IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 22, Issue 7 Ser.2 (July. 2023), PP 14-18
www.iosrjournals.org

A Retrospective Study Of Intravenous Bolus Phenylephrine Versus Ephedrine In Controlling Hypotension Under Spinal Anaesthesia In Patients Undergoing Caesarean Sections At A Tertiary Care Hospital

Dr. Swati
Junior Resident Department of Anaesthesiology Narayan Medical College Sasaram Bihar.
Dr. Mrignaini Sinha
Junior Resident Department of Anaesthesiology Narayan Medical College Sasaram Bihar.

Abstract
Introduction:
Several Techniques Have Been Proposed To Prevent Hypotension In Obstetric Patients. Ephedrine And Phenylephrine Are Individually Used To Prevent Maternal Hypotension; However, Each Has Its Own Drawbacks. Some Researchers Have Reported That The Infusion Of Combined Ephedrine And Phenylephrine Immediately After Spinal Anaesthesia For Caesarean Delivery Reduces The Incidence Of Maternal Hypotension. Hypotension Is A Major Concern Of The Anaesthetists Whenever Subarachnoid Block Is Performed Especially In Obstetric Patients. Vasopressors Have Been Shown To Be More Effective At Limiting Spinal Hypotension Than Other Treatment Of Hypotension Like Preloading And Left Uterine Displacement. The Aim Of The Study Is To Compare The Effect Of Bolus Intravenous Ephedrine With Phenylephrine For The Maintenance Of Arterial Blood Pressure During Elective Caesarean Section Under Spinal Anaesthesia.
Aim:
The Aim Of The Study Is To Compare The Effect Of Bolus Intravenous Ephedrine With Phenylephrine For The Maintenance Of Arterial Blood Pressure During Elective Caesarean Section Under Spinal Anaesthesia.
Method:
This Was A Retrospective Study Done From Data Collected Of 1 Year, From 100 Caesarean Section Procedures That Used Ephedrine And Phenylephrine As Vasopressors During Spinal Anaesthesia Were Collected. In Order To Select Data, Computer Tables Were Randomly Generated. Patients Were Divided Into Two Groups Of 50 At Random. In Order To Select Data, Computer Tables Were Randomly Generated. For Categorical Variables, Student's T-Test And Chi-Square Test Were Used.
Result:
There Was No Significant Difference Between The Two Groups In Terms Of Age, Height, Or BMI. In Groups 1 And 2, The Number Of Rescue Doses Required Was Statistically Insignificant. The Differences Between The Two Groups In Baseline HR, SBP, DBP, And Mean Blood Pressure Were Statistically Insignificant. Patients Receiving Phenylephrine Had A Greater Rate Of Bradycardia. The Difference In Neonatal Birth Weight Between The Two Groups Was Not Statistically Significant. At 1 Minute And 5 Minutes, No Neonate Had An Apgar Score Of 7.
Conclusions:
There Was No Statistically Significant Difference In The Incidence Of Hypotension With Quick Administration Of Crystalloid At The Time Of Spinal Anaesthesia In Both Groups ($P > 0.05$) In The Current Study. The Current Study Concludes That In Appropriate Equivalent Doses, Ephedrine And Phenylephrine Are Equally Effective In Managing Hypotension During Spinal Anaesthesia For Caesarean Delivery.
Keywords: *Cesarean Section; Spinal Anaesthesia; Phenylephrine Hypotension; Ephedrine.*

Date of Submission: 24-06-2023 Date of Acceptance: 04-07-2023

I. INTRODUCTION

Hypotension is the most common complication of neuraxial anaesthesia in obstetric patients[1] and its prevalence in cesarean section is about 50-90%.[2,3] Maternal hypotension causes unpleasant symptoms such as nausea, vomiting, loss of consciousness, respiratory depression, and cardiac arrest. Hypotension may reduce

placental perfusion and result in foetal acidosis and neurological injury.[1-3] Several techniques have been proposed to prevent hypotension.[1-4] Ephedrine has been used as the agent of choice in the prevention and treatment of hypotension following spinal anaesthesia in pregnant women. However, recently, there have been concerns regarding its use because of complications such as supraventricular tachycardia, tachyphylaxis, and the probability of foetal acidosis.[1-7] Phenylephrine (a strong α-agonist of sympathetic receptors) can be used for the prevention and treatment of maternal hypotension. It reduces the incidence of nausea and vomiting as well as foetal acidosis, but it may cause maternal bradycardia and decreased cardiac output. Therefore, the use of phenylephrine, especially for prophylaxis of hypotension, is uncommon.[1,3,5,8,9] Combining drugs with different mechanisms of action lowers the amount of each drug, thus the undesired effects are minimized.[10] The present study aimed to evaluate the effect of prophylactic infusion of a combined ephedrine and phenylephrine on maternal hemodynamic before the induction of spinal anaesthesia for cesarean section. This topic was motivated by the fact that there have been no investigations evaluating the effect of vasopressors before spinal injection. In previous studies, the drugs were administered after spinal injection. Furthermore, there are dissimilar results on the infusion of combined ephedrine and phenylephrine after spinal anaesthesia for cesarean section if maternal hypotension and foetal acidosis occur.[5,6,11-13]

II. MATERIALS AND METHODS

This retrospective observational study was conducted at Narayan Medical College & Hospital Jamuhar, Sasaram, Bihar from April 2022 to March 2023. An informed consent was taken from all the participants, after explaining the main objectives of the study. Patients who were admitted in Obstetrical units of our hospitals were Randomly selected. Data of Caesarean Section surgeries were selected which used Ephedrine and phenylephrine as Vasopressors during Spinal Anaesthesia in last 1 year Randomization was done using computer tables in selecting data. The study was entirely observational in nature. Patients were divided into two groups of 50 at random. When maternal SBP fell by more than 20% from baseline, a bolus of intravenous (IV) ephedrine 6 mg was administered. When maternal SBP fell by more than 20% from the baseline, Group 2 received a 100 g IV bolus of phenylephrine. The heart rate (HR), electrocardiogram (ECG), non-invasive blood pressure (NIBP), respiratory rate, and arterial O_2 saturation (SpO_2) were all monitored upon arrival in the operating room. To maintain the patency of the IV cannula, all patients received a infusion of normal saline. Patients were put in the left lateral posture, and a lumbar puncture was conducted in the L3-L4 intervertebral area with a 25-gauge Quincke needle. After obtaining free flow of the cerebrospinal fluid, 1.5 mL (7.5 mg) of 0.5% bupivacaine(heavy) with 0.5 mL (25 micro gm) fentanyl was delivered at a rate of 0.2 mL/s. Co loading with 20 mL/kg Ringer's solution administered rapidly. The time of injection of the drug was noted and the patient was placed in a supine position. Immediately after induction of spinal anaesthesia, systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP) and HR were recorded. Neonatal outcome was assessed using Apgar score at 1 min and 5 min and neonatal umbilical cord blood pH values. At delivery, the umbilical cord was clamped and 1 mL of blood sample was collected in heparinized syringe for acid base analysis.

Inclusion criteria:

100 Patients with American Society of Anaesthesiologists (ASA) grades 1 and 2, ages 18-40, BMI range of 18.5-25, and systolic blood pressure of 120 to 140 mmHg were included in the study.

Exclusion criteria:

Candidates with a history of migraine, psychiatric diseases, drug use (except for approved pregnancy additives), multiple pregnancy, headache before surgery, contraindications for spinal anaesthesia, pregnancy disorders such as preeclampsia and Umbilical cord anomalies, and uncontrolled clinical conditions such as high blood pressure, diabetes, and cardiovascular diseases were all excluded from the study. Patients who got Atropine after bradycardia and those who had more than one try at spinal anaesthesia were also excluded.

Statistical Analysis:

The mean and standard deviation (SD) of continuous data were used. Intergroup comparisons were performed using the student's t-test and the chi square test for categorical variables. IBM SPSS Statistics 23 was used to analyse the information. Overall, $P < 0.05$ was proposed as the statistical significance level after adjustment.

III. Results:

The two groups, group 1 and group 2, were matched in terms of age, body weight, and height. The mean age was 30.71 years, and there was no significant variation in the age values of the three groups. Furthermore, the mean values for weight in kilograms, height in meters, and BMI were 60.2, 1.56, and 27.56,

respectively, with no significant difference between the three groups, as noted for age value.
In groups 1 and 2, the number of rescue doses required was statistically insignificant.

The differences between the two groups in baseline HR, SBP, DBP, and mean blood pressure were statistically insignificant. Patients receiving phenylephrine had a greater rate of bradycardia than those getting ephedrine. In both groups, HR was kept at the baseline value until the block was induced, at which point it climbed significantly for a few minutes, corresponding to the interval of decline in the MAP. After this time, the HR returned to its baseline values. The difference in mean HR and MAP till delivery was negligible between the two groups. However, the mean HR was 81-85 bpm in group 1 and 77-81 bpm in group 2 at the 30th and 60th minute observations, which were statistically significant. ($P < 0.05$), although being clinically insignificant. However, 64 of the 50 Patients in Group 2 and none in Group 1 had HRs of 50 bpm or higher, necessitating intervention.

The mean SBP, mean DBP, and mean arterial blood pressure of both groups fell rapidly from their baseline values until delivery; after that, the mean SBP was maintained in both groups. The difference in hypotension incidence between groups was not statistically significant ($P > 0.05$). In our study, the range of SBP in the two groups was 108-114 mmHg ($P = 0.03$), mean DBP was 58-66 mmHg ($P = 0.03$), and MAP was 76-80 mmHg ($P = 0.02$), all of which were statistically significant but clinically insignificant. The difference in neonatal birth weight between the two groups was not statistically significant. At 1 minute and 5 minutes, no neonate had an Apgar score of 7. The mean neonatal umbilical cord pH in groups 1 and 2 was 7.30 0.05 and 7.36 0.03, respectively. Parturient given phenylephrine had greater umbilical cord pH in their new borns than those given ephedrine, and the difference was statistically significant ($P < 0.005$).

IV. Discussion:

In the present study, there was no statistically significant difference in the incidence of hypotension with rapid administration of crystalloid at the time of induction of spinal anaesthesia (coload) in both the groups ($P > 0.05$). The overall incidence of hypotension in the study population was 43% that was significantly less compared to the incidence (more than 80%) observed in other studies. Khan et al.[14] observed a statistically significant ($P < 0.008$) difference in the incidence of hypotension in the coload group (44%) compared to the preload group (70%) in a study on 100 parturient. In this study, patients given phenylephrine had a greater rate of bradycardia than those given ephedrine. This is considered to be owing to a rise in blood pressure caused by a -agonist, which may result in reactive bradycardia (baroreceptor reflex). This was sensitive to glycopyrrolate with no negative repercussions. The result of this study is in accordance with the studies of Nazir et al.[15] (5/50 vs [15] 17/50 in the phenylephrine group) and Lee et al.[16][relative risk (RR) of 4.79; 95% confidence interval (CI), 1.47-15.60] with $P < 0.05$. The incidence of nausea and vomiting was more in the phenylephrine group than the ephedrine group 32% versus 20%) in our study that was not statistically significant ($P= 0.16$).

In this study, HR variations followed an inverse pattern to the MAP. The difference in mean HR and MAP till delivery was negligible between the two groups. However, at the 30th and 60th minutes, Observations revealed statistically significant ($P < 0.05$) but clinically insignificant changes in the mean HR of both groups [14]. Khan et al. discovered similar results, observing HR fluctuations with an increased trend for roughly 10 minutes. Anxiety, aortocaval compression, and hypotension were related to this alteration. Assuming the equivalent doses of ephedrine and phenylephrine were 6 mg and 100μg, respectively, The incidence of fall in blood pressure was maximum during the first 10 min following the subarachnoid block and we observed that vasopressor use was maximum during this period. This corresponds to the immediate sympathetic block after intrathecal injection. We also observed that phenylephrine was used more frequently in 10 min compared to ephedrine. It is distinctly apparent by the wider SDs of mean SBP values in the phenylephrine group but no statistical significant difference was observed ($P > 0.05$). On the other hand, Ngan Kee et al.[17] and Dyer et al. [18] opined that vasopressor requirements was reduced till the time of delivery in their studies. The average median dose was 0 mg versus 10 mg of ephedrine ($P < 0.001$) in the study by Ngan Kee et al. [17]

In this study, we found no difference between ephedrine and phenylephrine in terms of efficacy for treating hypotension after spinal anaesthesia in parturient undergoing caesarean delivery at the levels examined. The results of this study are in accordance with the study of Nazir et al. [15] and Adigun et al.[19] They observed that both vasopressors effectively restored both the systolic and DBP.

Gunda et al.[20] examined the efficacy and negative effects of the vasopressor's ephedrine and phenylephrine during caesarean delivery under spinal anaesthesia.

However, when it comes to maternal well-being, their research suggests that phenylephrine may be the better vasopressor. This could be related to the fact that their study employed a lower dose of ephedrine (3 mg) than this study.

In our study, the difference in birth weight of neonates between the two groups was not statistically significant. Parturient who were administered phenylephrine delivered neonates with higher umbilical cord pH

than those given ephedrine but the difference was clinically not important as there was no true foetal acidosis (pH <7.2). our study results regarding umbilical cord pH were in accordance with other investigators.[15,21,22]

In their investigations, they concluded that the pH of the umbilical artery was identical in both groups, regardless of whether ephedrine or phenylephrine was used to maintain blood pressure during spinal anaesthesia in parturient undergoing caesarean delivery.

However, our study results are not consistent with the studies carried [9,16] out by Ngan Kee et al. and Lee et al. where the umbilical artery pH was less in neonates in the ephedrine group than the phenylephrine group.

Umbilical artery acidotic alterations are sensitive indications of uteroplacental insufficiency. The study findings provide indirect indication that uterine blood flow may improve with phenylephrine when compared to ephedrine, it was shown to be more effective. One reason ephedrine causes acidosis is that it penetrates the placenta and has a direct effect (β_3 action) on the foetus, causing acidosis. However, there was no difference in Apgar score between the two groups at 1 and 5 minutes. The difference in neonatal birth weight between the two groups was similar and statistically insignificant.

V. Conclusion:

The current study concludes that ephedrine 6 mg and phenylephrine 100 g are equally effective in treating hypotension after spinal anaesthesia for caesarean delivery.

References

[1]. Chestnut DH, Wong CA, Tsen LC, Kee WDN, Beilin Y, Mhyre J. Chestnut's Obstetric Anesthesia: Principles and Practice E-Book. Elsevier Health Sciences; 2014.

[2]. Metzger A, Eisen I, Todris L, Etchin A, Kuit J. Maternal hypotension during elective cesarean section and short-term neonatal outcome. American Journal of Obstetrics & Gynecology. 2010; 202(1): 56.e1 -e5 .

[3]. Aragao FF, Aragao PW, Martins CA, Salgado FN, Barroqueiro ES. Comparison of metaraminol, phenylephrine and ephedrine in prophylaxis and treatment of hypotension in cesarean section under spinal anesthesia. Rev Bras Anestesiol. 2014; 64(5): 299-306. PMID: 25168433.

[4]. Ngan Kee WD. Prevention of maternal hypotension after regional anaesthesia for cesarean section. Current Opinion in Anaesthesiology. 2010; 23(3): 304-9. PMID: 20173633.

[5]. Ng F, Karmakar M, Ngan Kee WD, Lee A, Gin T. A randomized double-blinded comparison of phenylephrine and ephedrine infusion combination to maintain blood pressure during spinal anesthesia for cesarean section delivery: The effects on fetal acid-base status and hemodynamic control. Anesthesia and Analgesia. 2008; 107(4): 1295-302.

[6]. Ngan Kee WD, Khaw K, Tan P, Ng F, Karmakar M. Placental transfer and fetal metabolic effects of phenylephrine and ephedrine during spinal anesthesia for cesarean section. Anesthesiology. 2009; 111: 506-12. PMID: 19672175.

[7]. Adigun TA, Amanor-Boadu SD, Soyannwo OA. Comparison of intravenous ephedrine with phenylephrine for the maintenance of arterial blood pressure during elective caesarean section under spinal anaesthesia. Afr J Med Med Sci. 2010; 39(1): 13-20. PMID: 20632667.

[8]. Magalhaes E, Goveia CS, de Araujo Ladeira LC, Nascimento BG, Kluthcouski SM. Ephedrine versus phenylephrine: prevention of hypotension during spinal block for cesarean section and effects on the fetus. Rev Bras Anestesiol. 2009; 59(1): 11-20. PMID: 19374211.

[9]. Ngan Kee WD, Lee A, Khaw KS, Ng FF, Karmakar MK, Gin T. A randomized double blinded comparison of phenylephrine and ephedrine infusion combinations to maintain blood pressure during spinal anesthesia for cesarean delivery: the effects on fetal acid-base status and hemodynamic control. Anesth Analg. 2008; 107(4): 1295-302. PMID: 18806043.

[10]. Das S, Mukhopadhyay S, Mandal M, Mandal S, Basu SR. A comparative study of infusions of phenylephrine, ephedrine and phenylephrine plus ephedrine on maternal haemodynamics in elective caesarean section. Indian J Anaesth.2011; 55(6): 578-83. PMID: 22223901.

[11]. Loughrey JP, Yao N, Datta S, Segal S, PianSmith M, Tsen LC. Hemodynamic effects of spinal anesthesia and simultaneous intravenous bolus of combined phenylephrine and ephedrine versus ephedrine for cesarean delivery. Int J Obstet Anesth. 2005; 14(1): 43-7. PMID: 15627538.

[12]. Bhattarai B, Bhat SY, Upadya M. Comparison of bolus phenylephrine, ephedrine and mephentermine for maintenance of arterial pressure during spinal anesthesia in cesarean section. JNMA J Nepal Med Assoc. 2010; 49(177): 23-8. PMID: 21180216.

[13]. Saravanan S, Kocarev M, Wilson RC, Watkins E, Columb MO, Lyons G. Equivalent dose of ephedrine and phenylephrine in the prevention of post-spinal hypotension in Caesarean section. Br J Anaesth. 2006; 96(1): 95-9. PMID: 16311286.

[14]. Khan M, Nisai W, Farooqi A, Ahmad N, Qaz S. Crystalloid co-load: Abetter option than crystalloid pre-load for prevention of postspinal hypotension in elective caesarean section. Int J Anaesthesiol 2013;32:1503

[15]. Nazir I, Bhat MA, Qazi S, Buchh VN, Gurcoo SA. Comparison between phenylephrine and ephedrine in preventing hypotension during spinal anesthesia for cesarean section. J Obstet Anaesth Crit Care 2012;2:92-7.

[16]. Lee A, Ngan Kee WD, Gin T. A quantitative, systematic review of randomized controlled trials of ephedrine versus phenylephrine for the management of hypotension during spinal anesthesia for cesarean delivery. Anesth Analg 2002;94:920-6.

[17]. Ngan Kee WD, Lee A, Khaw KS, Ng FF, Karmakar MK, Gin T. A randomized doubleblinded comparison of phenylephrine and ephedrine infusion combinations to maintain blood pressure during spinal anesthesia for cesarean delivery: The effects on fetal acidbase status and hemodynamic control.

[18]. Dyer RA, Farina Z, Joubert IA, Du Toit P, Meyer M, Torr G, et al. Crystalloid preload versus rapid crystalloid administration after induction of spinal anaesthesia (coload) for elective caesarean section. Anaesth Intensive Care 2004;32:351-7.

[19]. Adigun TA, Amanor-Boadu SD, Soyannwo OA. Comparison of intravenous ephedrine with phenylephrine for the maintenance of arterial blood pressure during elective caesarean section under spinal anaesthesia. Afr J Med Med Sci

2010;39:13-20.
[20]. Gunda CP, Malinowski J, Tegginmath A, Suryanarayana VG, Chandra SB. Vasopressor choice for hypotension in elective Cesarean section: Ephedrine or phenylephrine? Arch Med Sci 2010;6:257-63.
[21]. Prakash S, Pramanik V, Chellani H, Salhan S, Gogia AR. Maternal and neonatal effects of bolus administration of ephedrine and phenylephrine during spinal anaesthesia for caesarean delivery: Arandomised study. Int J Obstet Anesth 2010;19:24-30.
[22]. Cooper DW, Sharma S, Orakkan P, Gurung S. Retrospective study of association between choice of vasopressor given during spinal anaesthesia for high-risk caesarean delivery and fetal pH. Int J Obstet Anesth 2010;19:44-9.