Journal of Prevention, Diagnosis and Management of Human Diseases
Vol: 03, No. 02, June-Dec 2023
ISSN: 2799-1202, DOI: 10.55529/jpdmhd.32.17.25

Research Paper

The effect of fluid preloading on the incidence of hypotension during spinal anesthesia

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Article Info

Article History:
Received: 27 March 2023
Revised: 05 June 2025
Accepted: 13 June 2023
Published: 29 July 2023

Keywords:
Spinal Anaesthesia
Preload
Co-Loading
SBP and DBP
Elastic Stockings

ABSTRACT

Background: Small doses of local anaesthetic are injected into the CSF fluid in the subarachnoid region to produce spinal anaesthesia (SA). Aim: This paper was contributed to study the effect of fluid preloading on the incidence of hypotension during spinal anaesthesia. Patients and methods: This cross-sectional study recruited 45 patients in different hospitals in Iraq for a study that ranged from the 15th of June in the year 2021 to the 24th of August in the year 2022. This paper dealt with the study of the effect of fluid preload on the incidence of hypotension during spinal anaesthesia, as it included in the clinical characteristics' tests related to mothers or women who underwent caesarean delivery under spinal anaesthesia. This study divided the collected data into two groups, one of which was the patient group, which included patients who underwent spinal anaesthesia, which this group is considered as the co-loading group, which included 23 patients out of the total number of patients' data collected, while it was represented by the preload group, which included women who underwent spinal anaesthesia, which included 22 patients out of the total number of patients. This paper was conducting and analysing the collected data by SPSS. Discussion: The difference was that when their systolic blood pressure fell to 90 mm Hg, they began using a vasopressor heavily. The current finding found the Apgar score of the co-load who patients group (8.91) was found higher that preload who control group (8.95%) within 5 min in compare 1 min. In the present analysis, there was also a statistically significant variation between the co-load (81.4%) and pre-load (45.3%) groups in terms of the incidence of hypotension. The incidence of hypotension was statistically significantly different between the preload (80%) as well as co-load (51%) groups, according to research through (Oh AY et al., 2014). Both trials revealed that the co-load group's blood pressure dramatically

decreased. Conclusion: This study found that (45.3%) were within the preload group as a control group and (81.4%) in the co-load group as patients group had hypotension. Preloading was, therefore, more effective than co-loading in preventing spinal anesthesia-induced hypotension of cesarean section moms. It may not be essential to postpone surgery to provide a preload of liquids.

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1. INTRODUCTION

Small doses of local anesthetic are injected into the CSF fluid in the subarachnoid region to produce spinal anesthesia (SA). It is frequently utilized for surgeries on the sides of the abdomen, pelvis, perineum, and lower extremities; generally speaking, it is advantageous for operations below the umbilicus [1], [2]. SA offers numerous benefits, including being less costly, having less side effects for the respiratory system provided a high block is prevented, maintaining the integrity of the airway, which lowers the risk to aspiration, and offering great muscle relaxation in the lower abdomen and lower limb operations. The most popular method in elective caesarean sections is spinal anesthesia (SA). The most frequent side effect of this method is still hypotension [3], [4], [5], [6], [7].

As a result of the sympathetic blockade brought on by neuraxial anesthesia, SIH is the most frequent cardiovascular reaction to spinal anesthesia, leading to a reduction of cardiac output and blood supply to the placenta [8]. Lower Apgar scores may be linked to maternal hypotension that lasts longer than 2 minutes. It results from a decrease in systemic vascular resistance and an increase in venous capacitance. Because uterine blood flow depends on perfusion pressure, compromised fetal oxygenation results from diminished blood flow brought on by hypotension [9], [10]. With varied degrees of success, the practitioners have tried a variety of strategies and approaches to counteract these hypotensive effects of the spinal anesthetic, including leg wrapping, elastic stockings, positioning the patient optimally, intravenous fluids, and occasionally vasopressors [11], [12], [13].

One of the most effective ways to counteract the consequences of hypotension is to administer intravenous fluids as a preventative measure before doing the subarachnoid block. Both from the perspective of the mother and the fetus and newborn, hypotension following spinal anesthesia in caesarean birth is a common and severe consequence. Due to the sympathectomy brought on by spinal anesthesia, the venous capacitance increases, and the Systemic Vascular Resistance (SVR) decreases, which leads to secondary relative hypovolemia, which in turn results in hypotension. Patients who are having treatment witness it happen. It can cause the mother to experience nauseous, vomit, aspirate, dizziness, syncope, and arrhythmias. Fetal hypoxia and acidosis can result from maternal hypotension's additional disruption of the uteroplacental blood flow. The most serious risk of spinal anesthetic, which is often and widely used in obstetric surgical intervention, is hypotension. Both the mother as well as the fetus are at danger if this problem is not properly handled. There are debates about the best time to provide fluids. However, some research indicated that doing so can lower the incidence for spinal

hypotension [14], [15], [16], [17]. This paper was contributed to study the effect of fluid preloading on the incidence of hypotension during spinal anesthesia.

2. METHODOLOGY

This cross-sectional study recruited 45 patients in different hospitals in Iraq for a study that ranged from the 15th of June in the year 2021 to the 24th of August in the year 2022. This paper dealt with the study of the effect of fluid preload on the incidence of hypotension during spinal anaesthesia, as it included in the clinical characteristics' tests related to mothers or women who underwent caesarean delivery under spinal anaesthesia. This study divided the collected data into two groups, one of which was the patient group, which included patients who underwent spinal anaesthesia, which this group is considered as the co-loading group, which included 23 patients out of the total number of patients' data collected, while it was represented by the preload group, which included women who underwent spinal anaesthesia, which included 22 patients out of the total number of patients. This paper was conducting and analysing the collected data by SPSS. This paper was the distribution of patients who have spinal anaesthesia according to age in the range (26-40) years that can be seen in Table 1.

Moreover, this paper was also distributed of patients who have spinal anaesthesia according to BMI, in between <25.5 and >25.5, where these results can be found in

Table *2*. In addition, this paper was extended to examine the feature examinations of clinical characteristics in between patients and control groups which can include Baseline SBP, Baseline HR, Moderate hypotension, Severe hypotension, Onset of hypotension, and Duration of hypotension, where these results can be clearly in

Table *3*. To further of results, this paper was determined into measurements of blood pressure with comparisons between patients and control which include SBP and DBP, which has determined with (10,20,30,40,50,60) minutes which it has determined in

Figure 1.

Furthermore, this paper was investigated to Measure of pulse rate with comparisons between patients and control, and it is found in Table 4. The methodology was progressed within the Outcomes test of patients during and after surgery for patients which has detected into Amount of fluid, Blood loss, and Surgery time. These results have been shown in Figure 2. This study was Indicated results of hypotension detection during the time, which it is seen in Figure 3. This paper was assessed of patients' results in compare with control after surgery by Apgar score were determined with 1 min and 5 min, that it was determined in Figure 4.

3. RESULTS AND DISCUSSION

Table 1. Distribution of Patients Who Have Spinal Anaesthesia According to Age

N	**V**	**45**
	M	0
Me		33.0000
StEM		.65134
Med		33.0000
Mo		26.00[a]
SD		4.36931
Var		19.091
Ra		14.00
Min		26.00

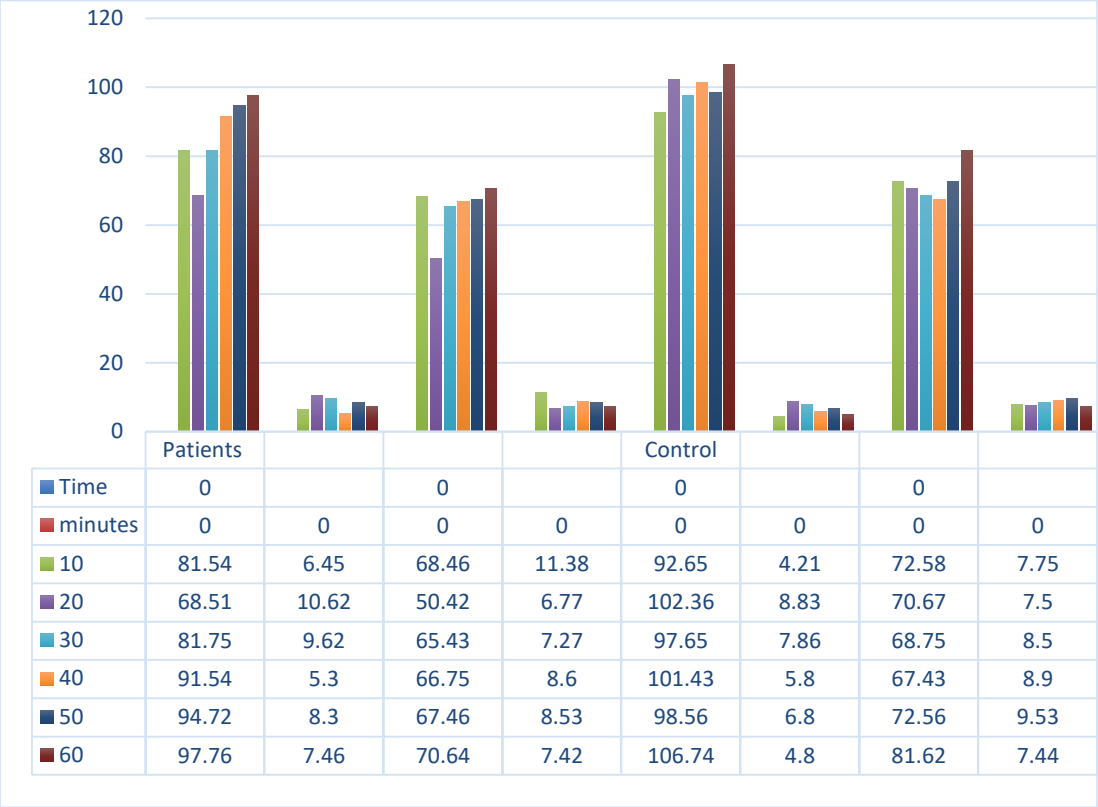
Max	40.00
S	1485.00

Table 2. Distribution of Patients Who Have Spinal Anaesthesia According to BMI

		Freq,45	P (%)	VP (%)	CP (%)
V	<25.5	19	42.2	42.2	42.2
	>25.5	26	57.8	57.8	100.0
	T	45	100.0	100.0	

Table 3. Feature Examinations of Clinical Characteristics in Between Patients and Control Groups

Variables	Patients Group (N=23)	Control Group (N=22)	P-Value
Baseline SBP, mmHg	122.82±8.6	126.52±9.92	0.04662
Baseline HR beats.min^{-1}	96.44±8.9	98.24±8.1	0.0472
Moderate hypotension, n (%)	14 (60.87%)	18 (81.81%)	0.0342
Severe hypotension, n (%)	9 (39.1%)	4 (18.18%)	0.0261
Onset of hypotension, min	6.41±5.21	7.53±6.36	0.04756
Duration of hypotension, min	3.6±1.82	3.1±1.57	0.0422



	Patients				Control			
Time	0		0		0		0	
minutes	0	0	0	0	0	0	0	0
10	81.54	6.45	68.46	11.38	92.65	4.21	72.58	7.75
20	68.51	10.62	50.42	6.77	102.36	8.83	70.67	7.5
30	81.75	9.62	65.43	7.27	97.65	7.86	68.75	8.5
40	91.54	5.3	66.75	8.6	101.43	5.8	67.43	8.9
50	94.72	8.3	67.46	8.53	98.56	6.8	72.56	9.53
60	97.76	7.46	70.64	7.42	106.74	4.8	81.62	7.44

Figure 1. Measurements of Blood Pressure with Comparisons Between Patients and Control

Table 4. Measure of Pulse Rate with Comparisons Between Patients and Control

Measure of Pulse Rate	Patients Group (N=23)	Control Group (N=22)	P-Value
10 minutes	81.44±7.8	84.28±9.6	0.0485
20 minutes	82.36±6.8	83.74±10.56	0.0486
30 minutes	82.63±5.8	85.87±9.3	0.0477

40 minutes	81.77±8.26	90.11±2.4	0.0488
50 minutes	86.65±5.51	87.26±6.75	0.04866
60 minutes	85.85±7.6	86.38±8.57	0.04799

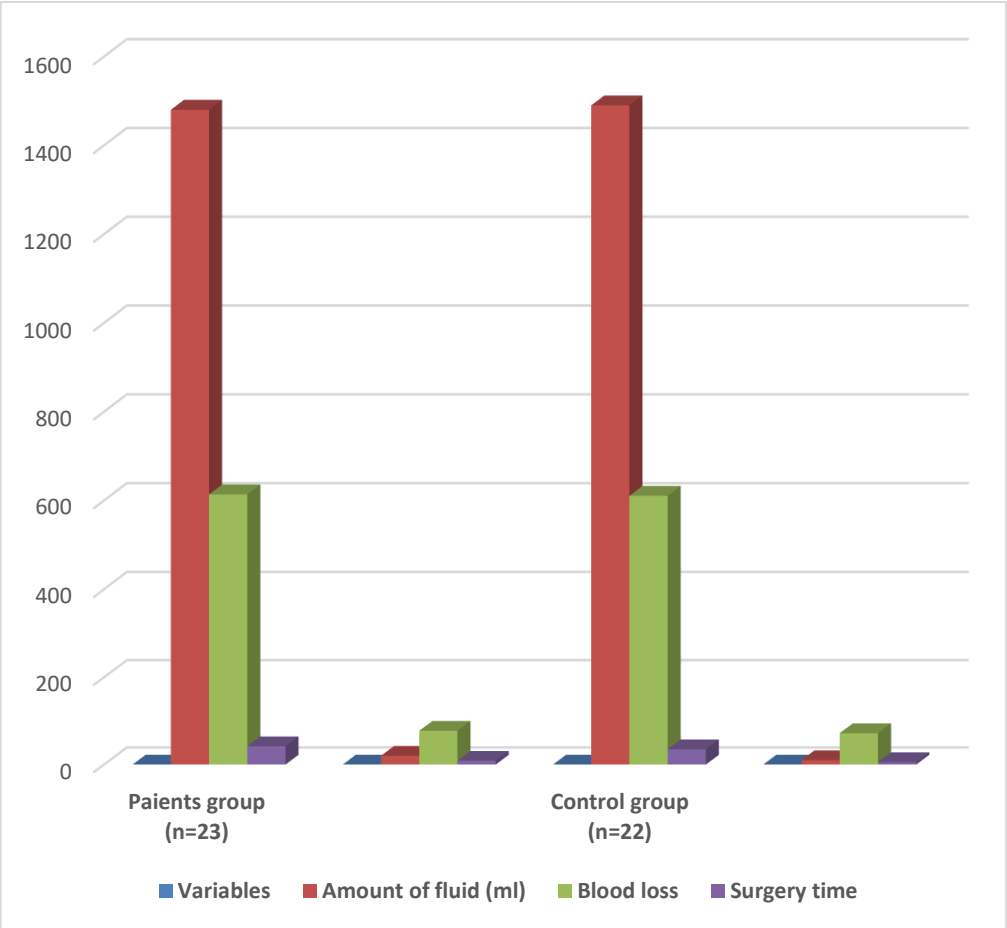


Figure 2. Outcomes Test of Patients During and After Surgery for Patients

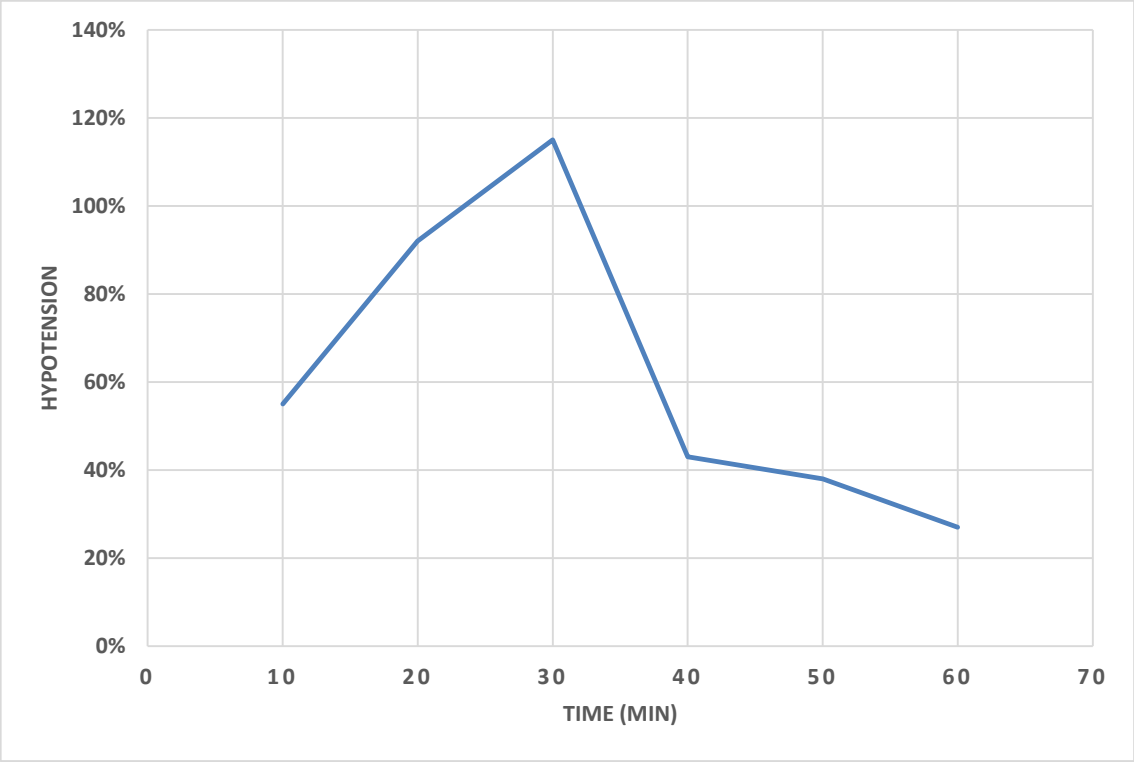


Figure 3. Indicated Results of Hypotension Detection During the Time.

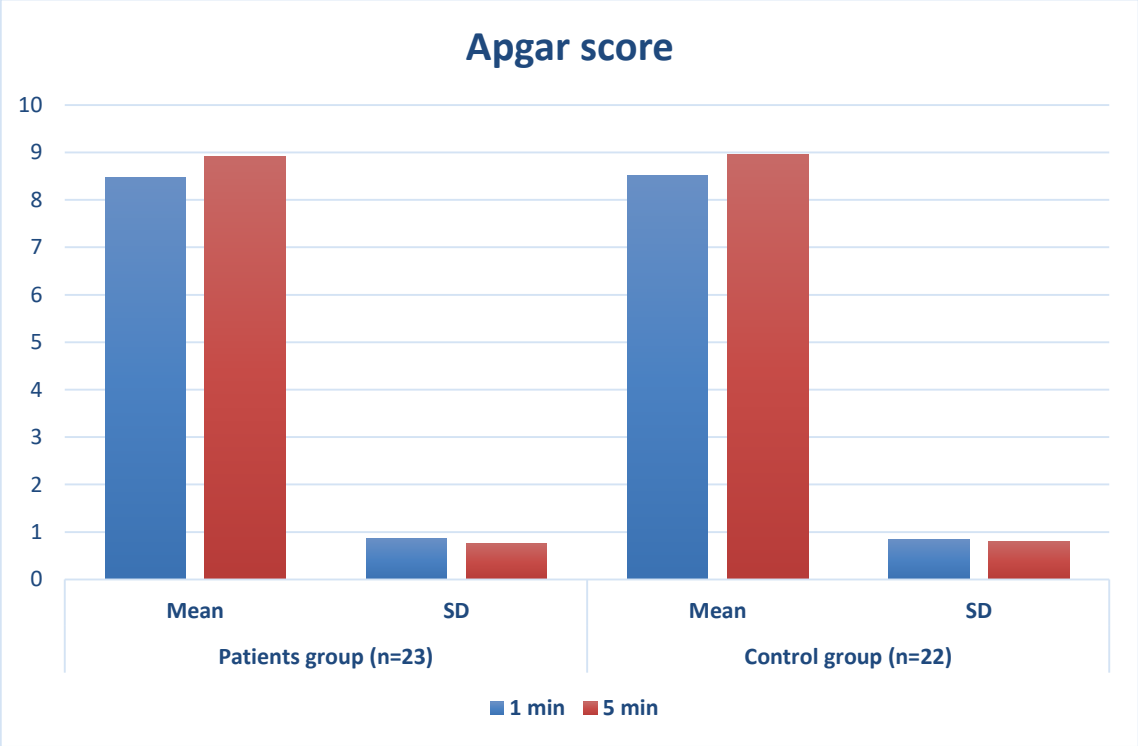


Figure 4. Assessments of Patients Results in Compare With Control After Surgery by Apgar Score.

Discussion

In 16% to 33% of cases, spinal anesthesia causes hypotension as a side effect. Decreases in Systemic Vascular Resistance (SVR), Cardiac Output (CO), or both are suggested to be the culprits. When pregnant women lie supine, the aortocaval compression in the gravid uterus exacerbates this reaction (Farid Z et al., 2016) [18]. With varied degrees of effectiveness, a variety of approaches and procedures have been utilized to counteract the hypotensive effects of the spinal anesthetic, including leg wrapping,

elastic stockings, positioning the patient optimally, intravenous fluids, and even vasopressors (Bajwa SJS et al., 2013). [19] To counteract the consequences of hypotension, prophylactic intravenous fluid delivery is one of the most important techniques (Bajwa SJS et al., 2013) [20]. Fluid preloading has been proven to be a routine, well-planned strategy of lowering the risk of hypotension after caesarean sections performed under regional anesthesia (Varshney RK and Kapoor K, 2016). [21] Despite multiple studies comparing the effects of preload and co-load on spinal-induced hypotension, neither method is regarded as the most efficient or secure, leaving room for more research.

In the present analysis, there was also a statistically significant variation between the co-load (81.4%) and pre-load (45.3%) groups in terms of the incidence of hypotension. The incidence of hypotension was statistically significantly different between the preload (80%) as well as co-load (51%) groups, according to research through (Oh AY et al., 2014). Both trials revealed that the co-load group's blood pressure dramatically decreased. [22] In contrast to this result, research through Banerjee et al. found no statistically significant difference between the co-loading and preloading groups in the incidence of hypotension. This can be because of various study areas. In contrast to the findings of this investigation, a study conducted by Farid Z et al. found that there was not a statistically significant difference for the incidence of hypotension following spinal anesthesia in the preload and co-load groups. They concluded that neither of the two methods can successfully stop spinal-induced hypotension. The difference was that when their systolic blood pressure fell to 90 mm Hg, they began using a vasopressor heavily. The current finding found the Apgar score of the co-load who patients group (8.91) was found higher that preload who control group (8.95%) within 5 min in compare 1 min.

4. CONCLUSION

This study found that (45.3%) were within the preload group as a control group and (81.4%) in the co-load group as patients group had hypotension. Preloading was, therefore, more effective than co-loading in preventing spinal anesthesia-induced hypotension of caesarean section moms. It may not be essential to postpone surgery to provide a preload of liquids.

Acknowledgments

The authors have no specific acknowledgments to make for this research.

Funding Information

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Dr. Emad Sabri Najm	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	
Dr. Anwar Ahmed Fadhil		✓	✓		✓	✓		✓	✓			✓		✓
Dr. Raghad Mohamed Shibli Younis	✓			✓		✓			✓		✓			✓

C: **C**onceptualization
M: **M**ethodology
So: **So**ftware
Va: **Va**lidation
Fo: **Fo**rmal analysis
I: **I**nvestigation
R: **R**esources
D: **D**ata Curation
O: Writing- **O**riginal Draft
E: Writing- Review& **E**diting
Vi: **Vi**sualization
Su: **Su**pervision
P: **P**roject administration
Fu: **Fu**nding acquisition

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

Ethical Approval

The study was conducted in compliance with the ethical principles outlined in the Declaration of Helsinki and approved by the relevant institutional authorities.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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How to Cite: Dr. Emad Sabri Najm, Dr. Anwar Ahmed Fadhil, Dr. Raghad Mohamed Shibli Younis. (2023). The effect of fluid preloading on the incidence of hypotension during spinal anesthesia. Journal of Prevention, Diagnosis and Management of Human Diseases (JPDMHD), 3(2), 17-25. https://doi.org/10.55529/jpdmhd.32.17.25

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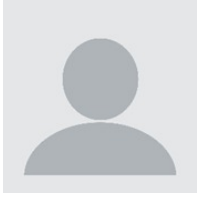	**Dr. Anwar Ahmed Fadhil,** is a consultant anesthesiologist at the Ministry of Health, Salahdin Health Directorate, Dhuluiya General Hospital, Salahdin, Iraq. With a strong background in anesthesia and intensive care, Dr. Fadhil has been actively engaged in clinical practice and research focusing on optimizing anesthetic management for surgical patients. His professional expertise includes spinal and regional anesthesia, management of

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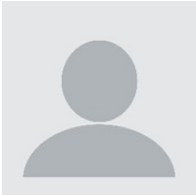	**Dr. Raghad Mohamed Shibli Younis,** serves as a specialist in Anesthesia and Intensive Care at the Ministry of Health, Al-Russafa Health Directorate, Fatima Al-Zahraa Teaching Hospital for Women and Children, Baghdad, Iraq. Her clinical practice centers on providing safe anesthesia care in obstetric and pediatric cases. She has a particular interest in maternal anesthesia, neonatal outcomes, and strategies to reduce anesthesia-related complications during cesarean sections. Dr. Younis continues to contribute to academic and clinical research in the field of anesthesia and critical care medicine. Email: raghadmedo@yahoo.com