



## ORIGINAL RESEARCH PAPER

## Anaesthesiology

## PROPHYLACTIC EPHEDRINE FOR PREVENTION OF HYPOTENSION DURING CESAREAN SECTION

**KEY WORDS:** Ephedrine; Hypotension; Prevention technique; Spinal anaesthesia.

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## ABSTRACT

This study was conducted to compare the efficacy of prophylactic ephedrine administration as bolus and infusion with crystalloid administration for prevention of hypotension during spinal anaesthesia for elective caesarean section. Studies have shown that ephedrine prevents hypotension and associated complications like decrease in uterine blood flow and prevents foetal acidosis and hypoxia. Thus maternal and foetal outcome is better, compared to other agents. Even though ephedrine remains the drug of choice to treat hypotension intra-operatively in caesarean section, only few studies are there to show prophylactic efficacy of ephedrine in preventing hypotension. In this study role of prophylactic ephedrine infusion in preventing hypotension and its effects on maternal hemodynamics and neonatal outcome in caesarean sections have been evaluated.

## Introduction:

Spinal anaesthesia has become a popular technique for caesarean sections over general anaesthesia as it is devoid of pulmonary complications like Mendelson's syndrome and exposure of foetus to multiple anaesthetic drugs. However, spinal anaesthesia associated with some adverse effects like profound hypotension (incidence as high as 80%) in term obstetric patients can adversely affect both the mother and foetus.

Various attempts have been made to reduce incidence and severity of hypotension like left uterine displacement, trendelenberg's position, use of compression stockings on leg, preloading with balanced salt solution<sup>1,2</sup>. In spite of using all these measures significant hypotension still occurs. Hence prophylactic use of vasopressors was introduced in practice. Ephedrine was the first agent used for this purpose and is considered as the drug of choice for obstetric population<sup>3</sup>. Ephedrine is a direct stimulator of  $\alpha$  and  $\beta$  receptors whereas its effect is mainly due to indirect release of noradrenaline.

Ephedrine improves preload, increases cardiac output and heart rate and causes mild arteriolar constriction. Recent study has shown that infusion of ephedrine prevents reduction of bovine uteroplacental blood flow secondary to release of nitric oxide, prevents foetal acidosis and hypoxia and is associated with better neonatal outcome compared with other vasopressors<sup>4</sup>. The purpose of this study is to determine role of prophylactic ephedrine in prevention of maternal hypotension during subarachnoid block for elective caesarean sections and its effects on maternal hemodynamics and neonatal outcome.

## Aims and objectives:

1. To study the role of prophylactic ephedrine in the prevention of maternal hypotension after spinal anaesthesia in LSCS.
2. To study the effect of ephedrine on maternal hemodynamics.
3. To assess foetal outcome by Apgar score.

## Materials and Methods:

In this prospective, randomized, double blind clinical trial 50 healthy full term parturients, between age group of 18-30 years, weighing between 45-66kg, with height ranging between 146-165cm, of ASA grade I undergoing elective caesarean section with term singleton pregnancy were selected. Patients with foetal compromised status like foetal distress, meconium in amniotic fluid, known foetal anomalies, pregnancy induced hypertension or pre-existing hypertension, patients with known cerebrovascular or cardiovascular disease and coagulation abnormalities were excluded from the study.

A thorough preoperative evaluation of all the parturients was done and patients were investigated for haemoglobin, complete blood

count, urine routine and microscopy, fasting blood sugar, blood grouping and cross matching. A written informed valid consent was obtained from all patients.

The basal pulse rate and blood pressure of all the patients was noted in left lateral 15 degree tilted position with uterine displacement. Average of 3 successive values was taken as baseline value.

Patients were randomly divided into two groups of 25 each.

## Group A (study group):-

Inj. Ephedrine 0.15mg/kg bolus was given slowly, immediately after giving the subarachnoid block over 2 minutes followed by 0.4 mg/kg/hr infusion till the delivery of foetus.

## Group B (control group):-

Only 0.9% NaCl 1.5 ml bolus was given immediately after the subarachnoid block, followed by infusion at the rate of 4ml/min till the delivery of the foetus.

Intravenous access was secured with 20G indwelling cannula on nondominant hand. Patients were premedicated with Ondansetron 4mg IV and inj. Ranitidine 1mg/kg 15 min prior to induction. Preloading was done with Ringer's lactate solution 10ml/kg over 10-15 minutes.

## Anaesthetic technique:

Multipara monitor was attached to record baseline HR, Blood Pressure and ECG. Under all aseptic precautions, the subarachnoid block was given with 1.8-2.2cc of 0.5% hyperbaric bupivacaine in L3-L4 space using 25G disposable spinal needle in sitting position. Patient was then placed in supine position with 15° left lateral tilt. Oxygen was given to all the patients by mask at 4 lit/min.

Hemodynamic parameters (systolic and diastolic blood pressure, pulse rate) were noted at 1 minute interval for first 15 minutes followed by five minute interval till end of surgery. Highest level of sensory block was checked by pinprick. Motor block was checked by Modified Bromage scale.

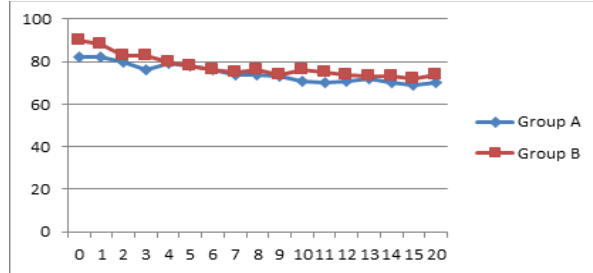
In both the groups, fall in the blood pressure for >20% of baseline or Blood pressure <80mm of Hg was defined as hypotension and was treated with 'rescue' ephedrine 5mg intravenous bolus. The supplemental and total ephedrine requirements before delivery of foetus were noted.

Time from the start of operation to delivery was recorded as skin incision - delivery (SI-D) interval, time from uterine incision (UI) to delivery (D) was noted as (UI-D) interval. Apgar score at 1 min and 5

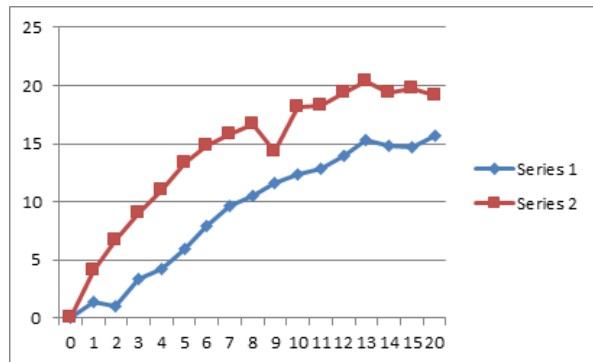
min. were recorded by a paediatrician in the study.

**Statistical Analysis:**

The value of <0.05 was considered to be statistically significant and p value <0.001 were considered as highly significant.

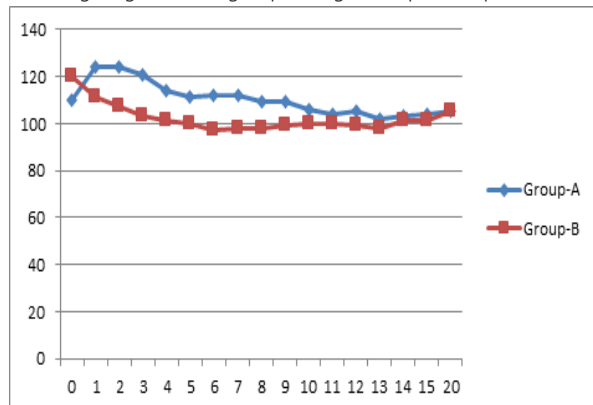


**Graph 1** shows that baseline heart rate was comparable in both the groups.

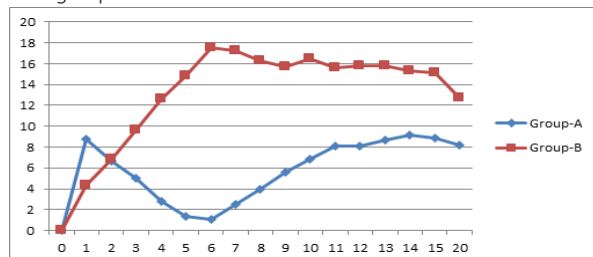


**Graph 2** shows the mean percentage changes in pulse rate from baseline values during intraoperative period.

There is statistical difference as compare to baseline values within the group (<0.005) during intraoperative period. Both groups showed statistically significant decrease in pulse rate compared to baseline value from 3<sup>rd</sup> minute onwards in the study group and from beginning in control group during intraoperative period.

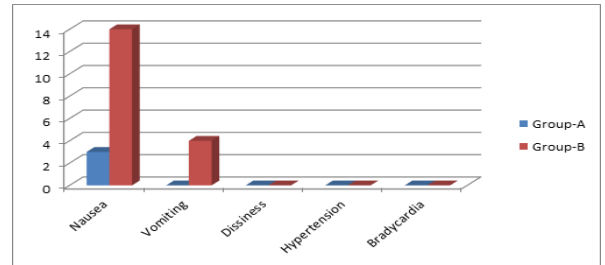


**Graph 3** shows intraoperative changes in systolic blood pressure in both groups



**Graph 4** shows mean percentage changes in systolic blood pressure from baseline values during intraoperative period.

The result was found to be statistically significant between both the groups (<0.005). There was statistically significant fall in systolic blood pressure in control group as compared to study group, however systolic blood pressure was maintained within target range (>80% of baseline values) in study group.



**Graph 5** shows maternal side effects( nausea and /or vomiting) in both the groups

It was statistically significant between both the groups(<0.005).maternal side effects were significantly lower in study group as compared to control group(12% vs 72%).

Table 1: INCIDENCE OF HYPOTENSION

	Group-A (study group)	Group-B (control Group)
No. Of patients requiring additional ephedrine	00 (00.00)%	23 (92.00)% (p<0.05)
Total amount of ephedrine required(mg)	11-15	5- 10 (p<0.05)

Table 1 shows incidence of hypotension in two groups and there was statistical difference between both the groups(<0.005).There was statistically significant incidence of hypotension in the control group as compared to study group

**Discussion:**

Spinal anaesthesia offers a fast, profound and high quality of sensory and motor block in women undergoing caesarean section with number of advantages over general anaesthesia. But spinal anaesthesia is also not without complication like hypotension with reported incidence as high as 80%<sup>5</sup>. The principle mechanism of hypotension is by interruption of preganglionic sympathetic impulses causing vasodilatation and peripheral pooling of blood causing decrease in venous return and cardiac output with associated bradycardia aggravating hypotension further.If left untreated it has detrimental effects on foetus like decreased uteroplacental blood flow, impaired foetal oxygenation, foetal acidosis and neurological injury.Foetal bradycardia generally follows maternal hypotension <80mm of Hg. It also presents with maternal side effects like nausea, vomiting dizziness and decreased consciousness which may lead to pulmonary aspiration<sup>6</sup> with apnoea or sudden death as a consequence. Various techniques have been tried to reduce the incidence and severity of hypotension but none was 100% effective. Fluid preloading was associated with pulmonary oedema in presence of increased alveolar capillary permeability and increase in circulating blood volume with retraction of uterus<sup>7</sup>.Albumin transfusion has also been tried with associated risk of anaphylactoid reaction. Hence prophylactic use of vasopressors which would stimulate cardiac rare and contractility with constriction of capacitance vessels seems more logical and intravenous use of Ephedrine suits the criteria well<sup>8</sup>.Ephedrine causes arteriolar vasoconstriction by stimulation of  $\alpha$  adrenergic receptors, while  $\beta$ 2 adrenergic activity results in vasodilatation in skeletal muscles. Continuous Ephedrine infusion is an acceptable method for better control of arterial pressure, less maternal side effects and better neonatal outcome<sup>9</sup>. In our study the pulse rate was significantly low intraoperatively in both the groups.Though statistically nonsignificant, the percentage decrease in control group was 20% compared to 15% in study group. There was significant increase in systolic blood pressure in study group in first 5 min,thereafter it started falling within the target range.While in control group it was significantly low throughout the procedure. The percentage reduction in SBP

was 18% in control group and 9% in study group in first 11 min which was statistically significant ( $p < 0.05$ ). No patient required rescue ephedrine in study group with incidence of 0% as against 92% in control group. The incidence of maternal side effects was statistically less 12% in study group as against 72% in control group.

The hypotension in control group was promptly corrected by rescue Ephedrine. Apgar score at 1 and 5 min interval was 9 and 10 respectively in both the groups.

#### Conclusion:

It can be concluded that preloading with fluids and left uterine tilt are not always sufficient to prevent hypotension. The use of prophylactic intravenous ephedrine 0.15mg/kg bolus immediately after spinal anaesthesia followed by 0.4mg/kg/hr infusion combined with preloading and left uterine tilt can effectively prevent hypotension, decrease incidence of nausea and vomiting and improves neonatal outcome.

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