

Maternal Haemodynamic Effects of Spinal Anaesthesia using Hyperbaric Bupivacaine in Sitting and Lateral Position for Caesarean Section - A Comparative Study

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Abstract: ***Background and Aims:** Spinal anaesthesia is the most common and safest methods used in caesarean section. This study aims to compare maternal haemodynamic alteration, onset of motor and sensory block after induction of spinal anaesthesia using hyperbaric bupivacaine in sitting and lateral position. **Methods:** Fifty patients of ASA grade I/II between the reproductive age group undergoing elective LSCS were included in this study. Patients were allocated in two groups alternately. Patients of group - 1 were administered spinal anaesthesia in sitting position and group 2 in lateral position and they are placed in supine position immediately. SBP, DBP, MAP, PR, SPO₂ were recorded pre - operatively, every 5 min intervals after spinal anaesthesia and post - operatively. Onset of motor and sensory blockade were also recorded. **Results:** In between 2 groups haemodynamic changes were statistically insignificant in different time intervals. Onset of motor block (mean±sd) in group - 2 is 4.4400±0.7118 and group - 1 is 5.6800±0.8524 respectively. So, the onset of motor block in group - 2 is significantly faster. (p<0.0001). Onset of sensory block (mean±sd) in group - 2 is 2.4400±0.7681 and group - 1 is 3.6800±0.8021 respectively. So, the onset of sensory block in group - 2 is significantly faster. (p<0.0001). **Conclusion:** Overall haemodynamic alteration in between 2 groups were statistically insignificant but the onset of motor and sensory blockade was significantly earlier in group - 2 (lateral position) than group - 1 (sitting) patients.*

Keywords: Spinal anaesthesia, haemodynamics, motor block

1. Introduction

The procedure for spinal anaesthesia, also known as spinal block, subarachnoid block, intradural block, and intrathecal block¹, involves injecting a local anaesthetic into the subarachnoid space with a small needle that is typically 9 cm (3.5 in) long. Spinal anaesthesia is frequently utilised in surgeries involving the lower extremities and procedures below the umbilicus, and it is a safe and effective kind of anaesthesia administered by anesthesiologists that can be used in place of general anaesthesia in this type of procedure. August Bier (1861 - 1949) performed the first intentional spinal anaesthesia for surgery by injecting 3 ml of a 0.5% cocaine solution into a 34 - year - old labourer on August 16, 1898.² After utilising it on six patients he and his assistant administered cocaine into the spine of each of the other's. Because of cocaine's toxicity after recommending it for procedures on the lower limbs they stopped using it. Since general anaesthesia is associated with a greater likelihood of maternal morbidity and mortality, spinal anaesthesia is now the preferred technique for lower segment caesarean sections.³

One benefit of spinal anaesthesia during a caesarean section over general anaesthesia is that it eliminates the need for a general anaesthetic to be delivered during the process. As a result, the patient is completely conscious and capable of taking part in the birth of her child. The operation will virtually completely relieve the patient's pain, allowing them to remain awake. In contrast to being under general

anaesthesia, patients are also less likely to feel sick. She can begin nursing the baby as soon as he/she is born and hold him/her in her arms. It is reasonably inexpensive and results in fewer respiratory problems, less bleeding, a speedy recovery from surgery, and a nearly return of bowel movement.

However, there are some drawbacks. The length of time needed to complete the surgery varies based on the anesthesiologist's level of expertise.

Finding the dural space and obtaining cerebrospinal fluid may not always be easy. In these circumstances, the procedure must be avoided. Spinal anaesthesia is typically not recommended for procedures lasting more than two hours. Medical equipment that has not been properly sterilised poses a danger of meningitis. Even if patients are sedated, spinal anaesthesia may not be appropriate for them. Sympathetic block, sensory analgesia, and motor blockade are the results of central neuraxial blocks. The level of block dependent upon drug factor (dose, baricity, volume, concentration, temperature of drug.), patient factor (CSF volume, age, pregnancy, weight, height, spinal anatomy), procedure factor (patient position level of injection, needle orifice direction). The most frequent unfavourable outcome of spinal anaesthesia or sub arachnoid block in pregnant patients is hypotension. If episodes of hypotension continue, they may cause both fetal and mother suffering and be harmful to both.⁴

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The parturient's position during and immediately following the administration of the spinal anaesthetic agent affects the cephalad diffusion of local anaesthetic in the cerebrospinal fluid and compression of the aorta and vena cava by the gravid uterus, both of which typically contribute to hypotension. By sliding the body entirely laterally to one side or by positioning a wedge underneath to raise one side of the maternal pelvis, aorto - caval compression can be prevented.⁵ Numerous methods of avoiding hypotension have been researched because it has so many negative impacts on both pregnant women and their new born babies.

Preloading the patient with intravenous fluids is one of these tactics, as is putting the patient in the trendelenburg position and using vasopressors or leg compression devices as a preventative measure. In order to prevent hypotension during delivery after regional block, it has been discovered that pure agonist phenylephrine is the preferred vasopressor rather than intravenous crystalloid prehydration, coload with colloids, and intravenous crystalloid prehydration.⁶

Two of the most significant elements that affect the speed of onset of sensory block and, ultimately, the hemodynamic consequences, are the posture of the mother and the density of the local anaesthetic medication used to induce spinal anaesthesia. Both the sitting position and the lateral decubitus position can be used to start spinal anaesthesia in pregnant women. In comparison to sitting, the lateral induction position is more comfortable and results in less hypotension.⁷

Incidence of hypotension was found to be lower (34%) in lateral induction position than in sitting position. (56%)⁷

Despite a rise in the use of spinal anaesthesia, the induction position is still largely at the anesthesiologist's discretion.⁸ The purpose of this study is to compare sitting posture with lateral induction posture because it is the most often utilised position for inducing spinal anaesthesia block in parturients. The aim of this study was to compare the maternal haemodynamic variability after induction of spinal anaesthesia using hyperbaric bupivacaine in sitting position and lateral position. The primary objective was to compare the haemodynamic changes sustained after administration of 0.5% hyperbaric bupivacaine for sub arachnoid block in sitting and lateral position and the secondary objectives was to compare onset of sensory and motor block.

2. Materials and Methods

This was a hospital based observational study carried out under the department of anaesthesiology, Jorhat Medical College and Hospital in the study period of one year from June, 2021 to May, 2022 with the prior permission and approval from the institutional Ethical Committee. Study population was patient undergoing elective Caesarean section. Sample size calculation was done as per last year records, considering the inclusion and exclusion criteria average number of case per month were 8. So the expected sample size for the proposed study was 48 which was rounded off to 50 for 6 months of data collection period. Patients was divided into two groups group 1 (n=25)

Induction of spinal anaesthesia on sitting position and group 2 (n=25) Induction of spinal anaesthesia on lateral position

For patient selection inclusion criteria were 1. Patients who are willing to give written informed consent. 2. ASA (American society of anaesthesiologist) grade I and grade II patients. 3. Pregnant mother with normal singleton pregnancy beyond 37 weeks of gestation. And the exclusion criteria were 1. Patient not willing to give consent. 2. Any contraindication to spinal anaesthesia. 3. ASA (American society of anaesthesiologist) grade III and above (Any patient with Pregnancy induced hypertension, history of diabetics, cardiovascular and cerebrovascular diseases and any other systemic illness). 4. Failed Spinal anaesthesia converted to general anaesthesia. The study variables were heart rate, systolic blood pressure, diastolic blood pressure, mean arterial pressure, SpO₂ (saturation of peripheral Oxygen) monitoring, onset time of sensory blockade, onset time of motor blockade. Written and informed consent was taken from all patients

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Data was presented in terms of mean +/- SD and t test was applied for testing the significance

Technique of Anaesthesia

All consecutive patients put up for elective LSCS under spinal anaesthesia & who fulfill the inclusion criteria had been taken for the study.

Routine pre operative check up (PAC) had be done. Detailed history, general and physical examination, system examination, auscultation of fetal heart sound and all necessary investigations were done. Preoperative fasting of minimum 8 hours was ensured. The base line vitals, heart rate, pulse rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure, SpO₂, ECG were recorded in the pre anesthetic room 15 minutes before the procedure. IV line was secured with 18G cannula. Premedication was done in the pre anesthetic room. The patients were shifted to operation room. After shifting, pre - operative heart rate, pulse rate, blood pressure, mean arterial pressure, and SPO₂, ECG was recorded. Patients were randomized into two groups.

Patients of group 1 were placed in sitting position and patients of group 2 were placed in left lateral position. After antiseptic dressing and draping limber puncture was done with 25G spinal needle at the level of L3 - L4 intervertebral space. Once free flow of cerebrospinal fluid was obtained 2.5 ml of injection hyperbaric Bupivacaine 0.5% administered at the rate of 0.2ml/sec.

The time of injection of drug noted and patients in group 1 (sitting) and group 2 (lateral) were immediately placed in supine position.

Inspired air was supplemented with oxygen at the rate of 5 lit/min until umbilical cord is clamped. Immediately after the induction of spinal anaesthesia systolic blood pressure,

diastolic blood pressure, mean arterial pressure, heart rate, SpO₂ were recorded in every 5 min till end of the operation.

Whenever the mean arterial pressure decreased below 20% of base line mean arterial pressure 6 mg of injmephentermine was given. When the maternal heart rate decreased below 60bpm inj atropine 0.3 mg given intravenously

3. Results and Observation:

It was observed that the demographic profiles of the two groups for this study were comparable. In group - 1, 22 (88.0%) patients were ≤ 30 years of age and 3 (12.0%) patients were ≥ 31 years of age. In group - 2, 19 (76.0%) patients were ≤ 30 years of age and 6 (24.0%) patients were ≥ 31 years of age. In group - 1, 15 (60.0%) patients had ASA I and 10 (40.0%) patients had ASA II. In group - 2, 15 (60.0%) patients had ASA I and 10 (40.0%) patients had ASA II. In group - 1, the mean height (mean \pm s. d.) of patients was 151.8000 ± 3.2532 . In group - 2, the mean height (mean \pm s. d.) of patients was 151.4400 ± 2.4166 . In group - 1, the mean weight in Kg (mean \pm s. d.) of patients was 65.7040 ± 4.8612 . In group - 2, the mean weight in Kg (mean \pm s. d.) of patients was 64.6240 ± 4.0495 . The difference in demographic parameters between the two groups was statistically insignificant. On comparing the onset of sensory block in between two groups it was found that In group - 1, the mean onset of sensory block (Min) (mean \pm s. d.) of patients was $3.6800 \pm .8021$. In group - 2, the mean onset of sensory block (Min) (mean \pm s. d.) of patients was $2.4400 \pm .7681$. Distribution of mean onset of sensory block (Min) with group was statistically significant ($p < 0.0001$) (fig: 1)

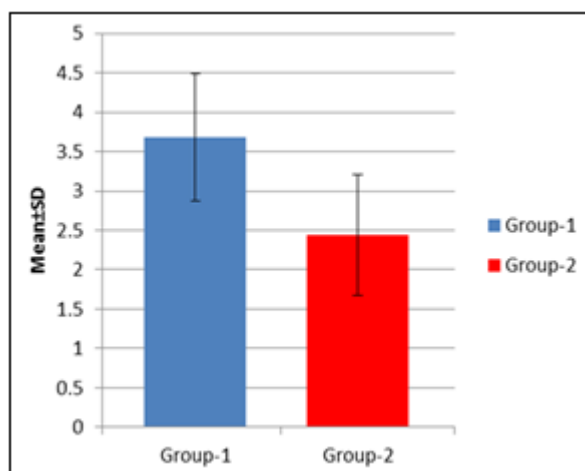


Figure 1: Distribution of mean Onset of Sensory Block

On comparing the onset of motor block in between two groups it was found that In group - 1, the mean Onset of motor block (Min) (mean \pm s. d.) of patients was $5.6800 \pm .8524$. In group - 2, the mean onset of motor block (Min) (mean \pm s. d.) of patients was $4.4400 \pm .7118$.

Distribution of mean onset of motor block (Min) with group was statistically significant ($p < 0.0001$). (Fig.2)

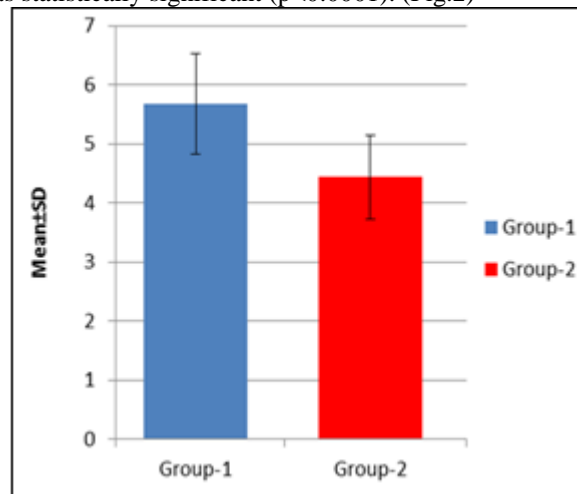


Figure 2: Distribution of mean Onset of motor Block

On comparing the variation of the heart rate in between two groups it was found that In group - 1, the mean heart rate baseline (mean \pm s. d.) of patients was 83.0000 ± 7.9948 . In group - 2, the mean heart rate baseline (mean \pm s. d.) of patients was 89.7600 ± 5.4105 . Distribution of mean heart rate baseline with group was statistically significant ($p = 0.0010$).

In group - 1, the mean heart rate immediate after SA (mean \pm s. d.) of patients was 81.0400 ± 7.4860 . In group - 2, the mean heart rate immediate after SA (mean \pm s. d.) of patients was 83.8400 ± 9.4060 . Distribution of mean heart rate immediate after SA with group was not statistically significant ($p = 0.2499$).

Distribution of mean HR at 5min with group was statistically significant ($p = 0.0005$). Distribution of mean HR at 10 min with group was not statistically significant ($p = 0.0783$). Distribution of mean HR at 15 min with Group was not statistically significant ($p = 0.5188$). Distribution of mean HR at 20 min with group was not statistically significant ($p = 0.3401$). Distribution of mean HR at 25 min with group was not statistically significant ($p = 0.2933$). Distribution of mean HR at 30 min with group was not statistically significant ($p = 0.6098$). Distribution of mean HR at 35min with group was not statistically significant ($p = 0.2985$). Distribution of mean HR at 40 min with group was not statistically significant ($p = 0.9425$). Distribution of mean HR at 45 min with group was not statistically significant ($p = 0.7359$).

In group - 1, the mean HR at post operative (mean \pm s. d.) of patients was 85.1200 ± 9.8206 . In group - 2, the mean HR at post operative (mean \pm s. d.) of patients was 80.2800 ± 7.4023 . Distribution of mean HR at post operative with group was statistically significant ($p = 0.0549$) (figure 3)

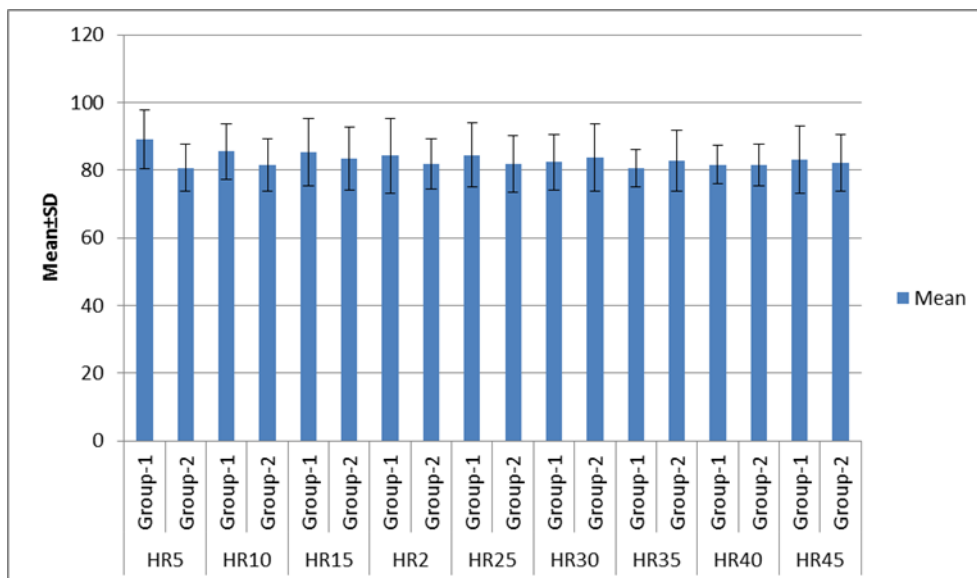


Figure 3: Distribution of mean Heart Rate

On comparing the variation of the SPO2 in between two groups it was found that In group - 1, the mean SPO2 at baseline (B) (mean± s. d.) of patients was 99.2800±.8426. In group - 2, the mean SPO2 at baseline (B) (mean± s. d.) of patients was 99.4000±.7638. Distribution of mean SPO2 at baseline (B) with group was not statistically significant (p=0.6002).

In group - 1, the mean SPO2 at Immediate after SA (mean± s. d.) of patients was 99.5200±.7141. In group - 2, the mean SPO2 at Immediate after SA (mean± s. d.) of patient was 99.3600±.7572. Distribution of mean SPO2 at Immediate after SA with group was not statistically significant (p=0.4459)

Distribution of mean SPO2 at 10 min with group was not statistically significant (p=0.8496). Distribution of mean

SPO2 at 15 min with group was not statistically significant (p=0.1383). Distribution of mean SPO2 at 25 min with group was not statistically significant (p=0.4473). Distribution of mean SPO2 at 30 min with group was not statistically significant (p=0.0621). Distribution of mean SPO2 at 35 min with group was not statistically significant (p=0.6933). Distribution of mean SPO2 at 40 min with group was not statistically significant (p=0.3730). Distribution of mean SPO2 at 45 min with group was not statistically significant (p=0.5533)

In Group - 1, the mean SPO2 at post operative (mean± s. d.) of patients was 99.4000±.8165. In Group - 2, the mean SPO2 at post operative (mean± s. d.) of patients was 99.5200±.7141. Distribution of mean SPO2 at post operative with group was not statistically significant (p=0.5827) (Figure: 4)

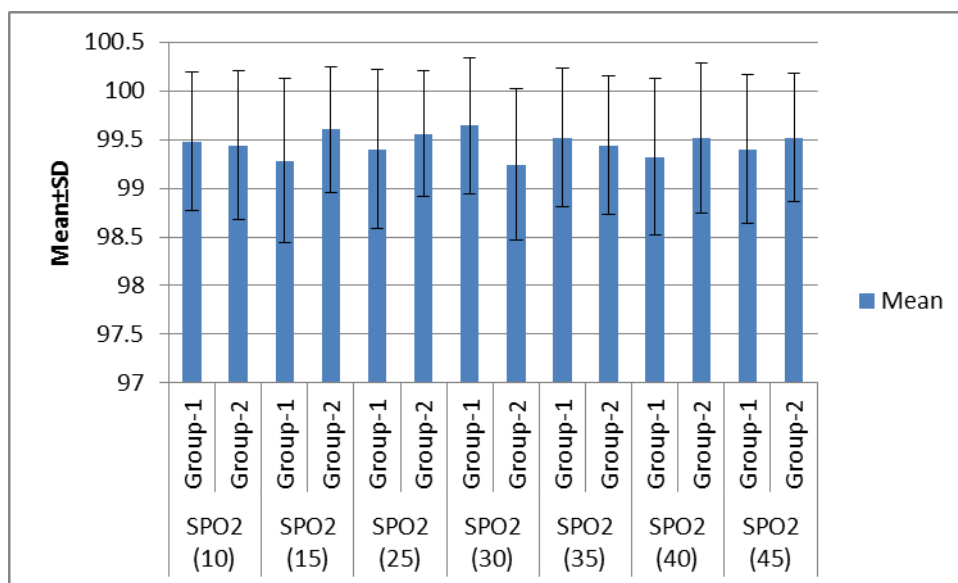


Figure 4: Distribution of mean SPO2

On comparing the variation of the SPO2 in between two groups it was found that In Group - 1, the mean MAP at Baseline (B) (mean± s. d.) of patients was 90.8800±4.7560.

In Group - 2, the mean MAP at Baseline (B) (mean± s. d.) of patients was 90.0533±3.7313. Distribution of mean MAP at

Baseline (B) with Group was not statistically significant ($p=0.4974$)

In Group - 1, the mean MAP at Immediate after SA (mean \pm s. d.) of patients was 89.0667 ± 3.9452 . In Group - 2, the mean MAP at Immediate after SA (mean \pm s. d.) of patients was 88.4000 ± 4.2687 . Distribution of mean MAP at Immediate after SA with Group was not statistically significant ($p=0.5690$).

Distribution of mean MAP at 5 min with Group was statistically significant ($p<0.0001$). Distribution of mean MAP at 10 min with Group was statistically significant

($p=0.0003$). Distribution of mean MAP at 15 min with Group was statistically significant ($p=0.0073$). Distribution of mean MAP at 20 min with Group was not statistically significant ($p=0.2641$). Distribution of mean MAP at 25 min with Group was not statistically significant ($p=0.0927$). Distribution of mean MAP at 30 min with Group was not statistically significant ($p=0.3900$). Distribution of mean MAP at 35 min with Group was not statistically significant ($p=0.5178$). Distribution of mean MAP at 40 min with Group was not statistically significant ($p=0.5311$). Distribution of mean MAP at 45 min with Group was not statistically significant ($p=0.9317$) (Figure: 5)

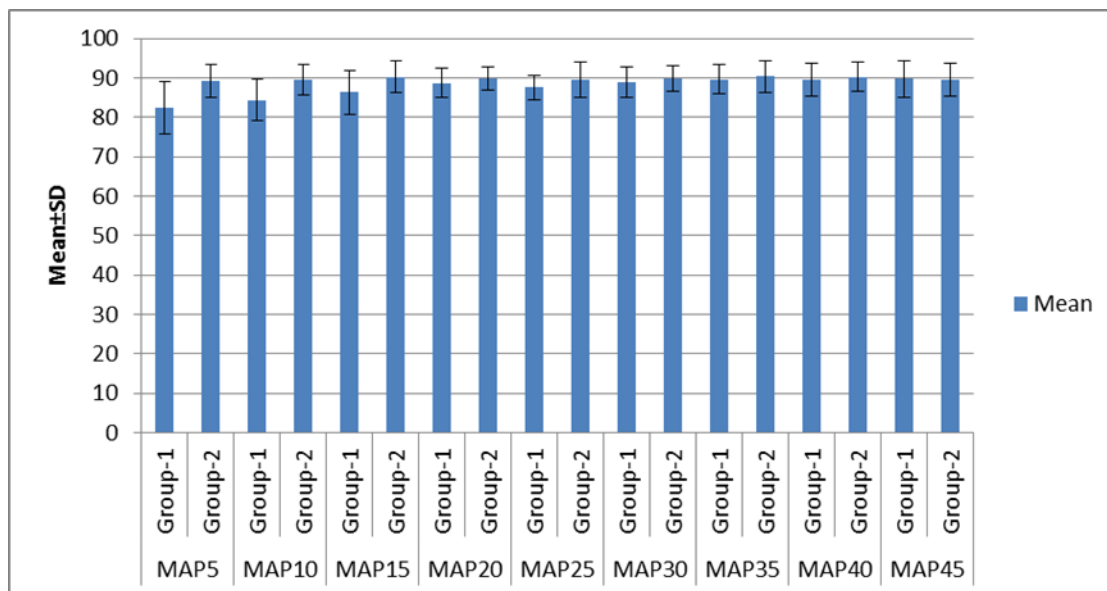


Figure 5: Distribution of MAP

4. Discussion

Haemodynamics: from the results and observation we came to this conclusion that overall haemodynamic changes in this study are statistically not significant in between sitting and lateral group of patients

In similar study Kharge ND, Mali A, Gujjar P. (2017) ⁹ Compared the effect of induction position for spinal anaesthesia in elective caesarean section on hemodynamic, sensory and motor block characteristics and patient satisfaction. They found that inducing position for spinal anaesthesia did not affect haemodynamic stability and is in accordance with our study

Onset of sensory block: In group 1 there were 25 patients and we administered them spinal anaesthesia in sitting position and in group 2 there were 25 patients who were placed in lateral position during administration of SA. we observed the time of onset of spinal and motor block in every patients of each group. We found that in this study In Group - 1, the mean Onset of Sensory Block (Min) (mean \pm s. d.) of patients was 3.6800 ± 0.8021 . In Group - 2 (lateral position), the mean Onset of Sensory Block (Min) (mean \pm s. d.) of patients was 2.4400 ± 0.7681 .

So the onset of sensory block is faster in group 2 (lateral position) than group 1 (sitting position) and the distribution

of mean onset of sensory block (Min) with group was statistically significant ($p<0.0001$).

Onset of motor block: In Group - 1 (sitting position), we found that the mean Onset of Motor Block (Min) (mean \pm s. d.) of patients was 5.6800 ± 0.8524 . In Group - 2 (lateral position) the mean Onset of Motor Block (Min) (mean \pm s. d.) of patients was 4.4400 ± 0.7118 .

So the onset of motor block is faster in group 2 (lateral position) than group 1 (sitting position) and the distribution of mean onset of motor block (Min) with group was statistically significant ($p<0.0001$)

In similar study Manouchehrian N, Moradi A, Torkashvand L (2021) ¹⁰ They conducted a study to examine the impact of spinal anaesthesia on the start of sensory block and hemodynamic status after caesarean sections in the sitting and lateral positions. They discovered that spinal anaesthesia during caesarean sections performed in the lateral position as opposed to the sitting position causes a faster sensory and motor block which is in accordance with our study.

5. Conclusion

From this study we concluded that over all changes of haemodynamic parameters in compare to both groups remains statically insignificant, however onset of motor

block and onset of sensory block is faster in group 2 (lateral) than group 1 (sitting) and it became statistically significant

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