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ORIGINAL RESEARCH

Comparative study of preloading colloid fluids with not preloading colloid fluids for prevention of hypotension in patients undergoing elective cesarean section delivery after subarachnoid block

Dr. Kshitij Patidar[1], Dr. Meher Shikha Verma[2], Dr. Ritu Verma[3], Dr. Atul Dixit[4], Dr. Dipti Saxena[5], Dr. Harsh Kumar Soni[6]

[1,6]PG third year, [2]Assistant professor, [3]Senior resident, [4]Professor , [5]Professor and HOD, Department of Anaesthesiology, critical care and pain management, Sri Aurobindo Institute of Medical Science, Indore, Madhya Pradesh, India

Corresponding author
Dr. Meher Shikha Verma
Assistant professor, Department of Anaesthesiology, critical care and pain management, Sri Aurobindo Institute of Medical Science, Indore, Madhya Pradesh, India

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ABSTRACT

Aim: Comparative study of preloading colloid fluids with not preloading colloid fluids for prevention of hypotension in patients undergoing elective cesarean section delivery after subarachnoid block.

Material and methods: 120 patients were divided in to two groups. 60 in each group. Group A - preloaded with colloid fluids: Preloading was done with 10-20 ml/kg of colloid, 20-30min prior moving patient to OT. Subarachnoid block was given with anaesthetic drug, then patient was placed in supine position. After the achievement of adequate level of block, systolic blood pressure , diastolic blood pressure and mean arterial blood pressure were recorded .Group B - not preloaded colloid solution : Subarachnoid block was given with anaesthetic drug, then patient was placed in supine position. After the achievement of adequate level of block, systolic blood pressure , diastolic blood pressure and mean arterial blood pressure were recorded.

Results: Most common diagnosis in Group A was POG with Previous LSCS (45%) whereas most common diagnosis in Group B was POG with PROM (33.3%). The post subarachnoid block lower SBP was more common in Group B patients as compared to group A patients ($p<0.001$). The post subarachnoid block lower DBP (hypotension) was more common in Group B patients as compared to group A patients ($p<0.001$). The post subarachnoid block lower MAP (hypotension) was more common in Group B patients as compared to Group A patients ($p<0.001$). Patients receiving preloading colloid fluids had lower incidence of hypotension compared to those not receiving preloading colloid fluids. Time interval when hypotension occurs after subarachnoid block was significantly longer in patients of Group A (9.30±1.951) who received preloading colloid fluids as compared to Group B (6.00±1.747) patients who did not received preloading colloid fluids.

Conclusion: We concluded that the parturient undergoing elective cesarean section when preloaded with colloid fluids, revealed less hemodynamic changes in terms of SBP, DBP and MAP as compared to those who were not preloaded with colloid.

Keywords: Preloading colloid fluids hypotension cesarean subarachnoid block.

Introduction

The vast majority of caesarean sections, both elective and emergency, are performed under spinal anaesthesia because it is a technique that is safe, rapid in its onset, and reliable. Furthermore, it eliminates the risk of airway complications, such as failed intubation, that are associated with general anaesthesia. [1,2] Hypotension is the most common response of the cardiovascular system to spinal anaesthesia, and it can cause a parturient to experience nausea, vomiting, and dizziness. [3] Fetal

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hypoxia and acidosis can be caused by prolonged hypotension in the mother, which results in decreased placental perfusion. [4] In the absence of preventative measures, the incidence of post-spinal hypotension can be extremely high. Preloading, left uterine displacement to avoid aortocaval compression, and vasopressor drugs are just some of the many methods that have been used to prevent or treat maternal hypotension. [5] It is standard practise to rapidly administer crystalloid fluid over the course of twenty minutes prior to spinal anaesthesia. [6] Preloading, on the other hand, has been called into question by other investigators[7-10], who discovered that even large volumes of fluids were unable to significantly reduce the incidence of hypotension. It is possible that the short intravascular half life of crystalloids, which ranges from 15 to 20 minutes, is caused by their rapid redistribution into interstitial space. Recently, rapid fluid administration at the time of spinal block has been advocated. This is due to the fact that it increases intravascular volume at the time of maximum vasodilatation[11,12] and prevents unnecessary delay in surgical procedures.

Sympathectic block usually decreases stroke volume. Venous and arterial vasodilation reduces preload (venous return) and afterload (systemic vascular resistance), respectively. Because of the large amount of blood that resides in the venous system (approximately 75% of the total blood volume) , that leads to decrease cardiac output. That above mechanism mostly cause hypotension after spinal anaesthesia for cesarean delivery.[6] It is a common clinical problem if severe , it can be associated with maternal and fetal morbidity. A qualitative systematic review found that administration of colloid fluids before initiation of spinal anaesthesia (preloading) is consistently more effective in preventing hypotension. Unfortunately , multiple studies have shown that cardiac output increases after induction of SAB and that fall in systemic vascular resistance leads to lower blood pressures, the degree of hypotension varies widely among patients. Risk factors include pregnancy , hypovolemia, advanced age ,obesity, concurrent general anesthesia and sensory level block T6.[8]

Material and methods

This analytical cross section study was done in the Department of Anaesthesiology, critical care and pain management, Sri Aurobindo Institute of Medical Science, Indore, Madhya Pradesh, India after taking the permission from the ethical committee. All the patients fulfilling the inclusion criteria and giving consent was included. 120 patients were divided in to two groups . 60 in each groups.

Group A - preloaded with colloid fluids

Preloading was done with 10-20 ml/kg of colloid, 20-30min prior moving patient to OT. The procedure and positioning was explained before subarachnoid block. After proper positioning painting and draping done. Subarachnoid block was given with anaesthetic drug, then patient was placed in supine position. After the achievement of adequate level of block, systolic blood pressure , diastolic blood pressure and mean arterial blood pressure were recorded .

Group B - not preloaded colloid solution

The procedure and positioning was explained before subarachnoid block. After proper positioning painting and draping done. Subarachnoid block was given with anaesthetic drug, then patient was placed in supine position. After the achievement of adequate level of block, systolic blood pressure , diastolic blood pressure and mean arterial blood pressure were recorded.

Inclusion criteria

- Patients more than 18 years age
- Patients posted for elective cesarean section delivery
- Patients with ASA status I and II .
- Plan of anaesthesia :- subarchnoid block in elective cesarean section delivery.

Exclusion criteria

- Patient having any allergic history with colloid fluids
- Patient not giving consent

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Statistical Analysis Plan

Data was categorized first using the frequency distribution table. Descriptive statistics was used to show the feature and characteristics of the collected data. The association between qualitative data was shown by Pearson's Chi square test. Quantitative data was expressed as mean and standard deviation. Categorical data was expressed as number and percentage.

Results

Group A: preloading colloid fluids given

Group B: preloading colloid fluids not given

Table 1: Comparing mean age between groups

Group	N	Mean	Std. Deviation	Std. Error Mean	P value
A	60	27.43	3.859	0.498	0.221
B	60	26.35	3.752	0.466	

Mean age of patients in Group A and Group B was 27.43±3.859 and 26.35±3.752 years respectively which was insignificant as revealed by the p value of 0.221.

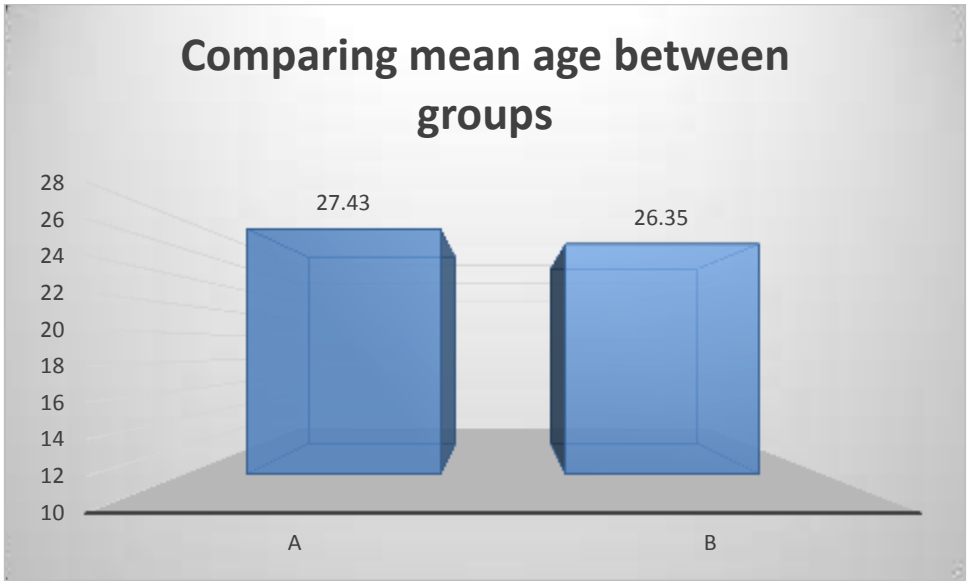

Table 2: Comparing BMI distribution between groups

			Group		Total	P value
			A	B		
BMI group	Normal	Count	11	12	23	0.711
		%	18.3%	20.0%	19.2%	
	Obese	Count	18	14	32	
		%	30.0%	23.3%	26.7%	
	Overweight	Count	31	34	65	
		%	51.7%	56.7%	54.2%	

Distribution according to BMI was comparable between the groups which means there was no significant difference in terms of patients who were overweight or obese as revealed by the insignificant p value of 0.711.

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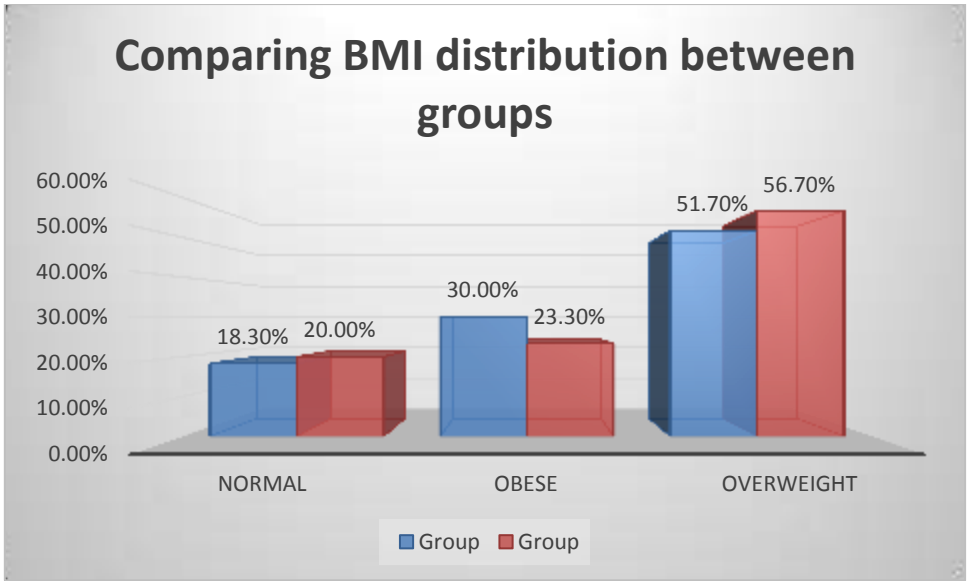

Table 3: Comparing gravida distribution between groups

			Group		Total	P value
			A	B		
Gravida	G1	Count	6	2	8	0.439
		%	10.0%	3.3%	6.7%	
	G2	Count	20	22	42	
		%	33.3%	36.7%	35.0%	
	G3	Count	23	21	44	
		%	38.3%	35.0%	36.7%	
	G4	Count	6	11	17	
		%	10.0%	18.3%	14.2%	
	G5	Count	2	3	5	
		%	3.3%	5.0%	4.2%	
	G6	Count	2	0	2	
		%	3.3%	0.0%	1.7%	
	Primi	Count	1	1	2	
		%	1.7%	1.7%	1.7%	

Distribution according to gravida was comparable between the groups as revealed by the insignificant p value of 0.439.

Table 4: Diagnosis

			Group		Total	P value
			A	B		
Diagnosis	BOH With Precious Pregnancy	Count	2	0	2	0.003
		%	3.3%	0.0%	1.7%	
	CPD	Count	1	0	1	
		%	1.7%	0.0%	0.8%	
	Oligohydramnios with Previous LSCS	Count	4	10	14	
		%	6.7%	16.7%	11.7%	
	Oligohydramnios	Count	2	0	2	
		%	3.3%	0.0%	1.7%	
	POG	Count	2	1	3	
		%	3.3%	1.7%	2.5%	
	POG with CPD	Count	1	0	1	

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		%	1.7%	0.0%	0.8%	
	POG with PROM	Count	5	20	25	
		%	8.3%	33.3%	20.8%	
	POG With Oligohydramnios	Count	7	4	11	
		%	11.7%	6.7%	9.1%	
	POG with Previous LSCS	Count	27	11	38	
		%	45.0%	18.3%	31.7%	
	POG with Previous LSCS, CPD	Count	1	0	1	
		%	1.7%	0.0%	0.8%	
	Previous LSCS	Count	7	13	20	
		%	11.7%	21.7%	16.7%	
	Severe Scar Tenderness, previous LSCS	Count	0	1	1	
		%	0.0%	1.7%	0.8%	
	Short Stature	Count	1	0	1	
		%	1.7%	0.0%	0.8%	

Most common diagnosis in Group A was POG with Previous LSCS (45%) whereas most common diagnosis in Group B was POG with PROM (33.3%).

Table 5: Comparing SBP

SBP	Group	N	Mean	Std. Deviation	Std. Error Mean	P value
Pre-Induction	A	60	120.40	12.156	1.440	0.151
	B	60	118.80	12.592	1.626	
After Subarachnoid Block	A	60	110.87	10.305	1.330	<0.001
	B	60	85.88	11.788	1.522	

Independent Samples Test

Pre-induction SBP was comparable between groups as revealed by the insignificant p value of 0.151.After subarachnoid block, SBP was near to normal in Group A patients (110.87±10.305) who received preloading colloid fluids as compared to Group B patients who did not received preloading colloid fluids (85.88±11.788). This highlight that post subarachnoid block lower SBP was more common in Group B patients as compared to group A patients (p<0.001). Patients receiving preloading colloid fluids had lower incidence of hypotension compared to those not receiving preloading colloid fluids.

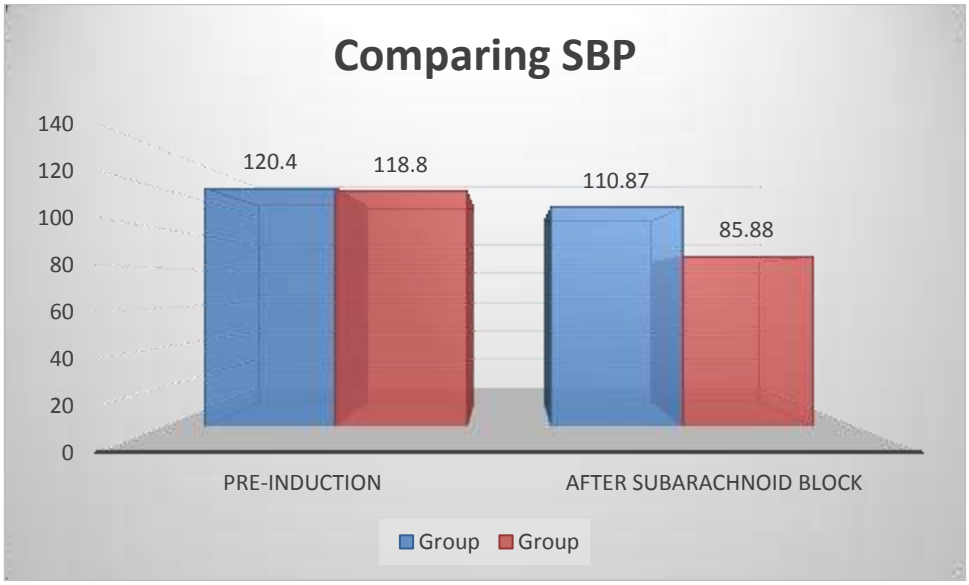

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Table 6: Comparing DBP

DBP	Group	N	Mean	Std. Deviation	Std. Error Mean	P value
Pre-Induction	A	60	75.37	7.351	1.149	0.671
	B	60	74.12	7.136	1.200	
After Subarachnoid Block	A	60	70.22	7.449	.962	<0.001
	B	60	52.58	5.794	.748	

Pre-induction DBP was comparable between groups as revealed by the insignificant p value of 0.671. After subarachnoid block, DBP was near to normal in Group A patients (70.22±7.449) who received preloading colloid fluids as compared to Group B patients who did not received preloading colloid fluids (52.58±5.794). This highlight that post subarachnoid block lower DBP (hypotension) was more common in Group B patients as compared to group A patients (p<0.001).Patients receiving preloading colloid fluids had lower incidence of hypotension compared to those not receiving preloading colloid fluids.

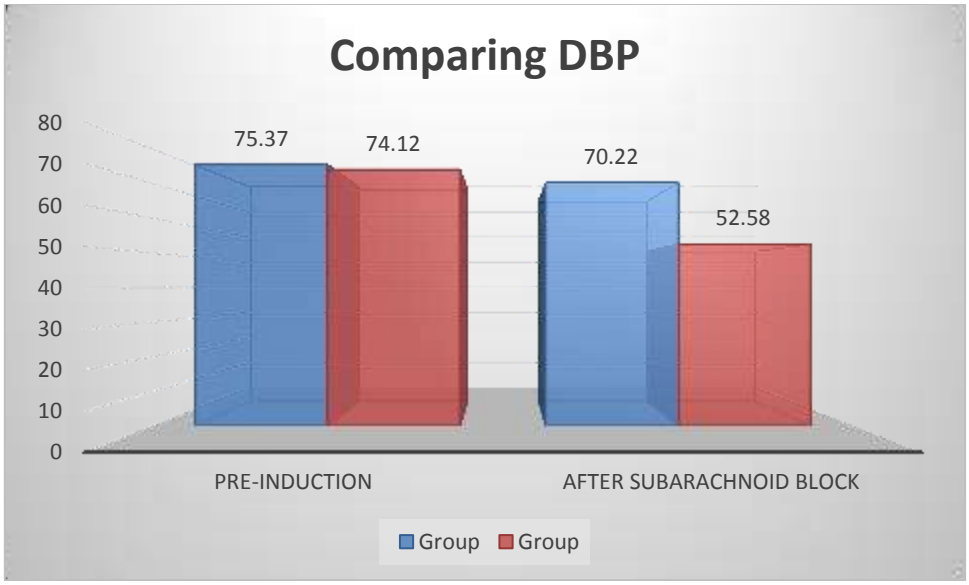

Table 7: Comparing MAP

MAP	Group	N	Mean	Std. Deviation	Std. Error Mean	P value
Pre-Induction	A	60	89.12	10.896	1.149	0.481
	B	60	88.08	10.763	1.151	
After Subarachnoid Block	A	60	83.32	7.657	.988	<0.001
	B	60	63.13	6.125	.997	

Pre-induction MAP was comparable between groups as revealed by the insignificant p value of 0.481. After subarachnoid block, MAP was near to normal in Group A patients (83.32±7.657) who received preloading colloid fluids as compared to Group B patients who did not received preloading colloid fluids (63.13±7.725). This highlight that post subarachnoid block lower MAP (hypotension) was more common in Group B patients as compared to Group A patients (p<0.001). Patients receiving preloading colloid fluids had lower incidence of hypotension compared to those not receiving preloading colloid fluids.

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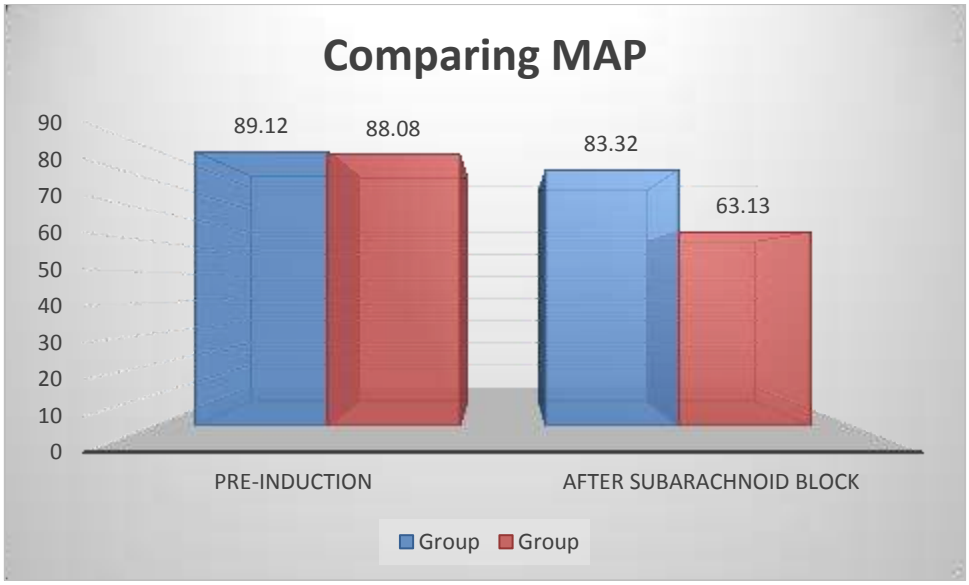
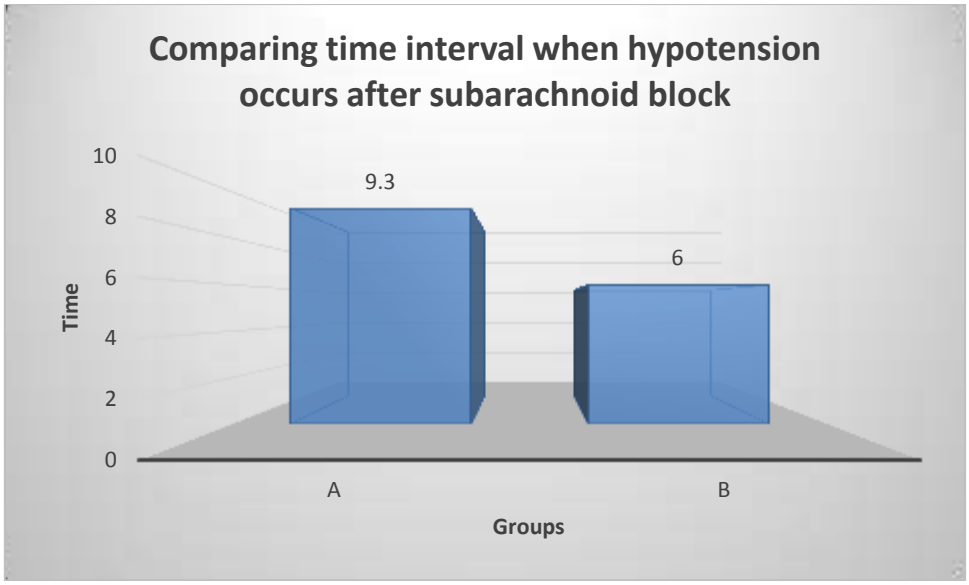


Table 8: Comparing time interval when hypotension occurs after subarachnoid block

Group	N	Mean	Std. Deviation	Std. Error Mean	P value
A	60	9.30	1.951	.252	<0.001
B	60	6.00	1.747	.225	

Time interval when hypotension occurs after subarachnoid block was significantly longer in patients of Group A (9.30±1.951) who received preloading colloid fluids as compared to Group B (6.00±1.747) patients who did not received preloading colloid fluids.



Discussion

Because it is simple to administer, has a quick onset, and eliminates the risk of airway complications associated with general anaesthesia, spinal anaesthesia is the type of anaesthesia that is most frequently used for caesarean sections. Though it has several advantages, high incidences of hypotension has been cause of concern for anaesthetists because it can lead to nausea, vomiting, foetal hypoxia even cardiac arrest.[13] So different techniques have been used to prevent hypotension. Hemodynamic changes after spinal anaesthesia occurs because of sympathetic block. This sympatholysis results in vasodilatation resulting in pooling of blood in vessels. So number of studies focused on fluid administration to fill vessels.

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Pre-induction SBP was comparable between groups as revealed by the insignificant p value of 0.151.After subarachnoid block, SBP was near to normal in Group A patients (110.87±10.305) who received preloading colloid fluids as compared to Group B patients who did not received preloading colloid fluids (85.88±11.788). This highlight that post subarachnoid block lower SBP was more common in Group B patients as compared to group A patients ($p<0.001$). Pre-induction DBP was comparable between groups as revealed by the insignificant p value of 0.671. After subarachnoid block, DBP was near to normal in Group A patients (70.22±7.449) who received preloading colloid fluids as compared to Group B patients who did not received preloading colloid fluids (52.58±5.794). This highlight that post subarachnoid block lower DBP (hypotension) was more common in Group B patients as compared to group A patients ($p<0.001$). Pre-induction MAP was comparable between groups as revealed by the insignificant p value of 0.481. After subarachnoid block, MAP was near to normal in Group A patients (83.32±7.657) who received preloading colloid fluids as compared to Group B patients who did not received preloading colloid fluids (63.13±7.725). This highlight that post subarachnoid block lower MAP (hypotension) was more common in Group B patients as compared to Group A patients ($p<0.001$).

This conclusion is comparable to the findings of a research that was carried out by Rao et al. in 2015 and compared the efficacy of preloading with that of co-loading with crystalloid fluid in the context of spinal anaesthesia after caesarean delivery. As compared to the preloading group, the incidence of hypotension in the coloading group was 40% ($P = 0.023$), which was considerably lower than the incidence of hypotension in the preloading group. This finding comes from the research conducted by Rao. [14] As compared to the preloading group, the incidence of hypotension was considerably reduced in the co-loading group compared to the preloading group ($P = 0.026$). These findings were similar with the findings of the research conducted by Oh et al. in 2014. [15,16]

This research also indicated that the incidence of hypotension observed from hemodynamic measures (SBP, DBP, and MAP) in the preloading group was lower than in the control group. Nevertheless, this difference was not statistically significant ($P > 0.05$), therefore it was not considered to be a finding of significance. This finding is in line with the findings of the study conducted by Faydaci and Gunaydin, which found that the administration of crystalloid fluid preloading prior to spinal anesthesia-assisted caesarean section surgery did not significantly lower the incidence of hypotension or nausea and vomiting when compared to the group that served as the control. [17]

The findings of Teoh and Siah[18], who compared the effects of colloid preload to those of colloid co load on maternal cardiac output, were similarly the same. These researchers came to the conclusion that although cardiac output rises initially in the preload group, this effect is only temporary. Both groups had hypotension at some point. 90% of patients in the preload group experienced a 10% drop in systolic blood pressure, whereas 75% of patients in the coload group had the same impact ($p = 0.41$). Baustita, Mojica et al.[19] examined three groups, one of which got preloading at a dosage of 20 ml/kg, another of which received coloading with the same volume, and a third of which received 1-2 ml/kg of fluid and was labelled as a placebo; we did not include a placebo group for ethical reasons. They also reported heart-related complications. Nausea, vomiting, and dizziness were cited as examples of these side effects. There was a trend towards higher hypotension in the preloading group compared to the placebo group, but the difference was not statistically significant. In both the coloading and placebo groups, results were similar. When considering cardiovascular risks, they concluded that coloading was preferable.

In this study the time interval when hypotension occurs after subarachnoid block was significantly longer in patients of Group A (9.30±1.951) who received preloading colloid fluids as compared to Group B (6.00±1.747) patients who did not received preloading colloid fluids.

Hypotension following spinal anaesthesia normally occurs in the first 15–20 min, and this period is the time necessary by local anaesthetic medicines to achieve a particular amount of nerve block and will continue. This is termed fixation time.[15] The findings of this research reveal that the injection of Ringer lactate fluid coloading has the effect of reducing blood pressure declines better than preloading in caesarean delivery. Crystalloids are not restricted to the intravascular region; they are quickly disseminated into the extracellular space such that the injection of crystalloid fluids during vasodilation is more successful than prophylaxis in avoiding hypotension during spinal anaesthesia in caesarean section surgery. The administration of fluid at the same time as the administration of local

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anaesthetic into the intrathecal space is deemed more reasonable to acquire maximal benefit throughout the period of blockade since crystalloid fluid still remains intravascularly during vasodilation due to sympathetic blockade. [15,16]

Conclusion

We concluded that the parturient undergoing elective cesarean section when preloaded with colloid fluids, revealed less hemodynamic changes in terms of SBP, DBP and MAP as compared to those who were not preloaded with colloid. In addition to that time interval when hypotension occurs after subarachnoid block was significantly longer in patients that were preloaded with colloid fluids.

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