

Quality of recovery and associated factors of among mothers undergoing cesarean section under spinal anesthesia at Wachemo University, Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital, Ethiopia, 2025: A cross sectional study

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Abstract

Background:

Cesarean section is one of the most frequently performed surgical procedures worldwide. Although advances in anesthesia and perioperative care have improved maternal safety, many mothers still experience delayed or poor postoperative recovery after cesarean delivery. Recovery is influenced by perioperative, obstetric, anesthetic, and postoperative factors. Identifying factors associated with poor recovery is important for improving maternal outcomes and optimizing perioperative care.

Objective:

To assess the quality of recovery and associated factors among mothers undergoing cesarean section under spinal anesthesia at Wachemo University Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital, Ethiopia, in 2025.

Methods:

An institution-based cross-sectional study was conducted among 415 mothers who underwent cesarean section under spinal anesthesia from January to March 2025. Data were collected using a structured questionnaire, patient chart review, and a standardized quality-of-recovery assessment tool within 24 hours after surgery. Data were entered and analyzed using SPSS version 26. Descriptive statistics were used to summarize the findings. Variables associated with poor recovery were identified using bivariable and multivariable logistic regression analyses. Statistical significance was declared at $p < 0.05$.

Results:

Among the participants, 324 (78%) mothers had good postoperative recovery, whereas 91 (22%) experienced poor recovery. Postoperative pain (AOR = 3.84, 95% CI: 2.11–6.98), postoperative nausea and vomiting (AOR = 2.76, 95% CI: 1.52–5.01), anxiety (AOR = 2.43, 95% CI: 1.36–4.35), emergency cesarean section (AOR = 2.91, 95% CI: 1.61–5.24), prolonged labor (AOR = 2.18, 95% CI: 1.24–3.84), delayed ambulation (AOR = 3.27, 95% CI: 1.81–5.92), delayed oral feeding (AOR = 2.54, 95% CI: 1.41–4.56), intraoperative hypotension (AOR = 2.67, 95% CI: 1.49–4.79), and postoperative headache (AOR = 2.61, 95% CI: 1.32–5.14) were significantly associated with poor recovery. Postoperative analgesia and spinal anesthesia with dexamethasone and tramadol adjuvants were protective factors.

Conclusion

Most mothers had good postoperative recovery after cesarean section under spinal anesthesia. However, a considerable proportion experienced poor recovery. Optimizing perioperative care, pain management, prevention of postoperative nausea and vomiting, and promoting early ambulation and oral feeding may improve postoperative recovery.

Introduction

Cesarean delivery is one of the most frequently performed surgical procedures worldwide and remains an essential intervention for reducing maternal and neonatal morbidity and mortality when medically indicated. Over the past few decades, the rate of cesarean delivery has increased considerably across many countries, and it currently accounts for nearly one in five births (1). In Ethiopia, access to cesarean delivery services has improved over time due to the expansion of maternal healthcare services; however, disparities in utilization and availability still exist among different regions and healthcare institutions (2).

Spinal anesthesia is widely considered the preferred anesthetic technique for cesarean delivery because of its rapid onset, reliable sensory and motor blockade, lower risk of maternal airway complications and aspiration, and its ability to facilitate early maternal–newborn bonding compared with general anesthesia (3). Despite these advantages, women undergoing cesarean delivery under spinal anesthesia may still experience various postoperative complications, including pain, nausea and vomiting, shivering, hypotension, fatigue, delayed ambulation, and psychological distress. These complications can adversely affect postoperative recovery, maternal comfort, and overall satisfaction with perioperative care (4–6).

Quality of recovery after cesarean delivery has increasingly become an important indicator for assessing the effectiveness of perioperative maternal care. Recovery after cesarean section is a complex and multidimensional process that extends beyond the absence of complications and includes physical comfort, emotional well-being, adequate pain control, restoration of physical function, and the mother's ability to care for and bond with her newborn. Poor postoperative recovery can lead to delayed mobilization, prolonged hospital stay, impaired mother–infant interaction, delayed initiation of breastfeeding, increased healthcare costs, and reduced maternal satisfaction with care (6, 7).

Several factors may influence postoperative recovery after cesarean section. Postoperative pain, postoperative nausea and vomiting, anxiety, emergency surgery, prolonged labor, delayed ambulation, delayed oral feeding, intraoperative hypotension, and postoperative headache have all been identified as important contributors to impaired postoperative recovery (8–10). In addition, perioperative anesthetic management and postoperative analgesic strategies may significantly influence maternal recovery quality(11).

Enhanced Recovery After Surgery (ERAS) protocols emphasize the importance of multimodal perioperative management approaches, including optimal pain management, prevention of nausea and vomiting, early mobilization, and early oral feeding to improve postoperative recovery outcomes (12).

However, implementation of these strategies remains inconsistent in many healthcare settings, particularly in low-resource countries.

Evidence from Ethiopia and other countries shows that recovery after cesarean delivery is influenced by multiple maternal, anesthetic, surgical, and postoperative factors. The recovery experience may differ from one woman to another depending on her clinical condition, the quality of perioperative care, and the support provided during the postoperative period. Women who receive adequate antenatal counseling and perioperative support often experience better and faster recovery, whereas severe postoperative pain, wound-related complications, anxiety, and stressful emergency cesarean delivery may negatively affect recovery outcomes. Although the quality of postoperative recovery has gained increasing attention in maternal healthcare, evidence regarding recovery after cesarean delivery under spinal anesthesia remains limited in many Ethiopian healthcare institutions (13, 14).

Although several studies have assessed postoperative outcomes after cesarean section, evidence regarding maternal quality of recovery and associated factors remains limited in Ethiopia and similar settings. Furthermore, few studies have comprehensively evaluated obstetric, anesthetic, intraoperative, and postoperative predictors of maternal recovery following cesarean section under spinal anesthesia.

Therefore, this study aimed to assess the quality of recovery and its associated factors among mothers undergoing cesarean delivery under spinal anesthesia at Nigist Eleni Comprehensive Specialized Hospital in 2025. The findings of this study may provide valuable information for healthcare professionals, hospital administrators, and policymakers to improve perioperative maternal care and develop appropriate strategies to enhance postoperative recovery and maternal outcomes following cesarean delivery.

METHODS AND MATERIALS

Study Area and Period

The study was conducted at Wachemo University, Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital. The hospital is located in Hossana town, Hadiya Zone, Southern Ethiopia, approximately 231 kilometers southwest of Addis Ababa. Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital is one of the major referral and teaching hospitals in the region and provides comprehensive obstetric, surgical, anesthetic, and neonatal care services for a large catchment population.

The study was conducted over a three-month period from January 1 to March 30, 2025.

Study Design

An institution-based cross-sectional study was conducted among mothers undergoing cesarean section under spinal anesthesia.

Study Population

The source population comprised all mothers who underwent cesarean section under spinal anesthesia at Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital during the study period. The study population included all eligible mothers selected during the data collection period who met the predefined inclusion criteria.

Inclusion Criteria

- Mothers who underwent cesarean section under spinal anesthesia during the study period.
- Mothers who were able to communicate and provide the required information within 24 hours after surgery.
- Age ≥ 18 years

Exclusion Criteria

- Mothers who underwent cesarean section under general anesthesia or those with conversion from spinal to general anesthesia.
- Mothers admitted to the intensive care unit following surgery.
- Mothers with severe psychiatric illness or communication difficulties.
- Mothers who declined to participate in the study.

Sample Size Determination

The sample size was determined using the single population proportion formula, based on the proportion of maternal satisfaction after cesarean delivery care (57.2%) reported in a previous study conducted in Bahir Dar city health facilities, Ethiopia (15).

Using the single population proportion formula:

$$n = \frac{\left\{ \left(z_{\left\{ \frac{\alpha}{2} \right\}} \right)^2 \times p(1-p) \right\}}{\left\{ d^2 \right\}}$$

Using a 95% confidence level ($Z = 1.96$), a 5% margin of error ($d = 0.05$), and $p = 0.572$, the initial sample size was calculated as:

$$n = \frac{\left\{ (1.96)^2 \times 0.572 (1 - 0.572) \right\}}{\{0.05^2\}} = 377$$

After adding:

- 10% non-response → about **415**

So final sample size would be approximately 415 participants.

Sampling Technique

A consecutive sampling technique was employed. All eligible women undergoing cesarean delivery under spinal anesthesia during the study period were included sequentially until the required sample size was achieved.

Study Variables

Dependent Variable

- The dependent variable was quality of recovery after cesarean delivery, categorized as good or poor recovery.

Independent Variables

- Socio-demographic factors: age, residence, educational status, occupation, marital status.
- Obstetric factors: gestational age, gravidity, prolonged labor, antenatal care follow-up, coexisting disease, type of cesarean section.
- Intraoperative factors: duration of surgery, estimated blood loss, intraoperative hypotension, type of spinal anesthesia.
- Postoperative factors: postoperative pain, postoperative nausea and vomiting, anxiety, delayed ambulation, delayed oral feeding, postoperative headache, postoperative analgesia administration.

Operational Definition

Quality of Recovery

The overall postoperative recovery status of a mother following cesarean delivery, measured using the Obstetric Quality of Recovery (ObsQoR-10) tool within 24 hours postoperatively. The tool assesses multiple domains including physical comfort, emotional state, pain, and functional recovery, with higher scores indicating better recovery (16, 17).

Good quality of recovery

Mothers who scored greater than or equal to the median value of the quality of recovery assessment tool within 24 hours after cesarean section were considered to have good quality recovery(17).

Poor quality of recovery

Mothers who scored below the median value of the quality of recovery assessment tool within 24 hours after cesarean section were considered to have poor quality recovery(17).

ObsQoR-10 score

A 10-item patient-reported recovery score used after childbirth, with each item contributing to the total recovery assessment; higher scores indicate better recovery(6).

Cesarean delivery under spinal anesthesia

Operative delivery performed through abdominal and uterine incisions with the mother receiving spinal anesthesia for the procedure(18).

Preoperative anxiety

Self-reported or clinically assessed anxiety present before surgery, recorded as yes/no based on the study tool or chart review(13).

Blood loss

The estimated amount of blood lost during cesarean delivery, recorded from the anesthesia or surgical record(4).

Comorbidity

The presence of one or more chronic medical conditions such as hypertension, diabetes, or other relevant illnesses documented before surgery(13).

Postoperative nausea and vomiting (PONV) as any episode of nausea, vomiting, or both occurring within the first 24 hours after cesarean delivery under spinal anesthesia(19).

Intraoperative hypotension

A reduction in systolic blood pressure $\geq 20\%$ from baseline or < 90 mmHg after spinal anesthesia(20).

Delayed ambulation

Inability to ambulate within 24 hours postoperatively(21).

Delayed oral feeding

Initiation of oral intake > 24 hours after surgery(22).

Moderate to severe postoperative Pain

When a patient experiences moderate to severe postoperative pain in the first 24 postoperative hours with a cutoff point of NRS ≥ 4 , this cutoff point was identified as the tolerable pain threshold(23, 24).

Data collection tool and procedure

Data were collected using a structured interviewer-administered questionnaire, patient chart review, and a standardized quality of recovery assessment tool. The questionnaire included socio-demographic, obstetric, intraoperative, anesthetic, and postoperative variables.

Quality of recovery was assessed within 24 hours after cesarean section using the Quality of Recovery assessment tool (ObsQoR-10 instrument). Pain severity was assessed using the numerical rating scale (NRS). Data were collected by trained anesthesia professionals under close supervision throughout the study period

Data Quality Control

To ensure data quality, the questionnaire was prepared in English and reviewed before data collection. The questionnaire should be pretested on 5% of participants before the main data collection to improve clarity and consistency. Data collectors and supervisors were trained on study objectives and procedures. Daily supervision and cross-checking were performed to ensure completeness, consistency, and accuracy of collected data.

Data Processing and Analysis

Data were coded, entered, and analyzed using SPSS version 26. Descriptive statistics were presented using tables, figures, frequencies, and percentages. Binary logistic regression analysis was performed to identify associated factors for poor quality of recovery. Bivariable logistic regression was performed to identify candidate variables for multivariable analysis. Variables with $p < 0.25$ were included in the multivariable logistic regression model. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were reported, and statistical significance was declared at $p < 0.05$. Model fitness was assessed using the Hosmer–Lemeshow goodness-of-fit test

RESULTS

Recruitment of Study Participants

During the study period, all mothers who underwent cesarean section under spinal anesthesia at Nigist Eleni Mohammed Memorial Comprehensive Specialized Hospital and fulfilled the eligibility criteria were

consecutively recruited into the study. During the study period, 435 mothers who underwent cesarean section were assessed for eligibility. Of these, 20 mothers were excluded due to conversion from spinal anesthesia to general anesthesia during surgery. Finally, 415 mothers who fulfilled the eligibility criteria were included in the study and completed the analysis, yielding a response rate of 100%. Figure 1.

Sociodemographic characteristics of participants:

A total of 415 mothers who underwent cesarean section under spinal anesthesia were included in the study, giving a response rate of 100%. The majority of participants, 333 (80.2%), were between 18 and 34 years of age, while 82 (19.8%) were aged 35 years and above. More than half of the participants, 238 (57.3%), were urban residents. Regarding educational status, 319 (76.9%) mothers had primary education or above, whereas 96 (23.1%) had no formal education. Most participants were married, accounting for 392 (94.5%) mothers. Concerning occupation, 256 (61.7%) participants were housewives. Table 1.

Table 1
Socio-demographic characteristics of mothers undergoing cesarean section under spinal anesthesia at selected Hospitals, 2025 (n = 415)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–34	333	80.2
	≥ 35	82	19.8
Residence	Urban	238	57.3
	Rural	177	42.7
Educational status	No formal education	96	23.1
	Primary and above	319	76.9
Marital status	Married	392	94.5
	Unmarried	23	5.5
Occupation	Housewife	256	61.7
	Government employee	72	17.3
	Merchant	51	12.3
	Other	36	8.7

Obstetric and intraoperative characteristics

The majority of participants had antenatal care follow-up. Among the study participants, 268 (64.6%) underwent emergency cesarean section, while 147 (35.4%) underwent elective cesarean section. The

majority of mothers, 381 (91.8%), delivered at term gestational age. Multigravida mothers accounted for 247 (59.5%) participants.

Prolonged labor occurred in 159 (38.3%) mothers. Coexisting diseases were identified in 63 (15.2%) participants, with pregnancy-induced hypertension being the most common condition. Most mothers, 345 (83.1%), had adequate antenatal care follow-up.

Regarding intraoperative characteristics, 148 (35.7%) surgeries lasted 60 minutes or longer, and intraoperative hypotension developed in 136 (32.8%) mothers. Concerning anesthetic technique, 140 (33.7%) mothers received spinal anesthesia with dexamethasone and tramadol adjuvants Table 2.

Table 2

Obstetric and intraoperative characteristics of mothers undergoing cesarean section under spinal anesthesia, 2025 (n = 415)

Variable	Category	Frequency (n)	Percentage (%)
Type of cesarean section	Emergency	268	64.6
	Elective	147	35.4
Gestational age	Preterm	5	1.2
	Term	381	91.8
	Post-term	29	7.0
Gravidity	Primigravida	168	40.5
	Multigravida	247	59.5
Prolonged labor	Yes	159	38.3
	No	256	61.7
Coexisting disease	Yes	63	15.2
	No	352	84.8
Types of coexisting disease	PIH	24	5.8
	Gestational diabetes mellitus	13	3.1
	Antepartum hemorrhage	10	2.4
	Hepatitis B virus infection	9	2.2
	Asthma	7	1.7
Antenatal care follow-up	Adequate ANC follow-up	345	83.1
	Inadequate/No ANC follow-up	70	16.9
Duration of surgery	< 60 minutes	267	64.3
	≥ 60 minutes	148	35.7
Estimated blood loss	< 1000 mL	340	81.9
	≥ 1000 mL	75	18.1
Intraoperative hypotension	Yes	136	32.8
	No	279	67.2
Type of spinal anesthesia	Spinal anesthesia alone	275	66.3

Variable	Category	Frequency (n)	Percentage (%)
	Spinal anesthesia with dexamethasone and tramadol adjuvants	140	33.7

Postoperative outcomes

Postoperative pain was reported in 148 (35.7%) mothers, while postoperative nausea and vomiting occurred in 106 (25.5%) participants. Anxiety was identified among 128 (30.8%) mothers.

Delayed ambulation and delayed oral feeding were observed in 137 (33.0%) and 131 (31.6%) participants, respectively. Postoperative headache occurred in 60 (14.5%) mothers.

Regarding postoperative analgesia, 222 (53.5%) participants received postoperative analgesic interventions. Diclofenac alone was the most commonly administered postoperative analgesic, followed by tramadol alone. The combination of tramadol and diclofenac was the least commonly utilized analgesic regimen. Table 3.

Table 3
Postoperative and clinical characteristics of mothers undergoing cesarean section under spinal anesthesia, 2026 (n = 415)

Variable	Category	Frequency (n)	Percentage (%)
Postoperative pain	Yes	148	35.7
	No	267	64.3
PONV	Yes	106	25.5
	No	309	74.5
Anxiety	Yes	128	30.8
	No	287	69.2
Delayed ambulation	Yes	137	33.0
	No	278	67.0
Delayed oral feeding	Yes	131	31.6
	No	284	68.4
Postoperative headache	Yes	60	14.5
	No	355	85.5
Postoperative analgesia given	Yes	222	53.5
	No	193	46.5
Type of postoperative analgesia	Diclofenac alone	96	23.1
	Tramadol alone	74	17.8
	Abdominal field block	40	9.6
	Combination of tramadol and diclofenac	12	2.9

Quality of Recovery

Quality of recovery was assessed at 24 hours postoperatively using the ObsQoR-10 questionnaire. The mean quality of recovery score among study participants was 76.4 ± 12.8 . Based on the median cutoff point of the total ObsQoR-10 score, 324 (78%) mothers had good quality recovery, whereas 91 (22%) had poor quality recovery following cesarean section under spinal anesthesia. Figure 2.

Factors associated with poor quality recovery after cesarean section

In the multivariable logistic regression analysis, postoperative pain, postoperative nausea and vomiting, anxiety, emergency cesarean section, prolonged labor, delayed ambulation, delayed oral feeding, intraoperative hypotension, and postoperative headache were significantly associated with poor quality recovery.

Mothers who experienced postoperative pain were 3.84 times more likely to develop poor quality recovery compared with mothers who did not experience postoperative pain (AOR = 3.84, 95% CI: 2.11–6.98). Similarly, mothers who developed postoperative nausea and vomiting were 2.76 times more likely to have poor quality recovery compared with those without postoperative nausea and vomiting (AOR = 2.76, 95% CI: 1.52–5.01).

Mothers with anxiety had 2.43 times higher odds of poor quality recovery compared with mothers without anxiety (AOR = 2.43, 95% CI: 1.36–4.35). Participants who underwent emergency cesarean section were nearly three times more likely to experience poor quality recovery compared with mothers who underwent elective cesarean section (AOR = 2.91, 95% CI: 1.61–5.24).

Mothers with prolonged labor were 2.18 times more likely to have poor quality recovery compared with those without prolonged labor (AOR = 2.18, 95% CI: 1.24–3.84). Delayed ambulation was also significantly associated with poor recovery, where mothers with delayed ambulation had 3.27 times higher odds of poor quality recovery compared with mothers who ambulated early (AOR = 3.27, 95% CI: 1.81–5.92).

Likewise, mothers who had delayed oral feeding were 2.54 times more likely to experience poor quality recovery compared with those who initiated oral feeding early (AOR = 2.54, 95% CI: 1.41–4.56). Mothers who developed intraoperative hypotension were 2.67 times more likely to have poor quality recovery compared with mothers without hypotension (AOR = 2.67, 95% CI: 1.49–4.79).

Furthermore, mothers who experienced postoperative headache were 2.61 times more likely to develop poor quality recovery compared with mothers without headache (AOR = 2.61, 95% CI: 1.32–5.14).

Conversely, postoperative analgesia administration and spinal anesthesia with dexamethasone and tramadol adjuvants demonstrated protective effects against poor quality recovery. Mothers who received postoperative analgesia were 59% less likely to develop poor quality recovery compared with mothers who did not receive postoperative analgesia (AOR = 0.41, 95% CI: 0.22–0.76). Similarly, mothers who received spinal anesthesia with dexamethasone and tramadol adjuvants were 52% less likely to experience poor quality recovery compared with those who received spinal anesthesia alone (AOR = 0.48, 95% CI: 0.25–0.91). Table 4.

Table 4. Multivariable logistic regression analysis of factors associated with poor quality recovery after cesarean section under spinal anesthesia, 2025 (n = 415)

Variable	Category	Poor Recovery n (%)	Good Recovery n (%)	COR (95% CI)	P- value	AOR (95% CI)	P- value
Age	≥35 years	24 (26.4)	58 (17.9)	1.62 (0.89– 2.95)	0.113	1.28 (0.63– 2.61)	0.492
	18–34 years	67 (73.6)	266 (82.1)	1		1	
Educational status	No formal education	28 (30.8)	68 (21.0)	1.68 (0.95– 2.98)	0.075	1.29 (0.64– 2.58)	0.473
	Primary and above	63 (69.2)	256 (79.0)	1		1	
Type of cesarean section	Emergency	63 (69.2)	205 (63.3)	3.56 (2.18– 5.82)	0.001	2.91 (1.61– 5.24)	0.001
	Elective	28 (30.8)	119 (36.7)	1		1	
Prolonged labor	Yes	46 (50.5)	113 (34.9)	2.71 (1.64– 4.49)	0.001	2.18 (1.24– 3.84)	0.007
	No	45 (49.5)	211 (65.1)	1		1	
Duration of surgery	≥60 minutes	39 (42.9)	109 (33.6)	1.48 (0.91– 2.40)	0.112	1.31 (0.72– 2.39)	0.372
	<60 minutes	52 (57.1)	215 (66.4)	1		1	
Estimated blood loss	≥1000 mL	21 (23.1)	54 (16.7)	1.50 (0.84– 2.70)	0.169	1.22 (0.61– 2.42)	0.571
	<1000 mL	70 (76.9)	270 (83.3)	1		1	
Intraoperative hypotension	Yes	41 (45.1)	95 (29.3)	3.14 (1.91– 5.17)	0.001	2.67 (1.49– 4.79)	0.001
	No	50 (54.9)	229 (70.7)	1		1	
Type of spinal anesthesia	Spinal anesthesia with adjuvants	18 (19.8)	122 (37.7)	0.39 (0.22– 0.69)	0.001	0.48 (0.25– 0.91)	0.024
	Spinal anesthesia alone	73 (80.2)	202 (62.3)	1		1	

Postoperative analgesia given	Yes	24 (26.4)	198 (61.1)	0.29 (0.17–0.50)	0.001	0.41 (0.22–0.76)	0.005
	No	67 (73.6)	126 (38.9)	1		1	
Postoperative pain	Yes	56 (61.5)	92 (28.4)	4.36 (2.71–7.01)	0.001	3.84 (2.11–6.98)	0.001
	No	35 (38.5)	232 (71.6)	1		1	
PONV	Yes	39 (42.9)	67 (20.7)	3.28 (1.99–5.40)	0.001	2.76 (1.52–5.01)	0.001
	No	52 (57.1)	257 (79.3)	1		1	
Anxiety	Yes	44 (48.4)	84 (25.9)	3.02 (1.88–4.86)	0.001	2.43 (1.36–4.35)	0.003
	No	47 (51.6)	240 (74.1)	1		1	
Delayed ambulation	Yes	52 (57.1)	85 (26.2)	4.12 (2.47–6.87)	0.001	3.27 (1.81–5.92)	0.001
	No	39 (42.9)	239 (73.8)	1		1	
Delayed oral feeding	Yes	48 (52.7)	83 (25.6)	3.26 (1.97–5.39)	0.001	2.54 (1.41–4.56)	0.002
	No	43 (47.3)	241 (74.4)	1		1	
Postoperative headache	Yes	27 (29.7)	33 (10.2)	3.18 (1.74–5.81)	0.001	2.61 (1.32–5.14)	0.006
	No	64 (70.3)	291 (89.8)	1		1	

Abbreviations

COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI = Confidence Interval; PONV = Postoperative Nausea and Vomiting.

Table Footnote

Variables with p-value <0.25 in bivariable logistic regression analysis were entered into multivariable logistic regression analysis. Variables with p-value <0.05 in multivariable analysis were considered

statistically significant predictors of poor quality recovery after cesarean section under spinal anesthesia.

Discussion

This study assessed the quality of recovery and associated factors among mothers undergoing cesarean section under spinal anesthesia using the ObsQoR-10 at 24 hours postoperatively. The study found that 78% of mothers achieved good recovery, whereas 22% experienced poor postoperative recovery. Although most mothers recovered satisfactorily within the first postoperative day, a considerable proportion continued to experience impaired recovery requiring clinical attention. Postoperative pain, postoperative nausea and vomiting (PONV), anxiety, emergency cesarean section, prolonged labor, delayed ambulation, delayed oral feeding, intraoperative hypotension, and postoperative headache were identified as significant predictors of poor recovery. In contrast, postoperative analgesia and the use of spinal anesthesia with adjuvants showed protective effects against poor postoperative recovery.

Although few Ethiopian studies have specifically evaluated postoperative recovery using the ObsQoR tool, available evidence from Ethiopia assessing maternal satisfaction and postoperative outcomes after cesarean delivery provides indirect comparison. Studies conducted in Ethiopia have shown that postoperative pain, delayed mobilization, and perioperative care-related factors negatively influence maternal satisfaction and postoperative experience following cesarean delivery (15, 25). These findings are consistent with the present study and suggest that the quality of perioperative and postoperative care plays a major role in maternal recovery outcomes. This may be because inadequate perioperative support and delayed postoperative care can increase physical discomfort, emotional distress, and functional limitation during the early recovery period.

Postoperative pain was strongly associated with poor quality of recovery in this study. Similar findings have been reported in studies from Ethiopia, Nigeria, and South Africa, where inadequate postoperative analgesia contributed to delayed mobilization, poor maternal comfort, and reduced postoperative satisfaction (24, 26-28). Studies conducted in Spain and Canada also demonstrate that uncontrolled pain after cesarean delivery negatively affects ambulation, sleep quality, breastfeeding, maternal–newborn interaction, and emotional well-being, ultimately impairing overall recovery (29, 30). Effective postoperative pain control therefore remains a cornerstone of enhanced maternal recovery after cesarean section. This association may be explained by the fact that severe postoperative pain limits physical activity, increases stress responses, interferes with maternal bonding and breastfeeding, and delays return to normal daily functioning.

The present study also identified PONV as an important predictor of poor recovery. This finding is in agreement with reports from Ethiopia and other African countries where PONV remains a common postoperative complication following cesarean delivery and is associated with delayed recovery, increased discomfort, and lower maternal satisfaction (31-35). Study was conducted in Singapore similarly shows that PONV delays oral intake, ambulation, and breastfeeding initiation, thereby negatively

affecting postoperative recovery quality after spinal anesthesia (36). This may be because persistent nausea and vomiting reduce maternal comfort, impair hydration and nutritional intake, contribute to fatigue, and delay early mobilization during the postoperative period.

Anxiety was another significant determinant of poor recovery. This finding aligns with evidence from Ethiopia and other African settings demonstrating that perioperative psychological distress adversely affects postoperative satisfaction, pain perception, and recovery after cesarean section (37, 38). Studies from Egypt and Canada have likewise shown that maternal anxiety is associated with poorer recovery scores, increased postoperative pain, and delayed functional recovery following cesarean delivery (39-41). Psychological preparedness and perioperative emotional support may therefore play an important role in improving maternal recovery outcomes. This could be explained by the fact that anxiety increases sympathetic nervous system activity, heightens pain perception, disturbs sleep, and negatively affects emotional well-being during recovery.

Emergency cesarean section was significantly associated with poor postoperative recovery. Similar findings have been reported in Ethiopia and other African countries, where emergency cesarean delivery is associated with higher rates of maternal complications, prolonged hospital stay, and unfavorable postoperative outcomes compared with elective procedures (42-44). Systematic review and meta-analysis study also demonstrate that emergency cesarean section carries greater maternal morbidity and poorer postoperative recovery due to factors such as prolonged labor, maternal exhaustion, and perioperative complications (45). This association may be related to the urgent nature of emergency surgery, limited preoperative preparation, increased maternal stress, and higher likelihood of obstetric complications.

Prolonged labor was also found to significantly impair postoperative recovery. This finding is consistent with evidence from Ethiopia, Uganda, and Nigeria showing that prolonged labor contributes to maternal exhaustion, perioperative stress, increased postoperative pain, delayed ambulation, and poorer functional recovery following cesarean delivery (14, 46, 47). The physiological stress associated with prolonged labor, including dehydration, metabolic imbalance, and fatigue, may further compromise postoperative recovery and wound healing (48). In addition, prolonged labor may increase physical exhaustion and tissue stress, thereby reducing maternal energy and delaying postoperative functional recovery.

Delayed ambulation and delayed oral feeding were significant predictors of poor recovery in the current study. These findings are consistent with Enhanced Recovery After Surgery (ERAS) recommendations, which strongly emphasize early mobilization and early oral intake following cesarean delivery(21). Evidence from randomized trials and meta-analyses demonstrates that early feeding improves bowel recovery, shortens recovery time, and facilitates earlier return to normal activity without increasing gastrointestinal (49, 50). Similar findings from Ethiopia and Nigeria have shown that delayed mobilization and oral feeding prolong hospital stay and worsen maternal recovery experiences after cesarean section (14, 46). Collectively, these findings highlight the importance of adherence to ERAS

principles in improving postoperative recovery outcomes. This may be because early mobilization enhances circulation and muscle function, while early oral feeding promotes gastrointestinal recovery, improves energy balance, and accelerates overall functional recovery.

Intraoperative hypotension was another significant predictor of poor recovery. This finding is supported by obstetric anesthesia literature showing that spinal anesthesia-induced hypotension is associated with nausea, vomiting, dizziness, weakness, and reduced maternal satisfaction after cesarean delivery (51, 52). ERAS recommendations also emphasize maintaining hemodynamic stability during cesarean section to optimize maternal recovery and postoperative experience (21). Similar findings from African settings, including Ethiopia, indicate that inadequate blood pressure control during spinal anesthesia contributes to perioperative discomfort and delayed recovery (53, 54). These findings suggest that effective prevention and management of intraoperative hypotension is a key determinant of high-quality postoperative recovery in obstetric patients. This may be explained by reduced tissue perfusion and oxygen delivery during hypotensive episodes, which can contribute to dizziness, weakness, nausea, and delayed postoperative recovery.

Postoperative headache was significantly associated with poor recovery in this study. Previous studies have shown that postdural puncture headache and other neuraxial anesthesia-related headaches impair maternal recovery by limiting ambulation, disturbing sleep, reducing breastfeeding initiation, and decreasing overall maternal comfort and satisfaction (55, 56). ERAS guidelines similarly recommend minimizing neuraxial anesthesia-related complications to improve postoperative recovery outcomes (57). Evidence from Ethiopia also suggests that postoperative headache remains a common complication after spinal anesthesia and negatively affects maternal recovery experiences (32, 58). This may be because postoperative headache limits mobility, worsens physical discomfort, interferes with rest, and reduces the mother's ability to care for and interact comfortably with the newborn.

The present study further demonstrated that postoperative analgesia had a protective effect against poor recovery. Mothers who received postoperative analgesia were less likely to experience poor recovery compared with those who did not receive adequate analgesia. Adequate pain management likely improves maternal comfort, facilitates ambulation and breastfeeding, and enhances overall postoperative recovery. Similar findings have been reported in obstetric anesthesia studies and ERAS-based recovery protocols emphasizing multimodal analgesia as a key component of enhanced recovery after cesarean section (59, 60). This protective effect may be attributed to improved pain control, reduced physiological stress response, earlier mobilization, and improved maternal functional capacity during the postoperative period.

Additionally, spinal anesthesia with adjuvants demonstrated a protective effect against poor postoperative recovery. Mothers who received intrathecal bupivacaine combined with tramadol and dexamethasone had better recovery outcomes compared with those who received spinal anesthesia alone. Similar findings have been reported in obstetric anesthesia studies demonstrating that anesthetic adjuvants improve postoperative analgesia and enhance maternal recovery following cesarean delivery.

(61, 62). This protective effect may be attributed to the analgesic properties of tramadol together with the anti-inflammatory and antiemetic effects of dexamethasone, which likely reduced postoperative pain, nausea, and vomiting while improving maternal comfort and functional recovery. In addition, prolonged analgesic duration and reduced postoperative opioid requirements may have further contributed to improved postoperative recovery quality.

Strengths and limitations of the Study

This study has several important strengths. First, the study assessed maternal quality of recovery using a standardized quality of recovery assessment tool, which enabled comprehensive evaluation of postoperative recovery among mothers undergoing cesarean section under spinal anesthesia. Second, the study included multiple perioperative, obstetric, anesthetic, and postoperative variables, allowing identification of several independent predictors affecting maternal recovery after cesarean section. Third, the study addressed an important but relatively under-investigated area in the local setting, particularly regarding maternal postoperative recovery after cesarean section under spinal anesthesia. Therefore, the findings may provide useful baseline information for future research, clinical practice improvement, and perioperative maternal care protocols.

In addition, the inclusion of protective perioperative interventions such as postoperative analgesia and spinal anesthesia with adjuvants provided clinically relevant findings that may contribute to improved postoperative recovery strategies.

Limitations of the Study

Despite its strengths, this study has some limitations. The cross-sectional nature of the study limits the ability to establish causal relationships between independent variables and postoperative recovery outcomes.

The quality of recovery was assessed only within the first 24 hours after cesarean section. Some postoperative complications and recovery-related outcomes, including post-dural puncture headache and longer-term functional recovery, may become more evident after 24 hours and therefore may not have been fully captured in this study.

In addition, some variables such as anxiety and postoperative pain were partly subjective in nature and depended on patient self-reporting, which could introduce reporting bias.

The study was also conducted in selected hospitals, which may limit the generalizability of the findings to other healthcare settings with different perioperative management protocols and patient populations.

Conclusion and recommendations

The present study found that the majority of mothers had good quality recovery after cesarean section under spinal anesthesia. However, a considerable proportion of mothers experienced poor postoperative

recovery within the first 24 hours after surgery.

Postoperative pain, postoperative nausea and vomiting, anxiety, emergency cesarean section, prolonged labor, delayed ambulation, delayed oral feeding, intraoperative hypotension, and postoperative headache were significant predictors of poor quality recovery.

Conversely, postoperative analgesia administration and spinal anesthesia with dexamethasone and tramadol adjuvants demonstrated protective effects against poor postoperative recovery.

The findings of this study highlight the importance of comprehensive perioperative management strategies focusing on effective postoperative pain control, prevention of postoperative nausea and vomiting, maintenance of intraoperative hemodynamic stability, early mobilization, early oral feeding, and optimization of anesthetic techniques to improve maternal postoperative recovery after cesarean section.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

For Anesthesia Professionals

- Greater emphasis should be given to effective postoperative pain management through multimodal analgesic approaches.
- Appropriate prevention and early treatment of postoperative nausea and vomiting should be strengthened.
- Close intraoperative monitoring and prompt management of spinal anesthesia-induced hypotension should be prioritized.
- The use of spinal anesthesia adjuvants may be considered to improve postoperative maternal recovery.

For Obstetric Care Providers

- Early ambulation and early oral feeding should be encouraged as part of postoperative recovery protocols following cesarean section.
- Special attention should be given to mothers undergoing emergency cesarean section and prolonged labor, as these mothers are at increased risk of poor postoperative recovery.

For Hospitals and Health Institutions

- Standardized postoperative recovery assessment protocols should be implemented for mothers undergoing cesarean section.
- Enhanced Recovery After Surgery (ERAS) principles should be incorporated into obstetric perioperative care practice.

For Future Researchers

- Further prospective and multicenter studies are recommended to evaluate long-term postoperative recovery outcomes after cesarean section.
- Future studies should include extended postoperative follow-up periods beyond 24 hours to better assess delayed postoperative complications and functional recovery outcomes.

Abbreviations

AOR
 Adjusted Odds Ratio
 ANC
 Antenatal Care
 APH
 Antepartum Hemorrhage
 BMI
 Body Mass Index
 CI
 Confidence Interval
 COR
 Crude Odds Ratio
 C/S
 Cesarean Section
 ERAS
 Enhanced Recovery After Surgery
 GDM
 Gestational Diabetes Mellitus
 HBV
 Hepatitis B Virus
 ICU
 Intensive Care Unit
 IV
 Intravenous
 NPO
 Nil Per Os

ObsQoR-10
Obstetric Quality of Recovery-10
OR
Odds Ratio
PIH
Pregnancy-Induced Hypertension
PONV
Postoperative Nausea and Vomiting
QoR
Quality of Recovery
SA
Spinal Anesthesia
SD
Standard Deviation
SPSS
Statistical Package for Social Sciences

Declarations

Ethical Approval and consent to participate

Ethical approval was obtained from the Institutional Review Board (IRB) of Wachemo University, College of Medical and Health Sciences, Ethiopia. The study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrollment.

Consent for publication

Not applicable.

Availability of data and material

The data used and materials to support the findings of this study are available from the corresponding author upon request.

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Author Contribution

Dejene Moreda Jiru (Corresponding Author): contributed to the study conception and design, supervised data collection, participated in data analysis and interpretation, drafted the manuscript, critically revised the manuscript for important intellectual content, and approved the final version for submission.

Zekarias Markos participated in study design, contributed to data collection, assisted in data entry and analysis, and reviewed the manuscript for important intellectual content. **Teketel Abebe** contributed to data collection, supported data quality assurance, and participated in manuscript drafting and revision. **Yisehak Wolde** participated in data collection, assisted in interpretation of findings, and contributed to manuscript revision and approval. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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Figures

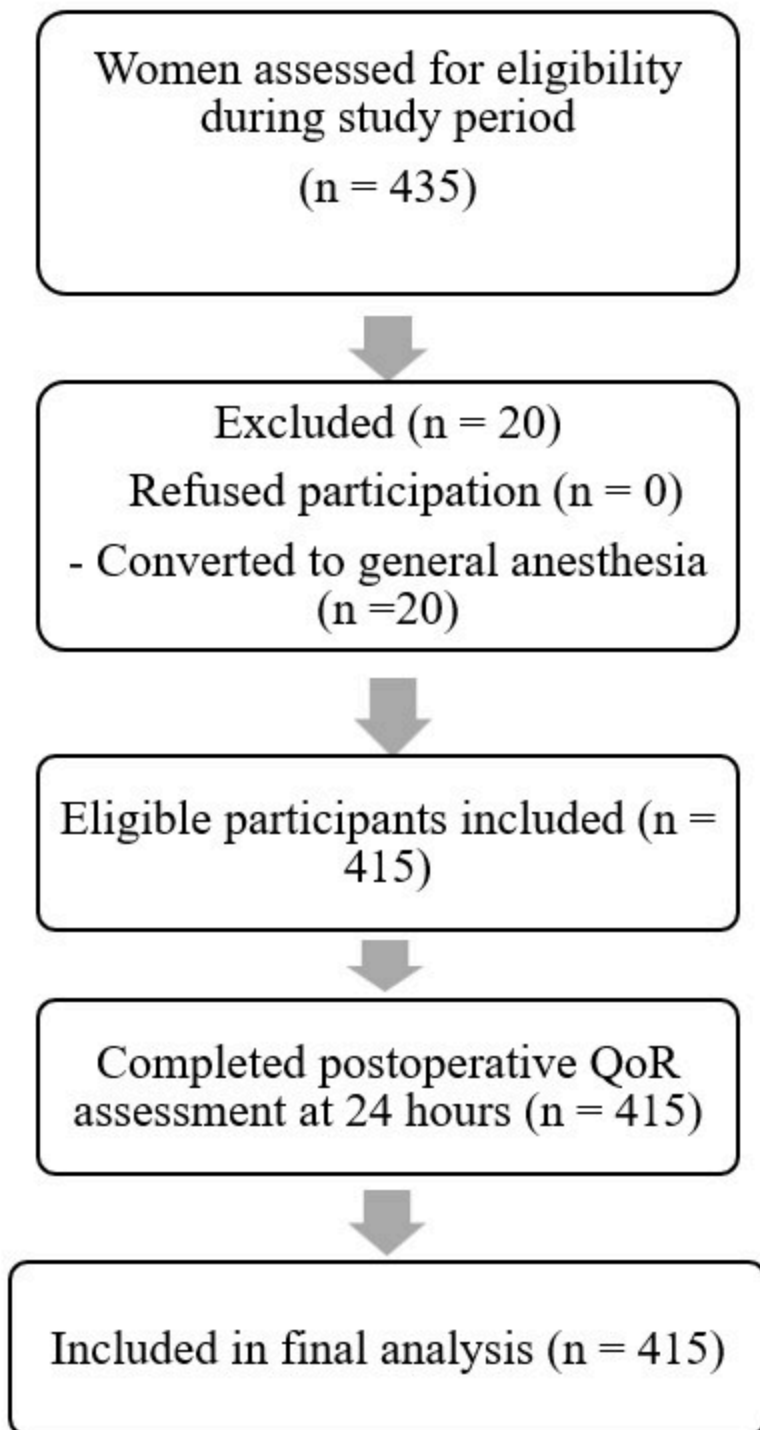


Figure 1

Flow diagram of participant recruitment

Quality of recovery after cesarean section

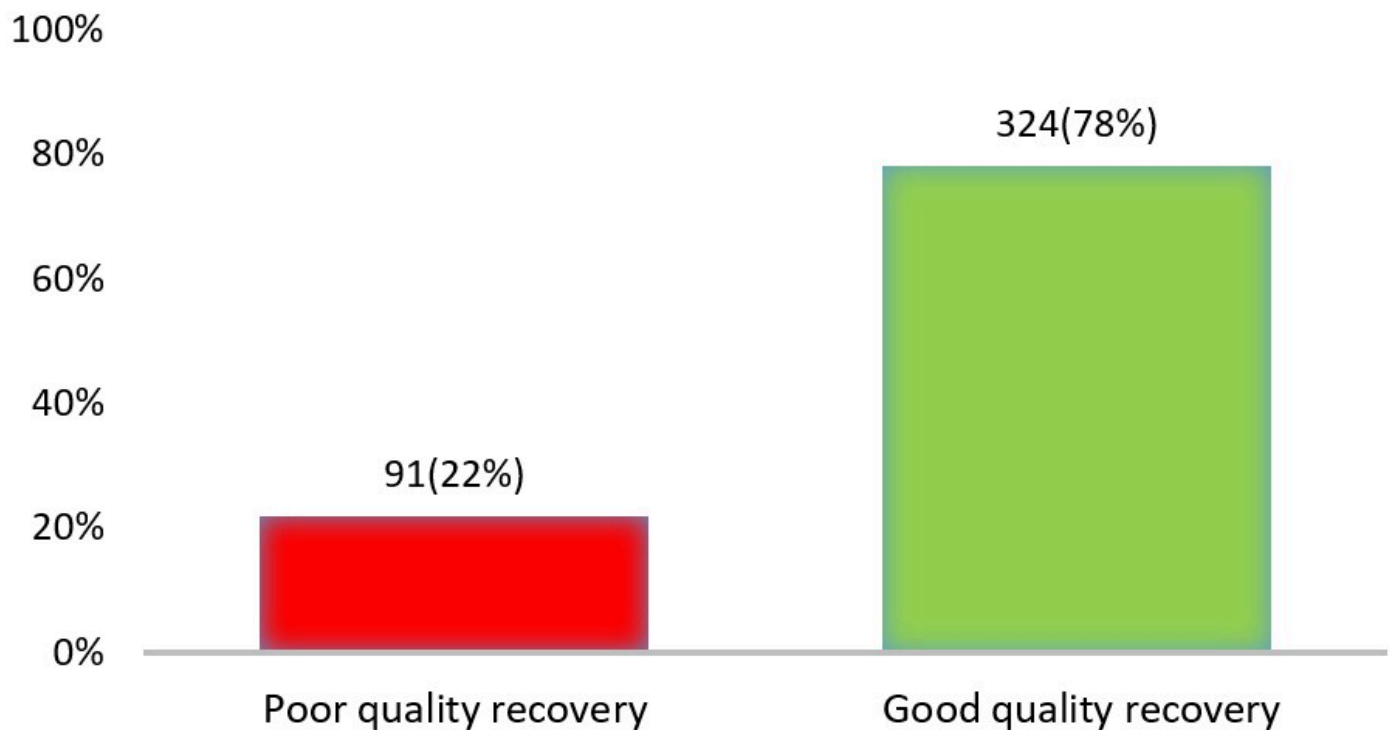


Figure 2

Prevalence of good and poor quality of recovery among mothers undergoing cesarean section under spinal anesthesia at Nigist Eleni Mohammed memorial comprehensive specialized hospital, 2025 (n = 415.)