

## Original Research Article

**Comparison of prophylactic ephedrine with crystalloid preloading for prevention of hypotension due to spinal anaesthesia for caesarian sections****Sahaja Gunda<sup>1</sup>, Giridhar Janampet Bekkam<sup>2\*</sup>**<sup>1</sup>*Assistant Professor of Anaesthesia, Nizamabad Govt. Medical College and Hospital, Nizamabad, Telangana, India*<sup>2</sup>*Assistant Professor of Anaesthesia, Panimalar Medical College Hospital and Research Institute, Chennai, India***Received: 11-09-2021 / Revised: 13-10-2021 / Accepted: 20-11-2021****Abstract**

**Background:** Hypotension is the usual complication of spinal anaesthesia in cesarean section. The present study was done to compare the efficiency of Ephedrine infusion and crystalloid preloading for the prevention of postspinal hypotension. **Methodology:** This study was conducted on sixty patients who were randomly divided into two groups of 30 patients each. Group I (n = 30) received 15 ml/kg of lactated Ringer's solution 10 min before spinal anaesthesia, and Group-II (n = 30) received prophylactic 5 mg ephedrine first and second minute and 1 mg every minute until 15 min after the spinal anaesthesia. Heart rate and systolic blood pressure were measured at 1min after spinal anaesthesia, and then every 3 minutes for the first 30 minutes then every 5 minutes for the next 30 minutes and then after 30 minutes. O<sub>2</sub> saturation was recorded every 30 minutes. **Observations and Results:** incidence of Hypotension was significantly higher in the group I (40%) compared to the group II (20%) (p-value 0.01). There is a significant fall in SBP in a fluid group compared to the Ephedrine group. Significant increase in the incidence of nausea and vomiting was observed in the group I (17%) when compared to the group II (3%), (p-value 0.02) and non significant increase in the incidence of Bradycardia was observed in group I (20%) when compared to group II (3%), (p-value 0.2). **Conclusion:** IV infusion of ephedrine was found to be very effective compared to crystalloid preloading in the prevention of hypotension in patients receiving spinal anaesthesia for cesarean section.

**Keywords:** Ephedrine infusion, preloading, hypotension, spinal anaesthesia.

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**Introduction**

In patients undergoing cesarean delivery, Spinal anesthesia gives a quick, rigorous, and symmetrical sensory and motor block of high quality[1,2]. Spinal anesthesia is usually given in cesarean section, but a higher incidence of hypotension is one of the disadvantage of this procedure, as the incidence varies from 70 to 80%[3]. spinal anaesthesia induced Hypotension in mother can cause placental hypoperfusion and fetal asphyxia[4].

Many procedures were attempted for reducing the incidence of Hypotension but were not successful in reducing[5]. Ephedrine which is a vasopressor may be considered as an effective alternative for reducing the incidence of Hypotension[6] as it acts directly by stimulating alpha and beta adrenergic receptors and indirectly by releasing norepinephrine from nerve endings in the autonomous nervous system[7].

The present study was done to compare the efficacy of ephedrine infusion versus crystalloid preloading in reducing the incidence of hypotension during spinal anaesthesia for cesarean section.

**Materials and methods**

This prospective randomized comparative study was done at government medical college and general hospital, Nizamabad from June 2020 to December 2020 on 60 healthy pregnant female patients with normal pregnancies planned for elective Caesarean section.

Approval from the institutional ethics committee was taken and from each patient informed written consent was taken. Patients were divided randomly into two equal groups (Ephedrine group and fluid group) of 30 patients each (by closed envelope method) before moved to the operating theatre. Continuous monitoring with electrocardiography, non-invasive blood pressure, heart rate and pulse oximetry was started once patient enters into the operation room. Baseline systolic blood pressure, heart rate, and arterial oxygen saturation were recorded. By using (18G) peripheral cannula a suitable peripheral vein was cannulated.

With the patient in sitting position, spinal anaesthesia was done at interspace L3-L4 with a 22 gauge spinal needle. All the patients received the same amount of local anesthetic 2 ml of 0.5% heavy Bupivacaine + fentanyl (25 µg). Then the patient was placed in the left lateral position by using a wedge under the right hip with slight elevation of the head; oxygen nasal cannula was used 4 litres/minute. Heart rate and systolic blood pressure were measured non invasively at 1min after spinal anaesthesia, and then every 3 minutes for the first 30 minutes then every 5 minutes for 30 minutes then after 30 minutes. O<sub>2</sub> saturation was recorded by pulse oximetry continuously and recorded every 30 minutes.

Oxytocin was administered after fetus delivery (10 units in 500 ml lactated Ringer) in both groups. Nausea and vomiting were also recorded. Nausea and vomiting treated with 10 mg metoclopramide. Postoperatively, all patients in the two groups were assessed for Heart rate, Blood pressure noninvasively and oxygen saturation and were recorded postoperatively after 30 minutes.

Data was analyzed using a statistical package of social studies SPSS version 16. Continuous variables were presented as mean ± standard deviation and categorical variables were presented as frequencies and percentages. Analysis of data was done using Student t-test & Chi-square test. P value ≤ 0.05 was considered statistically significant.

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**Results**

sixty patients were randomly allocated into group I (fluid group) and group II (ephedrine group) of 30 patients each. Demographic Data

including age, BMI were collected and there was no significant differences between the two groups (**Table 1**).

**Table 1: Demographic data of patients**

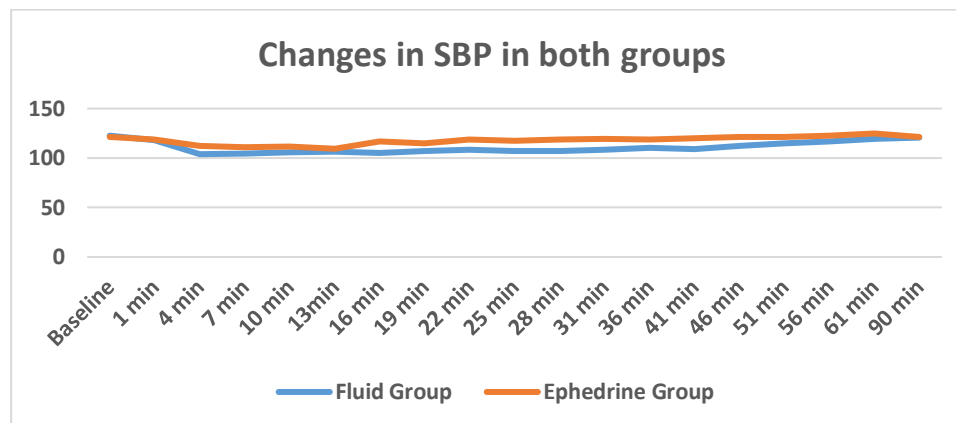
	Group 1 (fluid)	Group 2 (Ephedrine)	P-value
Age	31.03±5.75	30.84±4.08	0.3
BMI	34.5 ± 1.53	35.1 ± 1.64	0.4

In relation to systolic blood pressure, higher SBP was seen in Group-II (Ephedrine) when compared to Group-I (Fluid); In group-I there was significant fall in SBP from 22 minutes. (**Table 2**).

**Table 2: Systolic BP (mm hg)**

	Group-I (fluid)	Group-II (ephedrine)	P value
Baseline	122.6 ± 7.8	121.1 ± 9.9	<b>0.09</b>
1 min	118.3 ± 12.3	118.4 ± 12.3	<b>0.48</b>
4 min	103.9 ± 8.8	112.2 ± 15.5	<b>0.06</b>
7 min	104.6 ± 12.8	111.1 ± 13.7	<b>0.4</b>
10 min	105.7 ± 10.1	111.4 ± 13.2	<b>0.4</b>
13 min	106.7 ± 6.6	109.4 ± 12.0	<b>0.3</b>
16 min	105.4 ± 10.2	116.6 ± 10.9	<b>0.08</b>
19 min	106.9 ± 10.9	114.7 ± 13.5	<b>0.3</b>
22 min	108.1 ± 11.8	118.8 ± 10.8	<b>0.04*</b>
25 min	107.3 ± 8.6	117.4 ± 9.7	<b>0.03*</b>
28 min	107.3 ± 12.5	118.5 ± 11.9	<b>0.02*</b>
31 min	108.3 ± 8.3	119.1 ± 9.7	<b>0.01*</b>
36 min	110.4 ± 9.7	119.2 ± 9	<b>0.02*</b>
41 min	109.1 ± 6.1	120.2 ± 6.0	<b>0.001*</b>
46 min	112.4 ± 6.8	121.4 ± 9.8	<b>0.001*</b>
51 min	115.0 ± 5.4	121.2 ± 6.7	<b>0.001*</b>
56 min	117.1 ± 9	122.7 ± 6.2	<b>0.001*</b>
61 min	119.2 ± 6.2	124.8 ± 5.2	<b>0.001*</b>
90 min	120.5 ± 6.5	121.4 ± 7.59	<b>0.001*</b>

Data represented as Mean ± SD, \*= statistically significant (P<0.05)

**Fig 1: SBP changes in both groups**

Regarding Heart rate, it was higher in group-II when compared to group-I which was not statistically significant. Table 3

**Table 3: Heart rate**

	Group-I (fluid)	Group-II (Ephedrine)	P value
Baseline	86.5 ± 6.7	91.3 ± 8.8	<b>0.08</b>
1 min	89.5 ± 7.2	94.6 ± 10.4	<b>0.01*</b>
4 min	89.7 ± 11.6	93.2 ± 12.1	<b>0.1</b>
7 min	87.7 ± 10.5	94.2 ± 8.8	<b>0.7</b>
10 min	86.8 ± 10.3	92.3 ± 11.1	<b>0.06</b>
13 min	85.7 ± 8.4	93.2 ± 10.1	<b>0.4</b>
16 min	85.9 ± 9.3	91.4 ± 8.5	<b>0.08</b>
19 min	84.6 ± 11.7	91.2 ± 10.5	<b>0.2</b>
22 min	83.5 ± 11.2	90.8 ± 10.4	<b>0.5</b>
25 min	82.7 ± 7.4	89.7 ± 8.8	<b>0.1</b>
28 min	81.8 ± 10.4	89.5 ± 10.8	<b>0.3</b>

31 min	81.6 ± 7.2	89.4 ± 8.8	<b>0.1</b>
36 min	80.8 ± 8.8	88.5 ± 8.1	<b>0.7</b>
41 min	79.6 ± 7.2	87.5 ± 8.1	<b>0.8</b>
46 min	79.4 ± 8.3	87.2 ± 7.6	<b>0.9</b>
51 min	78.6 ± 4.4	87.1 ± 7.8	<b>0.2</b>
56 min	77.6 ± 8.1	86.8 ± 7.3	<b>0.5</b>
61 min	78.4 ± 7.3	86.3 ± 7.6	<b>0.6</b>
90 min	77.8 ± 8.6	85.2 ± 6.5	<b>0.7</b>

\*statistically significant (P<0.05)

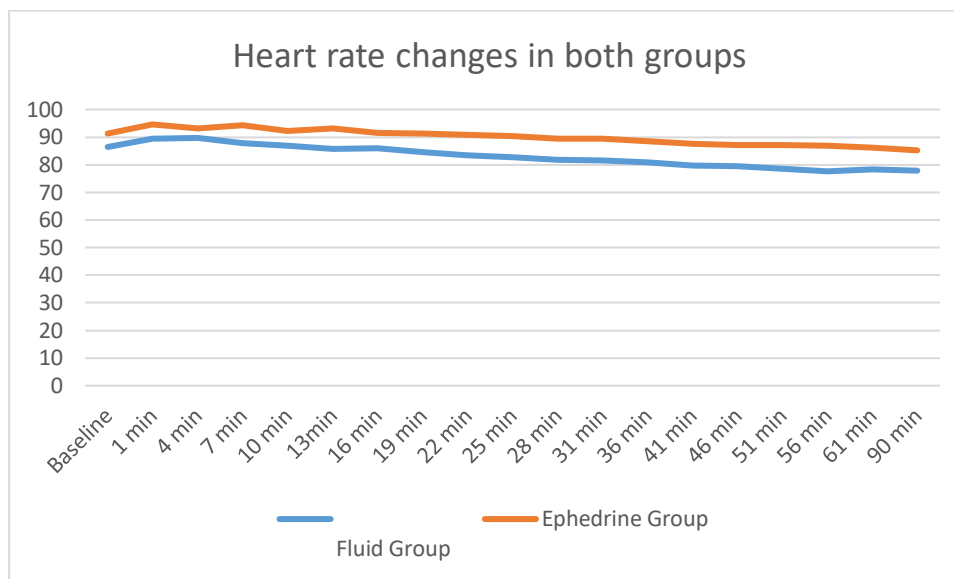


Fig 2: Heart rate changes in both groups

oxygen saturation was not statistically significant between the two groups (Table 4).

Table 4. Oxygen saturation.			
	Group I (fluid)	Group II (Ephedrine)	P value
Baseline	97.4 ± 0.8	98.2 ± 0.7	<b>0.34</b>
30 min	96.8 ± 0.5	99.5 ± 0.4	<b>0.12</b>
60 min	98.5 ± 0.4	98.7 ± 0.4	<b>0.23</b>
90 min (Post)	97.8 ± 0.5	98.9 ± 0.6	<b>0.14</b>
Data represented as Mean ± SD.			

In relation to the incidence of complications, the incidence of hypotension was significantly higher in group I (12/30) when compared to group II (6/30) with P value 0.01. Significant increase in the incidence of nausea and vomiting was observed in the group I (17%) when compared to the group II (3%), (p-value 0.02) and non significant increase in the incidence of Bradycardia was observed in group I (20%) when compared to group II (3%), (p-value 0.2). (Table 5).

Table 5: Incidence of Complications			
	Group 1 (n=30) (fluid)	Group 2 (n=30) (Ephedrine)	P-Value
Hypotension	12 (40%)	6 (20%)	0.01*
Nausea and vomiting	5 (17%)	1 (3%)	0.02 *
Bradycardia	6 (20%)	1 (3%)	0.2

\*statistically significant (P<0.05)

### Discussion

Hypotension induced by Spinal anaesthesia is treated physiologically by increasing the venous return which increases cardiac output. Incidence of Hypotension was not abolished by Keeping the head in down position or elevating the leg or wrapping the leg with crep bandage[8,9]. On the other hand great volumes of Crystalloids are required to decrease the incidence of hypotension[10]. These large volumes have detrimental effects like: Increased central venous pressure[11], blood dilution leading to decrease in oxygen carrying capacity[12], release of atrial natriuretic peptide initiating diuresis, thereby attenuating the effect of volume load on blood pressure[13]. Because of above reasons, spinal anaesthesia induced hypotension can be prevented by prophylactic administration of a pharmacologic

agent[14-16]. Compared to  $\alpha$ -or  $\beta$ -adrenergic agonist, mixed adrenergic agonist such as Ephedrine more ideally corrects the non cardiac circulatory sequelae of spinal anaesthesia[17]. Studies shown that episodes of hypotension can be prevented by prophylactic bolus or infusions of IV Ephedrine without unwanted side effects[18-20]. In the present study, effectiveness of fluid preloading with 15 ml/Kg lactated Ringer (group I) were compared with prophylactic IV ephedrine infusion without fluid preload (group II) for prevention of hypotension after spinal anaesthesia for cesarean section. We found significant increase of SBP in ephedrine group when compared to the fluid group and significant increased incidence of Hypotension, nausea and vomiting in fluid group compared to Ephedrine group.

Bhovi *et al.*[21] in their study observed that the incidence of hypotension was significantly more in the fluid group compared to ephedrine group.

Gajraj *et al.*[22] in their study found significant incidence of hypotension in the crystalloid group compared to the infusion group and non significant difference in the incidence of nausea and vomiting among the two groups.

### Conclusion

IV infusion of ephedrine was found to be very effective compared to crystalloid preloading in the prevention of hypotension in patients receiving spinal anaesthesia for cesarean section.

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