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Prevalence and Temporal Pattern of Severe Postoperative Pain Among Adults Undergoing Major Orthopedic Surgery At A Tertiary Hospital In Kenya

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ABSTRACT

Pain, an unpleasant sensory and emotional experience associated with actual or potential tissue damage, is a significant global health concern, affecting orthopaedic patients in both developed and developing nations. Acute post-surgical pain is an important predictive factor of chronic postoperative pain. Inadequate pain management remains a prevalent issue for surgical patients, with estimates ranging from 20% to 80%. Locally, the growing number of patients presenting with chronic pain and poor rehabilitation post musculoskeletal surgery in orthopedic clinics is partly attributed to inadequately managed acute post-surgical pain. Consequently, assessing the prevalence of severe postoperative pain and the adequacy of analgesic prescriptions among musculoskeletal surgery patients is crucial. This research will assist orthopedic surgeons in developing effective post-surgical pain management protocols, potentially reducing the incidence of severe uncontrolled pain in wards and eventually chronic pain in the clinics. To establish the prevalence of severe post-surgical pain at Moi Teaching and Referral Hospital (MTRH), Eldoret, Kenya. This study is a hospital based prospective study based at MTRH theatre and orthopedic wards carried out between June, 2024 and December, 2024. A total of 320 patients scheduled for major orthopedic surgery who met the inclusion criteria were enrolled. Every fourth patient scheduled for orthopedic surgery was systematically sampled for assessment of post-surgical pain using numerical rating scale (NRS) Descriptive statistics were used for continuous variables and frequency and percentages for categorical data. The overall prevalence of severe post-surgical pain was 56.88% in the initial 72 hours. Severe pain was recorded at 37.19%, 23.44%, 27.19%, 10.31% and 6.25% in 2 hours, 12 hours, 24 hours, 48 hours and 72 hours respectively. Majority of the patients received multimodal analgesics at 57.81%. Prevalence of severe post-surgical pain in orthopedic patients was relatively high in the initial 72 hours. Introduction of pain assessment scales for regular assessment of pain scores in the initial 72 hours of surgery in orthopedic wards. Utilization of strong opioids and nerve blocks for control of post-surgical pain in the initial 72 hours.

Keywords: Postoperative pain; severe pain; orthopedic surgery; pain prevalence; pain assessment

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INTRODUCTION

Postoperative pain is a common consequence of surgical intervention and is an important component of postoperative recovery. Pain is a complex and subjective experience that is influenced by biological, psychological, and individual factors. Its perception and intensity vary considerably between individuals, even when the nature of the surgical procedure is similar (6,10). Effective assessment of postoperative pain is therefore important for identifying patients experiencing clinically significant pain and guiding appropriate postoperative care.

Orthopedic surgery presents a particular challenge because many procedures involve substantial manipulation and disruption of musculoskeletal tissues. Surgical incision, tissue dissection, traction, and manipulation of bones, joints, muscles, and other soft tissues generate nociceptive input and may result in considerable acute postoperative pain (1,4). Orthopedic patients may therefore experience substantial pain during the early postoperative period, particularly following major procedures. Studies have reported that postoperative pain following orthopedic surgery may be more intense than that experienced following some other major surgical procedures (9).

The burden of postoperative pain extends beyond immediate patient discomfort. Severe acute pain may interfere with mobilization and functional recovery following orthopedic surgery and may contribute to the transition from acute to chronic pain (7,8). Persistent pain following orthopedic trauma has been associated with the severity of acute postoperative pain, highlighting the importance of identifying and addressing severe pain during the early postoperative period (11). The occurrence and intensity of postoperative pain may also vary according to individual and clinical characteristics, including preoperative pain, psychological factors, and characteristics of the surgical procedure (5,20,11).

Assessment of pain at different time points after surgery is important because postoperative pain is dynamic and may change during the early recovery period. Previous studies have assessed postoperative pain at multiple postoperative intervals and have demonstrated variation in pain severity during the first few days following surgery (14–16). In Tanzania, Mwashambwa et al. reported substantial postoperative pain among surgical patients assessed at 12, 24, and 48 hours after surgery (15). Similarly, Ndebea et al. reported acute postoperative pain among patients undergoing orthopedic and general surgery at a tertiary referral hospital in Tanzania (16). Studies from other settings have also demonstrated a considerable burden of postoperative pain among orthopedic patients (14,17).

Despite the clinical importance of postoperative pain, there remains limited information describing the prevalence and temporal pattern of severe postoperative pain among adults

undergoing major orthopedic surgery in Kenyan tertiary hospitals. Local evidence is important because the magnitude and pattern of postoperative pain may differ according to patient characteristics, types of orthopedic procedures, and the perioperative context. Determining the frequency of severe pain during the early postoperative period can provide useful information for strengthening routine pain assessment and postoperative care.

This study therefore aimed to determine the prevalence and temporal pattern of severe postoperative pain among adult patients undergoing major orthopedic surgery at Moi Teaching and Referral Hospital, Eldoret, Kenya, during the first 72 hours following surgery.

MATERIALS AND METHODS

This study employed a prospective observational study design and was conducted at Moi Teaching and Referral Hospital (MTRH), Eldoret, Kenya. MTRH is a specialized referral hospital serving patients from Western Kenya and surrounding regions. The hospital has approximately 1,000 beds and provides specialized orthopedic services. The study was conducted over a six-month period from June 2024 to December 2024. The study population comprised adult patients aged 18 years and above who underwent major emergency and elective orthopedic surgery at the main theatres of MTRH. Patients in a coma or other unresponsive state who could not appropriately express pain using the Numerical Rating Scale (NRS), patients with multisystem trauma, and individuals with dementia or neurological deficits that prevented appropriate assessment of pain were excluded from the study.

The sample size was calculated using the single-population proportion formula, ($n=Z^2p(1-p)/d^2$), where ($Z=1.96$) for a 95% confidence level, ($p=0.705$) was the expected proportion of postoperative pain, and ($d=0.05$) was the margin of error. The calculated sample size was approximately 319 participants and was rounded to 320.

The accessible population was estimated at 1,250 eligible patients. The sampling interval was calculated as 1,250/320, giving approximately four. A random starting point between 1 and 4 was selected, after which every fourth eligible patient was approached for recruitment until the target sample size was attained.

Data were collected using a structured questionnaire developed specifically for the study. Participants undergoing emergency surgery were identified in the casualty department, while those undergoing elective surgery were identified in the orthopedic wards. Baseline information collected before surgery included age, sex, educational background, occupational status, preoperative pain intensity, preoperative pain medication use, and previous or ongoing use of pain medication. Preoperative pain intensity was assessed using the NRS.

Postoperative pain intensity was assessed at 2,12,24,48 and 72 hours using the Numerical Rating Scale (NRS). Participants were asked to rate their pain on a scale from 0 to 10, where 0 represented no pain and 10 represented the worst pain imaginable. Pain scores were categorized as follows: Mild pain (1–3), Moderate pain (4–6), severe pain (7–10). For the present manuscript, the outcome of interest was severe postoperative pain, defined as an NRS score of 7–10 at the respective postoperative assessment.

Data were entered into Microsoft excel and analyzed with IBM SPSS statistic version 26. Severe postoperative pain was treated as a binary categorical outcome (yes/no). The proportion of patients experiencing severe postoperative pain was calculated, together with the corresponding confidence interval as specified in the study analysis plan. The prevalence of severe postoperative pain was also described at each postoperative assessment point—2, 12, 24, 48, and 72 hours—to describe the temporal pattern of severe pain during the first 72 hours following surgery then categorical variables were summarized using frequencies and percentages, while numerical variables were summarized using measures of central tendency and dispersion as appropriate.

The study was conducted after obtaining the required ethical and institutional approvals. Participation was voluntary, and eligible participants provided written informed consent.

RESULTS AND DISCUSSION

The mean age of participants was 39.5 years (SD 15.09), with an age range of 18–67 years. Males comprised 235 (73.4%) participants, while females comprised 85 (26.6%).

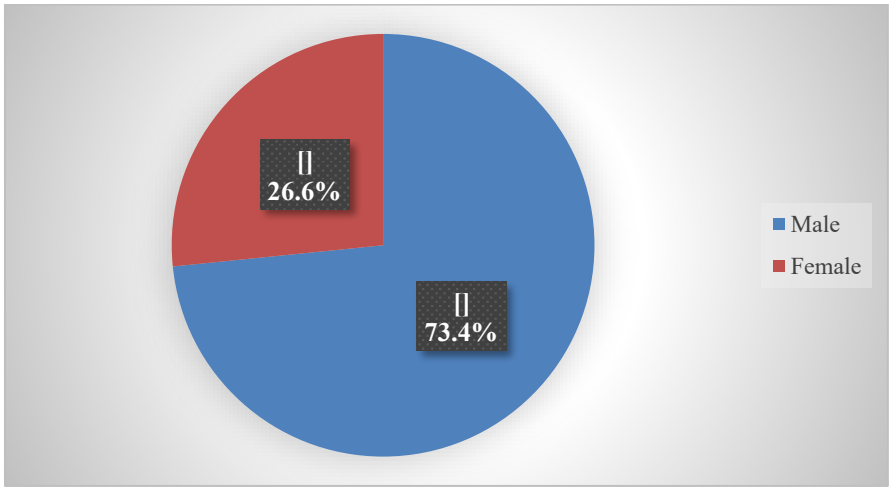


Figure 1: Gender distribution of study participants

Regarding age distribution, 95 (29.7%) participants were aged 18–27 years, 64 (20.0%) were aged 28–37 years, 55 (17.2%) were aged 38–47 years, 54 (16.9%) were aged 48–57 years, and 52 (16.3%) were aged 58–67 years.

Table 1: Age distribution of study participants

Age group (years)	Frequency (n)	Percentage (%)
18–27	95	29.7
28–37	64	20.0
38–47	55	17.2
48–57	54	16.9
58–67	52	16.3
Total	320	100.0

The majority of participants were single (n=141, 44.1%), followed by married participants (n=96, 30.0%), divorced participants (n=51, 15.9%), and widowed participants (n=32, 10.0%). Regarding educational attainment, 162 (50.6%) had primary-level education, 85 (26.6%) had secondary-level education, and 73 (22.8%) had college-level education.

During the first 72 hours following major orthopedic surgery, 182 of the 320 participants (56.88%) experienced severe postoperative pain at least once. This cumulative proportion was determined by counting each participant once, according to the first postoperative assessment at which severe pain was recorded.

Of the 182 participants who experienced severe pain, 119 (65.4%) had severe pain at the 2-hour assessment. A further 25 participants first experienced severe pain at 12 hours, 31 participants first experienced severe pain at 24 hours, three participants first experienced severe pain at 48 hours, and four participants first experienced severe pain at 72 hours.

The proportion of participants with severe postoperative pain varied across the five postoperative assessment points. At 2 hours after surgery, 119 (37.19%) participants reported severe pain. This decreased to 75 (23.44%) at 12 hours. The proportion subsequently increased slightly at 24 hours, when 87 (27.19%) participants reported severe pain. Thereafter, severe pain declined to 33 (10.31%) participants at 48 hours and 20 (6.25%) participants at 72 hours.

Table 2: Severity of postoperative pain at different postoperative assessment times

Pain severity	2 hours, n (%)	12 hours, n (%)	24 hours, n (%)	48 hours, n (%)	72 hours, n (%)
Mild	125 (39.06)	75 (23.44)	85 (26.56)	163 (50.94)	194 (60.62)
Moderate	76 (23.75)	170 (53.13)	148 (46.25)	142 (44.38)	106 (33.13)
Severe	119 (37.19)	75 (23.44)	87 (27.19)	33 (10.31)	20 (6.25)

Analgesic prescriptions and adequacy of pain management

During the first 48 hours after surgery, patients received different combinations of analgesics. Paracetamol was prescribed to 308 patients (96.3%), dexketoprofen to 234 (73.1%), morphine to 185 (57.8%), and tramadol to 96 (30.0%). Peripheral nerve blocks were administered to 32 patients (10.0%).

Using the Pain Management Index (PMI), analgesic treatment was classified as inadequate in 115 patients (35.9%) at 2 hours, 78 (24.4%) at 12 hours, 59 (18.4%) at 24 hours, 54 (16.9%) at 48 hours, and 29 (9.1%) at 72 hours. The proportion of patients with inadequate analgesic treatment decreased over the observation period, although some patients continued to experience inadequately treated pain at 72 hours.

Table 3: Adequacy of analgesic prescription during the first 72 hours after surgery

Assessment time	Adequate, n (%)	Inadequate, n (%)
2 hours	205 (64.06)	115 (35.94)
12 hours	242 (75.63)	78 (24.38)
24 hours	261 (81.56)	59 (18.44)
48 hours	266 (83.13)	54 (16.88)
72 hours	291 (90.94)	29 (9.06)

DISCUSSION

The finding that more than half of the patients experienced severe pain at least once during the first 72 hours is consistent with the considerable burden of postoperative pain reported in previous studies. Mwashambwa et al. reported substantial postoperative pain among surgical patients in Tanzania, with moderate-to-excruciating pain reported by 95.6% at 12 hours, 32.4% at 24 hours, and 5% at 48 hours (15). Although their study used a different pain-severity classification and included a broader surgical population, the reduction in more severe pain with increasing postoperative time is comparable with the pattern observed in the present study.

The temporal pattern observed in the present study is also broadly comparable with findings from other studies in the region. Sharma and Sitaula reported severe postoperative pain among orthopedic patients, with severe pain persisting into the second postoperative day (17). Similarly, Ndebea et al. reported substantial acute postoperative pain among patients undergoing orthopedic and general surgery at a tertiary referral hospital in Tanzania (16). However, direct comparison should be made cautiously because the studies differed in patient populations, surgical procedures, timing of assessment, and definitions used to classify pain severity.

The relatively high proportion of severe pain observed during the early postoperative period is clinically plausible in patients undergoing major orthopedic procedures. Orthopedic surgery involves manipulation and disruption of musculoskeletal tissues, generating substantial nociceptive input and potentially resulting in considerable acute postoperative pain (1,3,4). The immediate postoperative period may therefore represent a particularly vulnerable period for severe pain. The present study's finding of 37.19% severe pain at 2 hours is consistent with the broader observation in the thesis literature that substantial pain

occurs soon after orthopedic surgery. For example, Tsegaye reported moderate to very severe pain in 49.7% of orthopedic surgical patients during the immediate postoperative period (18). The decline in severe pain observed after the early postoperative period is also consistent with findings from previous studies. In the present study, severe pain decreased from 37.19% at 2 hours to 10.31% at 48 hours and 6.25% at 72 hours. Mwashambwa et al. similarly reported a marked reduction in more severe pain between 12 and 48 hours after surgery (15). Sharma and Sitaula also reported improvement in postoperative pain as the postoperative period progressed (17). This pattern may reflect the general progression of postoperative recovery; however, the present observational study cannot establish the specific mechanisms responsible for the decline.

An important observation in this study was the slight increase in severe pain from 23.44% at 12 hours to 27.19% at 24 hours. Therefore, severe pain did decline continuously throughout the observation period. A possible explanation is that postoperative pain is dynamic and may fluctuate during recovery rather than following a strictly linear pattern. Differences in individual pain experience, the type and extent of surgery, and other perioperative factors may contribute to variation in pain intensity between assessment points. Previous literature recognizes that pain experience varies considerably between individuals and is influenced by biological, psychological, and clinical factors (2,10).

The findings also differ from those reported by Nyambegera among patients undergoing invasive lower-limb orthopedic surgery at Kenyatta National Hospital. That study reported severe pain in 46% of patients at 12 hours, 62% at 24 hours, and 27% at 48 hours, which were higher than the corresponding time-specific proportions in the present study (19). Several methodological and population differences may account for the discrepancy. Nyambegera's study was restricted to invasive lower-limb orthopedic surgery, whereas the present study included major orthopedic procedures involving different anatomical regions. In addition, differences in the clinical characteristics of participants and the types of procedures studied may have contributed to the observed differences.

The present findings also differ from those of Ndebea et al., who reported severe pain proportions of 16.4% at 4 hours, 15.3% at 24 hours, 14.2% at 36 hours, and 16.4% at 48 hours (16). Their study included both orthopedic and general surgical patients, whereas the present study focused specifically on major orthopedic surgery. Differences in study population, surgical procedures, assessment intervals, and pain classification may therefore contribute to the different estimates.

The findings from Arefayne et al. also provide useful regional context. Their prospective observational study of patients undergoing emergency orthopedic surgery reported average-

to-severe pain in 38.5% of patients at 12 hours and 29% at 24 hours, with an overall incidence of average-to-severe pain within the first postoperative day of 70.5% (2). Although their outcome combined average and severe pain and their study population consisted specifically of emergency orthopedic surgical patients, the proportions reported at 12 and 24 hours are broadly comparable with the severe-pain proportions observed in the present study. The difference in pain classification means that these findings should not be interpreted as directly equivalent.

The differences between studies highlight the importance of considering the context in which postoperative pain is measured. Pain severity is influenced by characteristics of the surgical procedure and by individual differences in pain experience (10). Consequently, estimates from studies involving mixed surgical populations or different orthopedic subgroups may not be directly interchangeable with findings from a population of adults undergoing major orthopedic surgery. The use of repeated postoperative assessments in the present study provides a description of how severe pain was distributed across the first 72 hours rather than relying on a single postoperative measurement.

The high cumulative occurrence of severe pain observed in this study has implications for postoperative orthopedic care. The finding that 56.88% of patients experienced severe pain at least once indicates that severe pain was not confined to a small subgroup of patients. The concentration of severe pain during the early postoperative period further emphasizes the importance of regular pain assessment during this period. Previous literature has similarly emphasized the importance of systematic assessment of postoperative pain among orthopedic patients (12,13,17).

CONCLUSION

More than half of the adult patients undergoing major orthopedic surgery experienced severe postoperative pain at least once during the first 72 hours after surgery. Severe pain was most frequent at 2 hours, decreased at 12 hours, increased slightly at 24 hours, and declined substantially by 48 and 72 hours. These findings highlight the importance of regular postoperative pain assessment throughout the first 72 hours to identify patients experiencing severe pain and guide timely clinical management.

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