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Original Research Article

THE ROLE OF 6%HYDROXYETHYL STARCH AND RINGERS LACTATE FOR PRELOADING IN PATIENTS UNDERGOING ELECTIVE CAESAREAN SECTION UNDER SPINAL ANAESTHESIA - A PROSPECTIVE RANDOMISED CLINICAL STUDY

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Abstract

Background: Regional anaesthesia is the recommended technique of anaesthesia for patients having elective lower extremity surgery (LSCS) because to its quick onset and quicker recovery. The purpose of this study was to compare the preloading solutions Ringers Lactate and 6% Hydroxyethylstarch for use during elective caesarean sections performed under spinal anaesthesia. **Materials and Methods:** Under spinal anaesthesia, 80 ASA Grade 1 and 2 patients scheduled for elective caesarean sections participated in this study. After being split into two groups at random, the patients were preloaded 30 minutes before surgery with either 1000 millilitres of Ringers lactate or 500 millilitres of 6% Hydroxyethyl starch. Using a 23G spinal needle in the left lateral position, spinal anaesthesia was administered. The T6 sensory level was reached after 2cc of 0.5% heavy Bupivacaine was delivered into the subarachnoid area. From before preloading to the completion of the procedure, the patient's vital signs (HR, SBP, DBP, MAP), SPO2, and UOP were assessed. The patient was also observed for a full day following the procedure. **Results:** The results of our investigation indicated that the 6% Hydroxyethylstarch group experienced a lower incidence of hypotension than the RL group (P value:0.0001). In patients preloaded with 6% hydroxyethyl starch group compared to RL group, the total dose of ephedrine required for the treatment of hypotension was much lower. (P value of 0.0001) In all groups, the APGAR score for neonates was 8–10 and showed similar results (P value: 0.45 in the first minute, 1 at the fifth). **Conclusion:** Therefore, we draw the conclusion that 6% hydroxyethyl starch works better than Ringer's lactate solution and that it should be regularly used to preloading before spinal anaesthesia.

INTRODUCTION

Spinal anaesthesia became a popular regional anaesthetic treatment when Bier introduced it in 1898. Since it acts quickly, provides evenly distributed analgesia, profoundly relaxes muscles, maintains awareness throughout surgery, and promotes a successful recovery thereafter, regional anaesthesia has been the preferred method for elective caesarean sections.[1]

Strong visceral stimulation, abrupt cardiovascular alterations, and several other similar changes may be linked to the procedure and affect the fetal's well-being. The most sophisticated strategy for overcoming this obstacle is spinal anaesthesia.[2] Hypotension, which has been documented in 85% of patients following Caesarean section, is one of the most significant adverse effects of spinal anaesthesia. Three,[3]

According to recent research, preloading with colloids prevents hypotension more effectively than crystalloids.[6,7] Since colloids mostly stay in the intravascular compartment, where they create an oncotic pressure, they are more effective plasma

volume expanders than crystalloids. For individuals experiencing shock, using colloids to adjust the amount of blood in circulation can save their lives. Different colloids, such as albumin, dextran, gelatin polymers, and tectrastarch, have been employed in everyday practice. The third generation includes 6% hydroxyethylstarch, or Tetrastarch. A special blend of effectiveness and safety is offered by HES.The finest balance between cost, safety profile, and efficacy among all the synthetically accessible colloids is now provided by 6%HES. 6%HES is unique among colloids in that it is easily eliminated in the urine, leading to short-term volume growth that is less costly and antigenic.[8]

HES, or HYDROXYETHYLSTARCH,[9] One colloid that is commonly administered for the purpose of expanding intravascular volume is hydroxyethyl starch (HES). By adding hydroxyethyl groups to amylopectin, a big, branching, complicated carbohydarate known as HES is created. Serum amylase hydrolyzes HES, which the kidneys then eliminate.

Supine hypotension syndrome, aortocaval compression decreases cardiac output. decreased cardiac output as a result of less musculopropulsive power and decreased venous return to the heart. Small venules and arteriolar capillaries enlarge as a result of sympathetic denervation. heart's sympathetic nervous system paralysis, which results in bradycardia and a decrease in cardiac output. The paralysis of sympathetic nerve supply to the adrenal glands results in the depletion of catecholamines.

MATERIALS AND METHODS

Inclusion Criteria

1. Patients undergoing Elective Caesarean section under spinal anesthesia.
2. Age 18-40yrs.
3. ASA I and II.

Exclusion Criteria

1. Unwillingness of the patient.
2. BMI (Body Mass Index) >25kg/metersquare, Height less than 152cms.
3. Patients with Multiple gestation.
4. Patients with spine deformity, previous history of spine surgeries.
5. Severe anemia, coagulation abnormalities and bleeding disorders.
6. Patients with active skin lesions over lumbo sacral region.
7. Medical disorders like chronic hypertension, diabetes, liver disease, renal diseases (calculi, stenosis, altered renal function tests), and CVS abnormalities (MI, Heart blocks etc).

Methods

Baseline haemodynamic parameters following spinal Anesthesia. Heamodynamic Baseline Following preloading and spinal anaesthesia, parameters (Pulse rate, SBP, DBP, MAP), SPO2, and UOP will be assessed. Monitoring will subsequently be conducted at1,3,5,7,10,15, and 20 minutes, as well as every 5 minutes for both groups until the procedure is completed. IV boluses of 5 mg ephedrine will be used to treat patients who develop hypotension (a drop in blood pressure of more than 20% from baseline). If the hypotension does not improve, more ephedrine doses will be given if the patient's SBP does not go down below baseline, and the patient's needs will be monitored during the intraoperative period. If necessary, injections of Atropine 0.6 mg IV and Avil + Inj Dexona will be used to address other adverse effects such as bradycardia (heart rate less than 20% of baseline) and Such as bradycardia and shivering.

Patients who experience adverse responses to HES will be monitored for 24 hours following surgery, treated with injections of Avil and Dexona, if appropriate, and removed from the research. Patients who are converted to general anaesthesia will not be allowed to participate in the trial.

The neonatal outcome will be assessed after delivery using the APGAR score at the one and five-minute mark. Following surgery, patients will be checked on every four hours till twenty-four hours. Any difficulties arising from spinal anaesthesia or other sources (e.g., bupivacaine, HES) would be noted and addressed appropriately.

RESULTS

In order to better understand the function that 6% hydroxyethyl starch and ringers lactate play in preloading patients undergoing elective caesarian sections under spinal anaesthesia, the current study was conducted at the department of anaesthesia at Baroda Medical College. Eighty patients were included in the study, and they were split into two groups each:

GROUP 1: 500 cc of 6% HES preloading 30 minutes before to induction. (40)

GROUP 2: 30 minutes before to induction, preload with 1000 millilitres of Ringer lactates. (40)

The mean age of patients in Group1(HES group) was 26.05±4.16years and 25.45±3.05 years in Group 2(RL group) There were 29 ASA class I and 11 ASA class II patients in Group 1 as compared to 26 ASA class I and 14 ASA class II patients in Group 2 .Mean duration of surgery in Group 1 was59.58±13.58 minutes and 61.42±10.25 minutes in Group 2.Thus, this table shows that both Groups were comparable with respect to age, gender, ASA grading and mean duration of surgery and they are Statistically Non significant with respect to the above parameters.(P value>0.05). [Table 1]

INTRA GROUP VARIATION: The above table shows that there is Statistically significant HR (P Value <0.05) variation after preloading, 3rd min,5th min. 10th min, 15th min in HES group and after preloading, 1st min,3rd min,5th min ,7th min, 10th min, in RL group.

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INTERGROUP COMPARISON: The above table shows the changes in mean heart rate between the two groups from the baseline till 24hrs after the surgery. The change in the mean heart rate is **STATISTICALLY SIGNIFICANT** (P Value <0.05) between the two groups after preloading, after giving spinal anaesthesia, 5thmin,7thmin,10th min,15th min and 20 mins after giving spinal anesthesia.

There was no significant difference (P value <0.05) in the mean heart rate between the two groups postoperatively till 24hrs after surgery. [Table 2]

INTRA GROUP COMPARISON: The above table shows that the change in SBP is statistically significant (P Value<0.05) after giving spinal anesthesia, at 1st min, postoperatively after 4hrs and is Statistically highly significant (P Value <0.0001) from 3mins till 50 mins after giving spinal anesthesia (except for 1st min) in intra group comparison of HES group.

The table shows that the change in SBP is not statistically significant (P Value >0.05) Postoperatively in intra group comparison of RL group.

INTER GROUP COMPARISON: The above table shows the changes in Mean SBP between the two groups from the baseline till 24hrs after the surgery. The change in SBP is Statistically significant (P value<0.05) between the two groups after giving spinal anaesthesia, 1st min, 3rd min, 5th min,7th min,10th min.15th min after giving spinal anaesthesia.

There was no Statistically significant (P value>0.05) difference in the Mean SBP between the two groups postoperatively till 24hrs after surgery. [Table 3]

INTRA GROUP COMPARISON: The above table shows that the change in DBP is Statistically significant (P Value<0.05), at 1st min, 20th min, 45th min, in intra group comparison of HES group.

The table shows that the change in DBP is Statistically significant (P value<0.05) after giving spinal anaesthesia,5th min, 10th min,45th min in intra group comparison of RL group.

INTER GROUP COMPARISON: The above table shows the changes in Mean DBP between the two groups from the baseline till 24hrs after the surgery. There is Statistical significance (P Value<0.05) in the mean DBP between the two groups after giving spinal anaesthesia,1st min ,3rd min, 5th min after giving spinal anaesthesia.

There was no statistically significant (P value >0.05) difference in the Mean DBP between the two groups postoperatively till 24hrs after surgery. [Table 4]

INTRA GROUP COMPARISON: The above table shows that the change in MAP is Statistically significant (P Value <0.05), at 3RD,5TH, 7TH,40THmin and is Statistically highly significant (P Value<0.0001) from 10mins till 30 mins after giving spinal anesthesia, in intra group comparison of HES group.

The table shows that the change in MAP is Statistically highly significant (P Value <0.0001) after giving spinal anesthesia,1st min,3rd min,5th min,7th min,10th min,15th min,30th min,40th min and statistically significant (P Value <0.05), at 35th min,45th min,50th min after giving spinal anaesthesia, in intra group comparison of RL group.

INTER GROUP COMPARISON: The above table shows the changes in Mean MAP between the two groups from the baseline till 24hrs after the surgery. There is statistical significance (P value<0.05) in the mean MAP between the two groups after giving spinal anaesthesia,1st min ,3rd min, 5th min,7th min ,15TH min,20th min after giving spinal anaesthesia.

There was no significant difference (P value>0.05) in the Mean DBP between the two groups postoperatively till 24hrs after surgery. [Table 5]

INTRA GROUP COMPARISON: The above table shows that there is No statistical difference (P Value>0.05) in SPO2 in both RL and HES groups in their intra group comparison.

INTER GROUP COMPARISON: The above table shows the changes in Mean SPO2 between the two groups from the baseline till 24hrs after the surgery. There is No statistical difference (P Value >0.05) in the mean SPO2 between the two groups from the baseline, intraoperatively and post operatively till 24 hrs after surgery. [Table 6]

Table 1: Demographic Data

GROUP	GROUP 1 (HES group)	GROUP 2(RL group)	P VALUE
Age in years (Mean±SD)	26.05±4.16	25.45±3.05	P value >0.05
Gender (Female)	40	40	
ASA grade (I:II)	29:11	26:14	P value >0.05
Mean duration of surgery(minutes)	59.58±13.58	61.42±10.25	P value >0.05

Table 2: Distribution of Mean HR (Bpm) At Different Time Interval

HEART RATE	GROUP 1(HES group)		GROUP 2(RL group)		Inter Group Omparison
	Mean±SD	INTRA GROP (P value)	Mean±SD	INTRA GROUP (P value)	P VALUE
HR(bpm) baseline parameters	96 ±7.08		95.9 ±4.9		>0.05
HR(bpm) after preloading	92.6 ± 5.9	<0.05	88.1± 5.5	<0.05	<0.05
HR after spinal anaesthesia	95.5 ±5.6	>0.05	98.5 ± 4.5	<0.05	<0.05
HR 1min	97.2 ± 4.8	>0.05	97.8 ± 3.7	<0.05	>0.05
HR 3min	101.5 ± 4.9	<0.05	103.9 ± 10.9	<0.05	>0.05
HR 5min	102.2 ± 4.5	<0.05	101.2 ± 5.1	<0.05	>0.05

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HR 7min	96.2 ± 5.4	>0.05	104.9 ± 9.9	<0.05	<0.05
HR 10min	102 ±6.4	<0.05	106.6 ± 5.9	<0.05	<0.05
HR 15min	99.4 ±4.3	<0.05	97.2 ± 4.4	>0.05	<0.05
HR 20min	98.5 ± 5.9	>0.05	94.3 ± 3.1	>0.05	<0.05
HR 25min	97.9 ±4.5	>0.05	96.1 ± 4.2	>0.05	>0.05
HR 30min	98.1± 4.8	>0.05	96.3 ± 5.3	>0.05	>0.05
HR 35min	96.8 ± 4.9	>0.05	95.5 ± 4.6	>0.05	>0.05
HR 40min	94.7 ± 4.1	>0.05	93.6 ± 3.9	>0.05	>0.05
HR 45min	98 ± 5	>0.05	96.4 ±3.9	>0.05	>0.05
HR 50mins	95.7 ± 4.9	>0.05	94.2 ± 3.2	>0.05	>0.05
HR Postoperative (4hrs)	97.7 ± 7.4	>0.05	95.5 ± 3.48	>0.05	>0.05
HR Postoperative (8hrs)	97.9 ±4.5	>0.05	96.1 ± 4.2	>0.05	>0.05
HR Postoperative (12hrs)	98 ± 5	>0.05	96.4 ±3.9	>0.05	>0.05
HR Postoperative (16hrs)	97.9 ±4.5	>0.05	96.1 ± 4.2	>0.05	>0.05
HR Postoperative (20hrs)	97.7 ± 7.4	>0.05	95.5 ± 3.48	>0.05	>0.05
HR Postoperative (24hrs)	96.8 ± 4.9	>0.05	95.5 ± 4.6	>0.05	>0.05

Table 3: Distribution of Mean SBP (Mmhg) at Different Time Interval

SBP	GROUP 1(HES group)		GROUP 2(RL group)		Inter Group Comparison
	Mean±SD	INTRA GROUP (P value)	Mean±SD	INTRA GROUP (P value)	P value
SBP (mmhg) baseline parameters	124.6 ±8.1		126 ±5.1		>0.05
SBP(mmhg) after preloading	125.5 ±6.2	>0.05	126.3±4.3	>0.05	>0.05
SBP after spinal anaesthesia	120.4± 8.4	<0.05	116.4± 6.4	<0.0001	<0.05
SBP 1min	115.8± 6.6	<0.05	112.4± 4.8	<0.0001	<0.05
SBP 3min	109.3 ±8.2	<0.0001	104.7±10.4	<0.0001	<0.05
SBP 5min	115.8± 6.6	<0.0001	105.8±14.8	<0.0001	<0.05
SBP 7min	112.4 ±8.7	<0.0001	104.6±11.5	<0.0001	<0.05
SBP 10min	110± 7.9	<0.0001	105.8± 9.8	<0.0001	<0.05
SBP 15min	111± 11	<0.0001	106.5± 8.2	<0.0001	<0.05
SBP 20min	107.3± 9.2	<0.0001	109.2± 8.7	<0.0001	>0.05
SBP 25MINS	107.2 ±9.2	<0.0001	109.5±10.9	<0.0001	>0.05
SBP 30min	108.6 ±4.4	<0.0001	111.2± 8.9	<0.0001	>0.05
SBP 35min	116.4± 8.3	<0.0001	118.1± 9.5	<0.0001	>0.05
SBP 40min	114.4 ±5.3	<0.0001	110.9± 9.5	<0.0001	>0.05
SBP 45min	114 ±5.3	<0.0001	114± 9.5	<0.0001	>0.05
SBP 50mins	113.2± 4.7	<0.0001	114± 5.3	<0.0001	>0.05
SBP postoperative (4hrs)	127.5 ±7.3	>0.05	126± 9.5	>0.05	>0.05
SBP postoperative (8hrs)	127.3 ±9.2	>0.05	126.5± 10.9	>0.05	>0.05
SBP postoperative (12hrs)	124.4 ±5.3	>0.05	120.9± 9.5	>0.05	>0.05
SBP postoperative(16hrs)	123.2± 4.7	>0.05	124± 5.3	>0.05	>0.05
SBP postoperative(20hrs)	125.5 ±6.2	>0.05	126.3±4.3	>0.05	>0.05
SBP postoperative(24hrs)	124.6 ±8.1	>0.05	126 ±5.1	>0.05	>0.05

Table 4: Distribution of Mean DBP (Mmhg) at Different Time Interval

DBP	GROUP 1 (HES Group)		GROUP 2 (RL Group)		INTER GROUP COMPARISON
	Mean±SD	INTRA GROUP (P value)	Mean±SD	INTRA GROUP (P value)	P-value
DBP (mmhg) baseline parameters	79.7±7.2		82.3± 4.4		>0.05
DBP(mmhg) after preloading	82.1± 4.6	>0.05	81.1± 6.2	>0.05	>0.05
DBP after spinal anaesthesia	82.2± 6.7	>0.05	83.6± 4.9	<0.05	>0.05
DBP 1min	84.9± 5.8	<0.05	81.8± 4.7	>0.05	<0.05
DBP 3min	80.4± 6.6	>0.05	77± 7.9	>0.05	<0.05
DBP 5min	79.2± 8.2	>0.05	75.5±7.4	<0.05	<0.05
DBP 7min	78.4± 5.4	>0.05	77.2± 6.8	>0.05	>0.05
DBP 10min	76± 6.9	<0.05	76.2± 5.9	<0.05	>0.05
DBP 15min	77.1± 5.9	>0.05	79.3± 4.9	>0.05	>0.05
DBP 20min	75.3± 6.5	<0.05	77.8± 5.3	>0.05	>0.05
DBP 25MINS	77.2 ±7.9	>0.05	77.7± 5.4	>0.05	>0.05
DBP 30min	78.3± 7.8	>0.05	78.9± 5.2	>0.05	>0.05
DBP 35min	79.4± 8	>0.05	81.8± 3.9	>0.05	>0.05
DBP 40min	80.7± 5	>0.05	80.8± 5.6	>0.05	>0.05
DBP 45min	83.5± 6.8	<0.05	84.5± 6.9	<0.05	>0.05
DBP 50mins	79.5± 5.6	>0.05	81.2± 3.9	>0.05	>0.05
DBPpostoperative monitoring(4hrs)	78.4± 7.4	>0.05	80.6± 5.3	>0.05	>0.05
DBPpostoperative monitoring(8hrs)	76.2± 5.9	>0.05	76± 6.9	>0.05	>0.05

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DBP postoperative monitoring(12hrs)	77.1± 5.9	>0.05	79.3± 4.9	>0.05	>0.05
DBP postoperative monitoring(16hrs)	78.4± 5.4	>0.05	77.2± 6.8	>0.05	>0.05
DBP postoperative monitoring(20hrs)	83.5± 6.8	>0.05	84.5± 6.9	>0.05	>0.05
DBP postoperative monitoring(24hrs)	84.2± 7	>0.05	85.2 ±7.2	>0.05	>0.05

Table 5: Distribution of Mean MAP at Different Time Interval

MAP	GROUP 1 (HES group)		GROUP 2(RLgroup)		Inter group comparison
	Mean±SD	INTRA GROUP (P value)	Mean±SD	INTRA GROUP(P value)	P-value
MAP(mmhg)baseline parameters	94.7± 6.7		96.8± 4.1		>0.05
MAP(mmhg) after preloading	96.5± 3.7	>0.05	96.1± 4.6	>0.05	>0.05
MAP after spinal anaesthesia	94.9± 6.3	>0.05	92.2± 4.4	<0.0001	<0.05
MAP 1min	95.3± 4.1	>0.05	92± 4.2	<0.0001	<0.05
MAP 3min	90± 4.9	<0.05	86.2± 8.3	<0.0001	<0.05
MAP 5min	89.1± 6.9	<0.05	85.6± 8.5	<0.0001	<0.05
MAP 7min	89.7 ± 6.4	<0.05	84.7± 7.4	<0.0001	<0.05
MAP 10min	87.3± 6.2	<0.0001	86.2± 6.8	<0.0001	>0.05
MAP 15min	88.4± 5.2	<0.0001	88.4 ±4.4	<0.0001	<0.05
MAP 20min	85.9± 5.4	<0.0001	88.2 ±4.6	<0.0001	<0.05
MAP 25MINS	86.7± 6.4	<0.0001	88.3± 4.9	<0.0001	>0.05
MAP 30min	88.4± 5.7	<0.0001	85.6± 4.8	<0.0001	>0.05
MAP 35min	91.8±6.7	>0.05	93.9 ±4.4	<0.05	>0.05
MAP 40min	91.9 ± 4	<0.05	90.1± 5.4	<0.0001	>0.05
MAP 45min	93.7± 5.5	>0.05	94.4± 5.1	<0.05	>0.05
MAP 50mins	90.7± 3.9	>0.05	93.3 ±3.9	<0.05	>0.05
MAP postoperative monitoring(4hrs)	92.2± 3.8	>0.05	95.5± 4	>0.05	>0.05
MAP postoperative monitoring(8hrs)	98.3± 4.9	>0.05	96.7± .4	>0.05	>0.05
MAP postoperative monitoring(12hrs)	93.7± 5.5	>0.05	94.4± .1	>0.05	>0.05
MAP postoperative monitoring(16hrs)	95.5± 4	>0.05	92.2± 3.8	>0.05	>0.05
MAP postoperative monitoring(20hrs)	93.6± 5.5	>0.05	94.6± 5	>0.05	>0.05
MAP postoperative monitoring(24hrs)	96.2± 6.8	>0.05	97.3± 6.2	>0.05	>0.05

Table 6: Distribution of Mean Spo2 at Different Time Interval

SPO2	GROUP 1 (HES group)		GROUP 2(RL group)		INTER GROUP COMPARISON
	Mean±SD	INTRA GROUP (Pvalue)	Mean±SD	INTRA GROUP (P value)	P-value
SPO2 (mmhg) baseline parameters	99.6±0.5		99.5± 0.5		>0.05
SPO2(mmhg) after preloading	99.8±0.4	>0.05	99.6± 0.5	>0.05	>0.05
SPO2 after spinal anaesthesia	99.7± 0.5	>0.05	99.7± 0.5	>0.05	>0.05
SPO2 1min	99.6± 0.5	>0.05	99.6± 0.5	>0.05	>0.05
SPO2 3min	99.7± 0.5	>0.05	94.9± 0.8	>0.05	>0.05
SPO2 5min	99.6± 0.5	>0.05	99.7± 0.5	>0.05	>0.05
SPO2 7min	99.8± 0.4	>0.05	99.8± 0.4	>0.05	>0.05
SPO210min	99.8± 0.4	>0.05	99.6± 0.4	>0.05	>0.05
SP02 15min	99.7± 0.4	>0.05	99.6± 0.5	>0.05	>0.05
SPO2 20min	99.8± 0.4	>0.05	99.7± 0.4	>0.05	>0.05
SPO2 25mins	99.7± 0.5	>0.05	99.6± 0.5	>0.05	>0.05
SPO2 30min	99.7± 0.4	>0.05	99.7± 0.5	>0.05	>0.05
SPO2 35min	99.8± 0.4	>0.05	99.8± 0.4	>0.05	>0.05
SPO2 40min	99.7± 0.5	>0.05	99.6± 0.5	>0.05	>0.05
SPO2 45min	99.6± 0.5	>0.05	99.5± 0.5	>0.05	>0.05
SPO2 50mins	99.7± 0.5	>0.05	99.8± 0.4	>0.05	>0.05
SPO2 postoperative monitoring(4hrs)	99.8± 0.4	>0.05	99.5± 0.5	>0.05	>0.05
SPO2 postoperative monitoring(8hrs)	99.7± 0.5	>0.05	99.6± 0.5	>0.05	>0.05
SPO2postoperative onitoring(12hrs)	99.8± 0.4	>0.05	99.5± 0.5	>0.05	>0.05
SPO2postoperative monitoring(16hrs)	99.8± 0.4	>0.05	99.7± 0.4	>0.05	>0.05
SPO2postoperative monitoring(20hrs)	99.7± 0.5	>0.05	99.6± 0.5	>0.05	>0.05
SPO2postoperative monitoring(24hrs)	99.8± 0.4	>0.05	99.6± 0.5	>0.05	>0.05

DISCUSSION

The subarachnoid space spinal nerves are blocked to produce spinal anaesthesia, a type of regional anaesthesia. In the past century, this anaesthetic approach has gained the greatest popularity and widespread use. For a caesarean section, it is the recommended anaesthetic method since it is easy to administer, acts quickly, produces consistent post-operative analgesia, and promotes well-defined muscular relaxation. Given the physiological ramifications of the procedure and the state of the

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patient, it is often the preferred approach for achieving optimal operating circumstances. With that said, it may be safely employed. Because of economic factors, a lack of advanced anaesthetic equipment, and compressed gas shortages in distant places, spinal anaesthesia is particularly important in developing nations like India.

Arterial hypotension is still a possible risk associated with spinal anaesthesia, and it significantly raises the risk of maternal death and morbidity. Up to 85% of individuals undergoing elective caesarean sections under spinal anaesthesia have been documented to have hypotension. (Madhusudhan and others, 2016) According to Shahidul Islam et al. (2014), hypotension following spinal anaesthesia can be caused by a variety of factors, including sympathetic blockade, which can result in relative hypovolemia, dilatation of resistance and capacitance vessels, venous pooling, which can reduce venous return, and maternal factors like aortocaval compression and supine hypotension syndrome, which can cause marked maternal hypotension. Unexpectedly low blood pressure in mothers can cause nausea, vomiting, aspiration of stomach contents, unconsciousness, and abrupt cardiac collapse. Furthermore, placental blood flow in pregnancy will also be affected because This may result in acidosis, bradycardia, and foetal hypoxia.

It has been demonstrated that the preventative administration of widely used crystalloids, such as Ringers lactate and Normal saline, prior to regional anaesthesia is unsuccessful in eradicating spinal anesthesia-induced hypotension. According to studies, approximately 2.5–3 times the amount of IV crystalloid is required to accomplish the same degree of blood volume expansion as colloid solution because around 75% of IV crystalloids migrate into interstitial space. Its ability to increase the plasma volume is just momentary. After spinal anaesthesia, healthy partners do not seem to enhance the mother's hemodynamics, even after increasing the crystalloid quantities.

This was discovered in a research involving 40 women having caesarean sections, where the newborn outcome was evaluated using arterial and venous blood gases as well as APGAR ratings.

In both groups, whether 10% HES or Ringers lactate was used for preloading, the average APGAR score was equivalent. (Siddik and colleagues, 2010)

CONCLUSION

When 6%HES is used as a preloading solution during an elective caesarean section performed under spinal anaesthesia, steady hemodynamics have been seen during the procedure. Mother and baby can safely use 6% hydroxyethyl starch with few adverse effects. When administering preloading solutions to patients undergoing elective caesarean sections under spinal anaesthesia, 6% hydroxyethyl starch works better than crystalloid (Ringers lactate).

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