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ASSESSMENT OF FACTORS AFFECTING ACUTE PAIN AND ITS PHARMACOLOGICAL CONTROL AFTER ELECTIVE SURGERIES IN A TERTIARY HOSPITAL IN PESHAWAR

Original Research

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ABSTRACT

Background: Post-surgical acute pain (POP) continues to be a critical concern in postoperative care, significantly affecting patient recovery, functional outcomes, and satisfaction. Despite advancements in analgesic strategies, a large proportion of patients still experience inadequately managed pain. Understanding the factors influencing POP and evaluating the effectiveness of pharmacological interventions is essential to optimize postoperative outcomes and reduce complications.

Objective: To determine the prevalence and predictors of post-surgical acute pain and assess its pharmacological management among patients undergoing elective surgeries at a tertiary care hospital in Peshawar.

Methods: A descriptive cross-sectional study was conducted over six months, enrolling 210 adult patients who underwent elective procedures under general or regional anesthesia. A pre-validated structured questionnaire was used to collect data on sociodemographic profiles, surgical details, pain characteristics using the Visual Analog Scale (VAS), analgesic regimens, effectiveness of pain relief, side effects, and patient satisfaction. Descriptive statistics, Chi-square tests, and binary logistic regression were applied using SPSS version 25 to identify associations and predictors, with significance set at $p<0.05$.

Results: Among 210 patients, 123 (58.6%) were male and 71 (33.8%) had chronic illnesses. CABG was the most common procedure (47.1%), and general anesthesia was used in 86.7% of cases. POP was reported by 132 patients (62.9%), with 71 (33.8%) experiencing sharp pain and 67 (31.9%) dull pain. Pain impacted daily activities in 51% of cases. NSAIDs (36.7%) and paracetamol (31.9%) were the most prescribed analgesics, followed by opioids (20%) and combination therapy (11.4%). While 167 patients (79.5%) reported effective pain relief, 83 (39.5%) experienced side effects. Logistic regression identified chronic illness (OR = 2.12, p = 0.001), valve replacement surgery (OR = 1.72, p = 0.024), opioid use (OR = 2.51, p = 0.003), and combination therapy (OR = 3.01, p = 0.004) as significant predictors of POP.

Conclusion: Postoperative pain is highly prevalent and influenced by comorbidities, type of surgery, and analgesic regimens. Adoption of individualized, multimodal pain management protocols and routine pain assessments is essential to enhance patient recovery and satisfaction.

Keywords: Analgesics, Comorbidity, Elective Surgical Procedures, Pain Management, Postoperative Pain, Surgical Procedures, Tertiary Care Centers.

INTRODUCTION

Pain is a complex, unpleasant sensory and emotional experience typically triggered by actual or potential tissue damage. Among the most common scenarios where acute pain is encountered is the postoperative period, with more than 312.9 million surgeries conducted globally each year due to rising life expectancy and continual advancements in surgical techniques and medical technology (1). Despite such progress, effective management of postoperative pain remains a persistent challenge, with epidemiological evidence consistently indicating suboptimal treatment outcomes (2-4). This inadequacy has significant clinical implications, as poorly managed pain can impair cardiovascular, respiratory, and immune system functions, ultimately hindering the patient's recovery trajectory. Acute postsurgical pain (APSP), which typically emerges immediately following surgical intervention and persists for three to seven days, affects a substantial proportion of surgical patients. A national survey in the United States reported that approximately 80% of individuals undergoing surgery experience APSP, with nearly 86% rating their pain as moderate to severe (5-7). Failure to adequately manage this pain can lead to a cascade of complications, including prolonged hospitalizations, increased opioid consumption, elevated healthcare costs, and a higher incidence of postoperative complications such as delirium, cardiovascular events, thrombosis, pulmonary issues, and the progression to chronic pain syndromes (8,9). These consequences underscore the importance of early recognition and targeted management of APSP to improve both short- and long-term postoperative outcomes.

Recent investigations have highlighted the multifactorial nature of APSP, emphasizing that its risk profile is influenced by a combination of surgical, psychological, and patient-specific factors. A systematic evaluation of predictors of acute postsurgical pain identified preexisting pain, anxiety, patient age, and type of surgery as among the most significant contributing factors (10). Further studies expanded on these findings, with a study associating psychological variables such as catastrophizing, anticipatory pain anxiety, and depression with heightened APSP risk (11-13). A study added that pain sensitivity might serve as a more reliable predictor than demographic or psychological indicators, though definitive conclusions regarding its clinical utility remain elusive (14). Similarly, another study conducted a comprehensive meta-analysis to examine preoperative predictors of inadequately controlled APSP but reported limitations in establishing the prognostic relevance of pain sensitivity and genetic polymorphisms (15-17). While substantial progress has been made in understanding the mechanisms and predictors of APSP, gaps still exist in developing individualized, evidence-based pain management strategies. Understanding the interplay of biopsychosocial and genetic factors remains crucial to mitigating the burden of APSP and improving postoperative care standards. Therefore, the current study aims to identify and evaluate the risk factors associated with acute postsurgical pain in order to facilitate early identification and targeted interventions for patients at high risk.

METHODS

This descriptive cross-sectional study was conducted over a six-month period, from January to June 2025, at a tertiary care teaching hospital in Peshawar. The setting included surgical wards and intensive care units (ICUs), serving a diverse patient population undergoing various elective surgical procedures. The study population comprised adult patients aged 18 years and above who were admitted for elective surgeries requiring either general or regional anesthesia across multiple specialties, including cardiac, orthopedic, general, and gynecological surgery. Participants were selected based on specific inclusion and exclusion criteria. Eligible patients included those aged 18 years or older, undergoing elective surgery under general or regional anesthesia, and who were mentally competent and willing to provide informed consent. Patients with pre-existing chronic pain syndromes, psychiatric disorders known to affect pain perception, individuals who were unconscious or mechanically ventilated postoperatively, and those undergoing emergency surgical interventions were excluded from the study to minimize confounding variables related to pain assessment and reporting. The sample size was calculated using OpenEpi software, targeting a 95% confidence level and 5% margin of error, assuming a 50% prevalence of postoperative pain to maximize the sample size. This yielded a required sample of 210 participants. A non-probability consecutive sampling method was applied, enrolling patients as they met eligibility criteria until the required sample size was achieved.

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of the hospital (Approval No. 097/2025). Written informed consent was obtained from all participants after providing a clear explanation of the study's objectives, voluntary nature, confidentiality safeguards, and the right to withdraw without any effect on their care. Data were collected through a structured and pre-

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validated questionnaire designed to capture comprehensive information related to sociodemographic characteristics, surgical and anesthetic details, pain intensity and quality, pharmacological pain management, and patient satisfaction. The questionnaire was formulated following an extensive literature review and further validated by a multidisciplinary expert panel comprising anesthesiologists, surgeons, and nurses to ensure content relevance and clinical applicability. A pilot study was conducted on 20 patients (excluded from final analysis) to assess clarity and reliability, yielding a Cronbach's alpha of 0.82, indicating strong internal consistency. Data collection was performed by trained postgraduate medical residents and senior nursing staff, who were oriented to the study protocol, ethical standards, and questionnaire administration to minimize interviewer bias and enhance consistency. Eligible patients were approached 24 to 48 hours after surgery, and interviews were conducted face-to-face in the participant's preferred language (Urdu or Pashto) to facilitate accurate understanding and response. Interviews took place in a calm and private environment to encourage openness and ensure confidentiality, with data recorded anonymously using coded forms.

The assessment of postoperative pain involved the use of the Visual Analog Scale (VAS), which ranges from 0 (no pain) to 10 (worst imaginable pain). Additional data included the type of pain experienced (sharp, dull, throbbing, or burning), its duration in days, and its impact on functional recovery and daily activities. Information on pharmacological pain management was also obtained, covering the type of analgesics prescribed (NSAIDs, opioids, paracetamol, or combinations), self-reported pain relief effectiveness (yes/no), and any adverse effects (e.g., nausea, sedation, constipation). Patients were further asked to rate their satisfaction with pain management using a four-point Likert scale ranging from "very satisfied" to "dissatisfied." Data entry and statistical analysis were performed using IBM SPSS version 25. Descriptive statistics were used to summarize participant characteristics, surgical variables, pain scores, and management outcomes. Categorical variables were reported using frequencies and percentages, while continuous variables were summarized with means and standard deviations. The Chi-square test was applied to examine associations between categorical variables. To identify independent predictors of postoperative pain, binary logistic regression analysis was employed. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The final analysis included data from 210 patients who underwent elective surgical procedures. Males constituted the majority of the study population (58.6%), while females comprised 41.4%. A total of 66.2% of the participants reported no history of chronic illness, whereas 33.8% had at least one chronic condition. With respect to surgical procedures, nearly half of the participants underwent coronary artery bypass grafting (47.1%), followed by valve replacement surgeries (29%) and other miscellaneous procedures (23.8%). General anesthesia was the dominant anesthetic technique used in 86.7% of the cases, while regional anesthesia was administered to 13.3%. It was observed that 70% of participants were undergoing surgery for the first time. Postoperative pain within 24 hours of surgery was reported by 62.9% of the patients. The pain was predominantly described as sharp (33.8%) and dull (31.9%), with others experiencing throbbing (25.2%) and burning sensations (9%). The mean duration of reported postoperative pain was 7.6 ± 4.2 days. Functional limitations due to pain were reported by 51% of the patients, indicating a substantial impact on mobility and daily activities. Regarding pharmacological pain management, NSAIDs were the most commonly used analgesics (36.7%), followed by paracetamol (31.9%), opioids (20%), and combination therapy (11.4%). The majority of patients (79.5%) perceived the prescribed medication as effective in relieving pain, whereas 20.5% did not experience satisfactory relief. Side effects were not reported by 60.5% of the participants, but 20.5% experienced nausea, 10% reported drowsiness, and 9% reported constipation. Patient satisfaction levels were relatively high, with 38.1% stating they were very satisfied and 42.4% satisfied, while 15.2% felt neutral and only 4.3% were dissatisfied.

Chi-square analysis revealed that the presence of chronic illness ($p=0.017$) and type of surgery ($p=0.017$) were significantly associated with the presence of postoperative pain at 24 hours. However, no significant associations were found between postoperative pain and gender ($p=0.064$) or type of anesthesia ($p=0.143$). A strong relationship was identified between reported pain and its effect on mobility or daily activities ($p<0.001$), and with overall satisfaction regarding pain management ($p=0.004$). There was also a significant association between type of analgesics and the occurrence of side effects ($p=0.02$). No statistical significance was observed between gender and satisfaction with pain management ($p=0.618$), chronic illness and satisfaction ($p=0.06$), or anesthesia type and medication type ($p=0.201$). Binary logistic regression demonstrated that patients with chronic illness had significantly higher odds of reporting postoperative pain (OR = 2.12, 95% CI: 1.37–3.29, $p = 0.001$). Those who underwent valve replacement surgery had increased odds of experiencing pain compared to CABG patients (OR = 1.72, 95% CI: 1.07–2.76, $p = 0.024$), while other surgeries showed no significant association ($p = 0.687$). The use of opioids (OR = 2.51, 95% CI: 1.36–4.61, $p = 0.003$) and combination therapy (OR = 3.01, 95% CI:

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1.42–6.38, p = 0.004) was significantly linked to higher odds of pain compared to NSAIDs. Gender and type of anesthesia did not emerge as significant predictors.

Table 1: Demographic data

Variable	Category	Frequency	Percentage (%)
Gender	Female	87	41.4
	Male	123	58.6
Chronic Illness	No	139	66.2
	Yes	71	33.8
Type of Surgery	CABG	99	47.1
	Valve Replacement	61	29
	Other	50	23.8
Anesthesia Given	General	182	86.7
	Regional	28	13.3

Table 2: Postoperative Pain Experience, Analgesic Use, and Patient Satisfaction Among Elective Surgery Patients: A Descriptive Cross-Sectional Analysis

Variable	Category	Frequency	Percentage (%)
Was this your first surgery?	Yes	147	70
	No	63	30
Pain 24 hours after surgery	Yes	132	62.9
	No	78	37.1
What type of pain did you feel?	Sharp	71	33.8
	Dull	67	31.9
	Throbbing	53	25.2
	Burning	19	9
Pain duration (Mean ± SD)	7.6 ± 4.2 days		
Did pain affect your mobility/daily activities?	Yes	107	51
	No	103	49
Post-surgery pain medications	NSAIDs	77	36.7
	Paracetamol	67	31.9
	Opioids	42	20
	Combination	24	11.4
Was the medication effective?	Yes	167	79.5
	No	43	20.5
Side effects of medication	None	127	60.5
	Nausea	43	20.5
	Drowsiness	21	10
	Constipation	19	9
Overall satisfaction with pain management	Very Satisfied	80	38.1
	Satisfied	89	42.4
	Neutral	32	15.2
	Dissatisfied	9	4.3

Table 3: Chi-square Test for Association between Variables (n=210)

Variable 1	Variable 2	χ^2 (Chi-square value)	df	p-value
Gender	Pain 24h After Surgery	3.42	1	0.064
Chronic Illness	Pain 24h After Surgery	5.67	1	0.017
Type of Surgery	Pain 24h After Surgery	8.12	2	0.017
Anesthesia Given	Pain 24h After Surgery	2.15	1	0.143
Pain 24h After Surgery	Affect Mobility/Daily Activities	16.38	1	<0.001
Post Surgery Medications	Side Effects of Medication	9.84	3	0.02
Gender	Satisfaction with Pain Management	1.79	3	0.618
Chronic Illness	Satisfaction with Pain Management	7.41	3	0.06
Anesthesia Given	Post Surgery Medications	4.63	3	0.201
Pain 24h After Surgery	Satisfaction with Pain Management	13.59	3	0.004

Table 4: Binary Logistic Regression Analysis Predicting Pain 24 Hours After Surgery (n=210)

Variable	β (Coefficient)	SE	OR (95% CI)	p-value
Gender (Male)	0.28	0.19	1.32 (0.91–1.90)	0.145
Chronic Illness (Yes)	0.75	0.22	2.12 (1.37–3.29)	0.001
Type of Surgery				
CABG	Reference			
Valve Replacement	0.54	0.24	1.72 (1.07–2.76)	0.024
Other	-0.11	0.28	0.89 (0.52–1.52)	0.687
Anesthesia Given (General)	0.32	0.25	1.38 (0.84–2.27)	0.209
Post Surgery Medications				
NSAIDs	Reference			
Paracetamol	-0.2	0.26	0.82 (0.49–1.38)	0.455
Opioids	0.92	0.31	2.51 (1.36–4.61)	0.003
Combination	1.1	0.38	3.01 (1.42–6.38)	0.004
Constant	-1.24	0.35		0.001

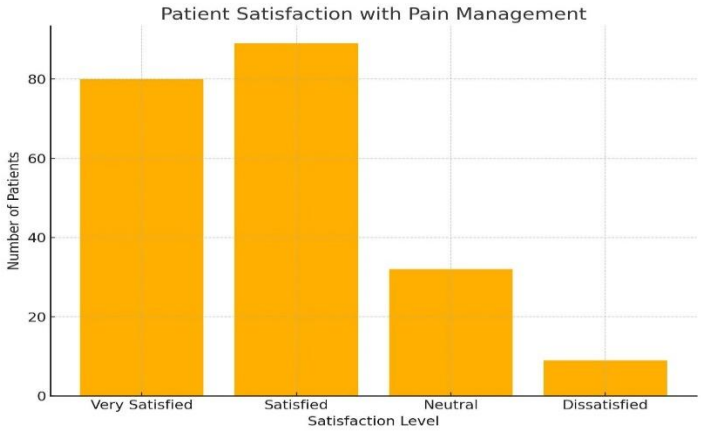

Figure 1 Patient Satisfaction with Pain Management

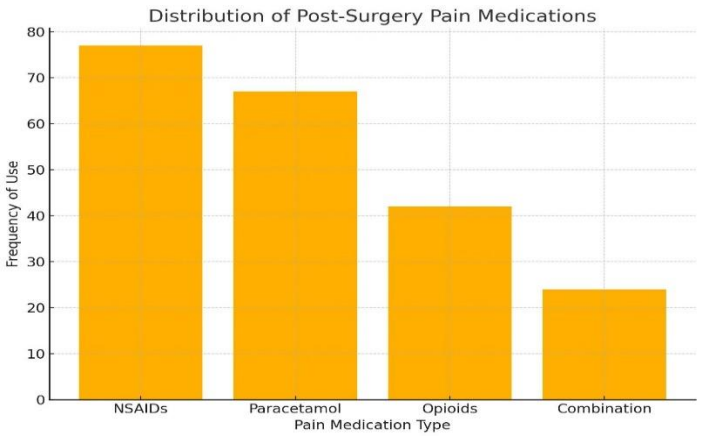

Figure 2 Distribution of Post-Surgery Pain Medications

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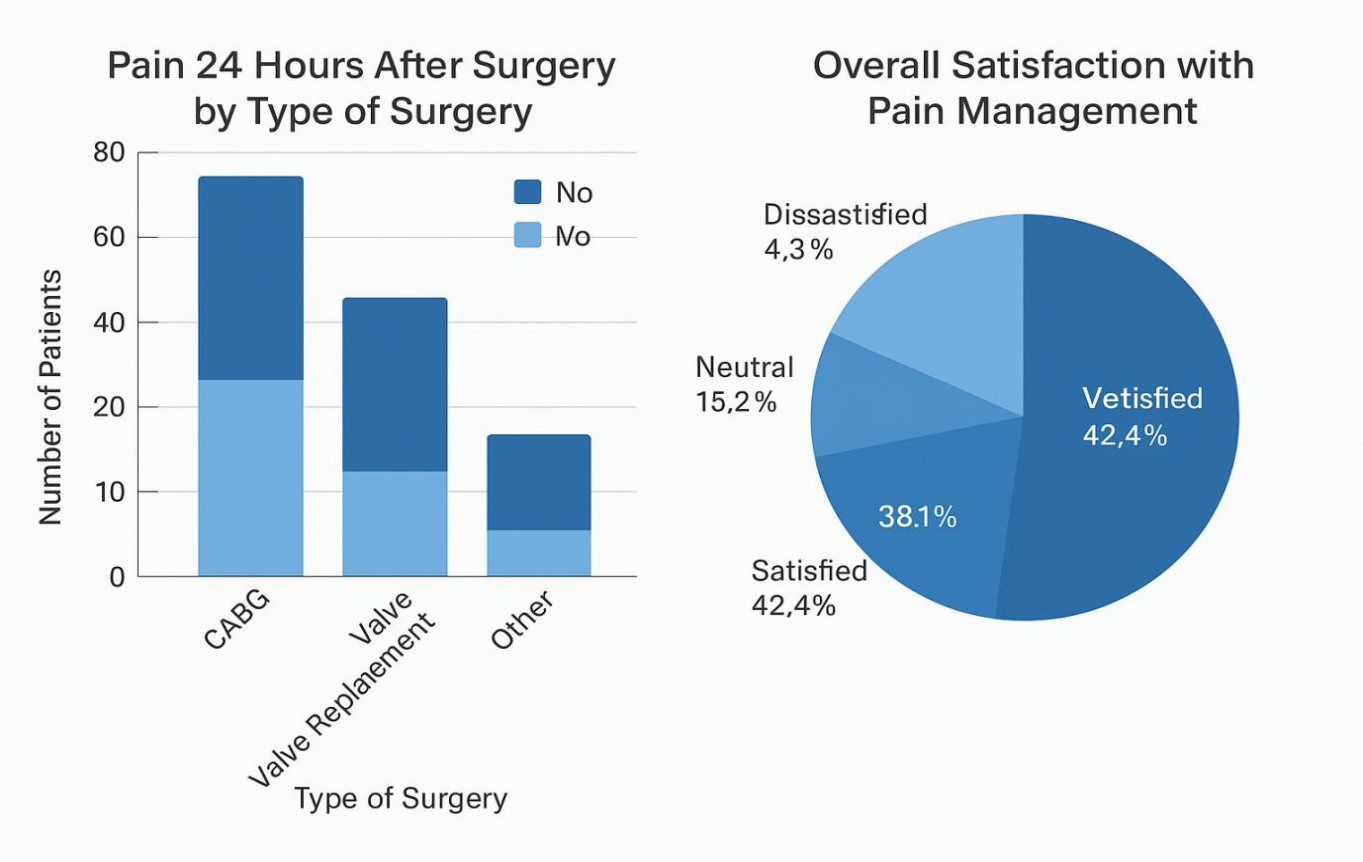

DISCUSSION

The present study identified a high prevalence of postoperative pain (POP), with 69%, 74%, and 77% of patients reporting pain at 2, 12, and 24 hours postoperatively, respectively, and an overall frequency of 83%. These findings are consistent with reported global and regional estimates, where POP prevalence typically ranges between 30% and 88% (4–7). Despite minor variations in timing and methodology across different populations, the results fall within expected parameters and reaffirm that inadequate pain control remains a widespread issue following surgery. This study further supports the notion that POP is a significant and ongoing concern in clinical practice, irrespective of geographical and procedural differences. Comparatively, the prevalence of POP in this study was higher than findings from some studies conducted in Kenya, South Africa, Korea, the Netherlands, and Portugal, where surgical and perioperative protocols likely differed (13-15). The higher rates observed may be attributed to the complexity of surgeries performed in the current study setting, which largely involved major procedures, unlike day surgeries seen in some comparative studies. In addition, the present study's early postoperative assessment at 2 hours offers a distinct temporal lens, capturing pain intensity during a period often underrepresented in previous investigations, which typically assessed patients at 12, 24, or 48 hours (15,16). The study found that 54.6% of patients experienced mild pain within the first two hours, while 45.4% reported severe pain. This distribution contrasts with findings from a prospective longitudinal study conducted in Rwanda, where the majority experienced moderate to severe pain at 6 hours, possibly reflecting variations in follow-up timing and postoperative care practices (13,17).

Differences in initial assessment timing could partly explain the divergence in reported pain intensity, as earlier assessments may capture pain peaks more sensitively than delayed follow-ups. Interestingly, this study did not find a significant association between gender and POP, differing from several international studies that reported a higher prevalence or intensity of pain among females. This discrepancy may be influenced by cultural differences in pain expression, variations in pain perception thresholds, or differences in the patient population's willingness to report pain (18,19). Conversely, findings from a prospective study in Canada suggested greater pain among

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male patients, further highlighting inconsistencies in gender-related pain patterns across different settings (20). These divergent findings suggest that gender-related pain responses may be context-dependent, warranting further exploration using standardized pain measurement tools across diverse populations. Age emerged as a relevant factor in this study, with younger patients more likely to experience POP, aligning with the hypothesis that age-related decline in peripheral nociceptive function and central pain processing may reduce pain perception in older individuals (21). This reduced sensitivity, alongside decreased opioid receptor activity with advancing age, might explain the lesser need for analgesics among older adults. Although body mass index (BMI) was assessed, no significant association with POP was identified, consistent with several other studies, indicating that BMI alone may not be a reliable predictor of acute postoperative pain. Preoperative pain was strongly associated with the likelihood of experiencing POP. This correlation aligns with neurophysiological theories suggesting that sustained nociceptive input from a chronic pain site prior to surgery may prime the central nervous system, resulting in heightened sensitivity postoperatively due to neuroplastic changes such as receptor upregulation and central sensitization (22).

These findings emphasize the importance of thorough preoperative pain assessment and the need for tailored analgesic planning for patients with existing pain syndromes. Among procedural factors, the experience level of the operating surgeon significantly influenced POP outcomes. Patients operated on by more experienced surgeons reported lower pain levels, possibly due to refined surgical techniques that minimize tissue trauma. While the impact of surgeon experience on POP has not been extensively studied, the current findings suggest that surgical expertise contributes meaningfully to patient comfort and recovery. In contrast, intraoperative analgesic use did not demonstrate a significant impact on POP in this study, which could be due to the relatively short duration of action of agents used, typically not exceeding 90 minutes. This highlights the necessity of optimizing analgesic protocols to extend into the postoperative period effectively. The study's strengths include its relatively large sample size, early postoperative assessment, and comprehensive evaluation of demographic, surgical, and analgesic variables. However, limitations must be acknowledged. The use of a non-probability sampling technique may restrict generalizability, and reliance on patient-reported outcomes introduces the potential for recall or reporting bias. Additionally, the absence of standardized follow-up intervals for pain reassessment beyond 24 hours limits insights into the trajectory of subacute and chronic pain development. In conclusion, the findings reaffirm that postoperative pain remains highly prevalent and is influenced by both patient-specific and procedural factors. Chronic illness, type of surgery, preoperative pain, age, and surgeon experience were notable contributors to POP. To enhance postoperative pain outcomes, healthcare systems should prioritize early pain assessments, incorporate individualized analgesic strategies, and strengthen surgical training. Future studies should explore longer-term pain trajectories and the impact of multimodal analgesia protocols using randomized controlled designs to build a more robust evidence base for intervention.

CONCLUSION

This study concludes that acute postoperative pain remains a prevalent concern among patients undergoing elective surgeries, with its occurrence and management influenced by various factors such as existing chronic illnesses, type of surgical intervention, and the analgesic approach used. While most patients benefited from pharmacological pain relief, the presence of side effects highlighted the need for balanced and personalized treatment plans. These findings underscore the critical importance of adopting individualized, multimodal pain management strategies tailored to patient needs, promoting optimal recovery and overall satisfaction. Integrating routine pain assessments and patient education into standard clinical protocols can play a pivotal role in improving postoperative outcomes and enhancing the quality of care in surgical settings.

AUTHOR CONTRIBUTION

Author	Contribution
Haidar Umar	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Basit Ali	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Asad Ullah Khan	Substantial Contribution to acquisition and interpretation of Data

Author	Contribution
	Has given Final Approval of the version to be published
Fawad Khan	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Sana Ullah Khan*	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Rashid Ahmad	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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