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ORIGINAL RESEARCH

Prevalence and Factors Associated with Postoperative Pain After Cesarean Section at a Comprehensive Specialized Hospital in Northwest Ethiopia: Prospective Observational Study

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Background: Cesarean section is the commonest obstetric procedure worldwide and pain is the leading compliant during the postoperative period. The objective of this study was to assess the prevalence and factors associated with postoperative pain after cesarean section at a University Hospital in Northwest Ethiopia.

Materials and Methods: A prospective observational study was conducted among parturients who underwent cesarean section. After obtaining ethical approval, 299 parturients were approached. The numerical rating scale was used to measure pain severity. The association between variables was determined at 95% CI with binary logistic regression. A p-value <0.05 was considered significant.

Results: A total of 290 parturients were included with a response rate of 97%. The overall prevalence of moderate to severe postoperative pain after a cesarean section was 85.5% (95% CI: 81.4–89.0%) within the first 24 postoperative hours. On the multi-variable analysis, preoperative anxiety (AOR: 2.3, 95% CI: 1.1–4.9), history of previous cesarean section (AOR: 2.3, 95% CI: 1.1–5.0), Pfannenstiel incision (AOR: 3.2, 95% CI: 1.3–8.0) and absence of regional analgesia (AOR: 3.7, 95% CI: 1.7–7.9) were significantly associated with moderate to severe postoperative pain after cesarean section.

Conclusion: The prevalence of moderate to severe pain in the first postoperative day was unacceptably very high. Parturients who had preoperative anxiety, history of previous cesarean section, Pfannenstiel incisions, and those who did not receive regional analgesia have significantly suffered from postoperative pain. Pain severity needs to be assessed and documented by using pain-rating scales and interdisciplinary pain management should be provided.

Keywords: pain, post-cesarean section pain, postoperative pain, cesarean section, obstetric anesthesia and analgesia

Introduction

Cesarean section (CS) is the commonest obstetric procedure in Ethiopia and worldwide.[1,2] Pain is the leading anticipated problem in the postoperative period.[3] Pain is a sensory and emotional experience that is influenced by physiologic, sensory, affective, cognitive, sociocultural, and behavioral factors.[4] Moderate to severe pain after CS can cause morbidities, patient discomfort, dissatisfaction, poor wound healing, delayed recovery, prolonged hospital stay, poor quality of life, and chronic pain; all of which have cost implications.[5–9] If postoperative pain is poorly

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Received: 10 November 2021
Accepted: 21 December 2021
Published: 6 January 2022

treated particularly in mothers who underwent CS, it will interfere with ambulation, breastfeeding, and other maternal care of the newborn. Having a baby is considered as a pleasant event, but it can be traumatic if the mother is suffering in pain.[10] Therefore, adequate pain relief after CS by using safe and effective analgesic modalities is a universal concern since pain relief is one of the basic human rights.[11]

The most popular pain management modalities are systemic and intrathecal administration of opioids, patient-controlled analgesia, non-steroidal anti-inflammatory drugs, and regional nerve blocks. These modalities can be combined in multimodal analgesia, which results in synergistic analgesia with lowered side effects.[7,8,12,13] Despite advances in pain management, parturients experience moderate to severe pain in the acute postoperative period.[10] As previous studies reported, 78.4% to 92% of parturients had experienced moderate to severe pain. Furthermore, very little is known about the magnitude and factors associated with post-cesarean section pain in developing countries, especially in sub-Saharan Africa where multiple dimensions of challenges to assess and manage postoperative pain. These challenges are commonly associated with the scarcity of well-trained clinicians, materials, drugs, and facilities.[5–8] The objective of this study was to assess the prevalence and factors associated with postoperative pain after CS at University of Gondar Comprehensive Specialized Hospital (UoGCSH), Northwest Ethiopia.

Materials and Methods

Study Design, Period, Population, and Variables

A prospective observational study was conducted at UoGCSH from February 15 to April 20, 2019. The hospital is located in Gondar town, Northwest Ethiopia and CS was the commonest surgical operation in the hospital with an average of 120–160 per month. The source population was all parturients who underwent CS and the study population was all parturients who underwent CS at UoGCSH during the study period. All volunteer adult (18+) parturients that underwent CS were included. Parturients who had pre-existing cognitive dysfunction and chronic pain with ongoing treatment were excluded. The dependent variable was postoperative pain which was measured by using a numerical rating scale (NRS) and independent variables were sociodemographic factors, clinical factors, intraoperative factors, and postoperative factors.

Operational Definitions

The Numerical rating scale with 11 points (NRS-11): is a valid and reliable pain assessment tool. Number assigned from 0 to 10 to represent the severity of pain: 0 = no pain, 1–3 = mild pain, 4–6 = moderate pain, 7–10 = severe pain.[14] The NRS-11 was preferred due to its simplicity to understand by the parturients.[15,16]

Full return of consciousness: a state of consciousness of an individual after general anesthesia and become able to be easily arousable, aware of, and identity the surroundings.[17]

Spinal anesthesia wear-off: a point of time at which the action of spinal anesthesia ends up and patients gradually start to feel and move their legs.[18]

Sample Size Determination and Sampling Technique

The sample size was determined by single population proportion formula. Murray and Retief reported that the prevalence of moderate to severe pain during the first 24 postoperative hours after CS was 87%.[19] The sample size was calculated, assuming a 95% confidence interval with a 4% margin of error.

$$n = \left(Z\frac{\alpha}{2}\right)^2 x\ p(1-p)/\varepsilon^2$$

We have p = 0.87, ε = 0.04, Zα/2 at 95% CI = 1.96

$n = (1.96)^2 \times (0.87 \times 0.13)/(0.04)^2$

$n = 271.6 \approx 272$

A ten percent non-response rate was added and the final sample size was 299.

Data Collection, Quality Control, and Analyses

After obtaining ethical approval from the Ethical Review Committee of the School of Medicine, data were collected by using a pre-tested structured questionnaire. A pilot study was conducted on 30 (10%) clients who were not incorporated in the main study. The participants have received adequate information about the study and informed consent was obtained. Pain severity was assessed and documented by using NRS-11 at 2nd, 12th, 24th postoperative hours. The data were analyzed by using SPSS version-20 (IBM Corporate). Normality was tested by the Shapiro–Wilk test. The Hosmer and Lemeshow test was

used for model assessment. The association of variables was determined by binary logistic regression at a 95% confidence interval and presented in crude and adjusted odds ratio. A p-value less than 0.05 was considered as statistically significant. This prospective observational study was appraised and reported by using STROCSS guideline. Additionally, it complies with the Declaration of Helsinki and its Research Registry Unique Identification Number is researchregistry7303.

Results

A total of 290 parturients who underwent CS were included in this study. Nine patients were excluded from analysis due to incomplete data. The age of most parturients was between 18 and 34 years and the median age (IQR) was 28 (25–30.3) years (Table 1). Most of the clients did not receive preemptive analgesia other than spinal anesthesia. The larger proportion of parturients underwent CS with spinal anesthesia and only 21 (7.2%) with general anesthesia. Predominantly, emergency CS was performed during the study period (Table 2).

The NRS-11 score at the 2nd postoperative hour shows that 24.5% of parturients experienced none to mild pain, whereas 75.5% of parturients reported having moderate to severe pain. At the 12th hr, 80.0% of parturients had moderate to severe pain and only 20.0% had scored no to mild pain. At the 24th hr, 41.4% had experienced no to mild pain while 58.6% experienced moderate to severe pain. The overall prevalence of postoperative pain was 85.5% in the first 24 postoperative hours (95% CI: 81.4%, 89.0%) (Figure 1).

A 52.4% of parturients did not receive any analgesics at the 2nd hr. Out of those who received analgesics at this point, 73.2% were treated by diclofenac. The numbers of parturients that received analgesics were increased at the 12th hr and 77.2% of clients had received certain types of systemic analgesics. Diclofenac and tramadol were the commonest analgesics administered to treat pain. At the 24th hr, 36.9% of parturients did not receive any analgesics (Figure 2).

The most commonly practiced regional analgesic options for postoperative pain relief after CS in the hospital were epidural analgesia, and abdominal blocks (TAP block, Ilioinguinal/Iliohypogastric nerve blocks and para-incisional wound infiltration). However, regional analgesics were provided only for 66 (22.8%) parturients, while the remaining 224 (77.2%) did not receive regional analgesia and TAP block was the most frequently performed 35 (53.0%) (Figure 3).

Table 1 Socio-Demographic and Clinical Characteristics of the Parturients Who Delivered with Cesarean Section at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia; 2019 (N = 290)

Variables	Frequency (n)	Percentage (%)
Age		
18–34	219	75.5
≥35	71	24.5
Body mass index (Kg/m^2)		
Underweight	11	3.8
Normal	194	66.9
Overweight	56	19.3
Obese	29	10.0
Educational status		
Illiterate	41	14.2
Primary school	56	19.3
Secondary school	92	31.7
College and above	101	34.8
ASA status		
II	258	89.0
III and above	32	11.0
Preoperative anxiety		
Yes	151	52.1
No	139	47.9
Preoperative analgesics		
Yes	26	9.0
No	264	91.0
Parity		
Nulliparous	122	42.1
Multiparous	168	57.9
History of previous Cesarean Section		
Yes	196	67.6
No	94	32.4

In the multivariate logistic regression analysis, preoperative anxiety, history of previous cesarean section, type of incision, and administration of regional nerve blocks were found significantly associated with postoperative pain ($p < 0.05$) (Table 3).

Discussion

The overall prevalence of moderate to severe postoperative pain in the first 24 postoperative hours was 85.5% (95% CI: 81.4–89.0%). Moderate to severe pain was reported in 75.5% of parturients at the 2nd hr, 80% at the 12th hr, and 58.6% at the 24th hr. These figures showed that there was inadequate treatment of pain during the postoperative period. Pain was the prevalent problem and undermanaged among surgical patients.[19,20] Postoperative pain after CS is

Table 2 A Cross-Tabulation of the Intraoperative Factors with Postoperative Pain After Cesarean Section in University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia; 2019 (N = 290)

Variables	Frequency (n)	Percentage (%)	Overall Postoperative Pain in 24 Hours	
			None to Mild	Moderate to Severe
Urgency of CS				
Emergency	190	65.5	28	162
Elective	100	34.5	14	86
Type of incision				
Midline	44	15.2	11	33
Pfannenstiel	246	84.8	31	215
Length of incision				
<10 cm	148	51.0	26	122
≥10 cm	142	49.0	16	126
Type of anesthesia				
General	21	7.2	3	18
Spinal	269	92.8	39	230
Surgical time				
<60 minutes	273	94.1	39	234
≥60 minutes	17	5.9	3	14
Regional nerve blocks				
Yes	66	22.8	18	48
No	224	77.2	24	200

Abbreviations: CM, centimeters; CS, cesarean section.

still poorly controlled and results in adverse outcomes in the wellbeing of both the mother and her newborn. Several studies have revealed a high prevalence of moderate to severe postoperative pain (78–93%) after CS.[19,21–25]

Moderate to severe postoperative pain was perceived in 88.2% non-CS surgical patients in Jimma, Southwest Ethiopia, and 57% at 2nd hr and 78% at 12th hr in Gondar, Northwest Ethiopia.[19,26] These results exposed the inadequate treatment of postoperative pain in the country. As Eisenach et al publicized, 10.9% of participants had severe acute pain within the first 36 postoperative hours,[24] which is much lower compared to our findings. The variations can be explained by a larger and multicenter sample and better practice of pain management in the developed United States of America. A survey conducted by Kintu et al reported that the prevalence of severe acute pain after CS was 33%, 39%, and 29% at Zero, 6th and 24th postoperative hours, respectively.[25] However, in our study, the prevalence of postoperative pain was much higher at all time points (2nd, 12th, and 24th hr). The discrepancy could be due to the difference in assessment time points. In the earlier study, pain assessment was started on arrival to recovery area (Zero hours) at which time-point spinal anesthesia might not wear-off. Furthermore, a visual analog scale was used in the previous study while we used NRS-11. The most commonly prescribed analgesia for postoperative pain management was intramuscular diclofenac followed by tramadol. The finding is similar to the Ugandan study and showed the underuse of multiple classes of analgesics to manage postoperative pain in low-income countries.[25] It was 3.7 times more likely to develop moderate to severe postoperative pain if regional analgesics were not administered as parts of multimodal analgesia. Multiple studies have supported that para-incisional wound infiltration and abdominal field nerve blocks after both spinal and general anesthesia can alleviate pain after CS and reduce opioid consumption.[27–29]

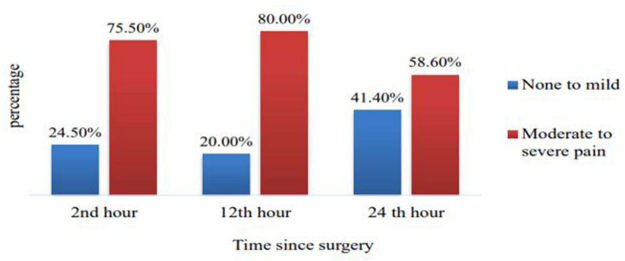

Figure 1 Pain after cesarean section at 2nd, 12th and 24th postoperative hours at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia (N = 290).

Preoperative anxiety was found associated with pain after CS. Parturients who had anxiety during the preoperative period were 2.3 times more likely to complain about

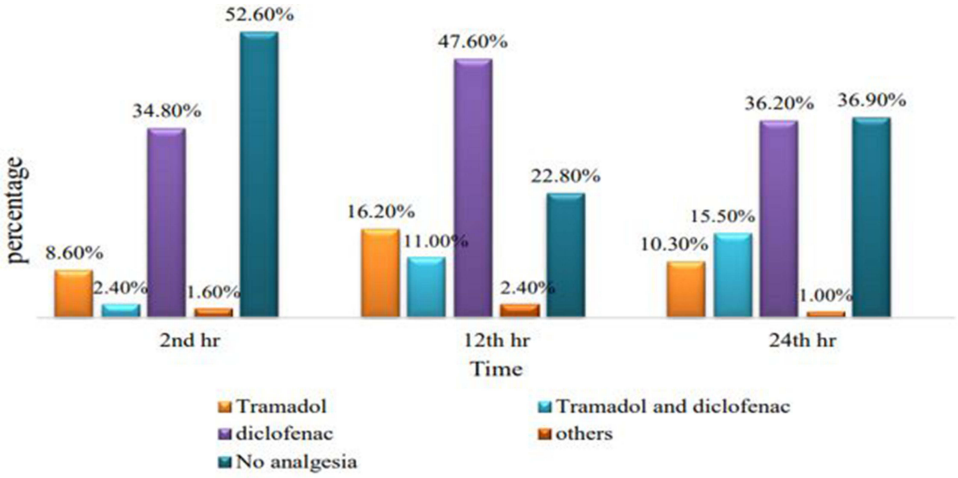

Figure 2 Systemic analgesics postoperatively given after cesarean section at the 2nd hr, 12th hr and 24th hr at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia (N = 290).

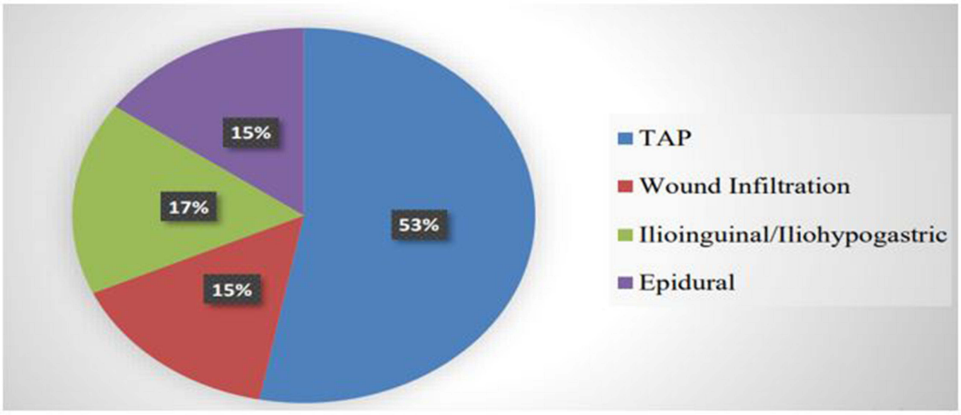

Figure 3 Regional analgesics provided for postoperative analgesia after cesarean section at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia (N = 66).

moderate to severe postoperative pain. Comparably, a study in Brazil has revealed that the occurrence of moderate to severe postoperative pain was 1.6 times in anxious mothers preoperatively.[22] Additionally, a previous study in our study area showed that 51.7% of patients had preoperative anxiety due to a fear of postoperative pain.[30] Anxiety and fear of pain can predict postoperative pain after CS.[31]

The type of incisions significantly affected the patterns of postoperative pain. The Pfannenstiel incisions caused moderate to severe pain by 3.2 folds than midline incisions. Habib et al concluded no significant difference between midline or Pfannenstiel incisions in terms of postoperative pain.[32] Despite this, another study has concluded that midline incision was associated with intense postoperative pain.[33] A randomized controlled trial found that pain of vertical incisions was higher than Pfannenstiel incisions in primary CS. However, in the consecutive CS, the pain of Pfannenstiel incisions was higher.[34] In the current study, a larger proportion of clients (67.6%) had a history of previous CS. Additionally, the dissimilarities can be explained by the length of incisions. The recommended optimal length of incision for CS is <10 cm.[35] In the current study, larger proportions of parturients (49%) had incision length of ≥10 cm, hence, increased injury to the abdominal wall nerves and increased the rate/intensity of postoperative pain. Pfannenstiel is the commonest type of incision since it was considered to offer adequate pelvic exposure, excellent postoperative strength, reduced risk of disruption, incisional hernia, hypertrophic scar, and good cosmetic results.[33] Furthermore, recent studies have shown that extra-

Table 3 Bivariate and Multivariate Binary Logistic Regression: Factors Associated with Postoperative Pain After Cesarean Section at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia; 2019 (X-Tab and OR with 95% CI) (N = 290)

Variables	Overall Postoperative Pain in 24 Hours		Odds Ratio (95% CI)	
	None to Mild n (%)	Moderate to Severe n (%)	Crude	Adjusted
Preoperative anxiety				
Yes	15 (9.9)	136 (90.1)	2.19 (1.1, 4.3)	2.3 (1.1, 4.9)
No	27 (19.4)	112 (80.6)	1	1[a]
Body mass index (Kg/m^2)				
<30	41 (15.7)	220 (84.3)	1	1
≥30	1 (3.4)	28 (96.6)	5.2 (1.1, 4.3)	4.3 (0.5, 34.4)
History of previous CS				
Yes	24 (12.2)	172 (87.8)	1.7 (0.8, 3.3)	2.3 (1.1, 5.0)
No	18 (19.1)	76 (80.9)	1	1[a]
Type of incision				
Pfannenstiel	31 (12.6)	215 (87.4)	2.3 (1.1, 5.0)	3.17 (1.3, 8.0)
Midline	11 (25.0)	33 (75.0)	1	1[a]
Length of incision				
<10 cm	26 (17.6)	122 (82.4)	1	1
≥10 cm	16 (11.3)	126 (88.7)	1.7 (0.9, 3.3)	1.5 (0.7, 3.1)
Regional nerve blocks				
Yes	18 (27.3)	48 (72.7)	1	1[a]
No	24 (10.7)	200 (89.3)	3.1 (1.6, 6.2)	3.7 (1.7, 7.9)

Notes: [a]Significant in multivariate binary logistic regression analysis.
Abbreviations: OR, odds ratios, CI, confidence interval, CM, centimeters CS, cesarean section.

peritoneal French Ambulatory cesarean section technique was safe and can reduce postoperative pain while accelerating recovery, suggesting that this technique should be more widely used.[36,37]

Our study has proved a significant association between previous CS and postoperative pain. When there was an experience of previous CS, suffering from moderate to severe pain increased by more than 2 folds and can be explained by increased risks of uterine dehiscence, bleeding, postoperative infection, adhesion, longer operating time, and hospital stay.[34,38,39] Even though the study was the first for its type in the country, its limitation was the inability to show cause and effect relations since its design was observational.

Conclusion

The prevalence of moderate to severe pain in the first 24 postoperative hours was unacceptably very high at UoGCSH and pain management in the recovery rooms and maternity wards was overlooked. Parturients who had preoperative anxiety, history of previous CS, Pfannenstiel incisions, and those who did not receive regional analgesia have significantly suffered from moderate to severe postoperative pain. Pain severity needs to be assessed and documented by using pain-rating scales and there should be interdisciplinary approaches to provide adequate pain management.

Abbreviations

AOR, adjusted odds ratio; ASA, American Society of Anesthesiologists; CS, cesarean section; NRS, Numerical Rating Scale; TAP, Transverse Abdominus Plane; UoGCSH, University of Gondar Comprehensive Specialized Hospital.

Data Sharing Statement

Data and materials used in this study are available and can be presented by the corresponding author upon reasonable requests.

Ethics Approval and Consent to Participate

Ethical approval to conduct the research was obtained from Ethical Review Committee of School of Medicine, College of Medicine and Health Sciences, University of Gondar. Informed consent was taken from each study

patients after brief explanation. Every participant was allowed to discontinue participation if did not want to finish it. The participants were assured that their treatment and other benefits they can gain from the hospital will not be interrupted due to their withdrawal. Confidentiality was ensured by removing identifiers and locking the questionnaires after data collection in a secured area. Additionally, when patients found experiencing pain in the postoperative period, the data collectors had reported for the corresponding care givers (Anesthetist, Surgeon or Nurse) to provide the appropriate pain management.

Acknowledgments

University of Gondar and data collectors.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

College of Medicine and Health Sciences, University of Gondar.

Disclosure

The authors report that they have no competing interests in this work.

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