-Very comfortable

Following assessments were also made-

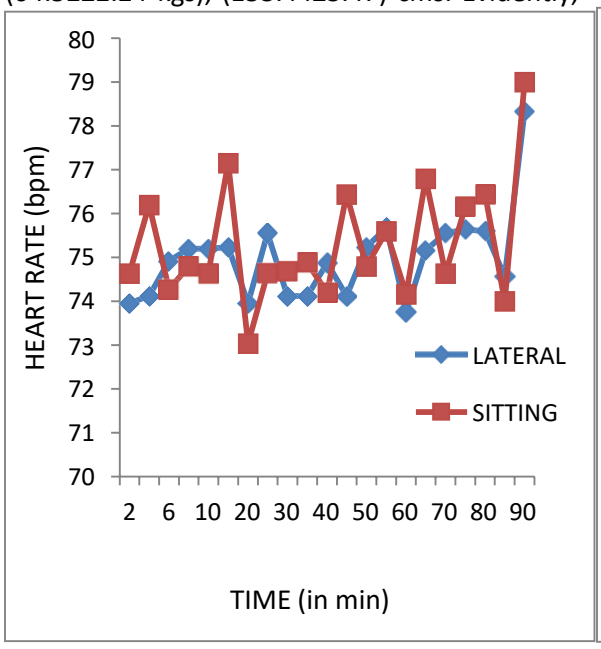
1. Hypotension
2. Vasopressor requirements
3. Incidence of peri-operative nausea and vomiting.
4. Neonatal Apgar scores at 1 and 5 minute.
5. Total amount of fluids administered

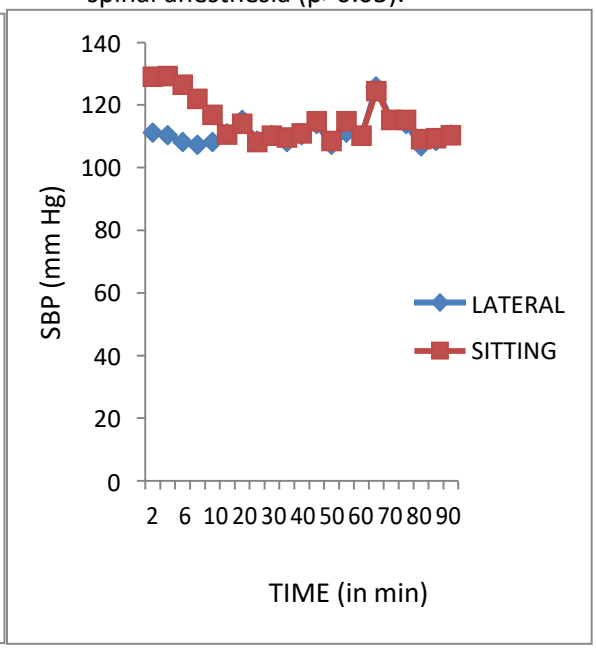
The data thus collected was analyzed. Appropriate statistical tests were applied.

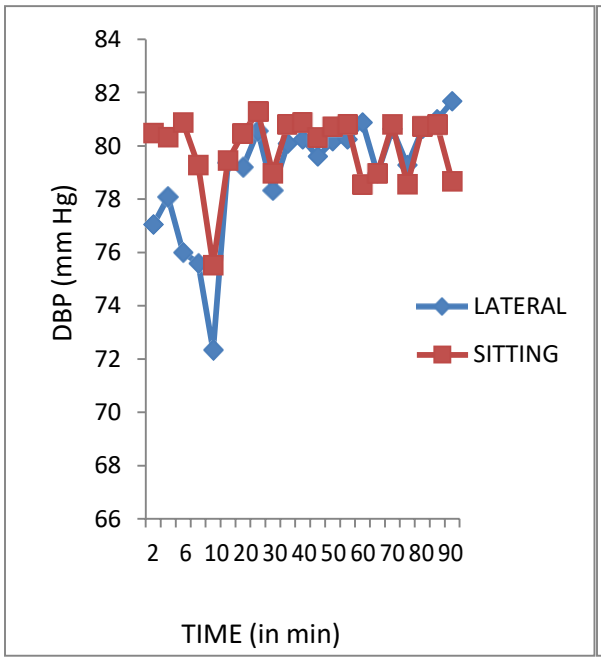
Results

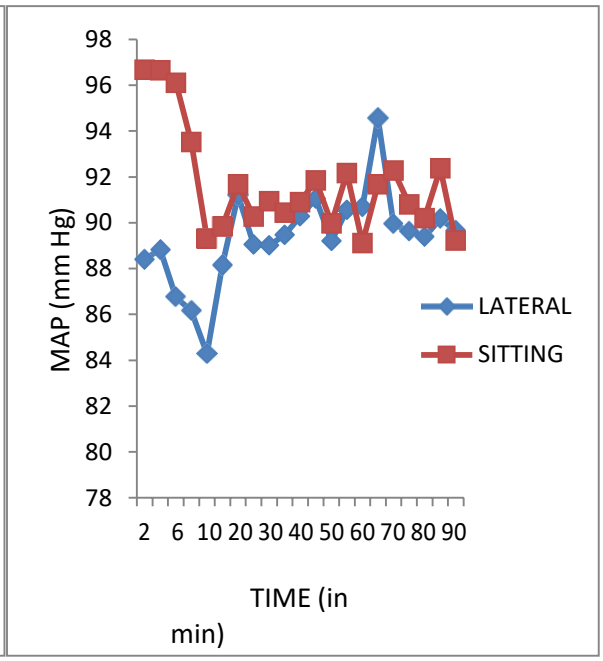
In this section, the results of the study will be described:

The mean age, mean weight and mean height of lateral group of patients was respectively; (24.44±2.43) years, (64.04±2.24) kgs and (154.44±2.57) cms. And the mean age, mean weight and mean height of sitting group of patients was respectively (24.52± 1.96) years, (64.52±2.24 kgs), (153.44±3.47) cms. Evidently, both the groups were comparable with respect to age, weight and height of patients. The lateral group had 17 (68%) patients with ASA I status, and 8 (32%) patients with ASA II status while as in the sitting group, 19 (76%) patients had ASA I status and 6 (24%) had ASA II status.Both the groups were comparable in terms of ASA grade distribution and the difference was not statistically significant.The mean duration of surgery was comparable between the groups; (85.6±4.64) minutes in lateral group and (85.4±4.06) minutes in sitting group. The baseline parameters in lateral group were heart rate (78.12±7.03beats /min), SBP (110.92±7.06mm Hg), DBP (81.68±7.43 mm Hg), MAP (94.56±4.71 mm Hg) and SPO2 (97.32±1.07%) and the baseline parameters in sitting group were heart rate (74.68±6.39 beats/min), SBP (110.60±7.19 mm Hg), DBP (80.64±8.04 mm Hg), MAP (91.68±7.71 mm Hg) and SPO2 (97.24±1.20%). The difference between them was statistically insignificant (p value > 0.05). The mean heart rate was comparable between the groups from 2 minutes to 90 minutes of time interval after the spinal anesthesia (p>0.05).









SBP, DBP and MAP was significantly higher in sitting position group compared to lateral group of patients at 2 min, 4 min, 6 min, 8 min and 10 minutes after the spinal anesthesia. However, the difference became insignificant from 15 minutes onwards to 90 minutes. SPO_2 was comparable between the groups from 2 to 90 minutes after the block.

Table 1: Various sensory and motor parameters

PARAMETER	LATERAL		SITTING		p-value
	Mean	SD	Mean	SD	
Sensory block (time to reach T4)	8.56	0.92	10.64	2.02	0.00002
Motor block (time to reach grade 3)	10.84	2.19	15.60	2.63	0.0000001

Sensory block was noted by pin prick method and time taken to reach T4 blockade was noted in minutes. The mean time to reach T4 blockade was significantly lower (8.56±0.92) mins in lateral group compared to (10.64±2.02)mins in sitting group.Motor block was noted by modified Bromage scale and time taken to reach grade 3 block was noted in minutes. The mean time to reach grade 3 blocks was significantly lower (10.84±2.19) minutes in lateral group compared to (15.60±2.63) minutes in sitting group.

TABLE 2: Showing incidence of patients with hypotention in lateral and sitting group

HYPOTENSION	NO. OF PATIENTS IN GROUP		TOTAL	p-value
	LATERAL	SITTING		
YES	8	1	9	0.023

NO	17	24	41	
TOTAL	**25**	**25**	**50**	

The incidence of hypotension was significantly higher in lateral group (8 patients) compared to 1 patient in sitting group. Vasopressor was required in 8 patients in lateral group compared to 1 patient in sitting group.

Table 3: Showing distribution of patients with vasopressor requirement

VASOPRESSOR REQUIREMENT	NO. OF PATIENTS IN GROUP		TOTAL	p-value
	LATERAL	SITTING		
YES	8	1	9	0.023
NO	17	24	41	
TOTAL	25	25	50	

Nausea/vomiting episodes and fluid requirement were comparable between the groups. Mean Apgar score at 1 minute in lateral group was 8.80±0.87 and 8.84±0.94 in sitting group, which was comparable statistically. The mean Apgar score at 5 minute in lateral group was (9.92±0.40) and (10.00±0.00) in sitting group, the difference was statistically comparable between the groups.

Table 4: satisfaction score distribution of patients in the two groups.

PATIENT SATISFACTION	LATERAL		SITTING	
	N	%	N	%
0	6	24%	0	0%
1	14	56%	5	20%
2	5	20%	20	80%

In lateral group, patient satisfaction score 0 was observed in 6(24%) patients, satisfaction score 1 was observed in 14(56%), satisfaction score 2 was observed in 5(20%) patients. In sitting group, patient satisfaction score 0 was observed in 0(0%), satisfaction score 1 was observed in 5(20%) patients, and a satisfaction score of 2 was observed in20(80%) patients. The mean satisfaction score was better in sitting group compared to lateral group; (1.80± 0.41) vs (0.96± 0.68)

Discussion

In the present study,we observed that demographic parameters like; age, weight and height of the patients was statistically comparable (p> 0.05).Difference between the ASA grade and duration of surgery were also statistically insignificant (p>0.05). Heart Rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and oxygen saturation (SPO_2) were recorded before surgery as baseline reading and thereafter monitoring was done intra operatively at different time interval. There was no significant difference in the baseline heart rate, blood pressure and oxygen saturation. In the present study we observed that there was statistically significant lower systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean blood pressure (MBP) in lateral position during the first 10 minutes of induction of spinal anaesthesia. Afterwards the difference

was insignificant. This is in accordance with the study done by RamayyanAchary A *et al.,* (2020) where he observed that there was more haemodynamic stability in sitting position as compared to lateral position.[12] This is in contrast with the study done by Obasuyi BI *et al.,* (2013) where fall in blood pressure was more in sitting position as compared to lateral position.[13] The lowest recorded mean arterial pressure was greater in Group L (72.9 ± 11.2 mmHg) than in Group S (68.2 ± 9.6 mmHg; P = 0.025).Also in the study done by Shahzad K *et al.,* (2013) there was no significant difference in the systolic as well as diastolic blood pressure between sitting and lateral positions.[14] In both the above studies isobaric bupivacaine was used where as in the present study hyperbaric bupivacaine was used.There was no significant difference in the heart rate between the sitting and lateral group. This is in accordance with the study done by Kharge ND *et al.,* (2017) who observed that induction position for spinal anaesthesia did not affect haemodynamic stability.[15]The present study is in contrast with that of Atashkhoei S *et al.,* (2018) who concluded that Bradycardia occurred in 8 (21.1%) patients of sitting position which required treatment with atropine, while none of the patients in the lateral group had bradycardia (p-0.014).[16]There was no statistical difference in the oxygen saturation (SPO_2) between the sitting and left lateral groups. This is in accordance with the study done by Atashkhoei S *et al.,* (2018) where he observed no significant difference in oxygen saturation (Group L 97.16±0.89, Group S 97.13±0.93, p-0.96) in the lateral and sitting induction positions of spinal anaesthesia in Caesarean section.[16]The sensory level was assessed using pin-prick sensation. The block was assessed till the level T4 was achieved and it was considered adequate for the surgery. In present study onset of sensory block was earlier in group B (left lateral group) and time to reach T4 was 8.56±0.92 mins when compared with the group A (sitting group) where it was 10.64±2.02 mins and it was found to be statistically significant. This is in accordance with the study done by Kharge ND *et al.,* (2017) who observed that at 10th minute and onwards, patients in lateral group achieved higher sensory level than those in sitting group.[15] The present study is also in accordance with the study done by RamayyanAchary A *et al.,* (2020) who observed mean value of onset time for sensory block to T5 dermatome in left lateral and sitting positions were 6.8±2.7 and 9.7±5.5 min respectively.[12] The present study is in contrast with the study done by Shahzad K *et al.,* (2013) where he observed that the time for onset of sensory block in the sitting group was 4.5 minutes compared with 5.4 minutes in the lateral group (p <0.006).[14]In the sitting group, 3 (8.6%) patients had highest sensory block up to T4 level, while in the lateral group, 2 (5.7%) achieved sensory block up to T5 level. The motor block was assessed using modified bromage scale. The time taken to achieve grade 3 block was noted. In present study onset of motor block was faster in left lateral group. Time to reach grade 3 motor block in left lateral group was 10±2.19 minutes whereas in sitting group, it was 15.60±2.63 minutes. This is in accordance with the study done by Kharge ND *et al.,* (2017) who observed that after 3 minutes, 16.7% of patients who were given lateral position had motor level score of 2, 83.3% patients had motor level score of 3 while 30% patients who were given sitting position had motor level score of 2 and 70% had motor level score of 3.[15]This is also in accordance with the study done by Laithangbam PK *et al.,* (2013) where he observed that time to reach maximum Bromage score was lowest in left lateral position(4.78±1.06min.) followed by Oxford(5.30±1.05min) and sitting position(5.52±0.91min).[17] This is in contrast with the study done by Shahzad K *et al.,* (2013) where he observed that there was no difference between the groups for mean time to achieve

maximum density of motor block.[14]Apgar scores at 1 and 5 minute were noted. Apgar score at 1 minute was 8.80±0.87 in left lateral group and 8.84±0.94 in sitting group. Apgar score at 5 minute was 9.92±0.40 for left lateral group and 10.00±0.00 for sitting group. The difference between the two groups was found to be statistically insignificant (p>0.05). This is in accordance with the study done by RamayyanAchary A *et al.,* (2020) where he found that Apgar at 1 minute (L 7.98±0.14, S 8.00±0.00) and 5 minute (L 8.98±0.14, S 9.00±0.00) were comparable and difference was statistically insignificant.[12] This is also in accordance with the study done by Atashkhoei S *et al.,* (2018) where he found that there were no differences in neonatal Apgar scores at one min of delivery, but mean neonatal Apgar scores in five min was higher in lateral with p-value=0.87 that was not significant.[16]At the end of the surgery, patients were asked about their satisfaction for overall comfort level for position during spinal anaesthesia in terms of three-point scale which was graded as 0- Not comfortable, 1- comfortable and 2- very comfortable. The mean satisfaction score for the left lateral group was 0.96±0.68 and for the sitting group was 1.80±0.41 and it was statistically significant. In the present study patient found sitting position more comfortable for induction of spinal anaesthesia. This is in accordance with the study done by RamayyanAchary A *et al.,* (2020) where he observed that patients in group S found their positioning more comfortable (76 vs. 34%, P < 0.001).[12] This is in contrast with the study done by Kharge ND *et al.,* (2017) where he concluded that there was statistically significant difference between the two positions with respect to the patient comfort score.83.3% patients in lateral group were having patient comfort score of 2 (very comfortable) as compared to 50% in sitting position.[15] Also in the study done by Shahzad K *et al.,* (2013), he concluded that more patients in the lateral position reported 'very comfortable' compared to the sitting group.Average fluids administered in both the groups (1176ml in left lateral group and 1204ml in sitting group) were comparable and the difference was not significant(0.69).[14] This is in accordance with the study done by Atashkhoei S *et al.,* (2018) where he observed no difference in the total IV fluid administered between the left lateral and the sitting group (Group L 2590.79±265.55ml, Group S 2602.63±323.19 ml, p- 0.25).[16]Incidence of nausea and vomiting in both the groups were 1 in left lateral group and 1 in sitting group. It was treated by giving 4 mg Ondansetron I/v. The difference was not statistically significant (p value-1). This is in accordance with the study done by Atashkhoei S *et al.,* (2018) where he observed no significant difference in the incidence of nausea and vomiting (lateral group -0, sitting group -3, p value 0.12).[16]Hypotension (decrease in mean arterial blood pressure of >20% of the baseline) was treated with fluid boluses followed by incremental doses of intravenous mephenteramine 6 mg. Incidence of hypotension and vasopressor requirement were more in patients of left lateral group (8 patients) as compared to patients in sitting group (1 patient) and the difference was statistically significant (p value-0.023). It may be due to faster spread of drug and rapid onset of sensory and motor block in left lateral group. This is in accordance with the study done by RamayyanAchary A *et al.,* (2020) where he found the drop in MAP was more in lateral position and this was statistically significant at most of the time point except at 2 and 8 min. Phenylephrine requirement was more in group L (77.91 ± 29.484 vs. 55.57 ± 18.898, P = 0.047) which was statistically significant.[12] This is also in accordance with the study done by Laithangbam PK *et al.,* (2013)where he found that the incidence of hypotension was highest in left lateral group(42%) followed by Oxford position(30%) and sitting position(26%) respectively.[17]Mephenteramine consumption

was also significantly higher (p value-0.03) in left lateral group (2.52±3.05) followed by Oxford position (1.50±2.37) and sitting position (1.20±2.01). The present study is in contrast with the study done by Obasuyi BI *et al.,* (2013) where he found that the incidence of hypotension was lower in Group L (17/50, 34%) than in Group S (28/50, 56%; P = 0.027).[13] This is also in contrast with the study done by Atashkhoei S *et al.,* (2018) who observed that duration of hypotension was significantly greater in group S (p=0.002).[16]

Conclusion

The present study demonstrated that both sitting and left lateral positions can be used for induction of spinal anesthesia in caesarean section. Although sensory and motor blockade are faster in left lateral group but sitting position is associated with more haemodynamic stability, less incidence of hypotension and less vasopressor requirement. Enhanced patient satisfaction of women was found among patients with spinal anesthesia in the sitting position compared to lateral position

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