

# Postoperative Pain After Cesarean Section at University of Gondar Comprehensive Specialized Hospital, Gondar, Northwest Ethiopia, 2019; A Cross-Sectional Follow-up Study

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## Research

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# Abstract

**Background:** Cesarean section is one of the most common obstetric procedures worldwide. Following this, parturients experience moderate to severe pain in the acute postoperative period. Therefore, in resource-limited settings, for full utilization of basic analgesic modalities and to take appropriate interventions, it is vital to know about the magnitude of the problem and its factors.

**Objective:** To assess the prevalence and factors associated with postoperative pain after cesarean section at the University of Gondar Comprehensive Specialized Hospital (UoGCSH), Northwest Ethiopia, 2019.

**Methods:** A hospital-based prospective follow-up study was conducted among parturients who undergo cesarean section in the University of Gondar Comprehensive Specialized Hospital, from mid-February to April 20, 2019, after approval of the ethical review committee. Consecutively, a total of 290 parturients were included with a response rate of 97%. To measure pain severity numerical rating scale was used. Data was entered into Epi-data version 4.2 and analyzed by SPSS version 20 (IBM Corporate). The association between independent factors and the outcome variable was determined at 95% CI with the chi-squared test, bivariate, and multivariate logistic regression. Hosmer-Lemeshow test was used to assess the goodness of fit. Variables with a p-value of < 0.05 were considered significant.

**Results:** In this study, the incidence of moderate to severe post-operative pain after 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.

**Conclusions:** In this study, a large proportion of parturients had experienced moderate to severe post-cesarean pain in the first 24 postoperative hours. Preoperative anxiety, history of previous cesarean section, Pfannenstiel incision, and parturients with no regional analgesia were significantly associated with post-cesarean pain. Pain severity needs to be assessed and documented by using pain-rating scales and there should be an interdisciplinary approach to provide adequate pain management in our hospital.

## Plain English Summary

Pain is one of the commonest condition during the postoperative period after surgical operation. It is associated with physical, biochemical and mental adverse outcomes. Cesarean Section (CS) is the most common surgical operation performed world-wide. This study was designed to measure the incidence of postoperative pain and its associated factors after CS within the first 24 postoperative hours.

Out of 290 parturients, 85.5% had experienced moderate to severe pain at least on one of the end-points within the first 24 postoperative hours. This finding was very high compared to others. Parturients with

preoperative anxiety, history of previous CS, Pfannenstiel incision and lack of regional analgesia were high likely to develop moderate to severe pain.

According to our findings, we recommended that to insure adequate and appropriate drugs and materials for pain management in the recovery rooms and maternity wards, provide regular training on pain management and assessment for clinicians who practice in the maternity care, and introduce appropriate modalities that can help relieving preoperative anxiety. Clinicians should provide special attention for parturients who has preoperative anxiety, history of previous CS and long Pfannenstiel incisions. They also should facilitate for the adequate access and provision of regional analgesia in the postoperative period.

## Background

Cesarean section (CS) is one of the commonest obstetric procedure in the world and in Ethiopia as well [1, 2]. Following this procedure, pain is the commonest and anticipated problem in the postoperative period [3]. Pain is a sensory and emotional experience which is influenced by physiologic, sensory, affective, cognitive, sociocultural and behavioral factors [4]. Surgical tissue damage increases peripheral and central sensitization which results in moderate to severe pain after CS [5–8], which leads to patient discomfort, decreased level of satisfaction and delayed recovery. Postoperative pain also can results in unwanted consequences, such as poor wound healing, prolonged hospital stay, poor quality-of-life, increased risk of morbidity, prolonged duration of opioid use and chronic pain. All of these have cost implications [5, 6, 9]. Especially in parturients who delivered with CS; if postoperative pain is inadequately treated, it may 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 in pain at the postoperative period [10]. Therefore, adequate pain relief after CS by using a safe and effective analgesic agent with different combinations, is a universal concern since pain relief is one of the basic human right [11].

Even though, there is no current “gold standard” post-cesarean pain management, there are many options of treatment modalities; of those, the most popular pain management modalities are; systemic and intrathecal administration of opioids, patient-controlled analgesia, intra-muscular injection of non-steroidal anti-inflammatory drugs and regional nerve blocks. Generally, these pain management modalities combined as part of multimodal analgesia, which results in additive or synergistic analgesia with lowered side effects [7, 8, 12, 13].

Despite such advances in pain management, parturients experience moderate to severe pain in the acute postoperative period, which is recognized as a major clinical problem that affects mothers and their newborns [10]. As previous studies reported, parturients after CS had 78.4–92% chance of experiencing moderate to severe pain. But very little is known about the magnitude of post-cesarean section pain and factors associated with post-cesarean section pain in the developing countries, especially in the sub-Saharan Africa. The developing world has multiple dimensions of challenges to assess and provide

adequate pain management services. These challenges are commonly associated with scarcity of well-trained clinician, materials, drugs and facilities. [5–8]. The objectives of this study was to assess the incidence of postoperative pain after CS and identify the factors associated with postoperative pain after CS at University of Gondar Comprehensive Specialized Hospital, Gondar, Northwest Ethiopia, 2019.

## Methods

A Hospital-based prospective follow up study was conducted from mid, February to April 20, 2019, in University of Gondar Comprehensive Specialized Hospital (UoGCSH). The Hospital is located in Gondar town, Northwest Ethiopia. Cesarean section (CS) is the commonly performed surgical operation with an average of 120–160 operation per month in two functional operation theatres that are dedicated for CS only.

The source population was all parturients who gave birth by CS under anesthesia and study population was all parturients who gave birth by CS under anesthesia at UoGCSH during the study period were the study. All volunteer adult (18+) parturients that underwent CS under both spinal and general anesthesia were included in this study. Parturients who had pre-existing cognitive dysfunction and those who had an ongoing treatment for chronic pain were excluded.

The dependent variable was postoperative pain after CS which was measured with numerical rating scale (NRS). The independent variables were socio-demographic factors (age, body mass index, religion, educational status, marital status and ethnicity), clinical factors (preoperative visit by anesthetists, preoperative anxiety, history of previous CS, preoperative use of analgesics, ASA status, and parity), intraoperative factors (type of surgery, type of incision, length of incision, type of anesthesia, the status of the newborn, surgical time, anesthesia time, regional nerve blocks and intraoperative analgesics) and postoperative factors (types of analgesics given at the postoperative period).

Numerical rating scale with 11 points (NRS-11) is a valid and reliable pain assessment tool in which the number assigned from 0–10 to represent the severity of pain: 0 = no pain, 1–3 = mild pain, 4–6 = moderate pain, 7–10 = severe pain [14]. In this study, NRS-11 was preferred to use due to its simplicity to understand by the parturients. Tolerable pain threshold is defined as a treatment threshold of pain score with a cut of point of NRS-11  $\geq$  4, which was considered to identify patients with pain of moderate to severe intensity [15, 16]. Full return of consciousness is defined as a state of consciousness of an individual when he/she is awake or easily arousable and aware of his surroundings and identity after general anesthesia [17]. Spinal anesthesia wear-off is defined as a period of time the spinal anesthetic ends up and patients will gradually start to be able to feel and move their legs and may experience tingling or pins and needles in their legs [18].

To determine sample size, single population proportion formula was used. A study done in South Africa reported that the incidence of moderate to severe pain during the first 24 postoperative hours and in the immediate postoperative period after cesarean section was (87%) [19]. By assuming 95% of confidence

interval with 4% margin of error, the sample size for the study was calculated as so based on this data sample size of this study was calculated by using a single population proportion formula as:

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

We have  $p = 0.87$ ,  $\epsilon = 0.04$ ,  $Z_{\alpha/2}$  at 95% CI = 1.96

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

$n = 271.6 \approx 272$ , then when we added 10% of the non-response rate, the sample size was  $n = 299$ .

All eligible consecutive parturients who underwent cesarean section were included in the study till the calculated sample size reached.

Data was collected by using a pre-tested structured questionnaire. The questionnaire was primarily prepared in English language and translated to Amharic language. Training for data collectors and supervisors was provided by the principal investigator. A pilot was conducted on 30 (10%) patients who were not included in the main study. Then necessary corrections were made accordingly to the questionnaire for the main study. The data collectors and supervisors were closely mentored by the principal investigator throughout the study period. Study participants were provided with adequate information regarding assessment tool (NRS-11). The data collectors took informed consent; reviewed the charts and document pain severity at rest and on movement by using NRS-11 at 2, 12, 24 postoperative hours. The type, doses and time of administered analgesics were also documented. The collected data was checked for the completeness and clarity

After completion of data collection, the variables were coded and cleaned. The data was entered into the Epi-data software (version 4.2) for cleaning for errors and was analyzed by SPSS version 20 (IBM Corporate). The normality of the data was tested by using Shapiro-Wilk normality test. Descriptive statistic was done and presented with frequency, percentage, mean, standard deviation, median and inter-quartile range (IQR). The relationships of nominal data with postoperative pain were analyzed by using cross-tabulations. Hosmer and Lemeshow test was used to assess the goodness of fit. The associations between the independent variables and outcome variable were determined at 95% confidence interval with chi-squared test, bivariate and multivariate binary logistic regression. The cut-point of statistical significance was  $P < 0.2$  for bivariate and 0.05 for multivariate regression. Crude and adjusted Odds Ratio were used to see the strength of the association for bivariate and multivariate logistic regression respectively.

## Results

A total of 290 parturients who deliver with cesarean section were involved in this study with a 97% response rate. Nine patients were excluded from the analysis due to incomplete data. The ages of the

majority of parturients 219 (75.5%) fall between 18 to 34 years. The median age (IQR) 28 (25–30.3) years. The median (IQR) of BMI of the parturients was 22.6 (20.6–24.6) Kg/m<sup>2</sup> respectively. The majority 206 (71%). had a normal BMI between 18.5 – 24.5 [Table 1].

Table 1  
Socio-demographic 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	219	75.5
18–34	71	24.5
≥ 35		
BMI (Kg/m <sup>2</sup> )	11	3.8
Underweight	194	66.9
Normal	56	19.3
Overweight	29	10.0
Obese		
Marital Status	11	3.8
Unmarried	269	92.8
Married	10	3.4
Divorced		
Educational status	41	14.2
Illiterate	56	19.3
Primary school	92	31.7
Secondary school	101	34.8
College and above		
BMI: Body Mass Index		

The majority of parturients 258 (89%) were ASA II while only 32 (11%) were ASA III and above. Most of the parturients had not given analgesics at the preoperative period 264 (91%), while few of them had received as preemptive analgesia or for the treatment of their pain 26 (9%) [Table 2]. A Large proportion of parturients 269 (92.8%) had undergone CS under spinal anesthesia, while only about 21 (7.2%) of parturients were with general anesthesia. About 190 (65.5%) of parturients were presented for emergency CS and the rest 100 (34.5%) were scheduled for elective CS [Table 3].

Table 2  
Health status and clinical characteristics of parturients who delivered  
Cesarean Section at University of Gondar Comprehensive Specialized  
Hospital, Northwest Ethiopia; 2019, (N = 290).

<b>Variables</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
ASA status	258	89.0
II	32	11.0
III and above		
Preoperative anxiety	151	52.1
Yes	139	47.9
No		
Preoperative analgesics	26	9.0
Yes	264	91.0
No		
Parity	122	42.1
Nulliparous	168	57.9
Multiparous		
History of previous Cesarean Section	196	67.6
Yes	94	32.4
No		
ASA: American Society of Anesthesiologists		

Table 3

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 sever
Urgency of CS	190	65.5	28	162
Emergency	100	34.5	14	86
Elective				
Type of incision	44	15.2	11	33
Midline	246	84.8	31	215
Pfannenstiel				
Length of incision	148	51.0	26	122
< 10 cm	142	49.0	16	126
≥ 10 cm				
Type of anesthesia	21	7.2	3	18
General	269	92.8	39	230
Spinal				
Surgical time	273	94.1	39	234
< 60 minutes	17	5.9	3	14
≥ 60 minutes				
Regional nerve blocks	66	22.8	18	48
Yes	224	77.2	24	200
No				
CS: Cesarean Section				

The NRS-11 score at the 2nd postoperative hr shows that 71(24.5%) of parturients experienced none to mild pain, while, about 219 (75.5%) of parturients reported to have moderate to severe pain. At the 12th hr more parturients 232 (80.0%) had moderate to severe pain compared to the 2nd hr and only 58 (20.0%) had scores for no to mild pain. At the 24th hr, about 120 (41.4%) had experienced no to mild pain while 170 (58.6%) experience moderate to severe pain. The overall incidence of moderate to severe postoperative pain after CS was 85.5% (95% CI: 81.4%, 89.0%) in the first 24 postoperative hours [Figure 1].

About 152 (52.4%) of the parturients did not received any analgesics at the 2nd hr. Out of those who took analgesics at this time (138 (47.4%)), the majority 101 (73.2%) had received diclofenac. The number of parturients that received analgesics was increased at the 12th hr. About 224 (77.2%) had received certain types of systemic analgesics. Diclofenac and tramadol were the leading analgesics administered to treat pain. At the 24th hr, about 107 (36.9%) of parturients did not obtain any analgesics. [Figure 2].

The most commonly practiced regional analgesic options for postoperative pain relief after CS in the hospital were epidural analgesia, abdominal field blocks such as TAP block and IL/IH nerve blocks and para-incisional wound infiltration. However, these regional analgesic were done only in about 66 (22.8%) of parturients, while the remaining 224 (77.2%) of parturients had not received regional analgesia. Among those regional analgesics, the most frequent 35 (53.0%) was TAP block [Figure 3].

On the bivariate binary logistic regression analysis; BMI, educational status, preoperative anxiety, history of previous cesarean section, type of incision, length of incision, administration of regional nerve blocks and systemic analgesics given at 12th hr were found significantly associated with postoperative pain ( $p < 0.2$ ). However, on the multivariate binary 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 after cesarean section ( $p < 0.05$ ). [Table 4].

Table 4

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	15 (9.9)	136 (90.1)	2.19 (1.1, 4.3)	2.3 (1.1, 4.9)
Yes	27 (19.4)	112 (80.6)	1 <sup>⊠</sup>	1 <sup>⊠</sup>
No				
BMI (Kg/m <sup>2</sup> )	41 (15.7)	220 (84.3)	1 <sup>⊠</sup>	1
< 30	1 (3.4)	28 (96.6)	5.2 (1.1, 4.3)	4.3 (0.5, 34.4)
≥ 30				
History of previous CS	24 (12.2)	172 (87.8)	1.7 (0.8, 3.3)	2.3 (1.1, 5.0)
Yes	18 (19.1)	76 (80.9)	1 <sup>⊠</sup>	1 <sup>⊠</sup>
No				
Type of incision	31 (12.6)	215 (87.4)	2.3 (1.1, 5.0)	3.17 (1.3, 8.0)
Pfannenstiel	11 (25.0)	33 (75.0)	1 <sup>⊠</sup>	1 <sup>⊠</sup>
Midline				
Length of incision	26 (17.6)	122 (82.4)	1 <sup>⊠</sup>	1
< 10 cm	16 (11.3)	126 (88.7)	1.7 (0.9, 3.3)	1.5 (0.7, 3.1)
≥ 10 cm				
Regional nerve blocks	18 (27.3)	48 (72.7)	1 <sup>⊠</sup>	1 <sup>⊠</sup>
Yes	24 (10.7)	200 (89.3)	3.1 (1.6, 6.2)	3.7 (1.7, 7.9)
No				
<sup>⊠</sup> Significant from bivariate binary logistic regression analysis <sup>⊠</sup> Significant from multivariate binary logistic regression analysis OR: Odds Ratios, CI: Confidence Interval, BMI: Body Mass Index, CS: Cesarean Section				

Parturients who had preoperative anxiety were 2.3 times more likely to had moderate to severe postoperative pain than those who were not anxious (AOR: 2.3, 95% CI: 1.1, 4.9). Similarly, the odds of having moderate to severe postoperative pain were 2.31 times (AOR: 2.3, 95% CI: 1.1, 5.0) higher among parturients who had history of previous cesarean section than those parturients who not. The study also

revealed that the likelihood of having moderate to severe post-operative pain after CS was 3.2 times (AOR: 3.2, 95% CI: 1.3, 8.0) higher during transverse incision compared to midline incision. Parturients who had not received regional analgesia and para-incisional wound infiltration as part of multimodal analgesia were 3.7 times (AOR: 3.7, 95% CI: 1.7, 7.8) more likely to have moderate to severe postoperative pain [Table 4].

## Discussion

The current study was designed to measure the incidence of postoperative pain after CS and identify factors associated with it in the first 24 postoperative hours. We found that the overall incidence 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. This shows that there was inadequate treatment of pain at the postoperative period after cesarean section. Pain is the prevalent problem and undermanaged in patients subjected to different types of surgical operations including CS [19, 20]. Postoperative pain after CS is still poorly controlled and results in adverse outcomes in the wellbeing of both the mother and her newborn. Several studies have revealed that there is a high incidence (78–93%) of moderate to severe postoperative pain after CS [19, 21–25].

The incidence of moderate to severe postoperative pain in surgical patients other than CS was 88.2% in Jimma, Southwest Ethiopia and 57% at 2nd hr and 78% at 12th hr in Gondar, Northwest Ethiopia [19, 26]. This results exposed inadequate treatment of pain of surgical patients in the country. A prospective cohort study done in the United States of America shown that the incidence of severe acute pain within the first 36 postoperative hours was 10.9% [24], which is much lower compared to our findings. The variations could be explained by larger and multicenter sample size and better practice on pain management in the developed United States of America. Another prospective survey in Uganda reported that the incidence of severe acute pain after CS at three time-points at Zero, 6th and 24th hr since surgery was 33%, 39% and 29% respectively [25]. In-contrast, the incidence of postoperative pain was much higher in our study at all time-points (2nd, 12th, and 24th hr). The discrepancy could be due to the difference of time-points of assessment. In the Ugandan study clients were assessed for pain as soon as arrived at the recovery area (Zero hour); and at this time-point spinal anesthesia might not wear off. Furthermore, the use of different pain scales could be another reason for the disparities since they used visual analogue scale while we used NRS-11. The most commonly prescribed analgesic for postoperative pain management was intramuscular diclofenac followed by tramadol. This finding is similar with the Ugandan study [25]. This could show the underuse of multiple classes of analgesics to manage postoperative pain in low-income countries. It was 3.7 times more likely to develop moderate to severe postoperative pain if regional analgesics (neuraxial, peripheral or para-incisional wound infiltration) were not administered as parts of multimodal analgesia. Multiple studies have supported that para-incisional wound infiltration and abdominal nerve blocks after both spinal and general anesthesia can alleviate pain after CS and reduce opioid consumption [27–29].

Preoperative anxiety was found to be one of the factors associated with pain after CS. Parturients who had anxiety at the preoperative period were 2.3 times more likely to complain for moderate to severe postoperative pain than those who were not anxious. Comparably, a study done in Brazil has revealed that the likelihood of having moderate to severe postoperative pain was 1.6 times in mothers who were anxious at the preoperative period [22]. In addition, a previous study in our hospital showed that about 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 after CS. The Pfannenstiel incisions were more likely to cause moderate to severe pain (AOR: 3.2, 95% CI: 1.3, 8.0) than the midline incisions. A study done in the United States of America shown no significant difference in postoperative pain when CS performed either with midline or pfannenstiel incisions [32], Despite these, a Danish study has concluded that midline incision is associated with having higher postoperative pain [33]. An RCT in Thailand found out that pain of the vertical incisions was higher than Pfannenstiel incisions at the 3rd, 12th and 24th postoperative hours in primary CS. However, in repeated CS, pain of Pfannenstiel incisions was higher at the 6th and 12th postoperative hours [34]. The possible reasons to this dissimilarities might be explained by the length of incisions. The recommended optimal length of incision for CS is < 10 cm [35]. Compared to others, larger proportions of parturients (49%) had incision length of  $\geq 10$  cm. This might have increased the likelihood of injury to the nerves of the abdominal wall and increased the incidence and intensity of postoperative pain. Pfannenstiel is the most performed type of incision in 246 (84.8%) of the parturient. It was considered to offers adequate pelvic exposure, excellent postoperative strength, reduced risk of disruption and incisional hernia, decreased risk of hypertrophic scar and good cosmetic results [33].

This study has proved the significant association between previous CS and postoperative pain. Parturients who had the experience of previous CS were more likely to have moderate to severe pain (AOR: 2.3, 95% CI: 1.1–5). The association can be explained by increased risks of longer operating time and hospital stay, uterine dehiscence, bleeding, postoperative infection and adhesion [34, 36, 37].

The strengths of the study are that it is the first in its type at the setup and the country at large. So it can be used as a cornerstone for the future studies in the field. It has measured the magnitude of the problem and identified factors that affected the problem. We believe that the results of the study can be used as a waking alarm for the stake-holders in the maternal care and help them to take appropriate actions to tackle the problem. The limitation of the study is its inability to show cause and effect relations since it is done with a cross-sectional design.

## Conclusions And Recommendations

The overall incidence of moderate to severe postoperative pain in the first 24 postoperative hours was very high and it occurred in 85.5% of parturients delivered by CS. This shows poor pain management in the recovery rooms and maternity wards. Parturients who had preoperative anxiety, history of previous

CS, Pfannenstiel incisions and those who did not received regional analgesia had suffered from moderate to severe postoperative pain after CS. According to our findings, we recommended that the hospital should insure adequate and appropriate drugs and materials for pain management in the recovery rooms and maternity wards, provide regular training on pain management and assessment for clinicians who practice in the maternity care, and introduce appropriate modalities that can help relieving preoperative anxiety. Clinicians should provide special attention for parturients who has preoperative anxiety, history of previous CS and long Pfannenstiel incisions. They also should facilitate for the adequate access and provision of regional analgesia in the postoperative period.

## List Of Acronyms And Abbreviations

AOR Adjusted Odds Ratio

ASA American Society of Anesthesiologists

BMI Body Mass Index

CS Cesarean Section

IL/IH Iliioinguinal /Iliohypogastric

NRS Numerical Rating Scale

TAP Transvers Abdominus Plane

UOGCSH University of Gondar Comprehensive Specialized Hospital

## Declarations

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### Availability of data and materials

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

### Authors' contributions

GD, YBW conceptualized the study and objectives. GD developed the proposal. YBW, AGH, and WBC criticized the proposal. All the authors had participated in the data and statistical analyses. YBW led the manuscript preparation. All the authors read and approved the final manuscript.

### **Ethics approval and consent to participate**

Ethical clearance to conduct the research was obtained from Ethical Review Board of School of Medicine, College of Medicine and Health Sciences, University of Gondar. Written informed consent form using Amharic and English languages was presented. Consent was taken from each study patients after brief explanation. Every participant was allowed to discontinue participation if did not want to finish it. Also 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 significant anxiety in the preoperative period, the data collectors had reported for the corresponding care giver (Anesthetist, Surgeon or Nurse) to provide pain management.

### **Consent for publication**

Not applicable; this article does not include any personal or clinical details of any participant.

### **Competing interests**

The authors declared that they have no competing interests.

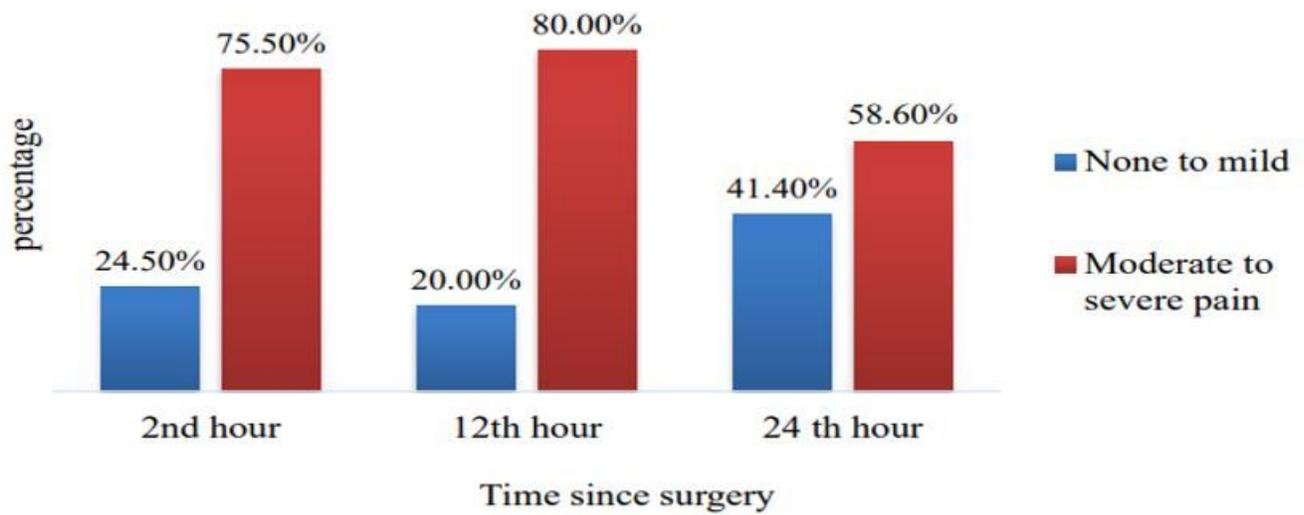
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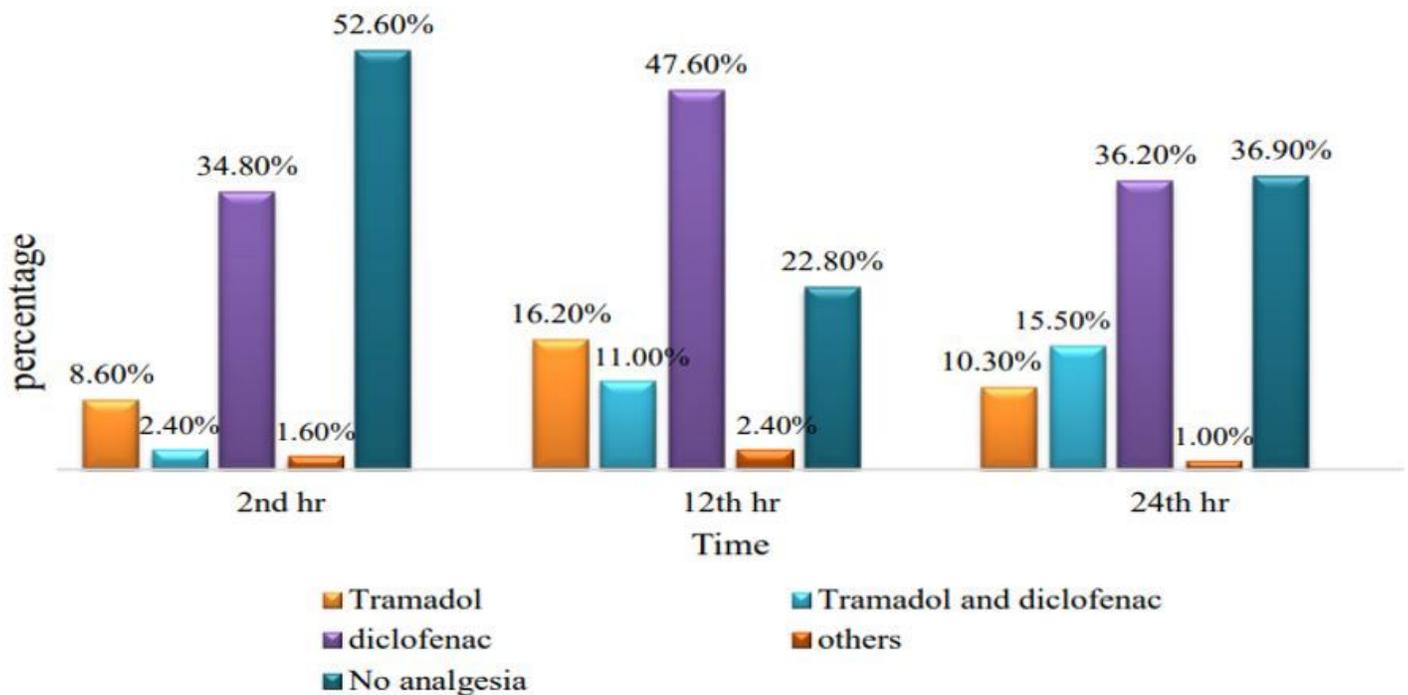
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## Figures



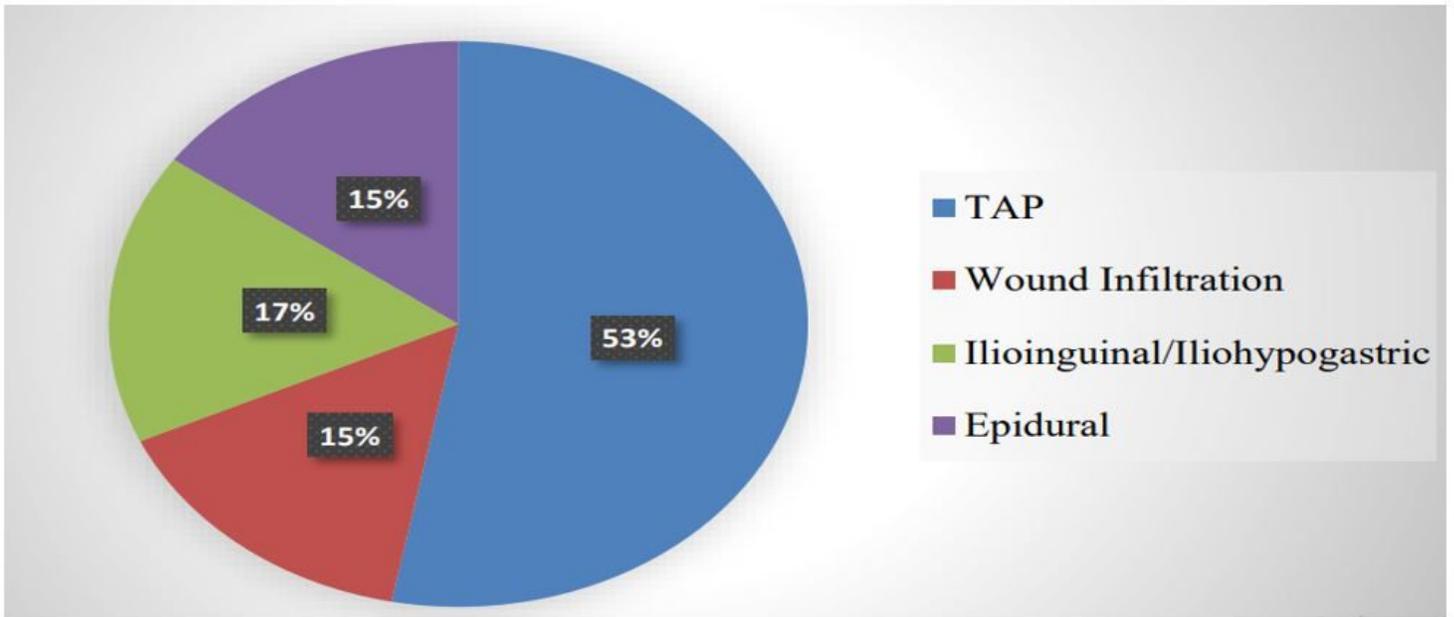
**Figure 1**

Pain after cesarean section at 2nd, 12th and 24th postoperative hours at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia; 2019, (N = 290)



**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; 2019, (N = 290).



**Figure 3**

Regional analgesics provided for postoperative analgesia after cesarean section at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia; 2019, (N = 66).