

## Assessment of Adequacy of Analgesics in Post-Operative Orthopedic In-patients using Visual Analogue Scale

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### DOI

[10.59779/jiomnepal.1393](https://doi.org/10.59779/jiomnepal.1393)

### Submitted

May 27, 2025

### Accepted

Aug 9, 2025

## ABSTRACT

### Introduction

Adequate post-operative pain management in orthopedic patients is essential for optimizing recovery and reducing complications. This study aimed to evaluate the adequacy of analgesic use among post-operative orthopaedic inpatients using the visual analogue scale (VAS).

### Methods

An observational cross-sectional study was conducted on 240 post-operative orthopedic in-patients at Patan Hospital, Lalitpur, Nepal. Analgesic administration patterns were analysed, and pain intensity was assessed at 6 hours and the next morning at 10 am post-operative using VAS score. SPSS 16 was used to evaluate analgesic adequacy and its association with age, gender, surgery type, and anatomical site.

### Results

The majority of patients were male 134 (55.8%) with a mean age of  $41.03 \pm 16.60$  years. The most frequently used analgesics were Pethidine 67 (27.92%) and ketorolac 64 (26.67%). The mean VAS score decreased from 6.43 at 6 hours post-operatively to 4.96 the next morning in major surgeries ( $p < 0.001$ ), and similar statistically significant reductions were observed in other surgical categories and anatomical sites, including spine and pelvis. VAS scores showed a significant reduction in pain across all sites and surgical types, particularly in spine and pelvic surgeries. Major surgeries had higher initial VAS scores, which improved significantly by the next day ( $p < 0.001$ ).

### Conclusion

Analgesic use in this setting was effective in pain reduction observed among post-operative orthopedic in-patients. These results indicate that timely and appropriate analgesic administration effectively controls post-operative pain in orthopedic in-patients and highlight the importance of protocol-based pain management strategies tailored to surgical invasiveness.

### Keywords

Analgesics; orthopedic surgery; pain management; post-operative pain; visual analogue scale (VAS)

## INTRODUCTION

In the post-operative settings, especially after orthopedic surgeries, inadequate pain control can delay recovery, increase hospital stay and healthcare costs, and reduce patient satisfaction and overall quality of life.<sup>1,2</sup> It is critical, not only for comfort but also to enhance recovery and functional results.<sup>3</sup>

Analgesic medications play a central role in managing post-operative pain. However, prescribing practices and the adequacy of pain relief may vary depending on institutional protocols, available drugs, and individual clinical judgment. Prescription pattern analysis forms a key part of drug utilization studies. It helps in identifying the rational of drug use, improving the quality of prescribing, minimizing adverse effects, and promoting cost-effective therapy.<sup>4,5</sup>

International studies have provided insights into the adequacy of analgesic use. Study from Poland,<sup>6</sup> to evaluate the effectiveness of prescribed analgesic using visual analogue scale (VAS) has showed that most of the patients were satisfied with quality of post-operative pain control.

In the Nepalese context, although some studies have assessed drug utilization in hospital settings,<sup>7</sup> limited research exists on the adequacy of analgesic use especially in post-operative orthopedic inpatients. Hence, the study aimed to evaluate the adequacy of analgesic use among post-operative orthopedic inpatients using the visual analogue scale.

## METHODS

A hospital-based observational cross-sectional study was conducted from October 2021 to March 2022 in the Department of Orthopedics, Patan Hospital, Patan Academy of Health Sciences (PAHS), to assess the adequacy of analgesics in post-operative orthopedic inpatients using the visual analogue scale (VAS).

A total of 240 patients were included using a consecutive sampling technique. Sample size was calculated using the formula,  $n = z^2 p(1-p)/d^2$ , where  $p = 0.82$ ,  $z = 1.96$  (95% confidence interval), and  $d = 0.05$  (margin of error), resulting in a calculated sample size of 236.48, rounded to 240. Elective orthopedic patients admitted for at least 48 hours post-operatively and who received analgesics were included. Exclusion criteria were uncooperative patients, emergency surgical cases, critically ill individuals, patients receiving multidrug analgesic combinations, and those discharged against medical advice.

Data were collected using a structured proforma. VAS scores were recorded twice for each patient:

once at 6 hours post-surgery and again at 10:00 AM the next day. For pediatric patients, VAS scoring was interpreted based on facial expressions. According to the VAS<sup>9</sup> score and the scoring criteria of lower limb, upper limb and spine, pain categorized as: 0 = no pain, 1–3 = mild pain, 4–6 = moderate pain and 7–10 = severe pain; a score  $\leq 3$  was defined as adequate pain control.

Statistical analysis was performed using SPSS version 20. Descriptive statistics (mean, standard deviation, percentages) summarized demographic and clinical data, while paired t-tests were used to compare VAS scores at the two time points. A p-value of  $<0.05$  was considered statistically significant.

Ethical approval was obtained from the Institutional Review Committee of PAHS. Written informed consent was taken from all participants, Minor participants consent taken from their parents and confidentiality was maintained.

## RESULTS

Total of 240 post-operative orthopedic inpatients were included in the study, comprising 134 (55.8%) male and 106 (44.2%) females, with a mean age of  $41.03 \pm 16.60$  years (range 9-90 years). The majority of patients belongs to the 15–30-year age group (30.42%), followed by the 31–40-year group (28.33%) (Table 1).

*Table 1. Age distribution*

Age group (years)	Number (%)	Mean $\pm$ S.D (years)
$\leq 14$	12 (5%)	41.03 $\pm$ 16.60
15 – 30	73 (30.42%)	
31 – 40	68 (28.33%)	
41 – 50	53 (22.08)	
$\geq 60$	34 (14.17%)	
<i>Total</i>	240 (100%)	

The analgesics prescribed post-operatively were pethidine (27.92%), ketorolac (26.67%), paracetamol (22.92%) and NSAIDs (22.50%).

Table 2 presents the comparison of VAS scores across surgical sites with paired t-test. Pain scores reduced significantly in all anatomical groups ( $p < 0.05$ ), with the most pronounced reduction observed in the spine and pelvis categories.

Pain control effectiveness was also analyzed based on the type of surgical management (Table 3). As shown in Table 3, VAS scores decreased significantly across all management categories. Patients undergoing major surgeries reported the highest initial pain (mean VAS 6.43), which improved

**Table 2.** VAS score comparison according to site of surgery

Site	Number	VAS score (Mean± SD)		P- Value
		6 hours	10 am	
Lower limb	122	6.16±1.82	4.70±1.45	<0.001
Upper limb	103	5.87±1.60	4.68±1.30	<0.001
Spine	12	7.08±0.79	5.33±1.16	<0.001
Pelvis	3	7.67±0.58	6.00±1.00	<0.018

**Table 3.** VAS score comparison according to type of management

Type of surgery	Number	VAS score (Mean± SD)		P- Value
		6 hours	10 am	
Minor	63	4.43± 1.16	2.40± 0.80	<0.001
Major	139	4.961± 1.42	2.60± 0.90	<0.001
Closed	38	4.76± 1.48	2.70± 0.95	<0.001

to 4.96 by the following morning. Minor and closed surgeries patients also experienced less pain.

These results indicate effective escalation and tailoring of analgesic regimens based on the severity of the surgical procedure. All categories demonstrated statistically significant reductions in VAS scores (p <0.001), indicating adequate post-operative pain control across different surgical approaches.

Pain score distribution based on categories is shown in Table 4. There was a significant shift in the number of patients reporting severe or moderate pain at 6 hours post-operatively to those reporting mild or no pain at 10 AM the next morning. This suggests substantial improvement in pain control over time.

Table 5 presents pain control classified as adequate or inadequate. The number of patients achieving adequate pain relief (VAS ≤3) increased significantly from 29.2% at 6 hours to 90.0% the following morning. The difference was statistically

significant (p < 0.001), indicating highly significant improvement in pain control.

**DISCUSSION**

In our study, the most commonly prescribed analgesics were Pethidine (27.92%) and Ketorolac (26.67%) followed by Paracetamol (22.92%) and NSAIDs (22.50%). The mean VAS score across all patients decreases significantly from 6.18 ± 1.64 at 6 hours to 4.78 ± 1.39 the next morning (p < 0.001), with major surgeries showing a reduction from 6.43 ± 1.61 to 4.96 ± 1.42. A significant reduction in VAS scores was observed across all categories, especially in patients undergoing spinal and pelvic surgeries. The findings showed that pain control was generally adequate, indicating effective use of analgesics.

The mean age was 41.03±16.60 years, with the largest proportion of patients in the 15-30 year group. This finding is consistent with Sharma et al.<sup>10</sup> who also reported a predominance of younger

**Table 4.** Distribution of patients according to pain category based on VAS score

Category of pain/VAS	Number (%) of patients	
	Post-op 6 hours	Post-op at 10 am
No (VAS 0)	12 (5.0%)	48 (20.0%)
Mild (VAS 1-3)	58 (24.2%)	168 (70.0%)
Moderate (VAS 4-6)	142 (59.2%)	20 (8.3%)
Severe (VAS 7-10)	28 (11.6%)	4 (1.7%)
<i>Total</i>	240 (100%)	240 (100%)

**Table 5.** Adequacy of pain control based on VAS score

Adequacy of pain control by VAS	Number (%) of patients		p-value
	Post-op 6 hours	Post-op at 10 am	
Adequate (VAS≤3)	70 (29.2%)	216 (90.0%)	<0.001
Inadequate (VAS>3)	170 (70.8%)	24 (10.0%)	
<i>Total</i>	240 (100%)	240 (100%)	

adults undergoing orthopedic surgeries in Nepal, and with Agrawal et al<sup>5</sup> who observed similar age trends in India. In contrast, Vallanoet al.<sup>11</sup> in Spain reported a higher mean age (~55 years), likely reflecting the greater proportion of elective joint replacement in older adults in European settings.

Our cohort was 55.8% male, similar to the male predominance observed by Agrawal et al.<sup>5</sup> Conversely, Borys et al.<sup>6</sup> found a female predominance in European centres, which may be due to the higher prevalence of degenerative joint disease surgeries in women. The male predominance in our study may reflect greater occupational and environmental exposure to trauma among men in Nepal.

Pain reduction was seen across all anatomical sites, with the most pronounced improvement in spinal (VAS: 7.08- 5.33) and pelvic (VAS: 7.67-6.00) surgeries. These findings are in line with Kawaliet al.<sup>8</sup> who reported higher baseline pain scores in spinal surgeries necessitating stronger analgesic regimens. Vallanoet al.<sup>10</sup> however, found abdominal surgeries to yield the highest pain scores, likely due to differences in surgical case mix.

When analysed by surgical management, major surgeries had the highest initial VAS scores (6.43) but also showed substantial reductions by the next morning (4.96). this is consistent with Dolin et al.<sup>12</sup> who noted that more invasive surgeries require escalated analgesia but can still achieve adequate control when protocols are properly followed. Vallanoet al.<sup>11</sup> similarly observed that early and appropriate analgesic escalation is critical in major surgical procedures.

Pain assessment in our study utilized the Visual analogue scale (VAS), a validated and widely accepted tool for post-operative pain monitoring.<sup>9,11,13</sup> The significant reduction in VAS scores at both 6 hours and the next morning mirrors results from Kawali et al.<sup>8</sup> who also demonstrated notable pain improvement when analgesic administration was guided by VAS monitoring. This consistency across settings underscores VAS reliability and its value in guiding timely analgesic adjustment in orthopaedic post-operative care. Previous large cohort studies have also demonstrated that pain intensity varies widely depending on the type of surgical procedure.<sup>14</sup> Furthermore, individual predictors such as younger age, female gender and preoperative anxiety have been identified as important risk factors for more severe acute post-operative pain.<sup>15</sup> These factors may partly explain the variability observed in our cohort.

This study has evaluated the effectiveness of analgesic administration among orthopedic patients following surgery in a tertiary care hospital in Nepal. A prospective cross-sectional design was used, involving 240 patients. Pain was assessed at two

time points - 6 hours and the next day morning post surgery using visual analogue scale (VAS). The study analyzed analgesic prescribing patterns and compared pain intensity across surgical types and anatomical sites.

The results show that proper use of analgesics after orthopedic surgery can give effective pain relief. This matters because good pain controls help patients heal faster, stay comfortable and go home sooner. It also gives doctors in Nepal local proof that their current practices are working and where they can still improve.

This study fills a critical gap in Nepalese literature by providing local evidence on post-operative pain management using objective measures. It highlights the importance of timely and appropriate analgesic use in orthopedic care and can serve as a basis for improving clinical protocols.

Limitations include the subjective nature of pain perception, variability in patient reporting, and the lack of stratification by comorbidities or individual analgesic dosages. As a single-center study, findings may not be generalizable to all settings, especially those with different analgesic availability or surgical practices. Post-operative analgesics should be administered on time, with regular pain assessment using the Visual Analogue Scale (VAS). Healthcare staff should receive training on safe and appropriate pain management. Hospitals are encouraged to develop local pain management protocols, and further should be conducted in multiple centers to assess long-term outcomes.

## CONCLUSION

Analgesic use in post-operative orthopedic inpatients at our tertiary care center was generally adequate, with reductions in VAS pain scores across all patients groups. Major surgeries showed the highest initial pain scores but also significant improvement. Marked reductions were observed in spine and pelvic surgeries. These findings support that analgesic use in these settings was generally adequate and effective. The findings provide local evidence to guide optimization of post-operative pain management in orthopedic care.

## ACKNOWLEDGEMENT

None

## FINANCIAL SUPPORT

The author(s) did not receive any financial support for the research and/or publication of this article.

## CONFLICT OF INTEREST

The author(s) declare that they do not have any

conflicts of interest with respect to the research, authorship, and/or publication of this article.

## AUTHOR CONTRIBUTIONS

Research concept: MG. Research design: MG. Literature review: MG, SA. Research experiment: MG. Data collection: MG, AS. Data analysis: MG, SA, AS. Statistical analysis: MG, SA. Manuscript preparation: MG, SA

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