

## Efficacy of Spinal Anesthesia in Elective Cesarean Section: A Clinical Study

Dr. Md. Mahbubul Alam Sarker<sup>1\*</sup>, Dr. Mehedi Masud<sup>2</sup>, Dr. Md. Shahadat Hossain<sup>3</sup>,  
Dr. Rahnuma Tasnim<sup>4</sup>, Dr. Shamim Ara Sultana<sup>5</sup>, Dr. Taj Uddin Ahmed<sup>6</sup>,  
Dr. Md. Mustafa Kamal<sup>7</sup>

<sup>1,2,3,4,5,6</sup>Assistant Professor, Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.

<sup>7</sup>Professor, Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.

Received: 02 January 2025

Accepted: 16 January 2025

Published: 20 January 2025

**\*Corresponding Author:** Dr. Md. Mahbubul Alam Sarker, Assistant Professor, Department of Anaesthesia, Analgesia and Intensive Care Medicine, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.

### Abstract

**Background:** Cesarean section is one of the most frequently performed surgical procedures in obstetrics, presenting unique challenges in anesthesia management due to pregnancy-induced physiological changes. This study aims to evaluate the efficacy of spinal anesthesia in elective cesarean sections, addressing its advantages and associated hemodynamic challenges.

**Aim of the study:** The aim of this study was to assess the efficacy of spinal anesthesia in elective cesarean section.

**Methods:** This retrospective study, conducted at Bangabandhu Sheikh Mujib Medical University's Department of Anaesthesia, Analgesia and Intensive Care Medicine from July 2022 to June 2023, included 64 women undergoing elective cesarean sections with spinal anesthesia. Preoperative and intraoperative assessments were standardized. Maternal satisfaction, postoperative pain, and neonatal outcomes were analyzed using SPSS version 22.0.

**Results:** The study included 64 participants with a mean age of  $32.69 \pm 5.99$  years. Hypotension was observed in 37.5% of cases, and 46.9% had a duration of anesthesia exceeding 100 minutes. Maternal satisfaction was fairly high, with 50% fairly satisfied, 29.7% highly satisfied, and 20.3% not satisfied. In terms of VAS pain scores, 68.8% of participants experienced mild pain (VAS  $\leq 3$ ), 25.0% reported moderate pain (VAS 4-7), and 6.2% experienced severe pain (VAS  $\geq 8$ ). Neonatal outcomes were favorable, with 96.9% having an Apgar score  $>7$  at 5 minutes, although 7.8% required NICU admission. Postoperative complications included nausea in 23.4%, vomiting in 29.7%, and shivering in 46.9% of participants.

**Conclusion:** Spinal anesthesia is effective for elective cesarean sections, providing high maternal satisfaction and favorable neonatal outcomes.

**Keywords:** Spinal Anesthesia, Elective Cesarean Section, Efficacy, Hemodynamic Challenges, Maternal Outcomes.

### 1. INTRODUCTION

Cesarean section is one of the most frequently performed surgical procedures in obstetrics, presenting unique challenges in anesthesia management due to pregnancy-induced physiological changes. These changes, particularly in the cardiovascular and respiratory systems, heighten the complexity of ensuring maternal and fetal safety during surgery.

Anesthetic management for cesarean sections demands a dual focus—providing effective anesthesia for the mother while maintaining optimal conditions for the unborn child.<sup>1,2,3,4</sup> Each anesthetic technique, whether regional or general, entails specific maternal and fetal risks.

In elective cesarean sections, the choice of anesthesia offers an ideal opportunity to compare the effectiveness, safety, and outcomes of various

approaches, providing valuable insights to optimize clinical practices.

Among the available anesthetic techniques, spinal anesthesia has emerged as the preferred choice for most cesarean sections due to its simplicity, cost-effectiveness, and rapid onset.<sup>5,6,7</sup> This technique provides a quick, profound, and symmetrical sensory and motor block using relatively low doses of local anesthetics, ensuring reliable surgical anesthesia.<sup>8</sup> Hyperbaric bupivacaine is the most commonly employed agent for spinal anesthesia, particularly in elective cesarean sections, as it offers excellent analgesia and muscle relaxation. However, spinal anesthesia is not without risks. Hemodynamic instability, including hypotension and bradycardia, is a well-known complication, necessitating vigilant monitoring and prompt intervention to mitigate potential adverse effects on both the mother and fetus.<sup>8</sup>

Adjuvants such as fentanyl have been extensively studied to enhance the effects of spinal anesthesia. Doses ranging from 2.5 to 50 µg have been utilized in cesarean sections, with 25 µg being the most commonly used dose.<sup>9,10,11</sup> While effective, no definitive dose-effect relationship has been established, and higher doses are associated with adverse effects such as opioid-induced hyperalgesia and tolerance.<sup>6</sup> A major maternal adverse effect of spinal anesthesia is hypotension, which, if untreated, can lead to serious fetal complications. Prophylactic administration of intravenous 5-HT<sub>3</sub> antagonists, such as ondansetron, has shown promise in mitigating hypotension and reducing vasopressor requirements, thereby potentially improving both maternal and fetal outcomes.<sup>12</sup> Despite its rapid onset and reduced risk of aspiration, spinal anesthesia has limitations, including the inability to reinforce the block and the risk of hypotension, which necessitates careful perioperative management.<sup>13</sup>

This study aims to evaluate the efficacy of spinal anesthesia in elective cesarean sections, addressing both its advantages and associated hemodynamic challenges. While prior research has highlighted benefits such as simplicity and affordability compared to epidural techniques, a comprehensive evaluation of its safety and effectiveness in clinical practice remains essential. By focusing on maternal and fetal outcomes, this research seeks to provide valuable

insights into optimizing the use of spinal anesthesia for elective cesarean sections.

## 2. OBJECTIVE

- The aim of this study was to assess the efficacy of spinal anesthesia in elective cesarean section.

## 3. METHODOLOGY & MATERIALS

This retrospective study was conducted in the Department of Anaesthesia, Analgesia and Intensive Care Medicine at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2022 to June 2023. A total of 64 patients undergoing elective cesarean section under spinal anesthesia were included in the study.

### Inclusion Criteria

- Women aged 18 years and older.
- Patients scheduled for elective cesarean section.
- Individuals classified as ASA I or ASA II.
- Patients who provided written informed consent for participation in the study.

### Exclusion Criteria

- Patients with contraindications to spinal anesthesia.
- Those undergoing emergency cesarean section.
- Individuals with pre-existing cardiovascular, neurological, or coagulation disorders.
- Patients with incomplete medical records or who declined to participate in follow-up evaluations.

Written informed consent was obtained from all participants to ensure confidentiality and voluntary participation. Preoperative assessments included a thorough medical history, physical examination, and baseline vital parameters. Spinal anesthesia was administered in a standardized manner using 0.5% hyperbaric bupivacaine, with patient positioning and drug administration following departmental protocols. Intraoperative monitoring involved continuous assessment of heart rate, blood pressure, and oxygen saturation. Maternal satisfaction and postoperative pain were assessed using a Visual Analog Scale (VAS), while neonatal outcomes were measured through Apgar scores at 1 and 5 minutes and the need for NICU admission. Postoperative complications, including nausea, vomiting, and shivering, were documented and

managed according to standard guidelines. Follow-up evaluations assessed maternal and neonatal outcomes, patient satisfaction, and recovery status. Data were compiled and analyzed using SPSS version 22.0, employing

descriptive statistics, including frequencies and percentages, to summarize demographic characteristics, clinical outcomes, and complications.

4. RESULTS

Table 1. Demographic Characteristics of the Study Participants (n=64)

Variable	Frequency (n)	Percentage (%)	
Age (In years)	21-30	23	35.9
	31-40	36	56.3
	41-50	5	7.8
	Mean±SD (years)	32.69±5.99	
BMI (kg/m <sup>2</sup> )	32.15±5.17		

Gestational age (weeks)		37.0 ± 1.4	
Gravida	Primigravida	30	46.9
	Multigravida	34	53.1
ASA Physical Status	ASA I	52	81.3
	ASA II	12	18.7

Table 1 presents the demographic profile of the study participants. The mean age of the participants was 32.69 ± 5.99 years. Among the 64 participants, 23 (35.9%) were aged 21–30 years, 36 (56.3%) were aged 31–40 years, and 5 (7.8%) were aged 41–50 years. Regarding gravida status, 30 (46.9%) participants were

primigravida, while 34 (53.1%) were multigravida. In terms of ASA physical status, 52 (81.3%) participants were classified as ASA I, and 12 (18.7%) were classified as ASA II. The mean BMI of the participants was 32.15 ± 5.17 kg/m<sup>2</sup>, and the mean gestational age was 37.0 ± 1.4 weeks.

Table 2. Intraoperative Outcomes of the Study Participants (n=64)

Variable	Frequency (n)	Percentage (%)
Hypotension (SBP < 90 mmHg)	24	37.5
Heart Rate Decrease/Bradycardia	19	29.7
Duration of Anesthesia > 100 min	30	46.9

Table 2 presents the intraoperative outcomes of the study participants. Among the 64 participants, 24 (37.5%) experienced hypotension with systolic blood pressure (SBP) dropping below 90

mmHg. A decrease in heart rate was observed in 19 (29.7%) participants. Additionally, the duration of anesthesia exceeded 100 minutes in 30 (46.9%) cases.

Table 3. Maternal and Neonatal Outcomes of the Study Participants (n=64)

Variable	Frequency (n)	Percentage (%)	
Maternal Satisfaction	Highly satisfied	19	29.7
	Fairly satisfied	32	50.0
	Not satisfied	13	20.3
VAS Pain Score	Mild Pain (≤ 3)	44	68.8
	Moderate Pain (4-7)	16	25.0
	Severe Pain (≥ 8)	4	6.2
Apgar Score >7	1 min	44	68.8
	5 min	62	96.9
NICU Admission	Yes	5	7.8
	No	59	92.2

Table 3 presents the maternal and neonatal outcomes of the study participants. Regarding

maternal satisfaction, 50% of the participants were fairly satisfied with the procedure, while

29.7% were highly satisfied and 20.3% were not satisfied. In terms of VAS pain scores, the majority of participants (68.8%) experienced mild pain (VAS  $\leq$  3), while 25.0% reported moderate pain (VAS 4-7), and 6.2% experienced severe pain (VAS  $\geq$  8). For the Apgar score,

68.8% of infants had a score  $>7$  at 1 minute, with a substantial increase to 96.9% at 5 minutes. As for NICU admission, 7.8% of infants were admitted to the NICU, while 92.2% did not require admission.

**Table 4.** Postoperative Complications of Study Participants (n=64)

Complication	Frequency (n)	Percentage (%)
Nausea	15	23.4
Vomiting	19	29.7
Shivering	30	46.9

Table 4 presents the postoperative complications observed in the study participants. Among the 64 participants, 15 (23.4%) experienced nausea, 19 (29.7%) had vomiting, and 30 (46.9%) experienced shivering.

### 5. DISCUSSION

This study, conducted at the Department of Anaesthesia, Analgesia and Intensive Care Medicine at Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, highlights the maternal and neonatal outcomes, as well as the intraoperative and postoperative complications associated with spinal anesthesia in elective cesarean sections. The results underscore the challenges of maintaining hemodynamic stability, with hypotension and heart rate decreases being common intraoperative occurrences. Additionally, the high incidence of postoperative complications such as shivering, nausea, and vomiting points to the need for effective management strategies to improve recovery. While most neonates had favorable Apgar scores, the necessity for NICU admissions in some cases indicates the importance of close monitoring to ensure optimal maternal and neonatal health outcomes.

In our study, the mean age of participants was  $32.69 \pm 5.99$  years, which aligns with findings by Mohanta et al. The majority of participants were aged 31–40 years (56.3%), consistent with our results. The mean BMI of  $32.15 \pm 5.17$  kg/m<sup>2</sup> reflects the elevated values noted by Ferrarezi et al.<sup>14</sup>, highlighting perioperative considerations for patients with higher BMI. The mean gestational age of  $37.0 \pm 1.4$  weeks corresponds with observations by Qublan et al.<sup>15</sup>, supporting the trend of cesarean sections performed near term. Regarding gravida status, 46.9% were primigravida and 53.1% multigravida, similar to findings by Islam et al.<sup>16</sup> Furthermore, ASA classification revealed 81.3% ASA I and 18.7%

ASA II, which reflects a predominantly healthy cohort, aligning with the findings of Islam et al.<sup>17</sup> These demographic trends reinforce the consistency observed in elective cesarean section populations, providing a solid context for evaluating spinal anesthesia efficacy.

In our study, 37.5% of participants experienced hypotension (SBP  $< 90$  mmHg), which is consistent with the findings by Fan et al.<sup>18</sup>, who reported a similar incidence of intraoperative hypotension during spinal anesthesia. Heart rate decreases were observed in 29.7% of cases, reinforcing the common hemodynamic changes associated with this technique. Additionally, the duration of anesthesia exceeded 100 minutes in 46.9% of participants, aligning with extended anesthesia times reported by Rosa et al.<sup>19</sup>, emphasizing the need for vigilant intraoperative monitoring during prolonged procedures.

Maternal satisfaction in our study showed variation, with 50% of participants being fairly satisfied, 29.7% highly satisfied, and 20.3% not satisfied. These findings align with those reported by Mohanta et al.<sup>14</sup>, who also examined satisfaction with spinal anesthesia in cesarean sections. Regarding pain, 68.8% of participants experienced mild pain (VAS  $\leq$  3), while 25.0% reported moderate pain (VAS 4-7), and 6.2% experienced severe pain (VAS  $\geq$  8). This distribution differs from the findings of Morgan et al.<sup>20</sup>, who noted a higher prevalence of severe pain. Neonatal outcomes were generally favorable, with 68.8% of infants having an Apgar score  $>7$  at 1 minute, improving to 96.9% at 5 minutes, which is similar to the results observed by Qublan et al.<sup>16</sup> This indicates good neonatal recovery. Additionally, 7.8% of infants required NICU admission, aligning with findings from Jan et al.<sup>21</sup> regarding the necessity for neonatal care following cesarean sections. These results



highlight the complex nature of maternal and neonatal outcomes in cesarean sections under spinal anesthesia.

Postoperative complications were observed in a subset of participants, with 23.4% experiencing nausea, 29.7% experiencing vomiting, and 46.9% experiencing shivering. These findings align with those of Islam et al.<sup>17</sup>, who also reported similar rates of postoperative nausea, vomiting, and shivering following spinal anesthesia in cesarean sections. The prevalence of shivering in our study matches typical findings in the literature, underscoring the importance of managing these common postoperative effects. The relatively high incidence of these complications suggests a need for proactive measures to alleviate discomfort and enhance the overall recovery experience for patients undergoing spinal anesthesia for elective cesarean sections.

### 6. LIMITATIONS OF THE STUDY

This study had some limitations:

- The study was conducted in a selected tertiary-level hospital.
- The sample was not randomly selected.
- The study's limited geographic scope may introduce sample bias, potentially affecting the broader applicability of the findings.

### 7. CONCLUSION

This study evaluated the efficacy of spinal anesthesia in elective cesarean sections. Participants had a mean age of 32.69 years, with a slight majority being multigravida. The administration of spinal anesthesia was effective, although some experienced hypotension and extended anesthesia duration. Maternal satisfaction was generally high. Neonatal outcomes were favorable, with most infants achieving high Apgar scores shortly after birth. However, a few infants required NICU admission. Postoperative complications included nausea, vomiting, and shivering, highlighting the need for careful monitoring. Overall, spinal anesthesia proved to be an effective anesthetic technique with manageable complications.

### REFERENCES

- [1] Kinsella MS, Lohmann G. Supine hypotensive syndrome. *Obstetrics & Gynecology*. 1994 May 1;83(5):774-88.
- [2] James AH. Pregnancy and thrombotic risk. *Critical care medicine*. 2010 Feb 1;38:S57-63.
- [3] James AH, Jamison MG, Brancazio LR, Myers ER. Venous thromboembolism during

- pregnancy and the postpartum period: incidence, risk factors, and mortality. *American journal of obstetrics and gynecology*. 2006 May 1;194(5):1311-5.
- [4] Munnur U, de Boisblanc B, Suresh MS. Airway problems in pregnancy. *Critical care medicine*. 2005 Oct 1;33(10):S259-68.
  - [5] Uppal V, McKeen DM. Strategies for prevention of spinal-associated hypotension during cesarean delivery: Are we paying attention. *Can J Anaesth*. 2017 Oct 1;64(10):991-6.
  - [6] Uppal V, Retter S, Casey M, Sancheti S, Matheson K, McKeen DM. Efficacy of intrathecal fentanyl for cesarean delivery: a systematic review and meta-analysis of randomized controlled trials with trial sequential analysis. *Anesthesia & Analgesia*. 2020 Jan 1;130(1):111-25.
  - [7] Hunt CO, Naulty JS, Bader AM, Hauch MA, Vartikar JV, Datta S, Hertwig LM, Ostheimer GW. Perioperative analgesia with subarachnoid fentanyl-bupivacaine for cesarean delivery. *Anesthesiology*. 1989 Oct 1;71(4):535-40.
  - [8] Carpenter RL, Caplan RA, Brown DL, Stephenson C, Wu R. Incidence and risk factors for side effects of spinal anesthesia. *Anesthesiology*. 1992 Jun 1;76(6):906-16.
  - [9] Dahlgren G, Hultstrand C, Jakobsson J, Norman M, Eriksson EW, Martin H. Intrathecal sufentanil, fentanyl, or placebo added to bupivacaine for cesarean section. *Anesthesia & Analgesia*. 1997 Dec 1;85(6):1288-93.
  - [10] Chu CC, Shu SS, Lin SM, Chu NW, Leu YK, Tsai SK, Lee TY. The effect of intrathecal bupivacaine with combined fentanyl in cesarean section. *Acta Anaesthesiologica Sinica*. 1995 Sep 1;33(3):149-54.
  - [11] Ben-David B, Solomon E, Levin H, Admoni H, Goldik Z. Intrathecal fentanyl with small-dose dilute bupivacaine: better anesthesia without prolonging recovery. *Anesthesia & Analgesia*. 1997 Sep 1;85(3):560-5.
  - [12] Sahoo T, SenDasgupta C, Goswami A, Hazra A. Reduction in spinal-induced hypotension with ondansetron in parturients undergoing caesarean section: a double-blind randomised, placebo-controlled study. *International journal of obstetric anesthesia*. 2012 Jan 1;21(1):24-8.
  - [13] Morgan P. Spinal anaesthesia in obstetrics. *Canadian journal of Anaesthesia*. 1995 Dec;42:1145- 63.
  - [14] Mohanta PK, Rahman A, Halder PC, Tania S. A Study between Lumbar Epidural and Spinal Anesthesia in Elective Cesarean Section in Rural Women in Bangladesh.
  - [15] Ferrarezi WP, Braga AD, Ferreira VB, Mendes SQ, Brandão MJ, Braga FS, Carvalho VH. Spinal anesthesia for elective cesarean section. Bupivacaine associated with different doses of

- fentanyl: randomized clinical trial. *Brazilian Journal of Anesthesiology*. 2021 Oct 25;71(6):642-8.
- [16] Qublan HS, Merhej A, Dabbas MA, Hindawi IM. Spinal versus general anesthesia for elective cesarean delivery: a prospective comparative study. *Clinical and experimental obstetrics & gynecology*. 2001 Jan 1;28(4):246-8.
- [17] Islam MM, Chowdhury MH, Mondal SK, Begum R, Hossain MM, Rahman MA. Efficacy of Intravenous Ondansetron Versus Ephedrine as Prophylactic Against Hypotension and Bradycardia Following Spinal Anaesthesia in Elective Caesarean Section-A Comparative Study. *Journal of the Bangladesh Society of Anaesthesiologists*. 2016 Jul 1;29(2):67-74.
- [18] Fan QQ, Wang YH, Fu JW, Dong HL, Yang MP, Liu DD, Jiang XF, Wu ZX, Xiong LZ, Lu ZH. Comparison of two vasopressor protocols for preventing hypotension post-spinal anesthesia during cesarean section: a randomized controlled trial. *Chinese medical journal*. 2021 Apr 5;134(7):792-9.
- [19] Rosa Delima Ekwantini R, ANGELICA INTAN PUSPITASARI A, Sri H. Influence Factorsof Hypotension in patients With Spinal Anesthesia. *Pakistan Journal of Medical & Health Sciences*. 2020;14(2):1465-7.
- [20] Morgan PJ, Halpern S, Lam-McCulloch J. Comparison of maternal satisfaction between epidural and spinal anesthesia for elective Cesarean section. *Canadian Journal of Anesthesia*. 2000 Oct;47:956-61.
- [21] Jan U, Amin L, Khan A, Durrani H, Payenda AR, Khan W, Ullah I, Ahmed F. Comparison of General Versus Spinal Anesthesia for Elective Cesarean Section at Northwest General Hospital Peshawar. *Migration Letters*. 2024;21(S11):1006-1

**Citation:** Dr. Md. Mahbul Alam Sarker et al. *Efficacy of Spinal Anesthesia in Elective Cesarean Section: A Clinical Study*. *ARC Journal of Anesthesiology*. 2025; 10(1):7-12. DOI: <https://doi.org/10.20431/2455-9792.1001002>.

**Copyright:** © 2025 Authors. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.