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Effects of phenylephrine and ephedrine in prevention and treatment of hypotension during spinal anaesthesia for elective cesarean section: A randomized controlled study

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***Abstract*---**Introduction: Hypotension and bradycardia are common side effects of spinal anaesthesia. It can have a potentially deleterious maternal and fetal impact. Phenylephrine is preferred vasopressor in prevention and treatment of post spinal hypotension (PSH) and Ephedrine investigated as an alternative to phenylephrine with promising results. Aim: To compare the efficacy and safety of Ephedrine with Phenylephrine for the prevention and treatment of hypotension under spinal anesthesia for cesarean delivery. Methods: This prospective, randomized study was done at tertiary care centre. Total 80patients of ASA I/II posted for elective Cesarean Section were randomly divided into 2 equal groups, Group P (Phenylephrine) received 100ug of Inj. Phenylephrine i.v. and Group E (Ephedrine) received 10mg of Inj. Ephedrine i.v. Result: Incidence of bradycardia was higher in phenylephrine group after

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induction. SBP, DBP and mean blood pressure measured during pre-operative, per-operative and post-operative periods in both groups showed low incidence of hypotension in Group P as compared to Group E. Conclusion: Phenylephrine is more efficient in managing hypotension during spinal anaesthesia for elective caesarean delivery. Neonatal outcome remains equally good in both the groups.

***Keywords*---**neuraxial block, vasopressor, pregnancy, hemodynamics.

Introduction

Neuraxial anesthesia remains the preferred choice for Cesarean deliveries across the world[1]. The primary physiologic alterations are decreased preload and cardiac volume, which combine with bradycardia to reduce arterial blood pressure and cardiac output [6]. It can have a potentially deleterious maternal and fetal impact [1]. They represent normal physiologic responses to anesthetized spinal sympathetic nerve fibers [2]. Phenylephrine is a selective α1 receptor agonist and β agonist action, frequently used in obstetric anesthesia [1]. It acts on adrenergic α1 receptors mediating vasoconstriction [3]. Potential negative chronotropic effect is due to reflex bradycardia and decreased cardiac output might not adversely influence the fetus in elective cases [1]. Vasopressors are more widely accepted as an effective method for decreasing Post spinal hypotension (PSH) than fluid loading[2]. Phenylephrine (PE) is preferred vasopressor in prevention and treatment of post spinal hypotension and Ephedrine investigated as an alternative to phenylephrine with promising results[4].

Ephedrine has both direct α and β agonist action. Its mechanism of action is primarily due to its indirect action of releasing norepinephrine from postganglionic nerve endings [1]. Intravenous boluses are therefore preferred to continuous intravenous infusions as the drug exhibits delayed onset of action and tachyphylaxis. [1]

Material and Methods

This prospective, randomized control study was conducted in the Department of Anesthesia, Dhiraj General Hospital (Tertiary care Centre) from January 2020 to June 2021. After clearance from Institutional Ethical committee (Approval no.-D19190) and a written informed consent, total 80 ASA I & II Parturients with age >18 years undergoing elective cesarean section under spinal anesthesia with a normal singleton pregnancy beyond 36 weeks gestation were recruited. Parturients with pre-existing co-morbidities like heart diseases, kidney diseases or known fetal abnormalities, any intake of drug that influence hemodynamic factors, massive obstetrics hemorrhage, complicated surgeries like obstetric hysterectomy, allergic to study drugs, failed spinal anesthesia converted to General anesthesia were excluded from the study.

All 80 parturients posted for elective cesarean section were enrolled and randomly divided equally into Group-P & Group-E with 40 parturients in each group by chit method.

Group E received prophylactic bolus of 10 mg ephedrine IV at the time of intrathecal injection, plus received rescue boluses of 5mg ephedrine, whenever maternal systolic blood pressure was less than 90 mmHg.

Group P received prophylactic bolus of 100ug of phenylephrine IV at the time of intrathecal injection, plus received rescue boluses of 50ug phenylephrine, whenever maternal systolic blood pressure was less than 90 mmHg.

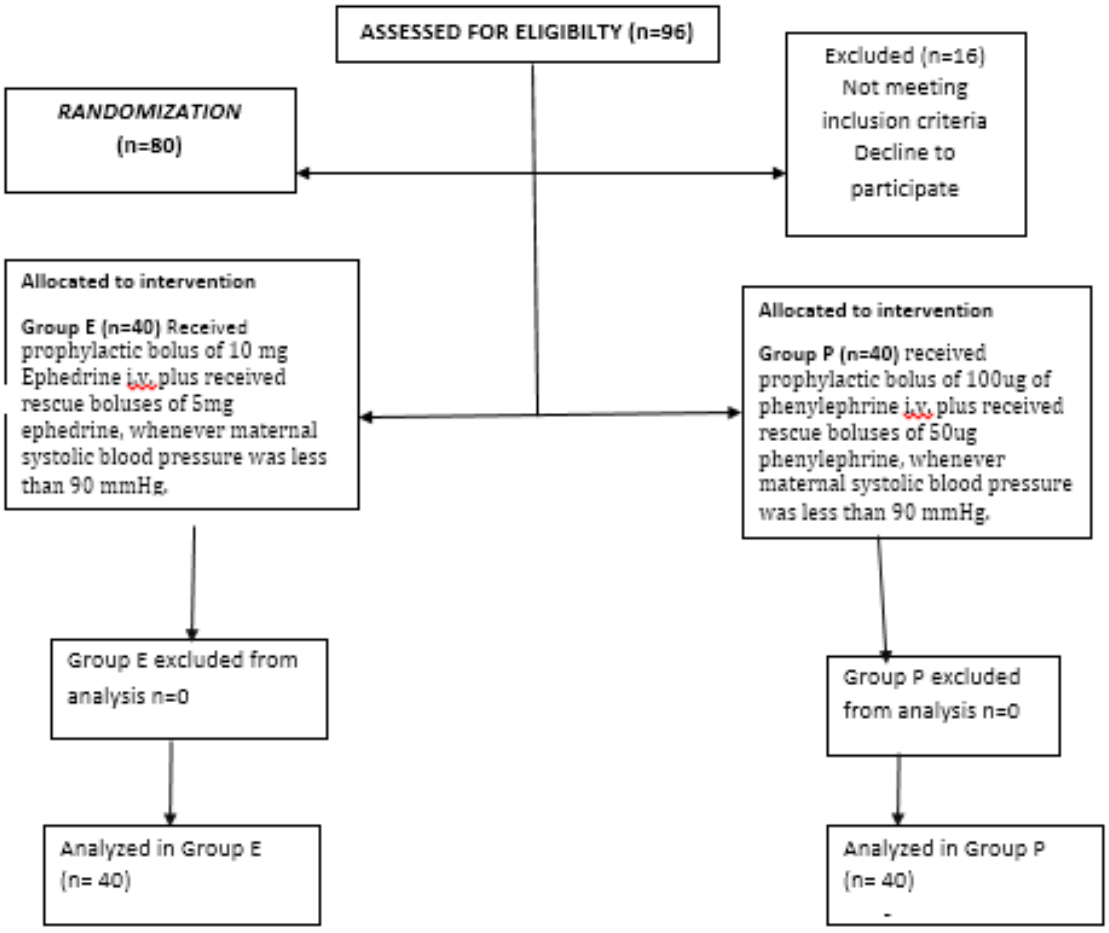

Figure 1. Study Flow Diagram

Pre-anesthetic examination was done on the previous day to surgery. Baseline investigations include blood routine investigations like complete blood count, coagulation profile and platelet count were advised. Patients were maintained on nil by mouth for 8 hours.

On the day of surgery, each subject received Inj. Ondansetron 0.08 mg/kg IV , Inj. Ranitidine 1mg/kg IV preoperatively as premedication. In the operating room

routine standard monitoring with non-invasive arterial pressure (NIBP), Pulse rate, electrocardiography (ECG), and pulse oximetry were established. Baseline measurements were performed 5 minutes before spinal anesthesia.

Each patient was preloaded with 15 ml/kg of ringer lactate solution. With the patient in the lateral position according to convenience, lumbar puncture was performed at the L3-L4 interspace with 2.2 ml (bupivacaine 0.5% Heavy) via a 25-guage Quincke spinal needle.
Immediately after completing the intrathecal injection, patients were positioned supine on the operating table. From this moment on, the level of the sensory block was evaluated by loss of pinprick discrimination at the time to incision and every 5 minutes. Sensory block to T6 dermatome was considered adequate anaesthesia. Study drug was given by the consultant anesthesiologist present in the operation theatre. Neonatal outcome was assessed using Apgar score at 1 and 5 minutes.

Statistical analysis

Parameters data was expressed as Mean ±S.D & comparisons of both the groups were made by student's unpaired t- test and referred for P- value for its significance. P-value less than 0.05 was taken to be statistically significant (SS) P-values derived from MedCalc Comparison of Mean T-test.

Results

A total of 80 with ASA I and II parturients were randomly allocated into two groups of 40 patients each.
The two groups were compared with regards to their age and body weight [table 1]. The distribution of parturients with respect to age, weight was statistically not significant in both the groups.

Table 1: AGE, WEIGHT distribution (DEMOGRAPHIC DATA)

Parameters	Group P Mean ±S.D	Group E Mean ±S.D	P-Value	Inference (NS- not significant, SS-statistically significant)
Age (Yrs)	24.73 ±4.18	25.6 ±4.69	0.3838	NS
Weight (Kgs)	62.75 ±7.89	61.75 ±9.02	0.5992	NS

TABLE 2: Systolic blood pressure and diastolic blood pressure (mm Hg) before Delivery at different time intervals after spinal anesthesia in both groups

Table 2 :Before Delivery

SBP(Minutes)	Group Phenylephrine	Group Ephedrine	P-Value	Inference (NS- not significant, SS-statistically significant)
	Mean ± S.D.	Mean ± S.D.		
0	133.5 ±5.04	129.1 ±9.45	0.0112	SS
2	125.9 ±9.29	120.3 ±11.9	0.0215	SS
4	119.4 ±14.72	113 ±13.86	0.0488	SS
6	116.1 ±9.09	105.7±14.82	0.0003	SS
8	114.14 ±7.52	102.82±13.18	0.0002	SS
10	104 ±0	105.56 ±8.72	NA	
12	100 ±0	100 ±0	NA	
15	0	0	NA	
20	0	0	NA	
DBP (Minutes)				
0	82.6 ±4.21	79.4 ±6.63	0.0119	SS
2	77.6 ±6.74	74.2 ±5.54	0.0159	SS
4	74.5 ±8.83	69.7 ±6.79	0.0079	SS
6	71.5 ±7.6	66.2 ±6.5	0.0012	SS
8	69.14 ±3.98	63.53 ±4.54	<0.0001	SS
10	66 ±0	68.67 ±3.07	NA	
12	64 ±0	64 ±0	NA	
15	0	0	NA	
20	0	0	NA	

SDP and DBP before delivery was evaluated at different time interval and it shows that there was statistically significant difference between the group P and group E in maintaining SBP at 0 , 2 , 4 , 6 , and 8 minutes after spinal anaesthesia after prophylactic boluses of respective drugs.

TABLE 3: Systolic blood pressure and Diastolic blood pressure (mm Hg) after delivery at different time interval after spinal anesthesia in both groups

Table 3 After Delivery				
SBP (Minutes)	Group Phenylephrine	Group Ephedrine	P-Value	Inference (NS- not significant, SS- statistically significant)
	Mean ± S.D.	Mean ± S.D.		
0	117.2 ±4.89	105.5 ±11.05	< 0.0001	SS
1	117.5 ±5.43	104.6 ±10.41	< 0.0001	SS
5	117.1 ±6.67	107.2 ±8.93	< 0.0001	SS
10	118.1 ±6.19	109.4 ±8.83	< 0.0001	SS
15	120.4 ±5.86	111 ±8.22	< 0.0001	SS
20	122.8 ±5.6	113.3 ±7.5	< 0.0001	SS
25	126.5 ±4.87	116.4 ±7.18	< 0.0001	SS

30	129.75 ±4.42	119.25 ±7.29	< 0.0001	SS
40	131.4 ±3.9	119.78 ±6.32	< 0.0001	SS
50	0	0	NA	
DBP (Minutes)				
0	72.5 ±4.74	65.3 ±3.41	< 0.0001	SS
1	73.3 ±4.68	65.2 ±2.59	< 0.0001	SS
5	73.5 ±4.61	67.2 ±2.43	< 0.0001	SS
10	72.9 ±4.73	68.5 ±2.86	< 0.0001	SS
15	74.7 ±4.26	69.5 ±2.39	< 0.0001	SS
20	76.9 ±3.36	71.9 ±2.68	< 0.0001	SS
25	79.9 ±2.9	74 ±2.72	< 0.0001	SS
30	83.13 ±2.59	75.25 ±2.86	< 0.0001	SS
40	83.8 ±1.44	76.22 ±2.98	< 0.0001	SS
50	0	0	NA	

Systolic blood pressure and Diastolic blood pressure after delivery was evaluated at different time interval and it shows that there was statistically significant difference between the group P and group E in maintaining SBP after delivery. A comparison of mean SBP and mean DBP in both groups, before and after delivery at different time intervals shows that there were no events of hypotension noted.

Table 4: Assessment of Systolic blood pressure and Diastolic blood pressure (mm Hg) Post operatively at different time interval in both groups

Table 4: Post Operative Vitals				
SBP (Minutes)	Group Phenylephrine Mean ± S.D.	Group Ephedrine Mean ± S.D.	P-Value	Inference (NS- not significant, SS-statistically significant)
0	130.5 ±3.94	119.2 ±7.23	< 0.0001	SS
10	130.5 ±3.94	121.5 ±6	< 0.0001	SS
20	130.7 ±3.47	122.8 ±4.68	< 0.0001	SS
30	130 ±3.51	123.2 ±4.94	< 0.0001	SS
40	130.7 ±3.52	124.6 ±7.05	< 0.0001	SS
50	132.3 ±4.36	125 ±8.24	< 0.0001	SS
60	132.6 ±4.75	127.5 ±8.32	0.0012	SS
DBP (Minutes)				
0	83.6 ±2.36	75.4 ±2.73	< 0.0001	SS
10	82.8 ±2.59	75.6 ±3.82	< 0.0001	SS
20	81.7 ±2.33	76.5 ±4.43	< 0.0001	SS
30	81.4 ±2.94	76.5 ±4.43	< 0.0001	SS
40	81.6 ±2.69	77.1 ±5.3	< 0.0001	SS
50	82.6 ±4.44	77.3 ±5.74	< 0.0001	SS
60	82.9 ±4.37	80.2 ±7.44	0.0513	NS

Systolic blood pressure and Diastolic blood pressure post operatively was evaluated at different time interval and it shows that there was statistically significant difference between the group P and group E in maintaining SBP. In Group P, mean SBP is higher side as compared to group E.

Table 5: Assessment of Mean arterial pressure (MAP) before and after delivery at different time interval in both groups.

Table 6: MAP BEFORE DELIVERY				
MAP (Minutes)	Group Phenylephrine Mean ± S.D.	Group Ephedrine Mean ± S.D.	P-Value	Inference (NS- not significant, SS-statistically significant)
0	99.57 ±3.57	95.97 ±7.18	0.0058	SS
2	93.38 ±7.42	89.57 ±7.5	0.0251	SS
4	88.73 ±10.92	84.13 ±8.99	0.0430	SS
6	85.17 ±9.45	79.37 ±9.16	0.0067	SS
8	62 ±37.76	65.13 ±28.49	0.6796	NS
10	3.93 ±17.36	36.43 ±40.92	NA	
12	3.8 ±16.77	3.8 ±16.77	NA	
15	0	0	NA	
20	0	0	NA	
MAP - AFTER DELIVERY				
0	87.4 ±4.29	78.7 ±5.65	< 0.0001	SS
1	88.03 ±4.09	78.33 ±4.79	< 0.0001	SS
5	88.03 ±4.38	80.53 ±4.06	< 0.0001	SS
10	87.97 ±4.41	82.13 ±4.32	< 0.0001	SS
15	89.93 ±4.08	83.33 ±3.49	< 0.0001	SS
20	92.2 ±3.57	85.7 ±3.5	< 0.0001	SS
25	95.43 ±3.01	88.13 ±3.56	< 0.0001	SS
30	78.93 ±40.04	71.93 ±36.59	0.4169	NS
40	49.83 ±50.48	40.83 ±45.79	0.4062	NS
50	0	0	NA	

Mean arterial pressure before and after delivery was evaluated at different time interval which shows that there was statistically significant difference between the group P and group E in maintaining MAP suggest that in group P, the mean arterial blood pressure remain higher side after prophylactic dose of phenylephrine than group E.

Table 6: Mean pulse rate (rate per min) at different time intervals in both groups.

Table 6: Pulse Rate (Minutes)	Group Phenylephrine	Group Ephedrine	P-Value	Inference (NS- not significant, SS-statistically significant)
	Mean ± S.D.	Mean ± S.D.		
PREOPERATIVE	94.2 ±10.37	95.85 ±10.96	0.4912	NS
Before delivery				
0	97.4 ±10.54	99.15 ±10.17	0.5463	NS
2	102.1 ±9.72	104.25 ±9.85	0.3288	NS
4	103.15 ±13.78	108.15 ±11.06	0.0774	NS
6	105.1 ±14.02	111 ±11.97	0.0464	SS
8	107.93 ±13.36	113.53 ±10.51	0.0405	SS
10	101 ±0	112.22 ±9.35	N.A.	
12	106 ±0	106 ±0	N.A.	
15				
20				
After delivery				
0	108.4 ±11.2	112.65 ±6.9	0.0444	SS
1	108.55 ±8.92	113.28 ±7.55	0.0124	SS
5	107.25 ±10.12	111.35 ±8.77	0.0564	NS
10	105.45 ±10.83	109.15 ±8.87	0.0986	NS
15	103.95 ±11.32	106.95 ±9.48	0.2026	NS
20	102.4 ±11.53	103.9 ±11.27	0.5580	NS
25	101.05 ±12.71	103.72 ±11.53	0.3281	NS
30	97.25 ±11.81	101.44 ±12.65	0.1298	NS
40	98.2 ±13.91	105.22 ±16.09	0.0401	SS
Post operative				
0	98.15 ±13.6	99.35 ±12.84	0.6860	NS
10	96.5 ±12.26	97.75 ±11.87	0.6445	NS
20	95.35 ±10.46	95.85 ±10.13	0.8286	NS
30	93.75 ±10.02	94.45 ±9.49	0.7492	NS
40	93.1 ±8.09	92.9 ±8.95	0.9168	NS
50	91.05 ±5.64	91.1 ±5.67	0.9686	NS
60	89.8 ±5.44	90.2 ±5.9	0.7534	NS

The difference in mean pulse rate compared between two groups immediately after spinal anaesthesia. Before delivery , at 6 and 8 minutes and after delivery, at 1 and 40 minutes there were statistically significant difference between two

groups. In group E, mean pulse rate is on higher side than group P. Mean Respiratory rate and Mean Spo2 were compared between both the groups pre and post operatively, which shows there is no statistically significance between both the groups.

Table 7 : Assessment of APGAR SCORE(mean) in both the groups

APGAR SCORE	Group Phenylephrine	Group Ephedrine	P-Value	Inference (NS- not significant, SS-statistically significant)
	Mean ± S.D.	Mean ± S.D.		
0 minute	8.65 ±0.62	8.55 ±0.64	0.4800	NS
1 minutes	8.88 ±0.33	8.75 ±0.44	0.1390	NS
5 minutes	9.25 ±0.44	9.1 ±0.3	0.0787	NS

APGAR scores at 0, 1 and 5 minutes were compared between both groups, and it shows that there is no statistically significant difference between group P and group E. No neonate had APGAR score <7 at 1 and 5 minute.

Table 8: No. of patient required rescue dose and Hypotensive episodes comparison between both groups

Table 8: parameter	Group-p N=40	Group E N=40	P value	Inference (NS- not significant, SS-statistically significant)
No. of patient required rescue dose	6 (15%)	14 (35%)	0.7147	NS
Hypotensive episodes	6 (15%)	16 (40%)	0.5480	NS

Overall, 6/40 (15%) parturients with the group-P and 14/40 (35%) paturients with group-E had one or more episodes of hypotension and required one or more boluses of vasopressor. The number of rescue doses required in group P and group E were statistically insignificant. 6/40 (15%) patients with group-P and 16/40 (40%) patients with group-E required rescue medications. Though it is not significant statistically but this indicated the number of patients who required rescue medications in ephedrine group is more than the number of patients in the phenylephrine group; results are in favor of phenylephrine.

The incidence of tachycardia is significantly higher with ephedrine (19/40) as compared with phenylephrine (0/40) group. The incidence of bradycardia is significantly higher with phenylephrine (4/40) than ephedrine (0/40) group.

Bradycardia was treated with inj. Atropine 0.6mg IV. The patients in the ephedrine group has significantly more episodes of nausea and vomiting than the patients in the phenylephrine group and the results are in favour of phenylephrine. There were no significant difference between phenylephrine and ephedrine group in the other variables such as headache & shivering. None of the patient included in the study developed Respiratory depression in any group.

Discussion

Spinal anaesthesia is the popular route of anaesthesia in parturients for cesarean delivery. The most important physiological response to spinal anesthesia involves cardiovascular system. Maternal hypotension and Bradycardia are the common complication after spinal anesthesia in obstetric patients which have deleterious effects on maternal as well as fetal outcome by reducing placental perfusion leads to fetal acidosis and neuronal damage and maternal symptom of low cardiac output such as nausea, vomiting, dizziness, and decrease sensorium [14]. The incidence of spinal anesthesia induced hypotension is reported to be as high as 80% [13].

After spinal anesthesia for cesarean delivery, risk of hypotension can be prevented by treatment of IV fluid, averting aorto-caval limiting and use of vasopressors. There is decrease of placental perfusion which is related to the reduction of maternal artery pressure [15]. In this study, all patients were pre-loaded with 15 ml/kg of Ringer's lactate, which was followed by the spinal anesthesia. Some studies have shown inadequacy of previous hydration due to hasty redistribution [16]. Crystalloids and colloid are used to prevent or treat maternal hypotension in addition to vasopressors [17]. The left uterine displacement, combined with fluid preload to prevent maternal hypotension, although vasopressors are also often necessary [18].

Results of the present study indicate that prophylactic dosage of phenylephrine 100ug i.v. and ephedrine 10 mg i.v. while giving spinal anesthesia during caesarean section caused a significant prevention of maternal hypotension events, decreased need of rescue vasopressor agents and improved fetal outcome. Phenylephrine as prophylactic drug can minimize the maternal hypotension events compared to ephedrine.

In this study uterine was directed to the left to decrease aortocaval compression, and the blockade was achieved at the same level almost in all patients. This management is compatible with another study, which confirmed that the left uterine displacement is known to reduce the effects of aortocaval compression [19]. Despite all the conservative measures, a vasoconstrictor drugs are often required to prevent low blood pressure during anesthesia in the spinal canal [20].

In our study, 100µg of phenylephrine i.v. and 10 mg of ephedrine i.v. was given to parturients to preserve systolic arterial blood pressure of 100 mmHg. Our study is congruent with **Saravanon *et al.* [21]** demonstrated a potency ratio of 80:1 (100 µg phenylephrine ~10 mg ephedrine) for equivalence between phenylephrine and

ephedrine as infusion in prevention of hypotension induced spinal anesthesia. Our study is congruent with **Morgan *et al.*** [22] that gave 10mg of ephedrine or 80ug phenylephrine to maintain systolic blood pressure of 100 mm Hg. Our study is also congruent to **Thomas, *et al.*** [24]**. Vakili H *et al.*** [9] in that participants were grouped into four and received 5mg ephedrine, 10 mg ephedrine, 50ug phenylephrine and 100ug phenylephrine results showed that hemodynamic parameters but in our study we have compared between two groups who received 10 mg ephedrine or 100µg phenylephrine .
Our study result is suggesting that phenylephrine is superior in prevention and treatment of maternal hypotension to ephedrine. Our results are consistent with Ngan **WD *et al*** which confirmed that phenylephrine was superior to ephedrine in prevention of hypotension which is in accordance with our study [25]. According to **Veeser m et al.** [23]**,** phenylephrine is the preferred drug for treatment of hypotension after spinal anesthesia for elective caesarean section, which agrees with our study. Clinical trials have shown that phenylephrine may be more beneficial than ephedrine when used to prevent or treat spinal anesthesia induced hypotension during caesarean section. Present study results confirm those reported in several previous studies on the safety of phenylephrine in pregnancy [26, 23].

The present study is not consistent with the study of **Magalhaes et al.** [18], They concluded that ephedrine was more effective than phenylephrine in the prevention of hypotension. This may be because a lower dose of phenylephrine was used in their study compared to this study. Additionally, our results are does not consistent with a **Prakash et al.** [27]**, Bhardwai et al.** [28] as they both confirmed that phenylephrine is as effective as ephedrine for treatment of hypotension after spinal anesthesia in women undergoing caesarean section this may be because of less sample size and use of low dose of phenylephrine as compared to our study respectively.

Edno Magalhães et al , [6] concluded that ephedrine at dose 10 mg is more effective in preventing maternal hypotension and with similar side effects compared to phenylephrine dose 80ug. This also may have been because a lower dose of phenylephrine was used in their study compared to this study.

Vakili H et al, [9] conducted a randomized double blind control trial results showed that significant differ ence in both phenylephrine and ephedrine groups in preventing maternal hypotension with ephedrine group has more events of complications such as nausea and vomiting with no difference in APGAR scores.
In the current study, 6 (15%) parturients in the phenylephrine group and 14 (35%) paturients with ephedrine group had one or more episodes of hypotension and required one or more boluses of vasopressor. The current study is consistent with study of **Gunda et al.** [29], showed that all patients had treatment for hypotension and 6% patients with group P and 8% patients with group E required rescue doses. In the current study, the number of rescue doses required in group P and group E were statistically insignificant.

A meta-analysis of four randomized clinical trials of **Lee, et al. [30]** showed that ephedrine could not be used as a prophylaxis against hypotension. This is

because it cannot prevent hypotension in low doses and in high doses can cause high blood pressure that may be problematic [31].

In the current study, 4 (10%) parturients who received phenylephrine and 0 (0%) who received ephedrine developed bradycardia which suggest that incidence of bradycardia is significantly higher (p value 0.0455 <0.05) with phenylephrine group than ephedrine group. Bradycardia was treated with inj. Atropine 0.5mg IV. These findings are similar to a study by **Lee et at.** [30] , **Thomas et al.** [24] **, Nazir et al.** [31] **, Arun Kumar Natarajan**, 2015 & **Anna Lee**, 2011, in their study reported a higher incidence of bradycardia in patient receiving phenylephrine when compared to ephedrine. The authors explained that this can be expected due to an increase in blood pressure, where α agonist can lead to reactive bradycardia. This result is in line with our findings that , 2 (5%) patients developed bradycardia in phenylephrine group and treated with atropine. Our study is NOT consistent with **Magalhaes, et al.** [18]**,** reported comparable number of bradycardia with ephedrine and phenylephrine.

In the current study, patient in phenylephrine, group 0/40 (0%) patient developed tachycardia after prophylactic dose of phenylephrine whereas patient with ephedrine group, 19/40 (47%) had developed tachycardia which was significantly higher in ephedrine group. which suggest that the incidence of tachycardia is significantly higher with ephedrine. Our study is discordant with other study conducted by **Gunda et al.** [24]**,** suggested that the incidence of tachycardia was significantly higher in ephedrine groups.

Our results are consistent with **Macarthur A et al.,** [32] **& Gunda CP et al,.** [24] indicate that significantly higher incidence of nausea/vomiting with ephedrine use. Yet our study does not consistent with **Magalhaes et al.** [18]**,** reported a higher incidence of nausea/ vomiting in patient receiving phenylephrine compared to those who received ephedrine group. It may be because no use of antiemetics as premedication in their study but in our study, we have used antiemetics inj. ondansetron 0.08 mg/kg i.v. and inj. ranitidine 1mg/kg i.v. preoperatively as premedication.

The current study shows there are no statistically significant difference in Apgar score between both the groups. No neonate had APGAR score <7 at 1 and 5 minute. The results are in accordance with **Adigun and Amnaor-Boadu et al.** [33], **Vakili H et al.** [9] in their study, the mean Apgar scores were similar for the two groups; no baby had Apgar score of <8 in either group.

Conclusion

From this randomized prospective study we concluded that with Phenylephrine 100 ug i.v. as prophylactic dose is more efficacious in preventing and treating hypotension compared to Ephedrine 10 mg i.v. during spinal anaesthesia in elective caesarean section delivery with less or no rescue dose requirements for hypotension without any post operative complications.

Study Limitations

Absence of the measurement of plasma levels of phenylephrine and ephedrine. Larger group of study can be done.

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