



Factors associated with postoperative pain among patients with upper limb fracture fixation surgery at Nghe An Trauma and Orthopedics hospital

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ABSTRACT

Objective: This study aimed to identify some factors associated with postoperative pain in patients undergoing upper limb fracture fixation surgery at Nghe An Trauma and Orthopedics Hospital in 2024. **Participants and methods:** A cross-sectional descriptive study was conducted on 150 patients who underwent upper limb fracture fixation surgery at the Upper Limb Department, Nghe An Trauma and Orthopedics Hospital, from April to June 2024. The Brief Pain Inventory (BPI) was used to assess postoperative pain levels. Anxiety levels were measured using the Hospital Anxiety and Depression Scale-Anxiety Subscale (HADS-A). Social support was evaluated using the ENRICHD Social Support Instrument (ESSI). Data were analyzed using SPSS 22.0. Descriptive statistics were used to summarize patient characteristics. Independent *t*-test was applied to compare differences between groups. Additionally, Pearson correlation analysis examined linear relationships between variables. The statistical significance was set at $p < 0.05$. **Results:** The proportion of male and female participants was 67.3% and 32.7%, respectively. The mean patient age was 45.7 ± 15.8 years, ranging from 18 to 77 years. A majority of patients (66.7%) had a high school education. Factors significantly associated with postoperative pain included surgical incision length, gender, duration of surgery, anxiety levels, and social support ($p < 0.05$) at 24, 48, and 72 hours postoperatively. **Conclusion:** Minimizing postoperative pain requires a multidisciplinary approach, including optimizing surgical techniques, implementing multimodal analgesia strategies, and enhancing psychological support. These measures are essential for reducing tissue trauma, improving pain management, and enhancing the quality of life for postoperative patients.

Keywords: Postoperative pain, upper limb fracture fixation, pain management.

INTRODUCTION

Postoperative pain is a common complication following fracture fixation surgery and plays a critical role in patient recovery. Multiple factors contribute to pain severity, including surgical factors (type, duration, and location of the

incision), patient-related factors (age, underlying health conditions, and response to pain medication), and wound-related factors (severity of injury, infection, and inflammation) ¹.

In the case of upper limb fracture fixation surgery, postoperative pain extends

beyond physical discomfort; it significantly affects patients' functional mobility, sleep quality, psychological well-being, and overall quality of life ^{2, 3}. Moreover, inadequate pain management may increase the risk of complications such as delayed wound healing and infections, further prolonging the recovery process. Previous research by Truong Dong Tam et al (2016) and Le Thi Mai Phuong & Phan Thi Dung (2021) has contributed valuable insights into the assessment and management of postoperative pain ^{4, 5}.

However, a more comprehensive understanding of postoperative pain and its associated factors remains essential. Further studies should investigate demographic (age, gender), psychological (anxiety levels), and social (support systems, economic status) factors influencing pain perception during the recovery period. Identifying these determinants will aid in the development of targeted pain management strategies, ultimately improving postoperative outcomes and patient quality of life.

Therefore, this study aims to explore key factors associated with postoperative pain in patients undergoing upper limb fracture fixation surgery at Nghe An Trauma and Orthopedics Hospital in 2024.

RESEARCH PARTICIPANTS AND METHODS

Research participants: Patients undergoing upper limb fracture fixation surgery at Nghe An Trauma and Orthopedics Hospital in 2024.

Inclusion criteria: Patients \geq 18 years old, who voluntarily consent to participate in the study.

Exclusion criteria: Patients with psychiatric disorders, those who are

unconscious, in a coma, or experiencing delirium postoperatively, and patients with pathological fractures.

Research duration and location: The study was conducted at the Upper Limb Department of Nghe An Trauma and Orthopedics Hospital from April to June 2024.

Research design: A cross-sectional descriptive study design.

Sample size and sample method: A complete sampling method was employed, including all patients undergoing upper limb fracture fixation surgery at Nghe An Trauma and Orthopedics Hospital during the study period. A total of 150 patients met the inclusion criteria.

Data collection instrument: General information about the patients included demographic data and general clinical information (13 questions) were collected.

Postoperative pain was assessed using the Cleeland Brief Pain Inventory (BPI) developed by Cleeland ⁶, which consists of four questions rated on a scale from 0 to 10 at three different time points: 24 hours, 48 hours, and 72 hours postoperatively. The mean postoperative pain score at each time point was calculated by taking the average of the highest pain score, the lowest pain score, the current pain score, and the average pain score.

Postoperative anxiety in patients was assessed using the Hospital Anxiety and Depression Scale-Anxiety subscale (HADS-A) developed by Zigmond and Snaith ⁷ which consists of 7 questions to measure the anxiety level of hospitalized patients. The total score of the scale is 21, corresponding to four levels of anxiety: no

anxiety, mild anxiety, moderate anxiety, and severe anxiety.

Social support was assessed using the ENRICH Social Support Instrument (ESSI), developed by Mitchell PH et al ⁸ in 2003, which includes seven questions (H1–H7) scored on a Likert scale from 1 to 5. The maximum score is 30 (H7 is not scored).

A pilot study conducted on 20 patients demonstrated that the pain, anxiety, and social support assessment tools had Cronbach’s alpha values of 0.9, 0.78, and 0.8, respectively. Furthermore, the translation and application of this questionnaire in previous Vietnamese studies further support its reliability. These findings indicated that the questionnaire has good reliability and is suitable for use in this research.

Data processing and analysis: To analyze the data collected from patient interviews, self-reported forms, and medical records, this study used SPSS 20.0

software. Both descriptive and inferential statistical methods were employed to ensure a comprehensive analysis.

Specifically, general information about the study participants was presented as frequencies, percentages, and mean values. To analyze group differences, the study utilized the independent t-test. Additionally, the Pearson correlation coefficient was applied to assess relationships between variables. A statistical significance level was set at $p < 0.05$.

Ethics in research: This study was approved by the Ethics Committee of Nam Dinh University of Nursing (certificate number 714/GCN-HDDD, dated April 8, 2024). All participants voluntarily agreed to participate in the study, and their personal information was kept strictly confidential. Data collection and processing were conducted accurately and transparently. The research findings were published exclusively in scientific reports.

RESULTS

Table 1. Demographic characteristics of patients

Demographic characteristics		n	%
Gender	Male	101	67.3
	Female	49	32.7
Age	18 - 30	28	18.6
	31 - 45	48	32.0
	46 - 60	43	28.7
	> 60	31	20.7
	Mean (SD) 45.7 (15.8)		
Qualification	General education	100	66.7
	Intermediate/college/Gaduate	26	17.3
	Postgraduate	24	16.0

The findings revealed that males constituted the majority of the study population, accounting for 67.3% of the total. The mean age was 45.7 ± 15.8 years, with 60.7% of participants aged between 31 and 60 years. Regarding educational qualification, 66.7% had completed high school.

Table 2. Mean postoperative pain score in patients after upper limb fracture fixation surgery

Postoperative pain	Mean	Standard Deviation
First 24 hours	27.2	2.3
After 48 hours	22.9	2.3
After 72 hours	18.3	2.2

The findings indicated that postoperative pain following upper limb fracture fixation progressively decreased over time. Pain intensity was highest during the first 24 hours, with a mean score of 27.2. By the second day, pain levels had declined to 22.9, followed by a further reduction to 18.3 on the third day.

Table 3. Association between gender and mean postoperative pain scores

Gender	Mean postoperative pain score		p-value*	t* value
	Mean	SD		
First 24 hours	Male	27.1 (2.4)	0.19	-1.30
	Female	27.6 (2.07)		
Day 2	Male	22.7 (2.2)	0.06	-1.88
	Female	23.4 (2.3)		
Day 3	Male	18.02 (2.2)	0.04	-2.10
	Female	18.9 (2.4)		

(*: Independent Samples Test)

On the third postoperative day, female patients had a higher mean pain score than male patients. This difference was statistically significant ($p < 0.05$).

Table 4. Correlation between age, surgery duration, incision length and mean postoperative pain score of patients

	Variable	r	p-value
First 24 hours	Age	- 0.06	0.49
	Surgery duration	0.01	0.24
	Incision length	0.2	0.04
Day 2	Age	-0.05	0.58
	Surgery duration	0.07	0.43
	Incision length	0.2	0.045
Day 3	Age	0.01	0.89
	Surgery duration	0.2	0.03
	Incision length	0.2	0.04

At 24, 48, and 72 hours postoperatively, incision length had a weak positive correlation with the total postoperative pain score ($r < 0.3$, $p < 0.05$). Additionally, surgery duration was weakly positively correlated with the total postoperative pain score on the third day ($r = 0.2$, $p < 0.05$). No significant correlation was found between age and postoperative pain ($p > 0.05$).

Table 5. Correlation between postoperative anxiety, social support and mean postoperative pain score

	Variable	r	p-value
First 24 hours	Postoperative anxiety	0.10	0.20
	Social support score	0.12	0.04
Day 2	Postoperative anxiety	0.10	0.25
	Social support score	0.12	0.16
Day 3	Postoperative anxiety	0.07	0.02
	Social support score	0.08	0.35

The study findings indicated a significant correlation between postoperative anxiety scores and pain scores on the third postoperative day ($p < 0.05$). However, no significant correlation was observed between total anxiety scores and total postoperative pain scores at 24 and 48 hours postoperatively ($p > 0.05$).

A significant correlation was found between social support scores and postoperative pain scores at 24 hours ($p < 0.05$). However, no significant correlation was found between total social support scores and total postoperative pain scores at 48 and 72 hours postoperatively ($p > 0.05$).

DISCUSSION

This study was conducted on 150 patients who underwent upper limb fracture fixation surgery at Nghe An Orthopedic and Trauma Hospital in 2024. The majority of the participants were between 31 and 60 years old and had a general education background. This result aligns with previous domestic studies ^{4,5}. Furthermore, the study results indicated that men had a higher risk of upper limb fractures than women, with rates of 67.3% and 32.7%, respectively. This finding aligns with previous studies by Tran Xuan Truong et al ⁹ (2023) and Le Thi Mai Phuong & Phan Thi Dung ⁵ (2021), both of which reported a higher

prevalence of men requiring upper limb fracture fixation surgery. These findings underscore the urgency of enhancing safety education and accident prevention efforts among men. Specifically, efforts should focus on raising awareness of self-protection, providing training on the use of personal protective equipment, and improving working conditions, particularly in high-risk occupations. Additionally, the development of public health programs aimed at improving overall health and minimizing injuries is essential ⁹.

The study results indicated that factors influencing postoperative pain following upper limb fracture fixation surgery included

gender, surgery duration, incision length, postoperative anxiety, and social support. These factors were statistically significant ($p < 0.05$).

Gender: The study results indicated that gender significantly influenced postoperative pain levels. Specifically, at 72 hours post-surgery, female patients reported higher pain levels than male patients ($p < 0.05$). This finding aligns with previous research, which also identified gender as a crucial factor affecting postoperative pain ^{1, 10}. Both studies noted that women reported higher pain levels than men, particularly in the immediate postoperative period. One possible explanation is that women frequently experience pain related to menstrual cycles, childbirth, and other gynecological conditions, which may contribute to greater sensitivity to pain. Additionally, women tend to express their pain more openly than men. Interestingly, however, the study by Allen et al ¹⁰ (2024) found that men demonstrated better postoperative recovery following upper limb surgery. These findings highlight the importance of considering gender differences when managing postoperative pain. To optimize treatment outcomes, clinicians should tailor pain management strategies based on individual patient characteristics, particularly for female patients who may require more targeted pain relief interventions.

Surgical duration: The study results demonstrated a weak positive correlation between surgical duration and the mean postoperative pain score on the third postoperative day ($r = 0.2$; $p < 0.05$). Additionally, incision length exhibited a weak positive correlation with mean postoperative pain scores at 24, 48, and 72 hours postoperatively ($r < 0.3$, $p < 0.05$).

These findings indicate that both surgical duration and incision length are associated with postoperative pain, although the correlation strength remains weak.

However, the findings of the present study differ from those reported by Mai Anh Dũng (2019), which identified a significant correlation between surgical duration and postoperative pain at 24, 48, and 72 hours postoperatively ¹. The discrepancy may be due to differences in sample size, study timing, and the anatomical sites examined. Additionally, factors such as surgical technique, incision length, type of surgery, and social support may influence postoperative pain outcomes.

To improve postoperative pain management, a multimodal approach should be considered, incorporating individualized pain management protocols ⁵. Regular pain assessment, appropriate analgesic adjustments, and the integration of various pain relief modalities-including early rehabilitation interventions-may support functional recovery, pain reduction, and complication prevention ¹¹.

Surgical incision length: The study results demonstrated a positive correlation between surgical incision length and the mean postoperative pain score at 24 hours, the second postoperative day, and the third postoperative day following upper limb fracture fixation surgery. This finding aligns with the study on lower limb fracture fixation by Mai Anh Dung (2018), which reported correlation coefficients of 0.25, 0.30, and 0.20 for the mean postoperative pain score at 24 hours, the second day, and the third day, respectively ($r < 0.3$) ¹.

Given this correlation, surgical incision length represents a factor influencing postoperative pain levels and recovery

duration. Effective postoperative pain management strategies, including local anesthesia, nerve blocks, analgesic medications, and physical therapy, have been evidenced to contribute to pain reduction and improved recovery outcomes¹¹.

Postoperative anxiety: The results presented in Table 5 indicate that the correlation between anxiety and the mean postoperative pain score was significant only on the third postoperative day ($p < 0.05$), while no significant association was observed at 24 hours and on the second postoperative day ($p > 0.05$).

One possible explanation is that postoperative pain typically peaks within the first 24 hours and remains the dominant factor influencing patient perception. During this period, acute pain intensity may overshadow the effects of anxiety. As pain begins to subside on the second postoperative day, patients may have greater cognitive awareness of psychological factors, such as concerns regarding recovery, potentially contributing to the stronger correlation between anxiety and pain perception observed on the third postoperative day^{1,5}.

This finding aligns with the study by Jeong-Hyun Sohn¹², which demonstrated a strong correlation between pain and anxiety in postoperative patients, where higher levels of anxiety were associated with increased pain perception. Similarly, research by Nguyen Bich Phuong¹³ found that postoperative patients who reported higher levels of anxiety regarding their surgery tended to experience greater postoperative pain.

To improve the management of postoperative pain and anxiety, especially in the first 72 hours, it is important to

provide ongoing psychological support and effective pain management strategies early in the process. During the initial 24 to 48 hours-when postoperative pain intensity is typically at its peak-an integrated approach that combines multimodal analgesia with clear and detailed postoperative care information may help mitigate anxiety and, consequently, reduce pain perception. At 72 hours postoperatively, as pain intensity declines, anxiety-related concerns may become more pronounced¹². Therefore, sustained psychological support and structured health education programs should be incorporated throughout the recovery process⁵.

Social support: The study results indicated a correlation between social support scores and the mean postoperative pain score at 24 hours ($p < 0.05$); however, no significant association was observed on the second and third postoperative days ($p > 0.05$). These findings differ from those reported by Dao Tien Thinh¹⁴, in which social support was found to influence pain levels on the second and third postoperative days. Similarly, the study by Nguyen Bich Phuong¹³ reported an association at all three time points: 24, 48, and 72 hours postoperatively. The observed differences may be attributable to variations in patient population characteristics.

To optimize postoperative pain management and enhance recovery, early psychological and social support should be prioritized¹. Particularly during the first 24 hours, when postoperative pain typically peaks, timely psychological and emotional support may contribute to reduced pain perception, improved psychological well-being, and lower stress levels during treatment^{5,13}.

Limitations of the study: This study is limited in sample size, research location and should be conducted across multiple healthcare facilities to enhance generalizability. Furthermore, the assessment of social support and pain levels may lack sufficient detail and objectivity due to the reliance on self-report scales, which are susceptible to subjective bias and did not account for cultural, psychological, and socioeconomic variability. Therefore, future research should consider incorporating diverse assessment methods, including in-depth interviews and structured direct observation, to improve the reliability and validity of findings.

CONCLUSION

Surgical incision length was significantly correlated with postoperative pain ($r = 0.2$; $p < 0.05$). Gender, duration of surgery, and postoperative anxiety were significantly associated with pain at 72 hours after surgery ($p < 0.05$). Social support was significantly correlated with pain in the first 24 hours after surgery ($p < 0.05$). Age was not significantly associated with postoperative pain ($p > 0.05$).

RECOMMENDATION: Optimizing upper limb fracture fixation techniques to minimize incision length, implementing multimodal pain management, and individualizing analgesic regimens are essential strategies to improve postoperative outcomes. Additionally, enhancing psychological and social support for patients, particularly during the first 72 hours postoperatively, is crucial. Future research should integrate a combination of diverse pain assessment methods and social support evaluation approaches to obtain more objective and comprehensive findings, while also considering cultural, psychological, and socioeconomic factors.

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