

# Determination of Spinal Anesthesia Induced Hypotension in Cesarean Section

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## Abstract

**Background:** Spinal anesthesia is the global standard method of anesthesia for cesarean section. The present study was conducted to determine spinal anesthesia induced hypotension in cesarean section in study group. **Subjects and Methods:** The present study was conducted in the department of Anesthesia. It comprised of 68 pregnant women in age range 18-30 years. In all patients, ASA grade, gravidity, history of previous cesarean section and hypotension was recorded. **Results:** Age group 18-22 years had 32 patients, 23-27 years had 22 and 27-30 years had 14 patients. The difference was significant ( $P < 0.05$ ). ASA grade I was seen in 48 patients and II in 20 patients. Gravidity 1 was seen in 24, 2 in 16, 3 in 15 and 4 in 13. 46 had 1 previous cesarean section and 22 had 2. The difference was significant ( $P < 0.05$ ). Mild hypotension was present in 2, moderate in 3 and severe in 6. The difference was significant ( $P < 0.05$ ). **Conclusion:** Authors found that hypotension is frequently seen in cesarean section. In this study, 11 patients exhibited spinal anesthesia induced hypotension.

**Keywords:** Hypotension, Spinal anesthesia, Pregnant.

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**Received:** July 2019

**Accepted:** July 2019

## Introduction

Spinal anesthesia (SA) is the global standard method of anesthesia for cesarean section. However, SA induces maternal hypotension caused by aortocaval compression from the gravid uterus and sympathetic blockade which results in decreased arteriolar tone. Spinal anaesthesia can be associated with a number of problems, including hypotension and its sequelae.<sup>[1]</sup> Hypotension causes problems for the mother and fetus, including nausea, vomiting, dizziness and fetal acidemia. Therefore, prediction and prevention of maternal hypotension are potentially important. Previous reports have assessed the prediction of maternal hypotension during cesarean section under SA; methods have included heart rate variability (HRV), pleth variability, index (PVI) and cerebral oxygen saturation (ScO<sub>2</sub>). Furthermore, maternal hypotension may be predicted by a postural change-induced increase in heart rate (HR) or comparison with pre-anesthetic HR.<sup>[2]</sup>

Regional or general anaesthesia (GA) are both acceptable for caesarean delivery, use of GA has decreased dramatically in the past few decades due to a higher risk of anaesthesia related maternal mortality. As a consequence, spinal anaesthesia (SA) is now the technique of choice for CS. Although SA is generally well tolerated, it is still associated with considerable side effects, the most common of which is maternal hypotension, potentially endangering both mother

and child.<sup>[3]</sup>

The year 2002 marked the centenary of the first successful use of spinal anaesthesia for caesarean section by Hopkins who used it for a patient with placenta praevia. It is noteworthy that the technique was almost abandoned in its infancy because of problems associated with severe hypotension, which were exacerbated by the availability of only rudimentary monitoring and lack of awareness of the effects of vasodilatation and aortocaval compression.<sup>[4]</sup> The present study was conducted to determine spinal anesthesia induced hypotension in cesarean section in study group.

## Subjects and Methods

The present study was conducted in the department of Anesthesia. It comprised of 68 pregnant women in age range 18-30 years with American Society of Anaesthesiologists' (ASA) physical status grade I or II who were scheduled to undergo elective cesarean section.

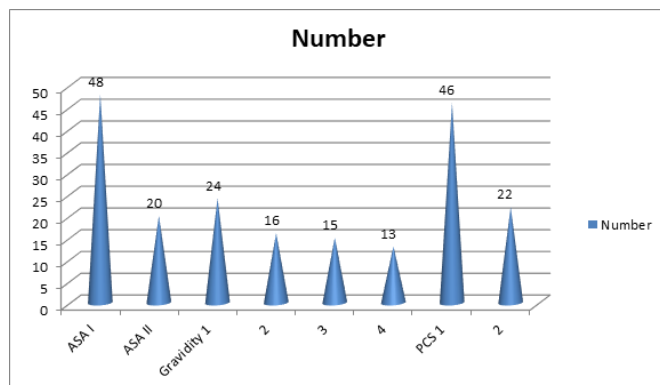
Patient information such name, age etc. was recorded. In all patients, ASA grade, gravidity and history of previous cesarean section was recorded. Mild hypotension was defined as a drop of  $\geq 10\%$  and  $\leq 20\%$  in baseline SBP, moderate hypotension defined as a drop of  $> 20\%$  and  $\leq 30\%$  in baseline SBP and severe hypotension defined as a drop of  $> 30\%$  in baseline SBP. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

## Results

**Table 1: Age wise distribution of patients**

Age group (Years)	Number	P value
18-22	32	0.01
23-27	22	
28-30	14	

[Table 1] shows that age group 18-22 years had 32 patients, 23-27 years had 22 and 27-30 years had 14 patients. The difference was significant ( $P < 0.05$ ).



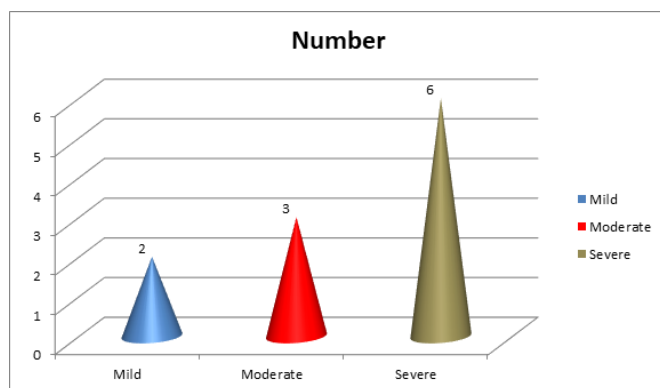
**Figure 1: Assessment of parameters**

[Figure 1] shows that ASA grade I was seen in 48 patients and II in 20 patients. Gravidity 1 was seen in 24, 2 in 16, 3 in 15 and 4 in 13. 46 had 1 previous cesarean section and 22 had 2. The difference was significant ( $P < 0.05$ ).

**Table 2: Prevalence of hypotension**

Hypotension	Number	P value
Mild	2	0.01
Moderate	3	
Severe	6	

[Table 2 & Figure 1] shows that mild hypotension was present in 2, moderate in 3 and severe in 6. The difference was significant ( $P < 0.05$ ).



**Figure 2: Prevalence of hypotension**

## Discussion

Spinal hypotension is common in women who receive spinal anaesthesia for Caesarean section, with an incidence of up to 71%. Spinal hypotension can occur precipitously and, if

severe, can result in important perinatal adverse outcomes, such as maternal nausea and vomiting, fetal acidosis and may be an important contributory factor for maternal death related to regional anaesthesia. Mothers with pre-delivery hypovolaemia may be at risk of cardiovascular collapse because the sympathetic blockade may severely decrease venous return. As a consequence, prevention of spinal hypotension has been a key research area within the field of obstetric anaesthesia.<sup>[5]</sup> The present study was conducted to determine spinal anaesthesia induced hypotension in cesarean section in study group.

In present study, age group 18-22 years had 32 patients, 23-27 years had 22 and 27-30 years had 14 patients. We found that ASA grade I was seen in 48 patients and II in 20 patients. Gravidity 1 was seen in 24, 2 in 16, 3 in 15 and 4 in 13. 46 had 1 previous cesarean section and 22 had 2. Mitra et al.<sup>[6]</sup> revealed that the incidence of mild, moderate and severe hypotension was 20%, 35% and 40%, respectively. Eventually, ten risk factors were found to be associated with hypotension, including age  $>35$  years, body mass index  $\geq 25$  kg/m<sup>2</sup>, 11–20 kg weight gain, gravidity  $\geq 4$ , history of hypotension, baseline systolic blood pressure (SBP)  $<120$  mmHg and baseline heart rate  $>100$  beats/min in maternal modeling, fluid preloading  $\geq 1000$  ml, adding sufentanil to bupivacaine and sensory block height  $>T4$  in anaesthesia related modeling.

We found that hypotension was observed in 11 patients. We found that mild hypotension was present in 2, moderate in 3 and severe in.<sup>[6]</sup> Spinal anaesthesia is produced by the injection of local anaesthetic, often together with an opioid adjunct, into the subarachnoid space, with the objective of blocking conduction in afferent sensory fibres that transmit pain impulses to the brain. There is also an increase in sympathetic versus parasympathetic activity which predisposes to a greater degree of peripheral vasodilation.<sup>[7]</sup> Epidural blockade produces a similar extent of sympathectomy, but there is a lower incidence and severity of hypotension since the rate of onset of sympathectomy is slower, allowing more time for cardiovascular compensation.<sup>[8]</sup>

The main cause of maternal hypotension during SA for cesarean section is peripheral vasodilation, and it has been reported that the degree of decrease of BP and systemic vascular resistance depend on the dose of local anaesthetic. Identification of patients at risk of hypotension is important for anaesthesia management and maternal and fetal safety.<sup>[9]</sup> Prophylaxis of maternal hypotension has been investigated in numerous studies. Various fluid protocols have reduced but not prevented hypotension, hence the importance of early administration of vasopressors.

Some predictive factors of maternal hypotension during cesarean section under SA have been reported previously: increase in HR by  $>10$  beats/min, leg flexion or complaint of dysphoria following postural change from left lateral to supine position, high PVI before anaesthesia, decrease of ScO<sub>2</sub> under SA and pre-anaesthesia HR  $<71$  or  $>89$  beats/min.<sup>[10,11]</sup>

Spinal anaesthesia is produced by the injection of local anaesthetic, often together with an opioid adjunct, into the subarachnoid space, with the objective of blocking conduction in afferent sensory fibres that transmit pain

impulses to the brain.<sup>[12]</sup> However, conduction block from local anaesthetics non-specific and preganglionic fibres to the sympathetic chain are also affected, resulting in sympathetic block and hypotension which can cause hypoperfusion of the uterus and placenta.<sup>[13]</sup>

In pregnant women, greater sensitivity to local anaesthetics results in higher blocks, and compounded by the effects of aortocaval compression, hypotension occurs with greater frequency and severity.<sup>[14]</sup> Chinachoti et al,<sup>[15]</sup> suggested that Previously, maternal hypotension and fetal outcome were thought to be improved by avoiding aortocaval compression (left uterine displacement) and increasing the blood volume, such as by intravenous fluid loading to increase the venous return, cardiac filling pressure, and cardiac output (CO). These techniques, however, have proven ineffective, and use of vasopressors is the most reliable method for countering the hypotension induced by spinal anesthesia.

Vasopressor drugs act on  $\alpha$ 1-,  $\beta$ 1- and  $\beta$ 2-adrenoreceptors in the heart and vascular system. The physiological response of these adrenoreceptor agonists depends on the type and location of the receptors.<sup>[16]</sup> Vasoconstriction is mainly mediated by  $\alpha$ 1-receptors. However, some vasopressors can also stimulate  $\beta$ 1- and/or  $\beta$ 2-receptors directly or indirectly, leading to positive inotropic (increasing cardiac contractility) and/or positive chronotropic (increasing heart rate, HR) effects. The complex hemodynamic effects of the various vasoconstrictors depend on the relative stimulation of these adrenoreceptors.<sup>[17]</sup> Reflex cardiovascular responses to vasopressors, on the other hand, may result in other changes, including the unwanted reflex bradycardia.

The limitation of the study is small sample size. Inclusion of large sample could show different results. Large scale studies are required to substantiate the results.

## Conclusion

Authors found that hypotension is frequently seen in cesarean section. In this study, 11 patients exhibited spinal anesthesia induced hypotension.

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**How to cite this article:** Gupta SK, Singhal S. Determination of Spinal Anesthesia Induced Hypotension in Cesarean Section. *Acad. Anesthesiol. Int.* 2019;4(2):71-73.

DOI: [dx.doi.org/10.21276/aan.2019.4.2.19](https://doi.org/10.21276/aan.2019.4.2.19)

**Source of Support:** Nil, **Conflict of Interest:** None declared.