e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15 (6); 1439-1446

Original Research Article

Study of Dosage of Prophylactic Intravenous Ephedrine for Spinal Induced Hypotension During Spinal Anesthesia in Cesarean Section in Telangana Population

S. Saritha[1], Swapna T[2]

[1]Associate Professor, Department of Anaesthesiology, CMR Institute of Medical Sciences, Kandlakoya Village, Medchal Road, Hyderabad-501401, Telangana State

[2]Associate Professor, Department of Anaesthesiology, CMR Institute of Medical Sciences, Kandlakoya Village, Medchal Road, Hyderabad-501401, Telangana State

Received: 13-04-2023 / Revised: 15-05-2023 / Accepted: 11-06-2023
Corresponding author: Swapna T
Conflict of interest: Nil

Abstract:

Background: Spinal anaesthesia-induced hypotension occurs frequently, particularly in adults and patients undergoing cesarean section. Spinal anaesthesia-induced hypotension (SAIH) is caused by arterial and venous vasodilatation resulting from the sympathetic blockade. Ephedrine has traditionally been considered the vasoconstrictor of choice.

Method: Out of 70 (seventy), 35 were administered ephedrine and 35 in the controlled group were administered the same quantity of normal saline during spinal anaesthesia. Hemodynamic and neonatal outcomes were noted and compared.

Results: In the comparison of systolic BP between both the groups at the time intervals of 1, 2, 3 and 15 there were significant values ($p<0.001$). Apgar 1 minute, 5 minutes, and umbilical cord PH were compared with controls and were also highly significant ($p<0.001$).

Conclusion: The present pragmatic study has confirmed that I.V. infusion of Ephedrine was more effective than crystalloid preloading in preventing hypotension in parturients undergoing cesarean section without causing hemodynamic complications.

Keywords: Hemodynamic, Ephedrine, Spinal anaesthesia, Apgar score.

Introduction

Anaesthesia for caesarean delivery should take into consideration the safety of the mother and foetus. Regional anaesthesia is used for 95% of planned cesarean deliveries globally [1]. Spinal anaesthesia has many advantages, as it provides fast, profound sensory and motor block, adequate muscle relaxation [2]. Post-operative deep vein thrombosis and pulmonary emboli are less common following spinal anaesthesia due to earlier ambulation and discharge. However spinal anaesthesia has its complications. The most common complication of spinal anaesthesia is hypotension [3], which can cause significant morbidity and mortality as it may cause serious complications for the mother like nausea, vomiting, unconsciousness, and pulmonary aspiration, and for the baby as hypoxia, acidosis, and neurological injuries [4]. Hypotension occurs due to sympathetic nervous system blockade, leading to decreased vascular resistance and peripheral pooling of blood, which reduces cardiac output [5] Different techniques

have been tried to reduce the incidence and severity of hypotension. This includes the routine use of the lateral decubitus position, the infusion of up to 2 litres of fluids for intravascular volume expansion, which may reduce the risk of hypotension but does not eliminate it, and the use of vasopressors such as ephedrine, which may be an effective alternative for hypotension prevention. Ephedrine is sympathomimetic, non-catecholamine-mediated agent that directly stimulates alpha and beta adrenergic receptors and predominantly indirectly produces its effects through the release of nor-epinephrine from nerve endings in the autonomous nervous system. Hence, intravenous Ephedrine was used in spinal anaesthesia to control hypotension and evaluate the outcomes in both mother and foetus.

Material and Methods

70 (seventy) patients admitted to the obstetrics and gynaecology department of the CMR Institute of Medical Sciences, Kandlakoya village, Medchal Road, Hyderabad-501401, were studied.

Inclusion Criteria: Age between 20-48 years old, with a Body Mass Index (BMI) between 25 to 45. ASA grades I and II were selected for this study.

Exclusion Criteria: Patients who refused spinal anaesthesia; patients having allergic reactions to local anaesthetics and opioids; patients with coagulopathy disorders (due to bleeding disorders, liver disease, or on anticoagulants); patients with severe cardiac, respiratory, hepatic, or renal disease; and patients with pre-eclampsia and eclampsia were excluded from the study.

Method: Out of 70 (seventy) patients, 35 patients in Group-1 received 1 ml of (5mg) Ephedrine intravenously. 35 patients in Group-2 (controlled group) received an equal volume of normal saline intravenously, immediately after the sub-arachnoid block with 10 mg of 0.5 % Bupivacaine (heavy).

A thorough pre-anaesthesia evaluation was done a day before the scheduled operation for all patients, and oral administration of PPI (Ranitidine 150 mg) was advised the night before surgery.

On the day of the operation, injections Metaclopromide (10 mg) and Ranitidine (50 mg) were given intravenously, 20 minutes before the administration of spinal anaesthesia. Upon arrival of the patients at the operation theatre, baseline parameters were recorded with the help of a multichannel cardiac monitor. Preloading was done with ringer lactate solution (15 ml/kg body weight) about 15 minutes before the intended time of intrathecal drug administration. Under strict aseptic precautions, lumbar puncture was performed at the L3–L4 intervertebral space using a midline approach with a 25 gauge Quincke spinal needle in the lateral decubitus position, and 10 mg of 0.5% bupivacaine(heavy) was administered intrathecally. Immediately, either 1 ml of 5mg injection Ephedrine or an equal volume of normal saline was given intravenously to the parturient according to the computer generated randomization method.

The hemodynamic parameters such as heart rate, systolic BP, percentage saturation of oxygen (SpO2), and electrocardioogram were recorded at 1 minute intervals until delivery of the baby and thereafter at 5 minute intervals until the end of surgery, IV fluid was administered in the form of Ringer Lactate at a rate of 100 ml per hour. A decrease in systolic BP of more than 20% from baseline was considered "hypotension" and treated with rapid infusion of ringer lactate and 5 mg intravenous Ephedrine. A heart rate of 60 beats per minute, or bradycardia, was also treated with intravenous 0.6 mg Atropine sulphate. Apgar scores for babies were recorded at 1 and 5 minutes.

Statistical analysis: Various parameters, e.g., demographic hemodynamics and

Apgar scores, in both groups were compared with the z test and noted. The statistical analysis was carried out in SPSS software.

Observation and Results

Table-1: Comparison on demographic variable parameters in both

- Age (years) – 26.12 (± 3.32) in group-A, 25.82 (± 2.80) in controlled group, t test was 0.40 and p>0.68)
- Height (cm) – 158.20 (± 3.32) in group-A, 158.58 (± 4.28) in group-B, t test was 0.41 and p>0.33
- Weight (Kg) – 62.05 (± 5.18) in group-A, 64.50 (± 6.82) in group-B, t test was 1.5 and p>0.09

Table-2: Comparison of systolic blood pressure at in both groups at different time interval

- 0 – 122 (± 5.96) in group-A, 121.22 (± 4.30) in group-B, t test was 0.02 and p>0.53
- 1 – 120.77 (± 15.58) in group-A, 100.03 (± 22.28) in group-B, t test was 4.51 and p<0.001
- 2 – 119.18 (± 15.2) in group-A, 88.78 (± 13.78) in group-B, t test was 13.5 and p<0.001
- 3 – 119.28 (± 10.82) in group-A, 87.3 (± 8.89) in group-B, t test was 13.5 and p<0.001
- 5 – 112.38 (± 7.42) in group-A, 114.22 (± 7.81) in group-B, t test was 1.01 and p>0.31
- 10 – 110.42 (± 6.04) in group-A, 109.42 (± 3.72) in group-B, t test was 0.83 and p>0.40
- 15 – 112.12 (± 6.70) in group-A, 108.78 (± 3.30) in group-B, t test was 2.64 and p<0.01
- 20 – 111.10 (± 5.42) in group-A, 109.40 (± 3.92) in group-B, t test was 1.50 and p>0.13
- 25 – 110.04 (± 5.12) in group-A, 110.38 (± 5.28) in group-B, t test was 0.27 and p>0.78
- 30 – 111.12 (± 6.10) in group-A, 110.18 (± 3.07) in group-B, t test was 0.81 and p>0.42
- 35 – 110.36 (± 6.14) in group-A, 110.36 (± 3.17) in group-B, t test was 0 and p>0.5
- 40 – 111.20 (± 6.78) in group-A, 111.25 (± 3.89) in group-B, t test was 0.38 and p>0.96
- 45 – 113.19 (± 8.00) in group-A, 111.40 (± 3.64) in group-B, t test was 1.20 and p>0.23

Table-3: Comparison of hemodynamic data and clinical manifestation

- Hypertension – 20 (57.1%) group-A, 26 (74.2%) in group-B controlled group
- Rescue Ephedrine – 21 (60 %) group-A, 26 (74.2%) in group-B
- Rescue Ephedrine dosage – 3.02 (± 0.2) group-A, 4.05 (± 0.3) in group-B, t test 15.6 and p<0.001
- Average time for body delivery – 4.92 (± 0.7) group-A, 4.86 (± 0.8) in group-B, t test level was 0.23 and p>0.63

Table-4: Comparison of Neonatal outcome in both groups -

- Apgar score (1 minute) – 8.98 (± 0.18) in group-A, 8.85 (± 0.30) in group-B, t test level was 2.19 and p<0.03
- Apgar score (5 minutes) – 9.96 (± 0.16) in group-A, 9.84 (± 0.30) in group-B, t test level was 2.08 and p<0.04
- Umbilical cord PH – 7.33 (± 0.03) in group-A, 7.31 (± 0.02) in group-B, t test level was 3.28 and p<0.002.

Table 1: Comparison of demographic variables parameters in both group

Sl. No	Parameters	Group-A Study group (35)	Group-B Controlled (35)	t test	p value
1	Age (years)	26.12 (± 3.32)	25.84 (± 2.80)	0.40	p>0.68
2	Height (cm)	158.20(± 3.32)	158.58(± 4.28)	0.41	p>0.33
3	Weight (kg)	62.05(± 5.18)	64.50(± 6.82)	1.6	p>0.09

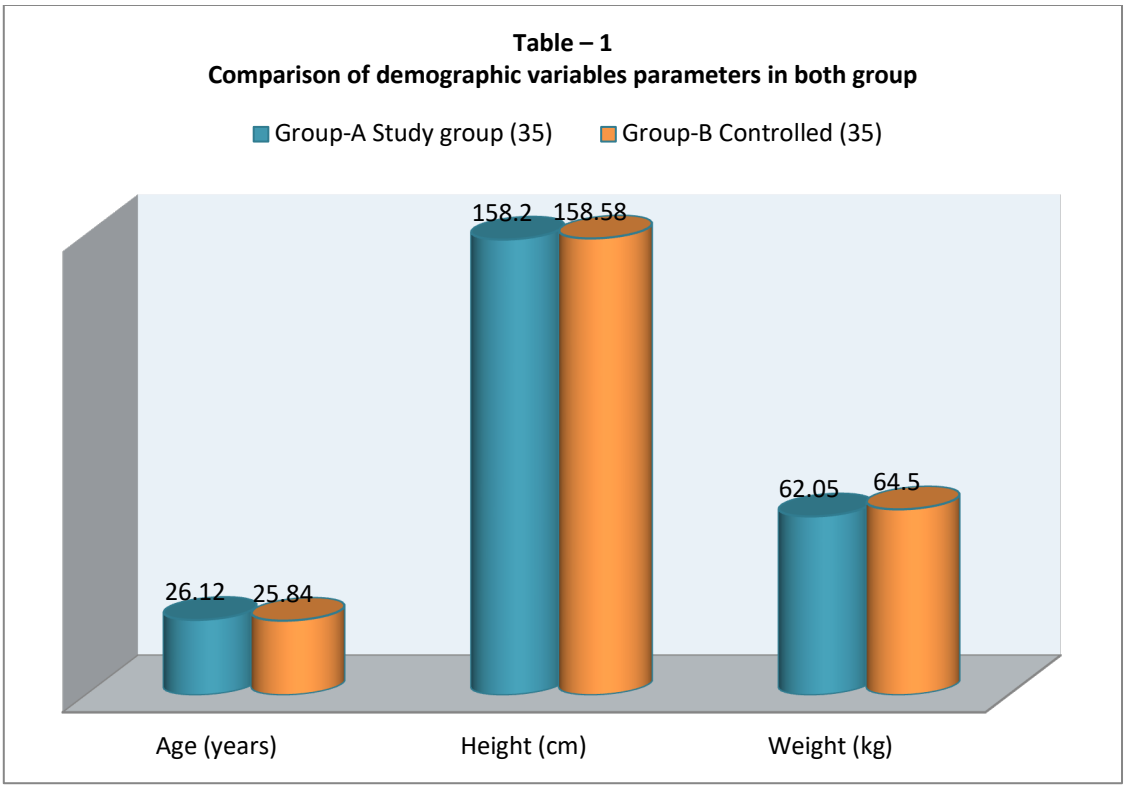

Figure 1:

Table 2: Comparison of systolic blood pressure in both groups

Time Interval	Group-A (35)	Group-B (35)	t test	p value
0	122(± 5.96)	121.22(± 4.30)	0.62	p>0.53
1	120.77(± 15.58)	100.03(± 22.28)	4.51	P<0.001
2	119.18(± 15.2)	88.78(± 13.58)	8.82	P<0.001
3	119.28(± 10.82)	87.3(± 8.89)	13.5	P<0.001
5	112.38(± 7.42)	114.22(± 7.81)	1.01	p>0.31
10	110.42(± 6.04)	109.42(± 3.72)	0.83	p>0.40
15	112.12(± 6.70)	108.78(± 3.30)	2.64	P<0.01
20	111.10(± 5.42)	109.40(± 3.92)	1.50	P>0.13
25	110.04(± 5.12)	110.38(± 5.28)	0.22	p>0.78
30	111.12(± 6.10)	110.18(± 3.07)	0.81	p>0.42
35	110.36(± 6.14)	110.36(± 3.17)	0	p>0.5
40	111.20(± 6.78)	111.25(± 3.89)	0.38	p>0.96
45	113.19(± 8.00)	111.40(± 3.64)	1.20	p>0.23

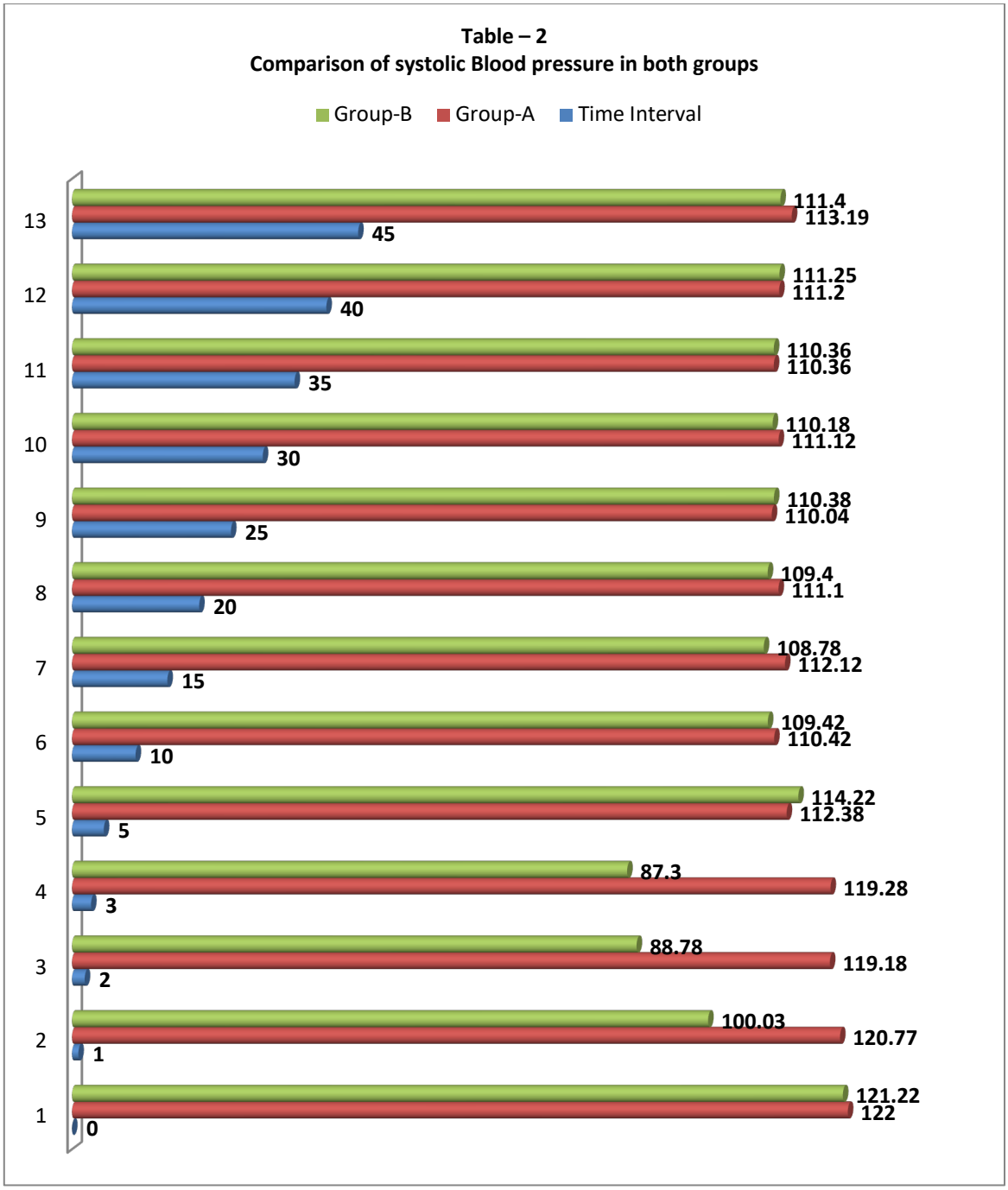

Figure 2:

Table 3: Comparison of Hemodynamic data and clinical manifestations

Parameter	Group-A(35)	Group-B(35)	t test	p value
Hypotension	20 (57%)	26(74.2%)	-	-
Reactive Hypertension	--	--	--	--
Rescue Ephedrine	21 (60%)	26 (74.2%)	--	--
Rescue Ephedrine dose (mg)	3.02(± 0.2)	4.05(± 0.3)	15.6	P<0.001
Bradycardia	--	--	--	--
Nausea and vomiting	--	--	--	--
Average time for baby delivery	4.92(± 07)	4.86(± 0.8)	0.33	p>0.63

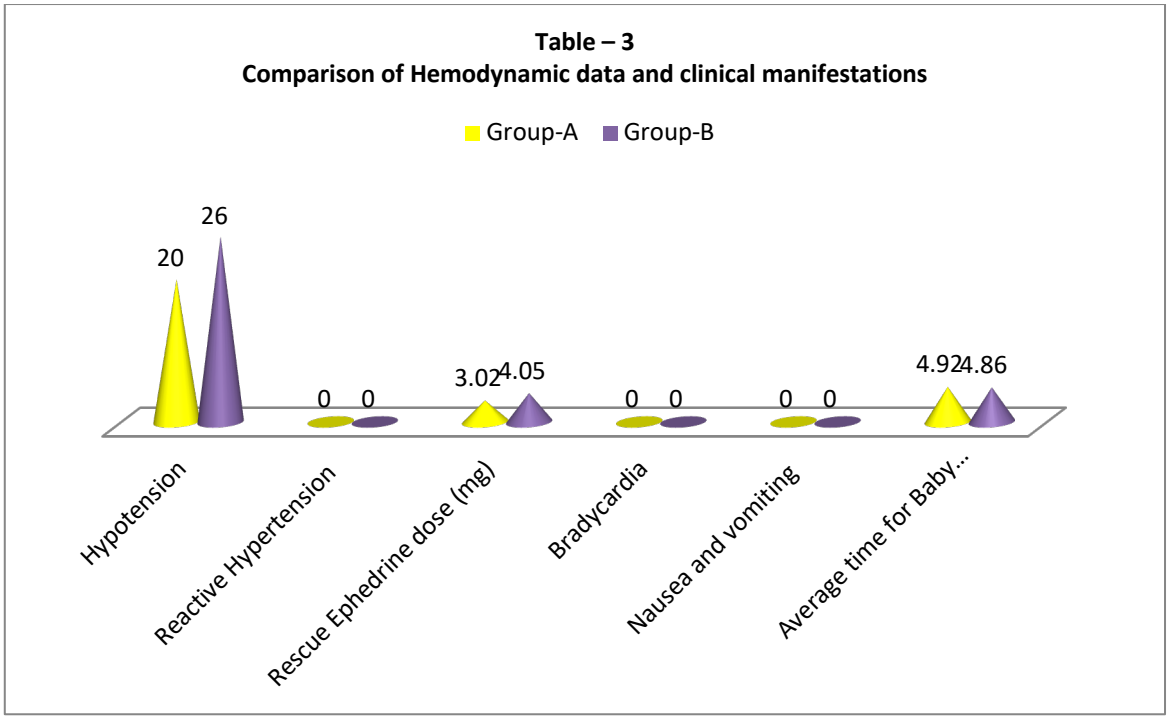

Figure 3:

Table 4: Comparison of Neonatal outcome in both groups

Parameter	Group-A	Group-B	t test	p value
Apgar Score at 1 min	8.98(± 0.18)	8.85(± 0.30)	2.19	p>0.03
Apgar Score at 5 min	9.96(± 0.16)	9.84(± 0.30)	2.08	p>0.04
Umbilical cord blood pH	7.33(± 0.03)	7.31(± 0.02)	3.28	p>0.002

All the parameters are more or less in agreement with each other

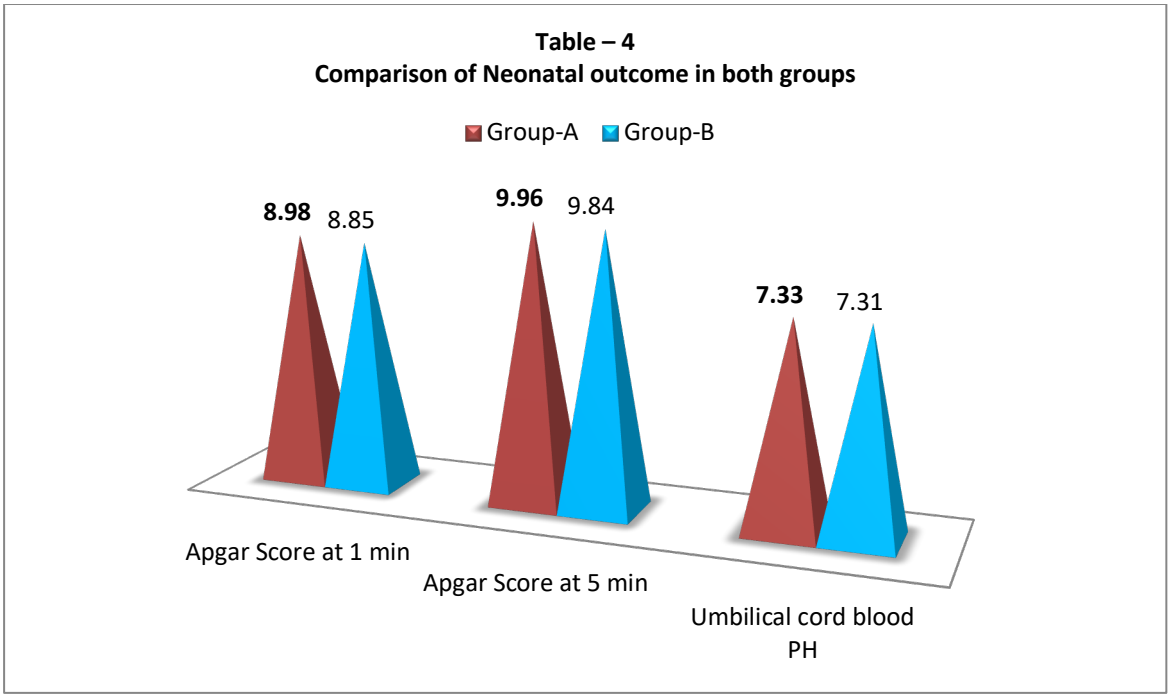

Figure 4:

Discussion

Present study is upon the usage of prophylactic intravenous Ephedrine for spinal induced hypotension during cesarean section in the Telangana population.

In the comparison of systolic blood pressure in both groups at different intervals 1, 2, 3, and 5 min, there were highly significant p values ($p<0.001$) (Table-1). In comparison of hemodynamic data and clinical manifestations hypotension was 20 (5%) in group A and 26 (74.2%) in group-B (controlled group). Rescue ephedrine: 21 (60%) in group-A, 26 (74.2%) in group-B. Rescue Ephedrine dosage (mg) 3.02 in group A, 4.05 in group-B (Table-3). A comparative study of neonatal outcome at 1 min and 5min and umbilical cord pH was highly significant (Table-4). These findings are more or less in agreement with previous studies [(6,7,8].

The incidence of hypotension is higher in cesarean sections due to the cardiac changes of the parturient. Compression of the inferior vena cava by the hypertrophic uterus and the development of collateral venous plexus circulation in the epidural space leads to a decrease in the amount of CSF (cerebrospinal fluid) in the lumbo-sacral area and a higher cephalad spread of local anaesthesia [9].

Ephedrine is the vasopressor of choice for prevention of hypotension after spinal anaesthesia during cesarean section because of its ability to maintain utero placental blood flow. Ephedrine's action is mainly indirect, through stimulating nor-epinephrine release from sympathetic nerve endings, and the utero placental circulation is largely devoid of direct sympathetic innervations, so it is considered resistant to the vaso-constrictive effects of ephedrine [10].

It is also reported that ephedrine was injected intramuscularly and observed to cause hypertension whenever spinal anaesthesia was not successful [11] Prophylactic IV ephedrine administered either by infusion or multiple boluses has been considered the gold standard method for preventing hypotension. Moreover, the effect of an IV bolus of ephedrine on arterial pressure is transient and lasts for only 10–15 minutes [12]. Hypotension after the delivery of the foetus is usually ignored, as it may be related to excessive blood loss during a c-section.

Summary and Conclusion

A short period of hypotension (less than 2 minutes) is frequently associated with spinal anaesthesia for cesarean sections. Prophylactic IV Ephedrine infusion is more effective in preventing hypotension due to spinal anaesthesia without causing significant tachycardia or hypertension.

Limitation of study – Owing to the tertiary location of the research centre, the small number of patients and the lack of the latest techniques, we have limited findings and research. This research paper was approved by the ethical committee of the CMR Institute of Medical Sciences, Kandlakoya village, Medchal Road, Hyderabad 501401.

References

1. Hussain N, Tayab S, Mohd T – Spinal anaesthesia for cesarean section, J. Surg. Pakistan 2002, 7; 19–21.
2. Rodgers A, Walker N – Reduction in post-operative mortality and morbidity with epidural or spinal anaesthesia," Br. Med. J. 2000, 321; 1493–95.
3. Rout CC, Rocke DA – Re-evaluation of the load of crystalloid preload in the prevention of hypotension associated with spinal anaesthesia for elective cesarean section Anaesthesiology 1993, 79; 262-9.
4. Higuchi H, Hirata J – Influence of lumbo-sacral cerebro-spinal fluid density, velocity, and volume on the extent and duration of Bupivacaine spinal anaesthesia Anaesthesiology 2004, 100; 106–114
5. Bhagat H, Malhotra K – Evaluation of preloading and vasoconstrictors as continued prophylaxis for hypotension

during subarachnoid anaesthesia. Ind. J. of Anaesthesia 2004, 48; 299–303
6. Vercautoran MP, Coppejans HC – Prevention of hypotension by a single 5-mg dose of Ephedrine during spinal anaesthesia in rehydrated cesarean delivery patients – Anaesthesia and Analgesia 2009, 90; 324–327.
7. Rout CC, Rocke DA – Prophylactic intramuscular Ephedrine prior to cesarean section," Anaesthesia and Intensive Care, 1992, 20; 448–452.
8. Bucklin BA, Hawkins JL – Obstetrics and Anaesthesia Workforce Survey: Twenty-Year Update, Anaesthesiology 2005, 103; 645–653.
9. Carvalho B, Coleman L – Analgesic requirements and post-operative recovery after scheduled compared to unplanned cesarean delivery – International J. of Obstetric Anaesthesia, 2010), 19; 10–15.
10. Cyna AM, Andrew M – Techniques for preventing hypotension during spinal anaesthesia for cesarean section – Cochrane Data Base Review 2006, 18; 320–25.
11. Holmen AJ, Joppila R – Intervillous blood flow during cesarean section with prophylactic Ephedrine and epidural anaesthesia. Acta Anaesthesiologica Scandinavia 1984, 28; 396-400.
12. Hawkins JL, Arens JF, practise guidelines for obstetric anaesthesia An updated report by the American Society of Anaesthesiologists Anaesthesiology 2007, 106; 843–863.