International Journal of Public Health Asia Pacific

Open Access: e-Journal
ISSN: 2822-0587(Online)

Fatigue in patients after surgery for lower limb fractures at Nghe An Orthopaedic and Trauma Hospital: A cross-sectional study

Phan Thi An Dung[1], Nguyen Thi Huyen[2], Nguyen Thi Thu Trieu[3*]

[1]Faculty of Nursing, Vinh Medical University, Vinh city, Vietnam
[2]Nghe An Maternity - Paediatric Hospital, Nghe An province, Vietnam
[3]Faculty of Nursing, Da Nang University of Medical Technology and Pharmacy, Da Nang city, Vietnam

*Corresponding author: Nguyen Thi Thu Trieu, nguyenthutrieu@dhktyduocdn.edu.vn

ABSTRACT

Background: Fatigue is a subjective feeling that causes loss of ability to participate in normal activities after surgery and affects the patient's quality of life. Postoperative fatigue in patients undergoing lower limb fracture surgery is often overlooked in clinical research compared to pain management or wound healing.

Objectives: This study aimed to describe the fatigue status in patients after surgery for lower limb fractures at Nghe An Orthopaedic and Trauma Hospital; and identify some related factors to postoperative fatigue in patients with lower limb fractures.

Methods: A cross-sectional prospective study was conducted on 312 patients admitted to the Lower Limb Department Nghe An Orthopaedic and Trauma Hospital with closed lower limb fractures from Feb 2024 to April 2024. Fatigue level of patients was assessed using the Identity - Consequence Fatigue Scale (ICFS). The data were analysed using descriptive statistics and Chi-square tests, with a significance level set at $P<0.05$.

Results: The study showed that fatigue level of patients after surgery is predominantly at a moderate level (56.7%), and high (23.1%). Besides, female patients experienced fatigue levels 4.13 times higher than male patients ($P = 0.003$). Post-fracture patients experiencing high pain levels had 3.51 times higher fatigue levels compared to those with mild or moderate pain ($P = 0.027$), while patients with high anxiety levels after surgery had 3.77 times higher fatigue levels than those with mild or moderate anxiety ($P = 0.035$).

Conclusion: The study revealed that most patients experienced moderate to severe fatigue following surgery for lower extremity fractures. Furthermore, fatigue levels were notably higher among female patients, those suffering from intense pain, and individuals with elevated postoperative anxiety. Future studies should adopt a prospective design to assess changes in fatigue levels over time, providing insights for more comprehensive and effective patient care strategies.

Keywords: Fatigue, Lower limb fractures, Post-surgery, Vietnam

1. Introduction

Lower Limb Fractures are common injuries. The most frequently encountered types include femoral shaft fractures, femoral neck fractures, intertrochanteric femur fractures, tibial fractures, and fibular fractures [1].

According to the United States, femoral fractures account for a high proportion of fractures requiring hospitalization, with approximately 300,000 people hospitalized each year [2]. In Vietnam, the incidence is around 7.1 per 100,000 people per year, accounting for 12% of all fractures [3]. The leading causes include traffic accidents and occupational accidents. The primary treatment is surgical intervention [4].

Several studies have shown that after surgery, patients often experience discomfort such as pain, fatigue, anxiety, and sleep disturbances [5-6]. A study by *Niva* found that 57% experienced fatigue, with its severity being significantly associated with the duration of postoperative pain [7]. Likewise, a study reported that 92% of patients suffered from postoperative fatigue, which was influenced by both pain intensity and anxiety levels [8]. Consistently, studies demonstrated that postoperative fatigue could impede participation in rehabilitation, resulting in delayed recovery. This delay may contribute to complications such as deep vein thrombosis, muscle atrophy, prolonged hospitalization, and negative social impacts [5-8]. However, despite extensive documentation, there is limited understanding of the demographic and clinical factors predicting higher fatigue levels, particularly after orthopaedic surgery.

In Vietnam, although numerous studies have investigated clinical characteristics and treatment outcomes of lower limb fractures [6, 9-10], no research has specifically addressed fatigue and its related factors at Nghe An Orthopaedic and Trauma Hospital. Therefore, this study aimed to describe postoperative fatigue and identify associated factors in patients undergoing surgery for lower limb fractures at this hospital.

2. Methods

2.1 Study Design

A cross-sectional study was conducted in the Lower Limb Department - Nghe An Orthopaedic and Trauma Hospital from Feb 2024 to April 2024, and this study was in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist (https://www.strobe-statement.org/).

2.2 Sampling

Samples included all patients admitted to at the Lower Limb Department – Nghe An Orthopaedic and Trauma Hospital with closed lower limb fractures and undergoing planned surgical treatment.

Inclusion criteria: Patients equal and over 18 years old; being diagnosed with closed lower limb fractures undergoing planned surgery (a surgery that was scheduled in advance rather than being performed as an emergency); being able to answer questions: able to hear, read, and understand Vietnamese; and willing to participate in the study.

Exclusion criteria included patients with fractures due to other causes (bone tumours, bone tuberculosis, etc.); patients undergoing emergency fracture surgery; patients who were unconscious or having psychological issues (such as: schizophrenia).

2.3 Sample Size and Sampling

This study applied a convenient sampling technique, and using the single proportion sample size calculation formula for a descriptive study, estimating the fatigue rate in patients after lower limb fracture surgery:

$$n = Z^2_{(1-\frac{\alpha}{2})} x \frac{p(1-p)}{d^2}$$

In which:

n: sample size

p: Fatigue rate in patients after lower limb fracture surgery. In this study, p = 0.42, based on the study by Nguyen et al. (2018) [9].

d: Absolute error margin, d = 0.06

Z: Standard normal distribution value, with a 95% confidence level, α = 0.05, we have Z = 1.96.

Applying these values to the formula, the estimated sample size is 260. To account for cases where participants did not complete the survey or drop out, we added 20% more. Thus, the final sample size for this study was 312 participants.

After obtaining informed consent, the research team distributed the questionnaires to participants and provided clarification when necessary. Upon completion, the questionnaires were collected and reviewed for completeness and validity. Clinical data related to diagnosis and treatment were verified through medical records.

2.5 Data Collection

The questionnaire included four parts.

- Part 1: Demographic information of research participants, including age, gender, waiting time for surgery, and surgical site.

- Part 2: The level of patients' pain was assessed by the Numeric Pain Rating Scale (NPRS), that was developed by *McCarberg B et al. (1989)* [11]. This scale has 10 levels, ranging from 0 to 10 points, where 0 indicates no pain and 10 represents the most intense pain the patient can perceive. Pain levels are classified into three groups: 1 - 3 points: Mild pain; 4 - 6 points: Moderate pain; and 7 - 10 points: Severe pain [11].

- Part 3: The level of anxiety in patients after lower limb fracture surgery was assessed using the DASS-21 questionnaire (Depression - Anxiety - Stress Scale) developed by *Lovibond et al.* [12]. In this study, the research team used only the 7 anxiety-related questions to evaluate the patients' anxiety levels. Each question has four response options, ranging from "0 - Not at all" to "3 - Very much." The total score ranges from 0 to 21 points, with the following classification: 0 points: No anxiety; 1 - 7 points: Mild anxiety; 8 - 14 points: Moderate anxiety; and 15 - 21 points: Severe anxiety [12].

- Part 4: Fatigue levels and the consequences of fatigue were assessed using the Identity - Consequence Fatigue Scale (ICFS), developed by *Paddison et al. (2016)* [13]. This scale consists of 25 questions divided into two subscales: Fatigue Sensation (9 items) and Fatigue Consequences (16 items). Each item is rated on a 5-point Likert scale from 1 (Not at all) to 6 (Always). The total score ranges from 25 to 150 points, with the Fatigue Sensation subscale scoring 9 - 54 points and the Fatigue Consequences subscale scoring 16 - 96 points. Finally, fatigue levels of patients were classified based on the total score from 25 questions, included: 25 - 42 points: Mild fatigue; 43 - 83 points: Moderate fatigue; and 84 - 150 points: Severe fatigue [13].

The English version of this tool was translated into Vietnamese by *Nguyen et al. (2018)* and tested on 30 post-surgical patients, yielding a high Cronbach's Alpha coefficient of 0.87 [9].

2.6 Data Analysis

The data was entered and analysed using SPSS 20 software. Descriptive statistics included percentages, frequencies, mean values, Standard Deviations (SD) to describe the variables. The Chi-square test was used to examine the differences in fatigue levels among patients after lower limb fracture surgery in relation to various factors. Results were considered statistically significant when $P < 0.05$.

3. Results

3.1 Participants' characteristics

Among 312 patients, most of them were male (63.5%), and 65.4% were over 40 years old. The majority (70.2%) underwent surgery within ≤ 2 days of waiting, and most surgeries were performed on the femur (55.8%) (Table 1).

Table 1: General characteristic of participants (n=312).

Contents	Number (n)	Percentage (%)
Sex		
Male	198	63.5
Female	114	36.5
Age		
< 20	42	13.5
≥ 20	270	86.5
Waiting time for surgery		
≤ 2	219	70.2
> 3	93	29.8
Surgical site		
Femur	174	55.8
Tibia	102	32.7
Fibula	36	11.5

3.2. Level of fatigue, anxiety, and pain of patients after surgery for lower limb fractures

The results in Table 2 indicated that the fatigue level of patients after surgery for lower limb fractures was predominantly at a moderate level (56.7%). Regarding anxiety levels after lower limb fracture surgery, the moderate level had the highest proportion at 58.7%. Additionally, the majority of patients (64.4%) experienced a high level of pain after surgery (Table 2).

Table 2: Level of fatigue, anxiety, and pain of patients after lower limb fracture surgery (n=312).

Contents	Number (n)	Percentage (%)
Level of fatigue		
Mild	63	20.2
Moderate	177	56.7
High	72	23.1
Level of anxiety		
Mild	93	29.8
Moderate	156	50.0
High	63	20.2
Level of pain		
Mild	24	7.7
Moderate	87	27.9
Severe	201	64.4

3.3. Correlation between demographic factors and fatigue level of patients after lower limb fracture surgery

The study found a statistically significant association between gender and fatigue levels in patients after lower limb fracture surgery. Specifically, female patients experienced fatigue levels 4.13 times (95% CI: 1.59 - 5.76) higher than male patients (P = 0.003). However, there was no statistically significant association between gender, surgery waiting time, surgical location, and fatigue levels (P > 0.05) (Table 3).

Table 3: Correlation between demographic factors and fatigue level of patients after lower limb fracture surgery (n=312).

Contents	Level of fatigue				OR (95%CI)	P-value
	Mild and Moderate (n=240)		High (n=72)			
	n	%	n	%		
Age						0.735
< 20	81	75.0	27	25.0	1	
≥ 20	159	77.9	45	22.1	0.849 (0.33-2.19)	
Sex						0.003
Male	171	86.4	27	13.6	1	
Female	69	60.5	45	39.5	4.13 (1.59-5.76)	
Waiting time for surgery						0.541
≤ 2	170	77.6	49	22.4		
> 3	60	64.5	33	35.5	3.41 (0.25-2.43)	
Surgical site						0.451*
Femur	149	85.6	25	14.4		
Tibia	63	61.8	39	38.2		
Fibula	28	77.8	8	22.2		

P-value from chi square test

3.4. Correlation between pain and anxiety levels and fatigue levels in patients after lower limb fracture surgery

Table 4 showed that post-fracture patients experiencing high pain levels had 3.51 times (95% CI: 2.10 – 6.22) higher fatigue levels compared to those with mild or moderate pain (P = 0.027). Similarly, patients with high anxiety levels after surgery had 3.77 times (95% CI: 2.03 - 5.75) higher fatigue levels than those with mild or moderate anxiety (P = 0.035).

Table 4: Correlation between pain and anxiety levels and fatigue levels in patients after lower limb fracture surgery (n=312).

Contents	Level of fatigue				OR (95%CI)	P-value
	Mild and Moderate (n=240)		High (n=72)			
	n	%	n	%		
Level of pain						0.027
Mild and Moderate	99	89.2	12	10.8	1	
Severe	141	70.1	60	29.9	3.51 (2.10-6.22)	
Level of anxiety						0.035

Contents	Level of fatigue				OR (95%CI)	P-value
	Mild and Moderate (n=240)		High (n=72)			
	n	%	n	%		
Mild and Moderate	231	92.8	18	7.2	1	
High	9	14.3	54	85.7	3.77 (2.03-5.75)	

4. Discussion

4.1 Participants' characteristics

Our results indicate that the majority of study participants were male (63.5%), which is consistent with the findings of *Lemon P et al. (2018)* [14] and *Nguyen et al.* [10]. This can be explained by the increasing incidence of traffic accidents, where men are the primary vehicle operators [15].

Additionally, most participants in the study underwent femur surgery (55.8%), a result that aligns with expectations. While fractures of other bones are commonly treated at district hospitals, femoral fractures are more complex due to the femur's size and structural significance [16]. As a result, Nghe An Orthopaedic Trauma Hospital, a specialized centre for severe orthopaedic injuries, sees a higher proportion of femur fracture cases.

Furthermore, 70.2% of patients had a surgery waiting time of ≤2 days, a finding consistent with the study of *Gleich et al. (2023)* [17]. Research suggests that delaying surgery beyond 48 hours for fracture injuries can lead to poorer mobility outcomes and significantly increased mortality. Therefore, performing surgery within two days is considered optimal for these patients.

4.2 Level of fatigue, anxiety, and pain of patients after lower limb fracture surgery

Fatigue is a common symptom in patients after lower limb fracture surgery and should not be overlooked by medical staff [6]. Postoperative patients may still experience side effects from anaesthesia, which can lead to symptoms such as nausea, vomiting, headache, dizziness, and general discomfort. These unpleasant symptoms can persist for an extended period, contributing to fatigue, loss of appetite, nutritional deficiencies, and reduced muscle tone [18]. Besides, our study found that 56.7% of patients experienced moderate fatigue, while 23.1% suffered from severe fatigue. These findings highlighted that fatigue is a prevalent and significant issue in post-surgical patients with lower limb fractures. Moreover, our results align with previous research [6,18], reinforcing the

importance of addressing fatigue in postoperative care.

The study found that many patients (58.7%) experienced a moderate level of anxiety following lower limb fracture surgery. Surgical procedures have a significant psychological impact on patients, often leading to concerns regarding the risks associated with the surgery, the qualifications of the surgical team, the potential for recovery, and the likelihood of postoperative complications, sequelae, or disabilities [19]. Anxiety levels tend to increase in cases where surgical costs are high, hospitalization is prolonged, mobility is restricted, or there is a risk of long-term functional impairment [20].

Post-operative patients may experience side effects from anaesthesia, leading to temporary symptoms such as nausea, vomiting, headache, and dizziness. Among these, pain remains a primary concern for most patients. Our study found that a significant proportion of patients (64.4%) reported experiencing severe postoperative pain. This finding aligns with previous studies conducted by *Nguyen et al. (2010)* [18] and *Chu et al. (2016)* [5]. Pain contributes to both physical and psychological distress, potentially affecting treatment outcomes. Therefore, recognizing pain levels and adjusting the patient care process accordingly is essential to improving postoperative care and optimizing treatment results.

4.3 Some factors related to fatigue in patients after lower limb fracture surgery

Our research results indicate a significant relationship between gender and fatigue levels, with female patients experiencing 4.13 times higher fatigue levels than male patients (P = 0.003). This discrepancy may be attributed to differences in disease perception between men and women. When hospitalized, patients often have multiple concerns, such as the safety of surgery, the surgeon's expertise, the recovery process, and potential complications or disabilities. These anxieties tend to be more pronounced in female patients, making them more susceptible to fatigue [20].

Additionally, our study found that patients with high post-fracture pain levels experienced fatigue 3.51 times more than those with mild to moderate pain (P = 0.027). This can be explained by the average pain score of our study subjects (6.78 ± 1.76), which corresponds to a high level of pain. Previous research has shown that postoperative patients often endure severe

pain in the first few days, which can persist and intensify with movement [9]. Pain is strongly associated with sleep disorders, which in turn contribute to fatigue. As pain increases, so does fatigue, and vice versa, highlighting the positive correlation between pain and fatigue [21]. Our findings align with previous studies [9,18].

Moreover, our study revealed that patients with high anxiety levels post-surgery exhibited fatigue levels 3.77 times higher than those with mild to moderate anxiety (P = 0.035). This finding is consistent with earlier research [7,18]. Anxiety in postoperative patients is often linked to stress about safety, concerns regarding treatment outcomes, financial burdens, and fears of post-treatment deformities affecting work, daily life, and self-image [20]. These worries are compounded by severe postoperative pain, discomfort from drainage tubes, and uncertainty about mobility after surgery, all of which contribute to heightened anxiety and subsequent fatigue.

These findings suggested that postoperative fatigue is quite common in patients with lower limb fractures. Therefore, measures to combat postoperative fatigue should aim to reduce the postoperative anxiety response, effectively treat pain to facilitate movement and exercise to increase postoperative recovery, thereby improving quality care for inpatient.

Limitation: This study was conducted on patients immediately after surgery, meaning that changes in fatigue levels during hospitalization or after discharge which may still impact the recovery process were not assessed. Therefore, future research should adopt a prospective design to compare fatigue levels at different time points. This approach would help identify trends in patient fatigue over time, allowing for the development of more effective nursing interventions and ultimately improving patient recovery outcomes. Practical implication: The findings suggested that postoperative fatigue is a significant issue among surgical patients, especially among females, those experiencing higher levels of pain, and those with elevated anxiety. Therefore, healthcare providers, particularly nurses and surgical care teams, should prioritize early identification and management of fatigue in these high-risk groups. Tailored interventions, including optimized pain management regimens, psychological support services, and gender-responsive care planning, should be implemented to address the multifactorial

nature of postoperative fatigue. These measures are essential to enhance patient recovery, improve quality of care, and reduce the overall burden of postoperative complications.

5. Conclusion

The study revealed that most patients experienced moderate to severe fatigue following surgery for lower extremity fractures. Furthermore, fatigue levels were notably higher among female patients, those suffering from intense pain, and individuals with elevated postoperative anxiety. These findings highlight the need for targeted nursing interventions to reduce postoperative fatigue, with a particular focus on managing anxiety and pain to enhance patient recovery. Future studies should adopt a prospective design to assess changes in fatigue levels over time, providing insights for more comprehensive and effective patient care strategies.

Acknowledgment

We would like to express our sincere thanks to the study participants for their enthusiastic cooperation.

Author Contribution

PTAD and NTH contributed to the study conception and design, data collection, data analysis, and manuscript drafting. NTTT contributed to study supervision, critical revision of the manuscript, and final approval of the version to be published. All authors read and approved the final manuscript.

Declaration

Ethical approval and consent to participate

The study was conducted after approval by the Scientific Council of Vinh Medical University according to Decision No. 56/QĐ-HĐKH dated December 23, 2023, and with the consent of Nghe An Orthopaedic and Trauma Hospital, as well as the support of the Head of the Inpatient Treatment Department at Nghe An Orthopaedic and Trauma Hospital. All participants were informed about the study's purpose and content, and those who consented were asked to sign a consent form before completing the questionnaire. Participants were free to withdraw from the study at any time without consequences. The study was designed to ensure that it did not interfere with the participants' health or well-being.

Competing interests

There are no conflicts of interest in this study.

Funding

Not applicable.

References

[1] Denisiuk M, Afsari A. Femoral shaft fractures. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2025.
[2] Laurila J, Huttunen TT, Kannus P, Kääriäinen M, Mattila VM. Tibial shaft fractures in Finland between 1997 and 2014. Injury. 2019;50(4):973–7.
[3] Hoang DK, Doan MC, Mai LD, Ho-Le TP, Ho-Pham LT. Burden of osteoporosis in Vietnam: An analysis of population risk. PLoS One. 2021;16(6):e0252592.
[4] Binh DT, Tuan LV, Phuong LHT, Hung DP. Primary intramedullary nailing for open femoral shaft fractures. Ho Chi Minh Med J. 2018;22(1):280-285
[5] Yang B, Li J, Feng D, Gong J, Yang Y, Cai X, et al. Latent profiles and determinants of postoperative sleep quality in elective surgery patients. Sci Rep. 2025;15(1):617.
[6] Nguyen TTT. Factors predicting postoperative fatigue among patients with closed fracture of leg undergoing internal fixation sugery in Khanh Hoa General hospital, Viet Nam. Master's thesis, Burapha University. 2016
[7] Niklasson A, Finan PH, Smith MT, Forsberg A, Dietz N, Kander T, et al. The relationship between preoperative sleep disturbance and acute postoperative pain control: A systematic review and meta-analysis. Sleep Med Rev. 2025;79(102014):102014.
[8] Zalon ML. Mild, moderate, and severe pain in patients recovering from major abdominal surgery. Pain Manag Nurs. 2014;15(2):e1-12.
[9] Nguyen TTL. Current situation and some factors related to fatigue of patients after open abdominal surgery at Viet Tiep hospital, Hai Phong in 2018. Master's thesis, Nam Dinh University of Nursing. 2018
[10] Nguyen QH, Hoang LV, Hoang TV, Ngo TP. Sleep quality and the relative factors in patients which are orthopedic and trauma surgery in Vinmec Times city hospital. Vietnam Med J. 2024;543(1):102-107
[11] McCarberg B and Cole BE. Pain in the older person. Biobehavioral Approaches to Pain. 1989;12(1):195-218.
[12] Lovibond PF & Lovibond SH. The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. Behaviour research and therapy. 1995;33(3): 335-343.
[13] Paddison JS, Booth RJ, Hill AG et al. Comprehensive assessment of peri-operative fatigue: development of the Identity-Consequence Fatigue Scale. Journal of psychosomatic research. 2016;60(6):615-622.
[14] Lemon P and Burke K. Nursing care of clients with musculoskeletal trauma, Vol 4, New Jersey, Alexander. Pearsonhighered.com. [cited 2025 Mar 19]. Available from: https://www.pearsonhighered.com/assets/preface/0/1/3/4/0134868188.pdf
[15] Cullen P, Möller H, Woodward M, Senserrick T, Boufous S, Rogers K, et al. Are there sex differences in crash and crash-related injury between men and women? A 13-year cohort study of young drivers in Australia. SSM Popul Health. 2021;14(100816):100816.
[16] Denisiuk M, Afsari A. Femoral shaft fractures. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2025.
[17] Gleich J, Neuerburg C, Schoeneberg C, Knobe M, Böcker W, Rascher K, et al. Time to surgery after proximal femur fracture in geriatric patients depends on hospital size and provided level of care: analysis of the Registry for Geriatric Trauma (ATR-DGU). Eur J Trauma Emerg Surg. 2023;49(4):1827–1833
[18] Nguyen HL. Factors related to postoperative syptoms among patients undergoing abdominal surgery. Master's thesis, Faculty of Nursing, Burapha University, Thailand. 2010
[19] Pinto A, Faiz O, Davis R, Almoudaris A, Vincent C. Surgical complications and their impact on patients' psychosocial well-being: a systematic review and meta-analysis. BMJ Open. 2016;6(2):e007224
[20] Goyal P, Prisha, Chacko JS, Goyal A, Gupta S, Kathuria S. Assessment of perioperative anxiety levels at three time-points during hospital stay in patients undergoing elective surgery. Perioper Med (Lond). 2025;14(1):27-32

[21] Milgrom LB, Brooks JA, Bunnell K et al. Pain levels experienced with activities after cardiac surgery. American Journal of Critical Care. 2004;13(2):116-125

Received 19/03/2025
Received in revised form 08/04/2025
Accepted 17/04/2025