International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 13, No. 8, August 2024 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_13.8.2024.17

**ORIGINAL RESEARCH**

# Postoperative Pain Management in General Surgery and Orthopedic Patients at a Tertiary Care Hospital: A Prospective Analysis

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Received: 03/07/2024 Accepted: 07/08/2024

## ABSTRACT

**Introduction:** Postoperative pain management in India remains a significant challenge, with very high prevalence rates of postoperative pain in some regions. Data on postoperative pain prevalence and associated risk factors in India are limited. This study aims to address this gap by investigating the prevalence of postoperative pain and its potential risk factors with the goal of optimizing pain management practices. **Materials and Methods:** A prospective cohort study was conducted on adult patients (≥18 years) undergoing elective general or orthopedic surgery. Demographic data were collected during pre-operative visits, and pain levels were assessed using a numerical rating scale (NRS 0–10) at 4, 24, 36, and 48 hours postoperatively. A NRS score greater than 3 was classified as moderate to severe postoperative pain. Risk factors for postoperative pain were analyzed using univariate and multivariable binary logistic regression. **Results:** The study included 321 patients. The prevalence of postoperative pain was recorded as 60.12% at 4 hours, 71.96% at 24 hours, 67.91% at 36 hours, and 57.01% at 48 hours post-surgery. Pethidine was the most commonly prescribed analgesic in the first 24 hours postoperatively (85.05%), with only 1% of patients receiving paracetamol or diclofenac, and 12.15% receiving tramadol. Multivariable analysis identified general anesthesia and intraoperative analgesia as significant risk factors for postoperative pain. **Conclusion:** Postoperative pain management is currently inadequate, leading to a high prevalence of reported pain on the first postoperative day. This highlights the need for improved postoperative analgesia, particularly in low- and middle-income countries. Further research involving larger cohorts and examining additional risk factors could provide insights into enhancing pain management strategies.

**Key Words:** Postoperative pain, prevalence, risk factors, India



## INTRODUCTION

Postoperative pain management continues to be a significant challenge for surgeons and anesthesiologists, particularly in low- and middle-income countries. The prevalence of moderate to severe pain varies globally, ranging from 14% to 55% in Western countries, with the highest incidence occurring on the day of surgery [1-3]. In contrast, data from low- and middle-income countries are limited, but prevalence rates can reach up to 95%. Despite the availability of various analgesics, loco-regional anesthesia techniques, and Acute Pain Services [4-6], inadequate postoperative pain relief remains a concern even in advanced medical settings.

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Uncontrolled postoperative pain can lead to numerous complications, including an increased risk of thromboembolic events, respiratory issues, anxiety, sleep disturbances, prolonged hospital stays, and chronic pain, all of which contribute to patient suffering, healthcare provider burden, and elevated healthcare costs [7–9]. A recent large cohort study highlighted that higher levels of postoperative pain and unacceptable pain levels are linked with a greater incidence of postoperative complications, emphasizing the critical need for effective postoperative pain management [10].

In developing countries, several risk factors for postoperative pain have been identified, including pre-existing pain, anxiety, younger age, female gender, and the type of surgery [11,12]. Identifying patients at higher risk and managing their postoperative pain effectively can facilitate early ambulation and recovery, potentially reducing complications. However, data on the prevalence of postoperative pain and risk factors for its development in low- and middle-income countries remain limited.

Our study aimed to determine the prevalence of postoperative pain following general and orthopedic surgeries in an Indian hospital. Additionally, we sought to identify risk factors associated with increased postoperative pain in this population, which could aid in personalizing postoperative pain management and enhancing postoperative outcomes.

## MATERIAL AND METHODS

This prospective cohort study was conducted at a tertiary hospital in India. Eligible participants were adults aged 18 years or older undergoing elective surgery. Exclusion criteria included patients unable to communicate (e.g., due to cognitive deficits or unconsciousness) and those who did not consent to the study. All patients received standard care appropriate for their elective surgical procedure.

Depending on the type of surgery and patient condition, anesthesia options included general anesthesia, spinal anesthesia, or peripheral nerve blocks.

**General Anesthesia:** Induction agents included ketamine, propofol, or thiopental, with suxamethonium as needed, and maintenance with volatile anesthetics (halothane, sevoflurane, or isoflurane), with or without pancuronium based on the surgical requirements.

**Spinal Anesthesia:** Administered with 15 mg of bupivacaine intrathecally.

**Peripheral Nerve Blocks:** Up to 20 mL of 0.5% bupivacaine was used at the targeted location, typically supraclavicular for upper limb surgeries and femoral and/or sciatic (at the popliteal level) for lower limb surgeries.

A hospital-wide acute pain protocol, following a multimodal and stepwise approach per the WHO analgesic ladder, was in place. Postoperative analgesia was prescribed by the surgeon based on the surgical procedure, wound size, and site, rather than the patient's pain assessment. Typically, pethidine 100 mg intramuscularly every 8 hours was prescribed for the first 24 hours after major surgeries, followed by either paracetamol 1 g orally every 8 hours (if oral intake was possible) or tramadol 100 mg intramuscularly every 8 hours. Diclofenac 75 mg intramuscularly every 8 hours was also used as needed during the subsequent 24 hours, before transitioning to oral paracetamol.

Demographic data (age, sex, ASA classification, history of chronic pain, use of analgesics, education level) and details of planned surgeries were collected the night before surgery. Postoperatively, information on the type of surgery, anesthesia used, perioperative pain management, and administered analgesics was documented. Pain was assessed using a numerical rating scale (NRS 0–10) at 4, 24, 36, and 48 hours post-surgery, with scores classified as:

**None/Mild:** NRS 0–3
**Moderate:** NRS 4–7
**Severe:** NRS 8–10

Scores greater than 3 were considered indicative of moderate to severe pain. All measurements were performed by a trained study personnel.

Data were analyzed using SPSS Version 21.0. Descriptive statistics were used to summarize continuous variables, while categorical variables were summarized with frequencies and proportions. Binary logistic regression models were employed to assess the relationship between potential risk factors and moderate to severe postoperative pain (NRS > 3). Odds Ratios (ORs) with 95% Confidence Intervals (CIs) were calculated using both univariate and multivariable regression analyses. Risk factors identified in univariate analyses were included in the multivariable model to adjust for confounding variables. A P-value of less than 0.05 was considered statistically significant.

## RESULTS

The study population was composed of 321 individuals with a diverse range of baseline characteristics (Table 1). The age distribution was as follows: 23.05% were aged 18–30 years, 22.43% were aged 31–40 years, 17.13% were aged 41–50 years, 19.63% were aged 51–60 years, 12.15% were aged 61–70 years, and 5.61% were over 70 years. The gender distribution was almost balanced, with males representing 52.02% and females 47.98%. Regarding educational background, 5.92% were illiterate, 43.93% had completed primary education, 30.84% had secondary education, and 19.31% had education beyond the secondary level. A notable 29.60% of participants had a history of chronic pain. The majority of patients were classified as ASA score 1

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(63.55%), indicating a normal healthy status, while 34.89% were ASA score 2, reflecting mild systemic disease. Only 1.56% were ASA score 3, indicating severe systemic disease. The types of surgeries performed were nearly evenly distributed between general surgery (50.16%) and orthopedics (49.84%). In terms of anesthesia, 43.93% of patients received general anesthesia, 38.01% underwent spinal anesthesia, and 18.07% had a peripheral nerve block.

**Table 1: Baseline characteristics of study population**

| Characteristics | n | % |
|---|---|---|
| Age groups | | |
| 18–30 years | 74 | 23.05 |
| 31–40 years | 72 | 22.43 |
| 41–50 years | 55 | 17.13 |
| 51–60 years | 63 | 19.63 |
| 61–70 years | 39 | 12.15 |
| >70 years | 18 | 5.61 |
| Gender | | |
| Male | 167 | 52.02 |
| Female | 154 | 47.98 |
| Education | | |
| Illiterate | 19 | 5.92 |
| Primary | 141 | 43.93 |
| Secondary | 99 | 30.84 |
| > Secondary | 62 | 19.31 |
| History of chronic pain | | |
| Yes | 95 | 29.60 |
| No | 226 | 70.40 |
| ASA score | | |
| 1 | 204 | 63.55 |
| 2 | 112 | 34.89 |
| 3 | 5 | 1.56 |
| Type of surgery | | |
| General surgery | 161 | 50.16 |
| Orthopedics | 160 | 49.84 |
| Anesthesia | | |
| General anesthesia | 141 | 43.93 |
| Spinal anesthesia | 122 | 38.01 |
| Peripheral nerve block | 58 | 18.07 |

The assessment of post-operative pain at various hours revealed a significant variation in pain scores (Table 2). At 4 hours post-surgery, 39.88% of patients reported pain scores in the NRS 0-3 range, 42.99% reported scores in the NRS 4-7 range, and 17.13% reported scores in the NRS 8-10 range. By 24 hours, there was an increase in patients experiencing moderate to severe pain, with 28.04% reporting NRS 0-3, 57.01% reporting NRS 4-7, and 14.95% reporting NRS 8-10. At 36 hours, 32.09% of patients were in the NRS 0-3 range, 52.96% in the NRS 4-7 range, and 14.95% in the NRS 8-10 range. By 48 hours, the proportion of patients in the NRS 0-3 range increased to 42.99%, while those in the NRS 4-7 range decreased to 41.12%, and those in the NRS 8-10 range slightly increased to 15.89%. This indicates a general trend of decreasing severe pain over time, with a notable proportion of patients still experiencing moderate pain up to 48 hours post-surgery.

**Table 2: Post-operative pain proportions**

| Post-operative hours | NRS 0-3 | | NRS 4-7 | | NRS 8-10 | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| 4 | 128 | 39.88 | 138 | 42.99 | 55 | 17.13 |
| 24 | 90 | 28.04 | 183 | 57.01 | 48 | 14.95 |
| 36 | 103 | 32.09 | 170 | 52.96 | 48 | 14.95 |
| 48 | 138 | 42.99 | 132 | 41.12 | 51 | 15.89 |

In the first 24 hours following surgery, pethidine was the predominant analgesic used, accounting for 85.05% of prescriptions (Table 3). Tramadol was used by 12.15% of patients, while diclofenac and paracetamol were used

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by 1.87% and 0.93% of patients, respectively. This suggests a strong preference for pethidine in managing postoperative pain in the early postoperative period.

**Table 3: Analgesics used for postoperative pain management in first 24 hours post-surgery**

| Analgesic used | n | % |
|---|---|---|
| Paracetamol | 3 | 0.93 |
| Diclofenac | 6 | 1.87 |
| Tramadol | 39 | 12.15 |
| Pethidine | 273 | 85.05 |

In the univariate analysis, several potential risk factors were significantly associated with postoperative pain, including younger age (with a trend), female sex, type of surgery, anesthesia plan (general anesthesia compared to peripheral nerve block), and intra-operative analgesia ($P < 0.05$). A history of chronic pain did not significantly influence postoperative pain outcomes. However, in the multivariable analysis, only general anesthesia (in comparison to spinal anesthesia and peripheral nerve block) and intra-operative analgesia remained significantly associated with postoperative pain ($P < 0.001$). Notably, 39.8% of patients had inadequate intraoperative pain management.

## DISCUSSION

The objective of our study was to determine the prevalence of postoperative pain following general and orthopedic surgery and to identify risk factors associated with increased postoperative pain in our patient population. Our findings indicate that approximately 70% of patients experienced moderate to severe pain within the first 48 hours after surgery, with 15% to 16% reporting severe pain. While we hypothesized that age might be a risk factor for postoperative pain, only general anesthesia was identified as a significant risk factor among the patients studied. This finding may be attributed to the generally poor provision of perioperative analgesia, which makes it challenging to identify additional risk factors and renders them less significant when a high proportion of patients experience moderate to severe pain.

Our study revealed a high prevalence (around 70%) of moderate to severe acute postoperative pain. In comparison, an Ethiopian cohort reported a 91.4% incidence of postoperative pain, with a mean pain intensity of 6.72 ± 1.44 [5]. Similarly, a study at a Western Cape referral hospital found that 62% of 1231 patients experienced moderate to severe pain following various surgical procedures [11]. A comprehensive systematic review of acute pain management following major surgeries (abdominal, thoracic, orthopedic, and gynecological) found that the mean incidence of moderate to severe pain and severe pain within the first 24 hours post-surgery was 30% and 11%, respectively. The review also noted that pain levels varied with the type of analgesic technique used, with lower incidences reported for patient-controlled intravenous and epidural analgesia compared to intramuscular analgesia [13]. The lower prevalence of severe pain in developed countries is likely due to advanced regional anesthesia techniques, well-established pain protocols, and the presence of specialized acute pain services [14–16].

At our hospital, surgeons are primarily responsible for postoperative pain management, unlike in some international settings where this responsibility is shared between surgeons and anesthesiologists [17]. An integrated approach from both specialties would be ideal for reducing postoperative pain. Despite following a multimodal acute pain protocol according to WHO standards, patients at Kilimanjaro Christian Medical Centre are typically administered monotherapy: pethidine is commonly used in the first 24 hours, after which it is switched to paracetamol, often without proper pain assessment or evaluation of treatment effectiveness [18]. Similar findings have been reported in other low- and middle-income countries, where inadequate pain assessment and reliance on medical staff experience rather than standardized protocols are common [5,11]. Additionally, inadequate intraoperative pain management was noted in nearly 40% of patients, indicating a lack of understanding of multimodal pain management among anesthesia staff. Enhanced training for medical staff is essential to improve acute postoperative pain management. Future studies could benefit from international collaboration to develop and evaluate training programs aimed at improving pain management practices.

In our study, univariate analysis identified female sex, type of surgery, anesthesia plan, and intraoperative analgesia as potential risk factors for acute postoperative pain. These findings align with results from studies conducted in the Netherlands, South Africa, and Sweden [4,8,11,12,16,19]. However, in the multivariate analysis, only general anesthesia (compared to spinal anesthesia and peripheral nerve blocks) and intraoperative analgesia were significantly associated with postoperative pain. The low sample size may have contributed to the lack of statistically significant findings for other risk factors, as the majority of patients (>70% on the first postoperative day) experienced moderate to severe pain. This underscores the difficulty in identifying reliable risk factors in the context of inadequate analgesia. Future research should focus on risk factors for postoperative pain in settings where adequate analgesia is provided.

DOI: 10.69605/ijlbpr_13.8.2024.17

## CONCLUSION

This study reveals that postoperative pain management at was inadequate, with more than 70% of patients experiencing moderate to severe pain on the first postoperative day. This highlights the urgent need for improved postoperative analgesia, particularly in low- and middle-income countries. The findings underscore the necessity for enhanced training and implementation of acute pain management protocols for medical staff. Future research with larger sample sizes should focus on identifying risk factors to better predict and manage postoperative pain, potentially leading to more individualized and effective perioperative pain management strategies.

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