Original Research Article

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Patterns and Effectiveness of Postoperative Pain Management in Elective Abdominal Surgeries: A Prospective Observational Study

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Abstract

Background: Postoperative pain is a frequent concern after elective abdominal surgery and may affect recovery, increase adverse effects, and lower patient satisfaction. In Bangladesh, data on real-world postoperative pain management remain limited.

Aim of the Study: This study aimed to evaluate postoperative pain management in patients undergoing elective abdominal surgery.

Methods & Materials: This prospective observational study included 220 adult patients undergoing elective abdominal surgery at the Department of Anaesthesiology, Bangladesh Medical College Hospital, Dhaka, Bangladesh, over 1 year from January 2024 to December 2024. Patients were enrolled consecutively after informed consent, and relevant perioperative and analgesic data were collected using a structured data sheet. Postoperative pain was assessed by a numeric rating scale at immediate recovery and at 2, 6, 12, 24, and 48 hours. Data were analyzed descriptively using SPSS version 26.0.

Results: Among 220 patients, multimodal analgesia was used in 154 (70.0%), and adequate pain control at 24 hours was achieved in 170 (77.3%). However, 164 (74.5%) experienced moderate to severe pain within the first 24 hours, and 91 (41.4%) required rescue analgesia. Moderate to severe pain declined from 143 (65.0%) at immediate recovery to 23 (10.5%) at 48 hours. Overall satisfaction was reported by 156 (70.9%) patients, with the best outcomes observed among those receiving multimodal analgesia with regional techniques.

Conclusion: Postoperative pain remained common after elective abdominal surgery, particularly in the early postoperative period. Multimodal analgesia with regional techniques was associated with better pain control, reduced rescue analgesia requirement, and higher patient satisfaction.

Keywords: Postoperative pain, elective abdominal surgery, multimodal analgesia, regional analgesia

Introduction

Postoperative pain remains one of the most common and clinically important problems following abdominal surgery. Globally, surgical care has expanded substantially, with more than 300 million operations estimated annually, yet safe perioperative recovery remains unevenly

distributed, particularly in low- and middle-income countries.[1,2] Elective abdominal surgery often causes significant postoperative pain that may delay mobilization, impair breathing and sleep, and reduce patient satisfaction. Despite advances in anesthesia and regional analgesia, inadequate pain control remains common. Effective pain management is essential for surgical quality, early recovery, and patient-centered care, as poorly controlled pain may increase opioid use, adverse effects, hospital stay, and the risk of persistent postsurgical pain.[3–5] Current clinical guidance supports structured pain assessment, the use of validated tools such as the numeric rating scale, individualized analgesic planning, and multimodal analgesia with drugs and techniques of different mechanisms of action.[3,6] In abdominal surgery, multimodal approaches may include paracetamol, non-steroidal anti-inflammatory drugs, opioids when indicated, epidural analgesia, transversus abdominis plane block, wound infiltration, and patient-controlled analgesia.[6–8] Postoperative pain remains highly prevalent, particularly in resource-limited settings. Studies from African and Asian countries report substantial rates of acute and moderate-to-severe pain, with inadequate pain assessment, limited regional analgesia, inconsistent protocols, insufficient patient education, and concerns about opioid-related adverse effects contributing to poor pain control.[9–11] Elective abdominal surgeries are common across multiple specialties, but local evidence on real-world analgesic practices, rescue analgesia, adverse effects, and patient satisfaction remains limited. Existing studies often focus on specific procedures or drugs, highlighting the need for broader evaluation of postoperative pain management in routine elective abdominal surgery.[11,12]

Methods

This prospective observational study was conducted among patients undergoing elective abdominal surgeries at the Department of Anesthesiology, Bangladesh Medical College & Hospital, Dhaka, Bangladesh. A total of 220 adult patients scheduled for elective abdominal surgery were enrolled in the study from January 2024 to December 2024. Adult patients scheduled for elective abdominal surgery under general, spinal, combined general-regional, or regional anesthesia were included. Patients undergoing emergency surgery, patients with altered consciousness, inability to communicate pain score, chronic opioid dependence, postoperative mechanical ventilation, or incomplete postoperative follow-up were excluded. After obtaining informed written consent, eligible patients were enrolled consecutively during the study period. Baseline demographic data, including age, sex, and body mass index, were recorded. Clinical variables such as ASA physical status, diabetes mellitus, hypertension, previous abdominal surgery, chronic pain history, preoperative analgesic use, presence of preoperative pain, and preoperative numeric rating scale score were collected using a structured data collection sheet. Postoperative analgesic use, rescue analgesia, opioid consumption, and regional techniques were recorded. Pain was assessed using the NRS (0–10) at rest and during movement/coughing at recovery, 2, 6, 12, 24, and 48 hours. NRS $\leq$3 indicated adequate pain control, while NRS $\geq$4 indicated moderate-to-severe pain. Adverse effects, recovery, sleep, mobilization, and patient satisfaction were also assessed. Data were analyzed descriptively using SPSS version 26.0.

Results

Among 220 patients, the mean age was 42.8 ± 13.6 years. The largest age group was 30–39 years, 59 (26.8%), followed by 40–49 years, 48 (21.8%). Females were slightly predominant, 116 (52.7%), while males were 104 (47.3%). Most patients had a normal BMI (114, 51.8%), followed by overweight (66, 30.0%) [Table 1].

Most patients were ASA II (118, 53.6%), followed by ASA I (78, 35.5%), indicating that the majority were clinically stable. Hypertension was present

in 56 (25.5%), diabetes mellitus in 46 (20.9%), and previous abdominal surgery in 50 (22.7%). Preoperative pain was present in 55 (25.0%), with a low mean preoperative NRS score of 1.2 ± 1.8 [Table 2].

Lower abdominal surgery was the most common procedure (37.3%), followed by pelvic (29.1%) and upper abdominal surgery (24.5%). Open surgery predominated (56.4%), while general surgery accounted for 50.9% of cases. The mean operative duration was 117.9 ± 42.1 minutes, with a mean estimated blood loss of 186.7 ± 142.4 mL [Table 3].

General anesthesia was the predominant technique, used in 170 (77.3%) patients. Intraoperative opioids were used in 187 (85.0%), with fentanyl being the most common opioid, 169 (76.8%). Regional analgesic techniques were used in 62 (28.2%) patients, most commonly the TAP block (33, 15.0%). Antiemetic prophylaxis was given to 175 (79.5%) patients [Table 4].

Postoperative multimodal analgesia was used in 154 (70.0%) patients. Regular paracetamol was prescribed in most cases, 202 (91.8%), while opioids were prescribed in 134 (60.9%) and NSAIDs in 104 (47.3%). Rescue analgesia was

Table 1: Baseline demographic characteristics of the study patients ($N = 220$)

Variables	Category	Frequency (n)	Percentage (%)
Age (years)	18–29	45	20.5
	30–39	59	26.8
	40–49	48	21.8
	50–59	39	17.7
	≥60	29	13.2
	Mean ± SD	42.8 ± 13.6	
Sex	Male	104	47.3
	Female	116	52.7
BMI category	Underweight	23	10.5
	Normal	114	51.8
	Overweight	66	30
	Obese	17	7.7

Table 2: Clinical characteristics of the study patients ($N = 220$)

Variables	Category	Frequency (n)	Percentage (%)
ASA physical status	I	78	35.5
	II	118	53.6
	III	24	10.9
Diabetes mellitus	Yes	46	20.9
Hypertension	Yes	56	25.5
Previous abdominal surgery	Yes	50	22.7
History of chronic pain	Yes	25	11.4
Preoperative analgesic use	Yes	35	15.9
Preoperative pain present	Yes	55	25
Preoperative pain score (NRS)	Mean ± SD	1.2 ± 1.8	

Table 3: Surgical-related characteristics of the study patients

Variables	Category	Frequency (*n*)	Percentage (%)
Type of abdominal surgery	Upper abdominal	54	24.5
	Lower abdominal	82	37.3
	Pelvic	64	29.1
	Other abdominal procedures	20	9.1
Surgical approach	Open	124	56.4
	Laparoscopic	88	40
	Converted laparoscopic to open	8	3.6
Surgical specialty	General surgery	112	50.9
	Gynecology	65	29.5
	Urology	24	10.9
	Colorectal surgery	14	6.4
	Hepatobiliary surgery	5	2.3
Duration of surgery (minutes)	Mean ± SD	117.9 ± 42.1	
Estimated blood loss (mL)	Mean ± SD	186.7 ± 142.4	

Table 4: Anesthesia-related characteristics of the study patients

Variables	Category	Frequency (*n*)	Percentage (%)
Type of anesthesia	General anesthesia	170	77.3
	Spinal anesthesia	25	11.4
	Combined general and regional anesthesia	25	11.4
Intraoperative opioid used	Yes	187	85
Main intraoperative opioid	Fentanyl	169	76.8
	Morphine	9	4.1
	Tramadol	9	4.1
Regional analgesic technique used	Yes	62	28.2
	No	158	71.8
Type of regional technique	TAP block	33	15
	Epidural analgesia	14	6.4
	Wound infiltration	11	5
	Rectus sheath block	4	1.8
Antiemetic prophylaxis given	Yes	175	79.5

required in 91 (41.4%) patients, with a mean time to first rescue analgesia of 5.5 ± 3.1 hours. Mean opioid consumption within 24 hours was 21.5 ± 18.2 mg morphine equivalent [Table 5].

Pain scores gradually decreased over time. At immediate recovery, pain at rest was 5.0 ± 2.0, and pain during movement or coughing was 6.1 ± 2.1. By 24 hours, these decreased to 2.5 ± 1.3 and

3.6 ± 1.5, respectively. Moderate to severe pain declined from 143 (65.0%) at immediate recovery to 50 (22.7%) at 24 hours and 23 (10.5%) at 48 hours [Table 6].

Adequate pain control at 24 hours was achieved in 170 (77.3%) patients, while 50 (22.7%) had inadequate pain control. However, 164 (74.5%) experienced moderate to severe pain at least once within the first 24 hours, and 45 (20.5%) had severe pain. Rescue analgesia was required in 91 (41.4%), indicating a considerable early postoperative analgesic requirement [Table 7].

Analgesia-related adverse effects occurred in 41.4% of patients, most commonly nausea (20.9%), constipation (14.5%), dizziness (12.7%), and vomiting (10.9%). Mean time to mobilization was 21.4 ± 9.6 hours, with a mean hospital stay of 4.7 ± 2.0 days. Pain disturbed sleep in 32.3% and limited mobilization in 33.6%. Overall, 70.9% of patients were satisfied or very satisfied, with a mean satisfaction score of 7.4 ± 1.8 [Table 8].

Multimodal analgesia with regional techniques provided the best outcomes, with the lowest 24-hour pain score (2.0 ± 1.1), highest adequate pain control (89.4%), lowest rescue analgesia requirement (25.5%), and highest satisfaction (87.2%). Single non-opioid and opioid-centered analgesia showed poorer outcomes, suggesting that regional multimodal strategies are associated with better postoperative pain control and satisfaction [Table 9].

Table 5: Pattern of postoperative analgesic management

Variables	Category	Frequency (*n*)	Percentage (%)
Multimodal analgesia used	Yes	154	70
	No	66	30
Regular paracetamol prescribed	Yes	202	91.8
NSAID prescribed	Yes	104	47.3
Opioid prescribed	Yes	134	60.9
Regional analgesic technique included	Yes	62	28.2
Epidural analgesia used	Yes	20	9.1
Patient-controlled analgesia used	Yes	15	6.8
Rescue analgesia required	Yes	91	41.4
Time to first rescue analgesia	Mean ± SD (hours)	5.5 ± 3.1	
Total opioid consumption within 24 hours (morphine equivalent)	Mean ± SD (mg)	21.5 ± 18.2	

Table 6: Postoperative Pain Scores at Different Time Points

Postoperative time	Pain at rest (Mean ± SD)	Pain during movement/coughing (Mean ± SD)	Moderate to severe pain *n* (%)
Immediate recovery, 0 hour	5.0 ± 2.0	6.1 ± 2.1	143 (65.0)
2 hours	4.6 ± 1.9	5.8 ± 2.0	128 (58.2)
6 hours	3.8 ± 1.7	5.1 ± 1.8	104 (47.3)
12 hours	3.1 ± 1.5	4.4 ± 1.6	74 (33.6)
24 hours	2.5 ± 1.3	3.6 ± 1.5	50 (22.7)
48 hours	1.7 ± 1.1	2.5 ± 1.3	23 (10.5)

Table 7: Adequacy of postoperative pain control and rescue analgesia

Outcome variables	Frequency (*n*)	Percentage (%)
Adequate pain control at 24 hours (NRS ≤3)	170	77.3
Inadequate pain control at 24 hours (NRS ≥4)	50	22.7
Moderate to severe pain at least once within first 24 hours (NRS ≥4)	164	74.5
Severe pain within first 24 hours (NRS ≥7)	45	20.5
Rescue analgesia required	91	41.4
No rescue analgesia required	129	58.6

Table 8: Postoperative adverse effects, recovery profile, and patient satisfaction

Variables	Category	Frequency (*n*)	Percentage (%)
Adverse Effects			
Any analgesia-related adverse effect	Yes	91	41.4
Nausea	Yes	46	20.9
Vomiting	Yes	24	10.9
Dizziness	Yes	28	12.7
Sedation	Yes	19	8.6
Respiratory depression	Yes	2	0.9
Pruritus	Yes	12	5.5
Urinary retention	Yes	18	8.2
Constipation	Yes	32	14.5
Gastritis/epigastric pain	Yes	16	7.3
Hypotension	Yes	15	6.8
Recovery Profile			
Time to first mobilization (hours)	Mean ± SD	21.4 ± 9.6	
Time to oral intake (hours)	Mean ± SD	10.7 ± 7.2	
Length of hospital stay (days)	Mean ± SD	4.7 ± 2.0	
Sleep disturbance due to pain	Yes	71	32.3
Mobilization limited by pain	Yes	74	33.6
Patient Satisfaction			
Satisfied or very satisfied	Yes	156	70.9
Satisfaction score (0–10)	Mean ± SD	7.4 ± 1.8	

Discussion

Postoperative pain remained common despite multimodal analgesia, with 74.5% experiencing moderate-to-severe pain and 41.4% requiring rescue analgesia within 24 hours. Although 77.3% achieved adequate pain control, 22.7% remained inadequately controlled, emphasizing the need for structured multimodal pain management.[3] Gan reported that more than 80% of surgical patients may experience postoperative pain, often with inadequate control.[4] In a large Chinese

Table 9: Postoperative pain control according to dominant analgesic management strategy

Dominant analgesic strategy	*n* (%)	Pain at 24 hours (Mean ± SD)	Adequate pain control at 24 hours *n* (%)	Rescue analgesia required *n* (%)	Satisfied/very satisfied *n* (%)
Single non-opioid analgesia	30 (13.6)	3.1 ± 1.5	20 (66.7)	17 (56.7)	17 (56.7)
Opioid-centered analgesia	37 (16.8)	3.0 ± 1.4	25 (67.6)	22 (59.5)	21 (56.8)
Systemic multimodal analgesia	91 (41.4)	2.5 ± 1.2	71 (78.0)	37 (40.7)	65 (71.4)
Multimodal analgesia with regional technique	47 (21.4)	2.0 ± 1.1	42 (89.4)	12 (25.5)	41 (87.2)
PCA or epidural-based advanced analgesia	15 (6.8)	2.3 ± 1.2	12 (80.0)	3 (20.0)	12 (80.0)

population-based study, Liu et al. reported moderate to severe pain on the first postoperative day in 48.7% of 26,193 surgical patients.[14] Bekele et al. reported acute postoperative pain in 82.2% of adult surgical patients, with moderate to severe pain in 34.24%.[9] The study observed a higher rate of moderate-to-severe pain within 24 hours (74.5%), possibly due to the predominance of open surgery, inclusion of movement-related pain, and limited use of regional analgesia. Pain decreased progressively, with mean rest pain falling from 5.0 ± 2.0 immediately after surgery to 1.7 ± 1.1 at 48 hours. Similarly, movement-related pain and the proportion of patients with moderate-to-severe pain declined over time, consistent with previous findings by Rede et al.[15] Ndebea et al. found postoperative pain remained common during the first 48 hours after elective surgery.[16] The first postoperative day was the critical period for analgesic optimization. Multimodal analgesia with regional techniques provided the best outcomes, with lower 24-hour pain scores (2.0 ± 1.1), higher adequate pain control (89.4%) and satisfaction (87.2%), and lower rescue analgesia requirements (25.5%). In contrast, opioid-centered analgesia showed poorer outcomes. These findings support multimodal and opioid-sparing strategies for improved postoperative pain management.[6–8,17] Evidence from previous studies also supports the role of regional techniques, such as TAP blocks and epidural analgesia, in improving pain control and reducing opioid requirements after abdominal surgery.[18,19] Analgesia-related adverse effects occurred in 41.4% of patients, most commonly nausea (20.9%), constipation (14.5%), dizziness (12.7%), and vomiting (10.9%). As opioids were used in 60.9% of patients, with a mean 24-hour consumption of 21.5 ± 18.2 mg morphine equivalent, these findings highlight the importance of opioid-sparing analgesic strategies to reduce adverse effects and improve recovery.[4,20] Opioid-sparing multimodal analgesia should be strengthened. Overall, 70.9% of patients were satisfied or very satisfied, with higher satisfaction among those receiving multimodal analgesia with regional techniques.[12]

Limitations of the Study

This was a single-center observational study with a relatively limited sample size, so causal relationships could not be established. Pain assessment was subjective, and long-term postoperative pain outcomes were not evaluated.

Conclusion

Postoperative pain remained a significant concern after elective abdominal surgery, especially during the early postoperative period. Multimodal analgesia, particularly when combined with regional techniques, provided better pain control, reduced rescue analgesic requirements,

and improved patient satisfaction. Structured, multimodal, opioid-sparing analgesic protocols should therefore be implemented to optimize postoperative recovery and patient-centered care.

Recommendations

Structured multimodal, opioid-sparing postoperative pain management should be routinely implemented, with wider use of regional analgesic techniques, regular pain assessment, timely rescue analgesia, adverse-effect monitoring, and patient education to improve recovery and satisfaction.

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