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Effect of Different Doses of Phenylephrine Co-Administered with Oxytocin on Maternal Hemodynamics During Caesarean Section Under Spinal Anaesthesia: A Randomized Comparative Study

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ABSTRACT

Background: Spinal anaesthesia for caesarean section is commonly associated with maternal hypotension, which may be further aggravated by oxytocin administration after delivery. Phenylephrine is frequently used to maintain maternal hemodynamic stability. The present study was conducted to evaluate the effect of different doses of phenylephrine co-administered with oxytocin on maternal hemodynamics during caesarean section under spinal anaesthesia.

Materials and Methods: This prospective randomised comparative study included 90 parturients aged 18–40 years belonging to ASA Grade I and II undergoing elective or emergency lower segment caesarean section under spinal anaesthesia. Patients were randomly divided into three groups of 30 each. Group A received oxytocin with phenylephrine 50 µg, Group B received oxytocin with phenylephrine 75 µg, and Group C received oxytocin with phenylephrine 100 µg. Hemodynamic parameters, including heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) were recorded intraoperatively and postoperatively. Incidence of hypotension, rescue vasopressor requirement, and side effects were compared among the groups.

Results: Demographic characteristics and diagnosis distribution were comparable among the groups. Heart rate remained comparable throughout the study period without significant bradycardia. Statistically significant differences were observed in SBP, DBP, and MAP among the groups during the intraoperative period, particularly between 12–35 minutes ($P < 0.001$). Group B showed better maintenance of maternal hemodynamics compared to Groups A and C. Rescue phenylephrine requirement was significantly lower in Group B (10%) compared to Group A (90%) and Group C (93.3%) ($P < 0.001$). The incidence of nausea and vomiting was also significantly lower in Group B (3.3%) compared to Group A (16.7%) and Group C (40%) ($P = 0.002$).

Conclusion; Co-administration of phenylephrine with oxytocin effectively improved maternal hemodynamic stability during caesarean section under spinal anaesthesia. The phenylephrine dose used in Group B provided superior maintenance of blood pressure with reduced hypotension, lower rescue vasopressor requirement, and fewer side effects, making it a more effective regimen for prevention of oxytocin-induced hypotension.

Keywords*: Caesarean section, spinal anaesthesia, oxytocin, phenylephrine, maternal hypotension, hemodynamic stability.*

INTRODUCTION

Spinal anaesthesia is the most commonly preferred anaesthetic technique for lower segment caesarean section because it provides rapid onset of sensory and motor blockade, excellent muscle relaxation, avoidance of airway manipulation, and reduced maternal morbidity compared to general anaesthesia (1). Despite these advantages, spinal anaesthesia is frequently associated with maternal hypotension due to sympathetic blockade, peripheral vasodilatation, and decreased venous return. Maternal hypotension may lead to nausea, vomiting, dizziness, decreased uteroplacental perfusion, fetal acidosis, and adverse neonatal outcomes (2).

Oxytocin is routinely administered after delivery of the baby during caesarean section to facilitate uterine contraction and reduce postpartum hemorrhage. However, oxytocin itself has significant cardiovascular effects including vasodilatation, tachycardia, reduced systemic vascular resistance, and hypotension, which may further aggravate spinal anaesthesia-induced hypotension (3). The combined hemodynamic effects of spinal anaesthesia and oxytocin therefore pose a considerable challenge to the anaesthesiologist in maintaining maternal cardiovascular stability during caesarean delivery (4).

Various preventive strategies have been used to reduce maternal hypotension during spinal anaesthesia, including intravenous fluid loading, left uterine displacement, vasopressor administration, and adjustment of anaesthetic technique. Among vasopressors, phenylephrine has emerged as the preferred agent because it is a selective α1-adrenergic receptor agonist that effectively restores vascular tone and blood pressure without significant adverse fetal effects (5). Phenylephrine improves venous return and systemic vascular resistance, thereby maintaining maternal blood pressure and uteroplacental perfusion (6).

Earlier studies predominantly used ephedrine for treatment of spinal hypotension; however, ephedrine has been associated with fetal acidosis due to increased placental transfer and stimulation of fetal metabolism (7). Recent evidence suggests that phenylephrine provides superior control of maternal blood pressure with better neonatal acid-base status compared to ephedrine (8). Consequently, phenylephrine is now widely recommended as the first-line vasopressor during caesarean section under spinal anaesthesia (9).

Although prophylactic phenylephrine administration effectively reduces maternal hypotension, the optimal dose of phenylephrine when co-administered with oxytocin remains uncertain. Inadequate dosing may fail to prevent hypotension, whereas excessive dosing may cause hypertension and reflex bradycardia. Therefore, determining the most effective dose that provides adequate hemodynamic stability with minimal side effects is clinically important (10).

The present study was undertaken to evaluate the effect of different doses of phenylephrine co-administered with oxytocin on maternal hemodynamics during caesarean section under spinal anaesthesia. The primary objective was to assess prevention of oxytocin-induced hypotension, while secondary objectives included evaluation of rescue vasopressor requirement, incidence of nausea and vomiting, and overall hemodynamic trends.

MATERIALS AND METHODS

Study Design and Setting

The present study was designed as a prospective randomised comparative study conducted in the Department of Anaesthesiology after obtaining approval from the Institutional Ethical Committee. Written informed consent was obtained from all patients included in the study.

The study was conducted on pregnant women undergoing elective and emergency lower segment caesarean section under spinal anaesthesia to evaluate the effect of different doses of phenylephrine co-administered with oxytocin on maternal hemodynamic stability.

Study Population

A total of 90 parturients belonging to American Society of Anaesthesiologists (ASA) Grade I and II, aged between 18–40 years, scheduled for elective or emergency lower segment caesarean section under spinal anaesthesia were included in the study.

Group Allocation

Patients were randomly divided into three groups consisting of 30 patients each:

- Group P50: Received oxytocin with phenylephrine 50 µg.
- Group P75: Received oxytocin with phenylephrine 75 µg.
- Group P100: Received oxytocin with phenylephrine 100 µg.

Randomization was done using computer-generated random numbers.

Inclusion Criteria

1. Pregnant women aged between 18–40 years.
2. ASA Grade I and II patients.
3. Patients undergoing elective or emergency lower segment caesarean section under spinal anaesthesia.
4. Patients willing to participate in the study.

Exclusion Criteria

1. ASA Grade III and IV patients.
2. Pregnancy-induced hypertension or severe cardiovascular disease.
3. Patients with coagulation disorders.
4. Known allergy to study drugs.
5. Local infection at the site of spinal puncture.
6. Severe fetal distress.
7. Patients refusing spinal anaesthesia.

Pre-Anaesthetic Preparation

All patients were thoroughly evaluated one day before surgery with detailed history, general physical examination, and systemic examination. Routine investigations were reviewed and patients were explained about the anaesthetic procedure and study protocol. Written informed consent was obtained from all patients.
Patients were advised to remain nil per oral for 6 hours before surgery.

On arrival in the preoperative room:

1. Intravenous access was secured using an 18G intravenous cannula.
2. Baseline vital parameters including heart rate, systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), respiratory rate, and oxygen saturation (SpO_2) were recorded.
3. Preloading was done with Ringer lactate solution 10–15 ml/kg body weight intravenously.

Premedication included:

- Inj. Glycopyrrolate 0.2 mg IV slowly.
- Inj. Ondansetron 4 mg IV slowly.
- Inj. Midazolam 1 mg IV slowly.

Anaesthetic Technique

After shifting the patient to the operation theatre, routine monitors including electrocardiography (ECG), pulse oximetry, and non-invasive blood pressure monitoring were attached and baseline parameters were recorded.

Under strict aseptic precautions, spinal anaesthesia was administered in the sitting position at the L3–L4 intervertebral space using a 25G Quincke spinal needle. After confirming free flow of cerebrospinal fluid, intrathecal hyperbaric bupivacaine was administered.

Following delivery of the baby, oxytocin was administered intravenously along with the allocated dose of phenylephrine according to the respective study group.

Patients were immediately positioned supine with left uterine displacement after spinal anaesthesia.

Parameters Observed

The following parameters were observed and recorded intraoperatively:
Primary Outcome

- Prevention of oxytocin-induced hypotension.

Secondary Outcomes

1. Rescue vasopressor requirement.
2. Incidence of nausea and vomiting.
3. Hemodynamic trends.

Hemodynamic Monitoring

Maternal hemodynamic parameters were recorded at regular intervals:

1. Heart Rate (HR)
2. Systolic Blood Pressure (SBP)
3. Diastolic Blood Pressure (DBP)
4. Mean Arterial Pressure (MAP)

5. Oxygen Saturation (SpO_2)

Hypotension was defined as a fall in systolic blood pressure below 20% of baseline value or SBP <90 mmHg. Bradycardia was defined as a heart rate <60 beats/minute.

Rescue Vasopressor Requirement

Episodes of hypotension were treated with rescue doses of intravenous phenylephrine. Total rescue phenylephrine requirement was recorded and compared among the groups.

Side Effects Observed

Patients were monitored for the following side effects:

1. Nausea
2. Vomiting
3. Bradycardia
4. Shivering
5. Headache
6. Other adverse effects if any

Statistical Analysis

Data obtained from the study were compiled and analyzed using appropriate statistical methods.

- Quantitative data were analyzed using Student's unpaired t-test and one-way ANOVA wherever applicable.
- Qualitative data were analyzed using the chi-square test.

The level of significance was interpreted as:

- $p > 0.05$: Not significant
- $p < 0.05$: Significant
- $p < 0.001$: Highly significant

RESULT AND OBSERVATIONS

Table 1: Comparison of Demographic Data (Age) of Patients in Group A, Group B and Group C

Age (years)	Group A (n = 30)	Group B (n = 30)	Group C (n = 30)	Total (n = 90)
< 20	0 (0%)	1 (3.3%)	0 (0%)	1 (1.1%)
20–30	30 (100%)	28 (93.3%)	30 (100%)	88 (97.8%)
31–40	0 (0%)	1 (3.3%)	0 (0%)	1 (1.1%)
Total	30 (100%)	30 (100%)	30 (100%)	90 (100%)
Mean ± SD	24.10 ± 1.71	24.00 ± 3.38	23.27 ± 2.30	23.79 ± 2.56

P value = 0.392 (Not statistically significant)

Table 2: Diagnosis Distribution among Three Groups

Diagnosis	Group A n (%)	Group B n (%)	Group C n (%)	Total n (%)
Primigravida	14 (46.7%)	16 (53.3%)	14 (46.7%)	44 (48.9%)
Multigravida	16 (53.3%)	14 (46.7%)	16 (53.3%)	46 (51.1%)
Total	30 (100%)	30 (100%)	30 (100%)	90 (100%)

P = 0.837 (Not Significant), Chi-Square Test

The distribution of primigravida and multigravida patients among the three groups was comparable and statistically not significant (P = 0.837).

Table 3: Comparison of Heart Rate (bpm) among Three Groups

Time Interval	Group A	Group B	Group C
Basal	93.50 ± 15.34	95.30 ± 11.97	90.83 ± 9.88
2 min	89.70 ± 13.06	91.73 ± 11.00	87.03 ± 9.48
4 min	86.37 ± 11.55	89.83 ± 10.68	84.43 ± 8.07
6 min	85.90 ± 11.25	89.07 ± 8.38	83.60 ± 8.92
8 min	86.03 ± 11.16	87.60 ± 7.72	82.83 ± 8.82
10 min	84.50 ± 10.25	86.27 ± 7.76	82.27 ± 8.63
12 min	82.43 ± 9.85	84.53 ± 8.47	82.43 ± 9.70
14 min	81.10 ± 10.45	83.67 ± 9.40	81.33 ± 10.33
16 min	81.47 ± 11.08	82.60 ± 8.87	80.10 ± 10.06
18 min	80.70 ± 10.57	83.20 ± 8.72	80.40 ± 9.39

20 min	**79.97 ± 9.29**	**82.73 ± 8.57**	**79.27 ± 8.18**
25 min	**79.80 ± 9.09**	**82.77 ± 8.59**	**78.23 ± 7.02**
30 min	**80.40 ± 9.72**	**83.03 ± 7.84**	**78.40 ± 7.72**
Immediate Postoperative	**88.00 ± 0.00**	**82.00 ± 0.00**	**0.00 ± 0.00**
30 min Postoperative	**86.00 ± 9.04**	**86.77 ± 7.73**	**84.80 ± 8.26**
60 min Postoperative	**84.20 ± 8.54**	**86.83 ± 8.62**	**83.20 ± 7.21**
90 min Postoperative	**83.03 ± 9.01**	**87.37 ± 8.20**	**83.37 ± 8.32**
120 min Postoperative	**86.20 ± 9.69**	**89.80 ± 9.55**	**83.60 ± 7.92**
150 min Postoperative	**85.60 ± 9.67**	**90.07 ± 10.00**	**85.50 ± 7.60**
180 min Postoperative	**87.43 ± 11.08**	**91.37 ± 11.74**	**85.20 ± 8.26**

Heart rate was comparable in all three groups throughout the study period and there was no incidence of bradycardia.

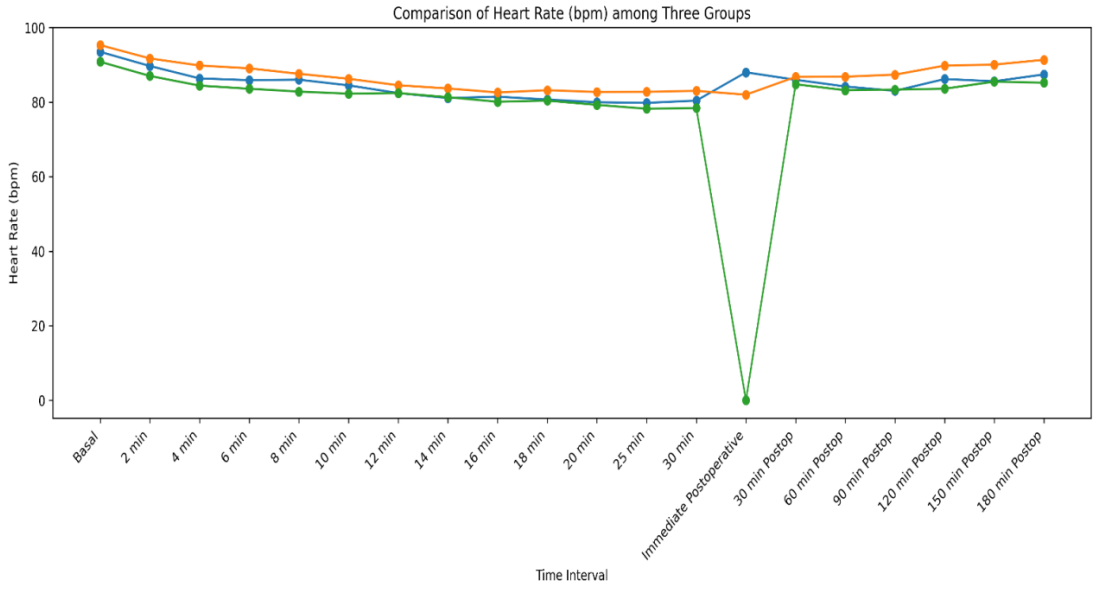

Table 4: Comparison of Systolic Blood Pressure (SBP) among Three Groups

Time Interval	Group A	Group B	Group C
Basal	**121.93 ± 8.61**	**122.13 ± 9.42**	**119.93 ± 6.38**
2 min	**118.63 ± 10.55**	**117.10 ± 8.88**	**116.73 ± 5.92**
4 min	**114.83 ± 10.02**	**113.73 ± 9.01**	**114.13 ± 5.93**
6 min	**112.17 ± 9.83**	**112.53 ± 7.25**	**111.20 ± 5.32**
8 min	**111.53 ± 11.59**	**114.30 ± 10.54**	**109.47 ± 5.58**
10 min	**110.73 ± 10.80**	**112.37 ± 8.73**	**106.87 ± 5.24**
12 min	**107.37 ± 10.02**	**110.70 ± 8.47**	**103.27 ± 6.74**
14 min	**103.63 ± 9.79**	**109.17 ± 9.21**	**99.57 ± 7.89**
16 min	**101.53 ± 12.55**	**110.23 ± 10.20**	**99.07 ± 7.32**
18 min	**97.30 ± 19.97**	**108.90 ± 10.49**	**95.77 ± 5.76**
20 min	**103.97 ± 10.34**	**110.53 ± 10.61**	**97.27 ± 5.54**
25 min	**104.83 ± 11.34**	**112.57 ± 9.74**	**99.20 ± 7.76**
30 min	**104.67 ± 11.60**	**112.31 ± 8.49**	**102.11 ± 6.82**
35 min	**107.21 ± 10.50**	**113.96 ± 8.71**	**105.37 ± 8.50**
40 min	**108.93 ± 10.64**	**115.40 ± 8.57**	**109.30 ± 7.63**
45 min	**110.25 ± 10.48**	**115.00 ± 9.13**	**112.17 ± 8.30**

Comparison of SBP among the three groups showed statistically significant difference from 12th to 20th minute ($P < 0.001$). Group B demonstrated better maintenance of systolic blood pressure compared to Groups A and C.

Table 5: Comparison of Diastolic Blood Pressure (DBP) among Three Groups

Time Interval	Group A	Group B	Group C
Basal	**71.77 ± 5.93**	**70.87 ± 8.34**	**68.60 ± 5.19**
2 min	**69.93 ± 8.11**	**68.63 ± 9.23**	**66.27 ± 5.28**
4 min	**67.20 ± 8.43**	**66.13 ± 10.03**	**63.73 ± 7.05**

6 min	**65.87 ± 7.46**	**66.43 ± 9.42**	**63.03 ± 6.63**
8 min	**65.53 ± 7.61**	**63.30 ± 9.96**	**62.73 ± 5.64**
10 min	**62.83 ± 8.14**	**61.63 ± 9.95**	**60.57 ± 6.87**
12 min	**61.80 ± 8.14**	**61.80 ± 8.99**	**59.17 ± 5.83**
14 min	**59.03 ± 9.38**	**62.67 ± 8.93**	**56.67 ± 5.77**
16 min	**58.07 ± 9.76**	**64.33 ± 7.88**	**54.13 ± 6.35**
18 min	**63.93 ± 8.30**	**60.93 ± 8.30**	**53.03 ± 5.59**
20 min	**57.50 ± 7.91**	**61.27 ± 9.04**	**53.77 ± 4.65**
25 min	**57.50 ± 8.65**	**61.67 ± 8.67**	**55.73 ± 3.98**
30 min	**59.10 ± 8.22**	**62.66 ± 8.21**	**57.27 ± 5.39**

Comparison of DBP among the three groups showed a statistically significant difference from 14th to 30th minute ($P < 0.001$). Group B maintained better diastolic blood pressure compared to Group C.

Table 6: Comparison of Mean Arterial Pressure (MAP) among Three Groups

Time Interval	Group A	Group B	Group C
Basal	**85.93 ± 15.00**	**88.27 ± 7.80**	**85.23 ± 5.26**
2 min	**87.17 ± 8.41**	**85.50 ± 10.06**	**82.93 ± 4.72**
4 min	**83.90 ± 8.07**	**82.57 ± 9.80**	**80.60 ± 5.56**
6 min	**82.33 ± 7.45**	**82.03 ± 10.19**	**79.10 ± 5.54**
8 min	**81.90 ± 9.04**	**80.27 ± 10.48**	**78.33 ± 5.01**
10 min	**80.30 ± 8.31**	**79.13 ± 9.47**	**76.07 ± 5.53**
12 min	**78.07 ± 8.46**	**78.67 ± 8.38**	**73.77 ± 5.99**
14 min	**75.00 ± 8.60**	**78.57 ± 8.44**	**70.53 ± 6.88**
16 min	**73.73 ± 10.19**	**80.20 ± 8.93**	**68.77 ± 6.70**
18 min	**71.50 ± 9.42**	**77.27 ± 9.31**	**66.77 ± 6.13**
20 min	**73.83 ± 8.61**	**78.07 ± 8.74**	**67.90 ± 4.91**
25 min	**73.63 ± 8.64**	**78.72 ± 9.23**	**69.63 ± 5.31**
30 min	**75.77 ± 8.10**	**79.31 ± 8.14**	**72.30 ± 5.15**
35 min	**77.03 ± 8.09**	**79.29 ± 8.00**	**74.27 ± 7.18**
40 min	**79.59 ± 7.49**	**83.08 ± 5.40**	**77.53 ± 6.31**

Comparison of MAP among the three groups showed statistically significant difference from 12th to 35th minute ($P < 0.001$). Group B maintained significantly better MAP compared to Group C.

Table 7: Comparison of Additional Rescue Dose of Phenylephrine Requirement Among the Three Groups

Variable	Group A (n = 30)	Group B (n = 30)	Group C (n = 30)	Total (n = 90)	P value
Additional dose of Inj. Phenylephrine 50 µg required	**27 (90.0%)**	**3 (10.0%)**	**28 (93.3%)**	**58 (64.4%)**	**<0.001****
Number of times rescue dose administered	**27 (90.0%)**	**3 (10.0%)**	**28 (93.3%)**	**58 (64.4%)**	**<0.001****

Statistical test used: Chi-square test/Fisher's Exact test

Table 8: Comparison of Side Effects Among the Three Groups

Side Effects	Group A (n = 30)	Group B (n = 30)	Group C (n = 30)	Total (n = 90)	P value
Nausea/Vomiting	**5 (16.7%)**	**1 (3.3%)**	**12 (40.0%)**	**18 (20.0%)**	**0.002****
Intraoperative uterine bleeding	**30 (100%)**	**30 (100%)**	**30 (100%)**	**90 (100%)**	**1.000**

Statistical test used: Chi-square test/Fisher's Exact test

DISCUSSION

The present prospective randomised comparative study was conducted to evaluate the effect of different doses of phenylephrine co-administered with oxytocin on maternal hemodynamics during caesarean section under spinal anaesthesia. Maternal hypotension following spinal anaesthesia is a frequent and clinically significant complication in obstetric anaesthesia, and oxytocin administration may further worsen cardiovascular instability. The present study aimed to identify the dose of phenylephrine that provides optimal maternal hemodynamic stability with minimal adverse effects. In the present study, demographic characteristics, including age distribution and gravida status, were comparable among all three groups. The mean age of patients in Group A, Group B, and Group C was 24.10 ± 1.71 years, 24.00 ± 3.38 years, and 23.27 ± 2.30 years, respectively, with no statistically significant difference ($P = 0.392$). Similarly, there was no

statistically significant difference in the proportion of primigravida and multigravida patients among the groups (P = 0.837). Comparable baseline characteristics ensured uniformity among study groups and minimised confounding factors. Similar demographic comparability was reported in previous studies (11,12).

Heart rate remained comparable among the three groups throughout the study period, and no patient developed clinically significant bradycardia. Although phenylephrine is associated with reflex bradycardia due to α-adrenergic vasoconstriction and baroreceptor-mediated vagal stimulation, the doses used in the present study did not produce marked reductions in heart rate. These findings are consistent with previous studies that also reported stable heart rate profiles with prophylactic phenylephrine administration during spinal anaesthesia for caesarean section (13,14).

Systolic blood pressure was significantly better maintained in Group B compared to Groups A and C. Statistically significant differences in SBP were observed, particularly between the 12th and 20th minute following spinal anaesthesia ($P < 0.001$). Group C showed greater reductions in SBP and a higher incidence of hypotension, while Group A demonstrated intermediate blood pressure control but required greater rescue vasopressor support. Group B consistently maintained systolic blood pressure closer to baseline values, indicating more effective prevention of oxytocin-induced hypotension. These findings correlate with earlier studies demonstrating that prophylactic phenylephrine effectively reduces maternal hypotension during caesarean delivery (15,16).

Diastolic blood pressure also showed significant intergroup variation. Group B maintained significantly better DBP compared to Group C from the 14th to 30th minute ($P < 0.001$). Maintenance of diastolic pressure is clinically important because it contributes to adequate coronary and uteroplacental perfusion. Reduced DBP observed in Group C may indicate inadequate vasopressor support during the period of maximum sympathetic blockade and oxytocin-induced vasodilatation. Similar findings have been reported previously regarding the efficacy of phenylephrine in maintaining vascular tone during spinal anaesthesia (17).

Mean arterial pressure followed trends similar to SBP and DBP. Statistically significant differences in MAP were observed from the 12th to 35th minute, with Group B maintaining significantly better MAP compared to Group C. Adequate MAP is essential during obstetric anaesthesia because sustained maternal hypotension may compromise uteroplacental blood flow and fetal oxygen delivery. The improved MAP profile observed in Group B suggests superior maternal cardiovascular stability with this phenylephrine dose regimen. Similar observations have been reported in previous studies evaluating prophylactic vasopressor administration during caesarean section (18,19).

An important observation of the present study was the requirement of rescue phenylephrine doses. Rescue vasopressor requirement was significantly lower in Group B compared to Groups A and C ($P < 0.001$). Only 3 patients (10%) in Group B required additional rescue phenylephrine, whereas rescue doses were required in 27 patients (90%) in Group A and 28 patients (93.3%) in Group C. This finding strongly suggests that the dose used in Group B provided superior prophylaxis against oxytocin-induced hypotension. Reduced rescue vasopressor requirement also reflects improved intraoperative hemodynamic control and decreased incidence of hypotensive episodes, which is comparable with previous studies (12).

The incidence of nausea and vomiting was significantly lower in Group B compared to the other groups. Nausea and vomiting occurred in 16.7% of patients in Group A, 3.3% in Group B, and 40% in Group C ($P = 0.002$). Intraoperative nausea and vomiting during spinal anaesthesia are closely related to maternal hypotension and reduced cerebral perfusion. Better maintenance of blood pressure in Group B likely contributed to the lower incidence of these adverse effects. Similar findings have been reported in earlier studies evaluating spinal hypotension during caesarean section (18).

No significant difference was observed among the groups regarding intraoperative uterine bleeding, and all patients had adequate uterine contraction following oxytocin administration. This indicates that co-administration of phenylephrine with oxytocin did not adversely affect uterine tone or interfere with obstetric management.

Overall, the findings of the present study demonstrate that prophylactic administration of an optimal intermediate dose of phenylephrine along with oxytocin provides superior maternal hemodynamic stability during caesarean section under spinal anaesthesia. Group B showed better maintenance of systolic blood pressure, diastolic blood pressure, and mean arterial pressure with significantly lower rescue vasopressor requirement and reduced incidence of nausea and vomiting. Therefore, the dose regimen used in Group B appears to be more effective for the prevention of oxytocin-induced hypotension while minimising maternal adverse effects.

CONCLUSION

Co-administration of phenylephrine with oxytocin during caesarean section under spinal anaesthesia improved maternal hemodynamic stability. Group B showed better maintenance of SBP, DBP, and MAP with lower incidence of hypotension, reduced rescue vasopressor requirement, and fewer episodes of nausea and vomiting compared to Groups A and C. Heart rate remained comparable among all groups without significant bradycardia. Thus, the phenylephrine dose used in Group B was found to be more effective in preventing oxytocin-induced hypotension and maintaining stable maternal hemodynamics.

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