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Original Research Article

Study of Dosage of Prophylactic Intravenous Ephedrine for Spinal Induced Hypotension during Caesarian Section in Jharkhand Population

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Conflict of interest: Nil

Abstract:

Background: Hypotension occurs frequently in spinal anesthesia induction, especially in adults and patients undergoing lower abdominal and inferior extremities. It causes decreased uterine blood flow, which may be lethal to the mother and newborn.

Method: Out of 80 (eighty), 40 were administered ephedrine, and 40 in the controlled group were administered the same quantity of normal saline during spinal anesthesia. Hemodynamic and neonatal outcomes were noted and compared.

Results: In comparison of systolic BP at the interval of 1, 2, 3, and 15 minutes had significant p values. In Apgar studies at the internal of 1, 5 minutes had significant o value. Moreover, PH of umbilical cord blood also had a significant p value.

Conclusion: It is confirmed that IV infusion of Ephedrine is more effective than crystalloid preloading in preventing hypotension in parturients undergoing caesarian section without causing hemodynamic complications.

Keywords: Ephedrine, Crystalloid, Apgar score, hemodynanicity, spinal anesthesia.

Introduction

Spinal anaesthesia is frequently used for lower abdominal surgeries (including hystectomy) and lower limb surgeries [1]. It is induced by injecting small amount of local anaesthetic into cerebrospinal fluid (CSF) in lumar region (L2-L3, L3-L4 levels). Maternal hypotension is one of the major complications in spinal anesthesia; such incidences are observed in 80% of cases, which is lethal to both mother and newborn [2]. It is associated with distressing symptoms of dizziness and nausea and may also interfere with surgical procedure. If not corrected, it leads to decreased uterine blood flow and may result in an acidotic neonate requiring active resuscitation [3].

Lateral uterine displacement and preloading with crystalloids or colloids have been commonly used to prevent spinal-induced hypotension, but the outcome is not satisfactory; hence, ephedrine is used along with infusion.

Ephedrine is a sympathomimetic agent non-catecholamine-mediated that directly stimulates alpha and beta adrenergic receptors and was compared with control (normal) pregnancy, and various significant parameters were evaluated [4].

Material and Method

80 (eighty) patients admitted to the department of obstetrics and gynecology of Sheikh Bhikari Medical College, Hazaribagh, Jharkhand-825301 were studied.

Inclusion Criteria: Female pregnant patients aged between 20 – 45 years old, with ASA grades II who gave their consent in writing were selected for this study.

Exclusion Criteria: Patients who refused spinal anesthesia; patients having allergic reactions to local anesthetics 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 80 (eighty) patients, 40 patients in Group-1 received 1 ml of (5 mg) Ephedrine intravenously. 40 patients in Group-2 (the controlled group) received an equal volume of normal saline intravenously, immediately after the subarachnoid block, with 10 mg of 0.5 % Bupivacaine.

A thorough pre-anesthesia 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 of Metaclopromide (10 mg) and Ranitidine (50 mg) were given intravenously, 20 minutes before the administration of spinal anesthesia. Upon arrival of the patients at the operation theater, 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 5 mg 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 electrocardiogram 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 sulfate. Apgar scores for babies were recorded at 1 and 5 minutes.

The duration of the study was May 2023 to June 2024.

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 groups –

- Age (years) – 26.10 (± 3.30) in group- A, 25.82 (± 2.78) in controlled group, t test was 0.41 and p>0.001
- Height (cm) – 158.18 (± 3.30) in group- A, 158.56 (± 4.26) in group-B, t test was 0.44 and p>0.001
- Weight (Kg) – 62.03 (± 5.16) in group- A, 64.52 (± 6.80) in group-B, t test was 1.8 and p>0.09

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

- 0 – 122 (± 5.95) in group-A, 123.20 (± 4.28) in controlled group, t test was 0.86 and p>0.38
- 1st Minutes – 120.79 (± 15.56) in group-A, 100.05 (± 22.26) in controlled group, t test was 4.82 and p<0.001 (p value is highly significant).
- 2nd Minutes – 119.16 (± 15.4) in group-A, 88.76 (± 12.56) in controlled group, t test was 9.67 and p<0.001 (p value is highly significant).
- 3rd Minutes – 119.26 (± 10.48) in group-A, 87.5 (± 8.82) in controlled group, t test was 14.6 and p<0.001 (p value is highly significant).
- 5th Minutes – 112.36 (± 7.44) in group-A, 114.20 (± 7.82) in controlled group, t test was 1.07 and p>0.31.
- 10th Minutes – 110.42 (± 6.04) in group-A, 109.44 (± 3.70) in controlled group-B, t test was 0.8 and p>0.40
- 15th Minutes – 112.10 (± 6.8) in group-A, 108.76 (± 3.28) in controlled group, t test was 2.83 and p<0.01 (p value is highly significant).
- 20th Minutes – 111.12 (± 5.40) in group-A, 109.38 (± 3.90) in controlled group, t test was 1.62 and p>0.10
- 25th – 110.02 (± 5.10) in group-A, 110.36 (± 5.26) in controlled group, t test was 0.56 and p>0.78.
- In 30 Minutes – 111.14 (± 6.8) in group-A, 110.16 (± 3.05) in controlled group, t test was 0.83 and p>0.42.
- In 35 Minutes – 110.38 (± 6.12) in group-A, 110.38 (± 3.16) in controlled group, t test was 00 and p>0.5.
- In 40 Minutes – 110.22 (± 6.76) in group-A, 111.23 (± 3.87) in group-B, t test was 0.008 and p>0.99
- In 45 Minutes – 113.17 (± 6.00) in group-A, 111.38 (± 3.62) in controlled group, t test was 1.61 and p>0.11

Table-3:

Comparison of hemodynamic data and clinical manifestation

- Hypertension – 23 (57.5%) cases group-A, 30 (75%) in controlled group
- Rescue Ephedrine – 24 (60 %) cases, 26 (75%) in controlled group
- Rescue Ephedrine (mg) – 3.02 (± 0.2) group-A, 4.06 (± 0.3) in controlled group, t test 18.2 and p<0.001 (p value is highly significant).
- Average time for body delivery – 4.94 (± 0.5) group-A, 4.88 (± 0.9) in controlled group, t test level was 0.36 and p>0.71.

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

- Apgar score at 1 minute – 8.96 (± 0.16) in group-A, 8.83 (± 0.28) in controlled group, t test level was 2.54 and p<0.005 (p value is highly significant).
- Apgar score at 5 minutes – 9.94 (± 0.14) in group-A, 9.82 (± 0.28) in controlled group, t test

level was 2.42 and p<0.005 (p value is highly significant).

- Umbilical cord blood PH – 7.34 (± 0.02) in group-A, 7.31 (± 0.03) in controlled group, t test level was 5.28 and p<0.003 (p value is highly significant).

Table 1: Comparison of demographic variables parameters in both groups (Total No. of patients: 80)

Sl. No	Parameters	Group-A Study group (40)	Group-B Controlled (40)	t test	p value
1	Age (years)	26.10 (± 3.30)	25.82 (± 2.78)	041	p>0.68
2	Height (cm)	158.18 (± 3.30)	158.56 (± 4.26)	0.44	p>0.85
3	Weight (kg)	62.03 (± 5.16)	64.52 (± 6.80)	1.8	p>0.09

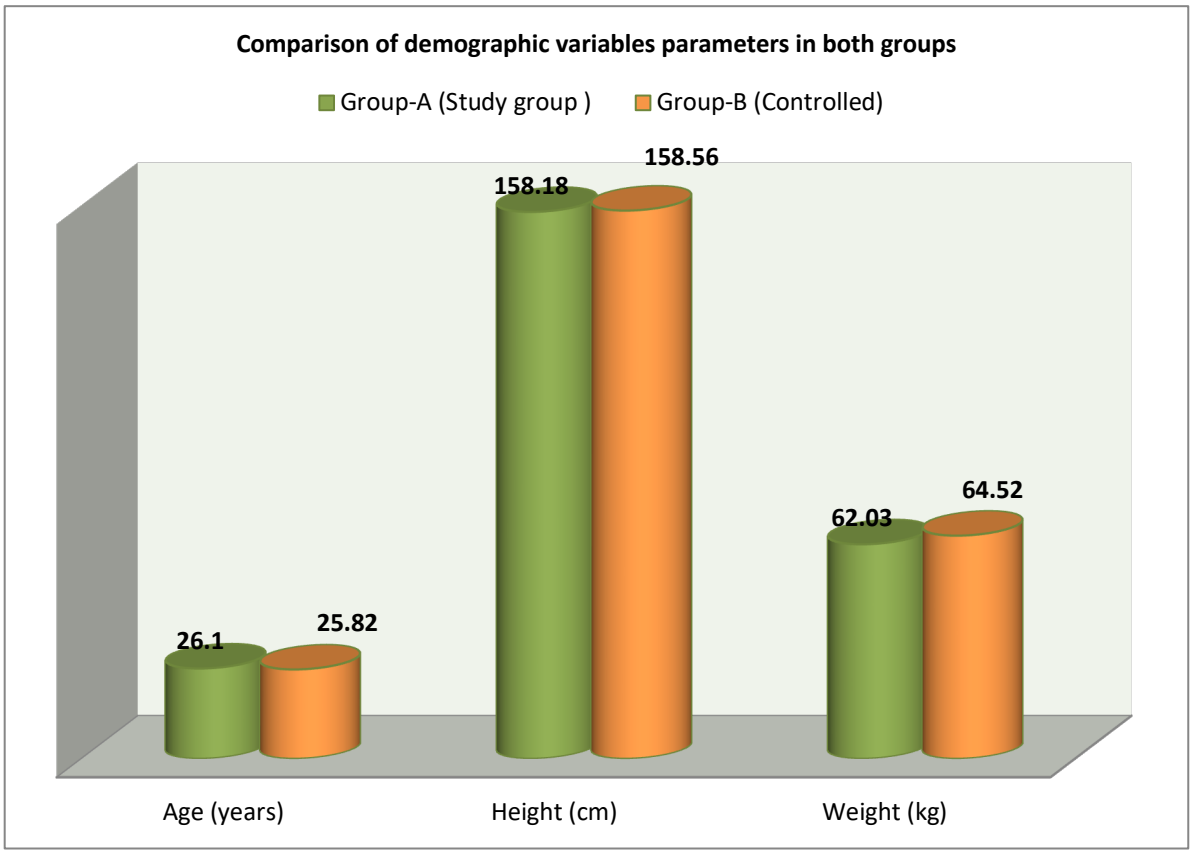

Figure 1: Comparison of demographic variables parameters in both groups

Table 2: Comparison of systolic blood pressure in both groups

Time Interval	Group-A (40)	Group-B (40)	t test	p value
0	122 (±5.95)	123.20 (± 4.28)	0.86	p>0.38
1	120.79 (±15.56)	100.05 (±22.26)	4.82	P<0.001
2	119.16 (±15.4)	88.76 (±12.56)	9.67	P<0.001
3	119.26 (±10.48)	87.5 (±8.82)	14.6	P<0.001
5	112.36 (±7.44)	114.20 (±7.82)	1.07	p>0.31 N.S
10	110.40 (±6.05)	109.44 (±3.70)	0.8	p>0.40 N.S
15	112.10 (±6.68)	108.76 (±3.28)	2.83	p<0.01
20	111.12 (±5.40)	109.38 (±3.90)	1.62	p>0.10 N.S
25	110.02 (±5.10)	110.36 (±5.26)	0.56	p>0.78 N.S
30	111.14 (±6.8)	110.16 (±3.05)	0.83	p>0.42 N.S
35	110.38 (±6.12)	110.38 (±3.16)	00	p>0.5 N.S
40	111.22 (±6.76)	111.23 (±3.87)	0.0081	p>0.91 N.S
45	113.17 (±6.00)	111.38 (±3.62)	1.61	p>0.11 N.S

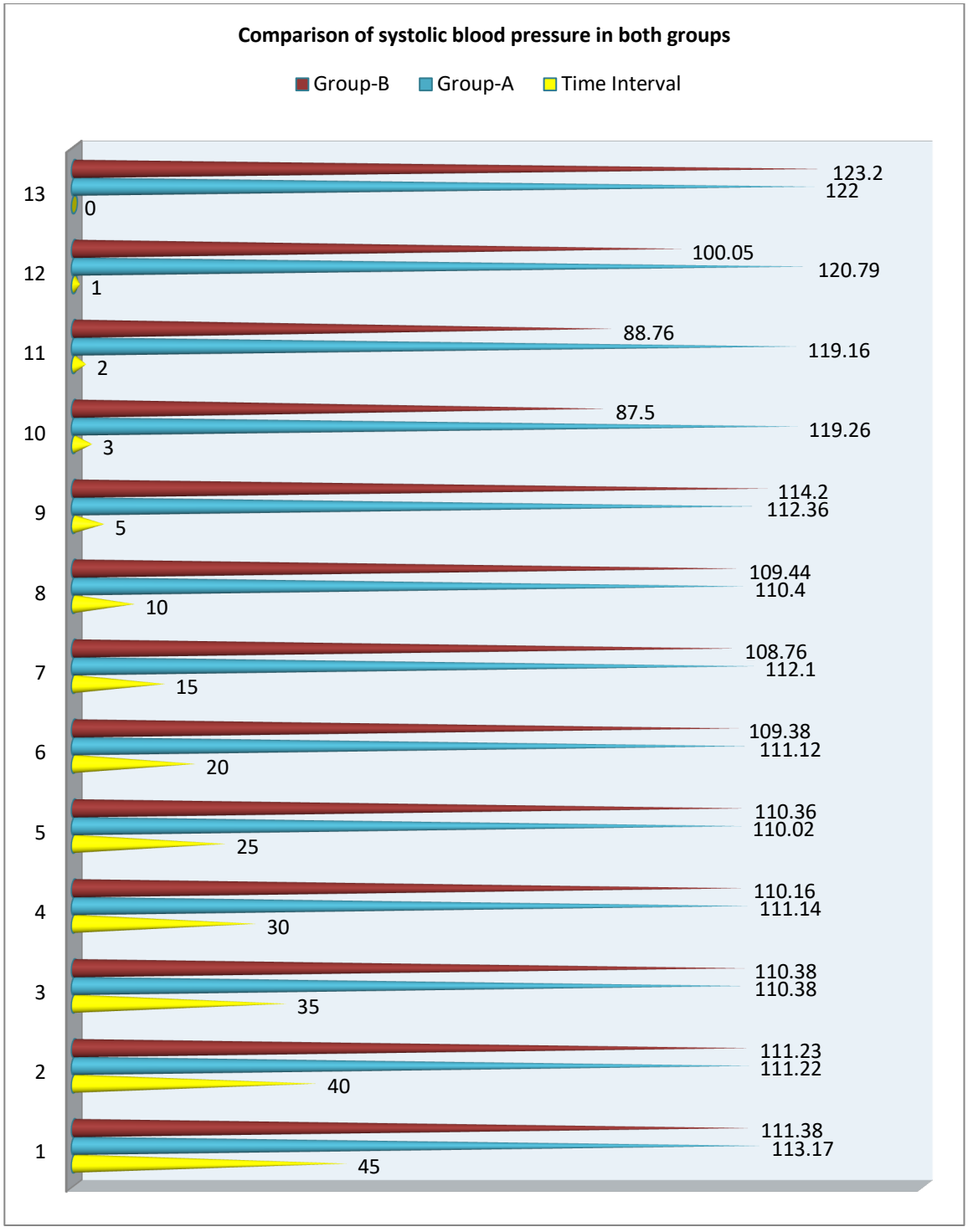

Figure 2: Comparison of systolic blood pressure in both groups

Table 3: Comparison of Hemodynamic data and clinical manifestations

Parameter	Group-A (40)	Group-B (40)	t test	p value
Hypotension	23 (57.5%)	30 (75%)	--	--
Reactive Hypertension	--	--	--	--
Rescue Ephedrine	21 (60%)	30 (75%)	--	--
Rescue Ephedrine dose (mg)	3.02 (±0.2)	4.06 (±0.3)	18.2	P<0.001
Bradycardia	--	--	--	--
Nausea and vomiting	--	--	--	--
Average time for baby delivery	4.94 (±0.5)	4.68 (±0.9)	0.36	p>0.71 N.S

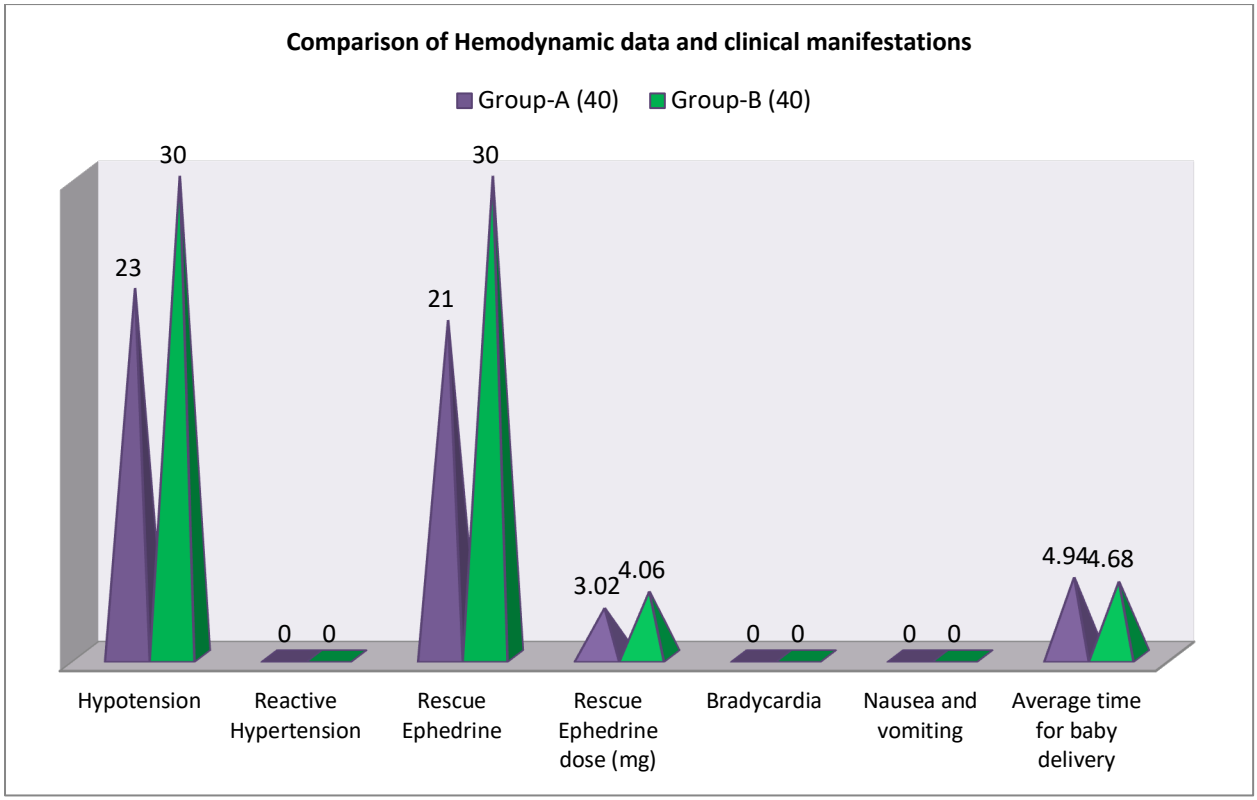

Figure 3: Comparison of Hemodynamic data and clinical manifestations

Table 4: Comparison of Neonatal outcome in both groups

Parameter	Group-A (40)	Group-B (40)	t test	p value
Apgar Score at 1 min	8.96 (±0.16)	8.83 (±0.28)	2.54	P<0.005
Apgar Score at 5 min	9.94 (±0.14)	9.82 (±0.28)	2.42	P<0.005
Umbilical cord blood pH	7.32 (±0.02)	7.31 (±0.03)	5.26	P<0.003

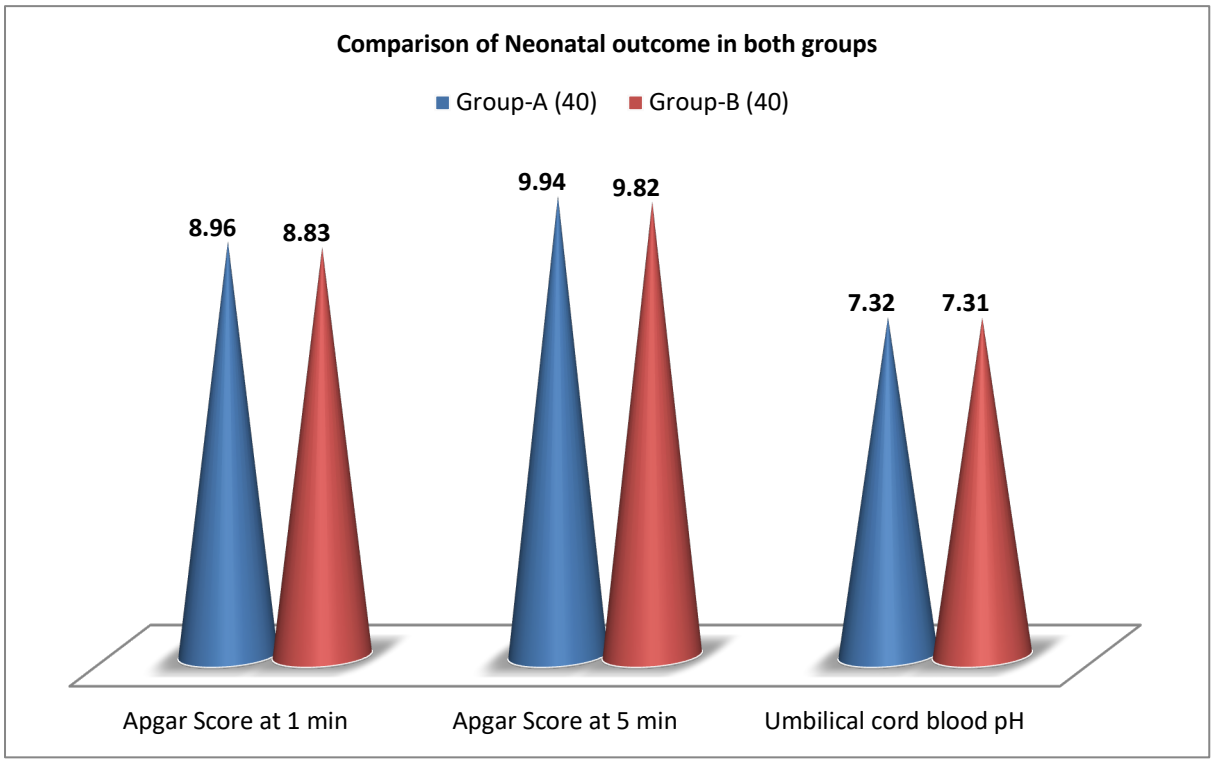

Figure 4: Comparison of Neonatal outcome in both groups

Discussion

The present study is upon the usage of prophylactic intravenous Ephedrine for spinal induced hypotension during cesarean section in the Jharkhand population. In comparison of demographic variables, parameters of both groups had intervals of 1, 2, 3, and 5 minutes and significant p values ($p<0.001$) (Table 2). In comparison of hemodynamic data, rescue ephedrine dose (mg) is 3.02 (± 0.2) in group A and 4.06 (±0.3) in the controlled group, t test 18.2 and ($p<0.001$) p value is highly significant (Table 3). In the comparison of neonatal outcome at 1 minute, 5 minutes had a significant p value ($p<0.001$). The PH of umbilical cord blood was compared in both groups, and the ($p<0.001$) p value was highly significant (Table 4). These findings are more or less in agreement with previous studies [5,6,7].

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 lumbosacral area and a higher cephalad spread of local anesthesia [8].

Ephedrine is the vasopressor of choice for prevention of hypotension after spinal anesthesia during cesarean section because of its ability to maintain utero placental blood flow [9]. Ephedrine's action is mainly indirect, through stimulating norepinephrine 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 anesthesia 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 fetus 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 anesthesia for cesarean sections. Prophylactic IV Ephedrine infusion is more effective in preventing hypotension due to spinal anesthesia without causing significant tachycardia or hypertension. The present study demands a pharmacological and patho-physiological study because the exact cause and factors that cause hypotension for a shorter duration are still unclear.

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 work was approved by the ethical committee of Sheikh Bhikari Medical College, Hazari Bagh, and Jharkhand-825301.

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