Assessment of Sleep Quality and Associated Factors in Patients after Hip Arthroplasty in Vietnam: A Cross-Sectional Study

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Abstract: _Introduction: Sleep disorders are particularly common in postoperative patients and can negatively impact recovery, especially for patients with hip arthroplasty. This study aims to describe the sleep quality of patients after hip arthroplasty, and identify factors associated with sleep quality in these patients. Methods: A cross-sectional descriptive study was conducted to 393 patients after hip arthroplasty in some hospital, Vietnam from Feb 2023 to April 2023. A Pittsburgh Sleep Quality Index (PSQI) was used to measure sleep quality of these participants. Binary Logistic Regression Analysis is used to test the predicted probability of the impact of factors on good and poor sleep quality of patients. Results: This cross-sectional study investigated sleep quality and its associated factors in 393 patients post-hip arthroplasty in Vietnam from February to April 2023. Using the Pittsburgh Sleep Quality Index (PSQI), we found that 64.3% of patients experienced poor sleep quality. Severe postoperative pain, high anxiety, and significant environmental disturbances were strongly linked to poor sleep (p < 0.05), with Binary Logistic Regression revealing that high anxiety increased the odds of sleep disturbances by 1.152 times compared to low anxiety. These findings underscore the need for targeted pain management, environmental adjustments, and psychological support to improve sleep and recovery outcomes in this populatio. Conclusions: Majority of patients have poor sleep quality after hip arthroplasty, while severe postoperative pain, high anxiety levels, and significant environmental disturbances affected their sleep quality. Nurses and healthcare providers should implement effective pain management strategies, improve hospital environmental conditions, and provide psychological counseling to enhance sleep quality in this patient population._

Keywords: hip arthroplasty, sleep quality, postoperative care, anxiety, Vietnam

1. Introduction

Sleep quality is a fundamental physiological need and a critical component of overall well-being.[1] The prevalence of sleep disturbances in the general population varies widely, ranging from 6% to 76.3% across different countries.[2-3] Sleep disorders are particularly common in postoperative patients and can negatively impact recovery, especially following major and invasive procedures such as hip replacement surgery.[4]

Hip arthroplasty is a highly effective treatment for degenerative hip injuries and femoral neck fractures. [1] Globally, approximately 80,000 to 100,000 hip replacement procedures are performed annually. [5] In Vietnam, a 2018 study reported 155 hip replacement surgeries performed on patients with these conditions.[6] Despite the effectiveness of this procedure, postoperative patients often experience various complications, including pain, nausea, anxiety, fatigue, and, notably, sleep disturbances.[7] Sleep disturbances are particularly prevalent, affecting up to 89% of patients in the postoperative period.[8] A study by Seid et al. (2022) found that poor sleep quality was the most frequently reported complaint among patients following surgery.[9]

Impaired sleep quality can contribute to multiple physical and psychological complications. Physically, it may lead to increased pain, fatigue, immunosuppression, anorexia, and constipation.[10] For patients, adequate sleep plays a crucial role in pain relief, stress reduction, anxiety management, and overall physical recovery. However, hospitalized patients often struggle with falling asleep, maintaining sleep, or experience early awakenings with difficulty returning to sleep.[7-8]

While previous studies have examined postoperative sleep disorders, limited research has specifically focused on sleep quality in patients following hip replacement surgery. Therefore, this study aims to: (1) describe the sleep quality of patients after hip arthroplasty and (2) identify factors associated with sleep quality in these patients.

2. Methods

2.1 Study Design

This study employed a cross-sectional descriptive design with an analytical component. It was conducted at the Orthopedics Department of Military Hospital 4 and the Orthopedics Department of General Hospital 115 from February 2023 to April 2023. The study adhered to the guidelines outlined in the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist (https://www.strobe-statement.org/) to ensure methodological rigor and transparency.

2.2 Sampling

The study included patients who had undergone hip replacement surgery and were receiving inpatient treatment at the Orthopedics Department of Military Hospital 4 and the Orthopedics Department of General Hospital 115.

The study included patients aged ≥18 years who had undergone hip replacement surgery and could communicate in Vietnamese. While we excluded if patients with hip joint disease who were not eligible for surgery due to comorbid conditions; being diagnosed with mental disorders; or were too fatigued to complete the interview.

2.3 Sample size and sampling

A convenient sampling technique was used for this study. The required sample size was determined using the standard formula for a descriptive study estimating the rate of poor sleep quality in patients after hip arthroplasty:

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

Where:
n: Required sample size
p: Estimated prevalence of poor sleep quality in patients after hip arthroplasty. Based on the study by Van Meirhaeghe et al. (2021), p = 0.35.[11]
d: Absolute error margin, set at 0.05.
Z: Standard normal distribution value for a 95% confidence level (Z = 1.96 when α = 0.05)

Substituting these values into the formula, the estimated sample size is 349 participants. To account for potential dropouts or incomplete surveys, an additional 15% was added, resulting in a final sample size of 393 participants.

2.4 Data collection

The study utilized a comprehensive questionnaire that included five parts:

- Part 1: Participants' demographic and clinical data: the research team accessed medical records to gather demographic information and clinical characteristics of the study subjects. Collected data included pre-admission sleep status, surgical history, duration of surgery, use of sedative analgesics, and presence of comorbidities.
- Part 2: Pain Assessment using the Numeric Rating Scale (NRS). The patient's pain level was evaluated using the Numeric Rating Scale (NRS), a widely used and effective tool for assessing postoperative pain, developed by McCarberg B et al. (1989). The NRS consists of a horizontal bar with 11 levels, ranging from 0 (no pain) to 10 (worst possible pain). For this study, postoperative pain was classified into two categories: 0–3 points considered as Mild pain; and 4–10 points as Severe pain.[12]
- Part 3: Anxiety levels of patients were assessed using the Hospital Anxiety and Depression Scale-Anxiety Subscale (HADS-A), developed by Zigmond et al. (1983).[13] This study used only the 7 anxiety-related questions from the HADS-A scale. Each question was scored from 0 to 3, with anxiety levels classified as follows: 0–7 points for normal anxiety; 8–10 points for mild anxiety; and 11–21 points for high anxiety. The scale demonstrated good internal reliability, with a Cronbach's alpha coefficient of 0.80.[14]
- Part 4: Hospital environmental factors affecting sleep quality were assessed using the Hospital Environmental Factors Questionnaire, developed by Nguyen et al. (2013).[15] This questionnaire consists of 4 items, each rated on a scale of 0 to 10, indicating the degree of environmental disturbance affecting sleep. The total score ranges from 0 to 40, with the following classifications: ≤39 points as little disturbance; and >39 points as significant disturbance. The reliability of this scale was high, with a Cronbach's alpha coefficient of 0.86.[15]

- Part 5: Sleep Quality Assessment using the Pittsburgh Sleep Quality Index (PSQI) that developed by Buysse J et al.[16] This self-assessment tool consists of 19 questions, categorized into 7 subscales: subjective sleep quality; sleep latency, sleep duration; sleep efficiency; sleep disturbances; use of sleep-aid medication; and daytime dysfunction. Each question was scored from 0 to 3, with 0 = no difficulty and 3 = severe difficulty. The total PSQI score ranges from 0 to 21, with sleep quality classified as: ≤5 points for good sleep quality; >5 points for poor sleep quality. The scale demonstrated high reliability, with a Cronbach's alpha coefficient of 0.87.[17]

2.5 Data Analysis

Collected data was cleaned before entering, entered the computer, and managed by IBM SPSS Statistics version 20.0. The results of processing and analyzing descriptive statistics were tabulated with frequency distribution and percentage of variables. Chi-square test was used to identify factors related to sleep quality after hip replacement surgery and test the hypothesis of the appropriateness of the regression model. Meanwhile, Binary Logistic Regression Analysis was used to test the predicted probability of the impact of factors on good and poor sleep quality of patients. Results were considered statistically significant when p < 0.05.

2.6 Ethical Considerations

The study was conducted after receiving approval from the Scientific Council of Vinh Medical University, as per Decision No. 54/QD-HDYK dated January 15, 2023. Official consent was obtained from Military Hospital 4 – Logistics Department – Military Region 4 and General Hospital 115. Additionally, the study was carried out with the approval and support of the department heads, head nurses, and staff of the Orthopedics Department at both hospitals. All participating patients provided written informed consent before enrollment. Patients retained the right to withdraw from the study at any time, and participation did not impact their treatment. All collected data remained confidential and were used solely for research purposes.

3. Results

3.1. Participants' characteristic

Demographic characteristics
Table 1 indicate that most study participants were 56 years or older, accounting for 72.1% Additionally, 220 patients (55.9%) were female. Most participants had a general education level, comprising 75.3% of the total sample. Furthermore, 64.5% of the study subjects were married (see Table 1).

Table 1: Demographic characteristics (n=393)

Contents		Number (n)	Percent (%)
Age	18-35	30	7.5
	36-55	80	20.4
	>=56	283	72.1
Sex	Male	173	44.1
	Female	220	55.9
Education level	High school	296	75.3

	Upper	97	24.7
	Single	30	7.5
Marital status	Maried	254	64.5
	Widow	89	22.6
	Divoced	20	5.4

Disease characteristics and treatment methods

The study found that 54.8% of patients reported having normal sleep quality before hospital admission. Additionally, 236 patients (60.2%) had no prior history of surgery. The majority of patients underwent surgical procedures lasting more than 2–3 hours (82.8%), and 93.5% of patients used paracetamol for postoperative pain management (see Table 2).

Table 2: Disease characteristics and treatment methods

Disease characteristics and treatment methods		Number (n)	Percent (%)
Pre-admission sleep status	Very good	13	3.2
	Good	156	39.8
	Moderate	215	54.8
	Poor	9	2.2
Surgical history	Never	236	60.2
	1 time	148	37.6
	>=2 times	9	2.2
Commobidities	Hypertension	84	21.5
	Diabete	51	12.9
	Kidney failure	17	4.3
	No	241	61.3
Duration of surgery	1-2 hours	22	5.4
	>2-3 hours	324	82.8
	>3 hours	47	11.8
Use of sedative analgesics	Pain killer: Paracetamol	368	93.5
	Sedation: Seduxen	25	6.5

3.2. Sleep quality, pain level, environmental factors, anxiety level of patients after hip arthroplasty

The results in Table 3 indicate that most patients (63.4%) experienced poor sleep quality following hip arthroplasty. Additionally, 90.3% of patients reported severe postoperative pain. Environmental disturbances in the hospital affected 58.1% of patients, while 51.7% experienced postoperative anxiety.

Table 3: Sleep quality, pain level, environmental factors, anxiety level of patients after hip arthroplasty

Contents		Number (n)	Percent (%)
Sleep Quality	Poor	249	63.4
	Good	144	36.6
Postoperative pain	Mild	38	9.7
	Severe	355	90.3
Hospital environmental	Little disturbance	165	41.9
	Significant disturbance	228	58.1
Anxiety levels	Mild anxiety	190	48.3
	High anxiety	203	51.7

3.3 Factors related to sleep quality of patients after hip arthroplasty

The findings in Table 4 demonstrate a significant association between postoperative sleep quality and three key factors: high postoperative pain, high environmental disturbance, and high postoperative anxiety ($p < 0.05$).

Table 4: Factors related to sleep quality of patients after hip arthroplasty

Factors	OR	95% CI
Age (≤ 56-year-old)		
> 56-year-old	0.62	0.54 - 1.47
Sex (Male)		
Femal	1.3	0.62 - 2.79
Postoperative pain (mild)		
Severe	3.12*	1.28 - 7.53
Hospital environmental (Little disturbance)		
Significant disturbance	5.13*	1.38 – 10.05
Anxiety levels (Mild anxiety)		
High anxiety	6.21*	1.92 – 13.05

Chi-square test with *$p<0.05$; OR=Odd ratio; 95% CI=95% confidence interval

The regression model, which included three independent variables, was found to be statistically significant (χ^2 (3, N=93) = 25.358; $p < 0.05$), indicating that the model effectively distinguished between patients with good and poor sleep quality. The model's explanatory power for sleep quality ranged from 16.9% (R^2 Cox & Snell) to 24.5% (R^2 Nagelkerke), with an overall prediction accuracy of 82.9%. Furthermore, the findings revealed that patients experiencing high postoperative anxiety had a 1.152-fold lower risk of developing sleep disturbances compared to those with low postoperative anxiety (p=0.04).

Table 5: Regression model of factors related to patients' sleep quality

Factors	B	OR	95% CI	P-value
Postoperative pain (mild)				
Severe	-0.7	0.52	0.28 - 1.53	0.46
Hospital environmental (Little disturbance)				
Significant disturbance	-1.501	0.28	0.05 - 0.51	0.24
Anxiety levels (Mild anxiety)				
High anxiety	-0.79	1.152*	1.92 - 3.05	0.04

Binary Logistic Regression Analysis; B=beta; OR=Odd ratio; 95% CI=95% confidence interval, *$p<0.05$

4. Discussion

Sleep quality is defined as an individual's satisfaction with all aspects of their sleep experience. For postoperative patients, good sleep plays a critical role in effective recovery, particularly for those undergoing elective hip replacement surgery, where prolonged waiting times and preoperative anxiety are common.[18] One of the most frequent complaints after total hip replacement is difficulty sleeping, making postoperative sleep quality a key concern for patient well-being.[19]

Our study revealed that 63.4% of patients experienced poor sleep quality after hip replacement surgery. This finding

aligns with the observation that 90.3% of patients reported severe postoperative pain, 58.1% experienced environmental disturbances, and 51.7% reported postoperative anxiety. This can be explained by pain stimuli activating the cerebral cortex, leading to brain wave disruption, sleep fragmentation, and heightened alertness. Additionally, the majority of our study participants were middle-aged, and 82.8% underwent surgeries lasting more than 2–3 hours, resulting in greater tissue and vascular damage, which could contribute to heightened postoperative discomfort. Moreover, 38.7% of patients had comorbidities, such as hypertension, diabetes, and chronic kidney disease, which may further exacerbate fatigue and negatively impact sleep quality.[15]

In addition, our research demonstrates a statistically significant relationship between sleep quality and three key factors: postoperative pain, environmental disturbances, and anxiety levels. Patients who experienced greater pain, more environmental disruptions, and higher levels of anxiety after surgery were more likely to report poor sleep quality.

Postoperative pain plays a crucial role in reducing sleep quality, while poor sleep further exacerbates pain sensitivity.[20] Pain stimuli affect the cerebral cortex, leading to brain wave activation, sleep fragmentation, and increased alertness. This relationship is largely due to tissue, muscle, and nerve damage following surgery, making postoperative discomfort inevitable. These findings are consistent with previous studies that have established a bidirectional relationship between pain and sleep disturbances.[21-22] In the first few nights after surgery, pain often causes patients to stay awake, experience restless sleep, struggle to fall asleep, or wake up frequently during the night without being able to return to sleep.[21] Research has also highlighted a significant temporal association between sleep, pain levels, and analgesic use. Specifically, a poor night's sleep is typically followed by increased pain and higher analgesic consumption the next day. Conversely, high pain levels and excessive analgesic use during the day are predictors of poor sleep quality the following night.[22] Although our study did not establish a predictive relationship between pain and sleep quality, it reinforces the importance of effective pain management as a critical intervention to improve postoperative sleep in patients experiencing significant discomfort.

Our study also found a statistically significant association between hospital environmental factors and sleep quality in patients after hip replacement surgery. However, regression analysis did not indicate a predictive relationship between environmental disturbances and sleep quality. These findings align with recent studies, which suggest that hospital environments significantly impact patients' ability to achieve restful sleep.[23] Approximately 80% of hospitalized patients report being frequently awakened during sleep and not feeling refreshed afterward. In a study of patients undergoing elective surgery, 93% experienced sleep disturbances compared to their sleep patterns at home. The primary causes of these disruptions were roommate noise and nighttime nurse visits. Additionally, noise has been widely reported as the most common environmental factor affecting inpatient sleep quality.[24] Given these findings, noise control should be considered a key component of improving patient satisfaction and postoperative sleep quality. Implementing strategies to minimize nighttime disturbances, such as adjusting hospital routines, reducing noise from medical staff and equipment, and providing patients with earplugs or white noise machines, may help mitigate the negative impact of the hospital environment on sleep.

Among the factors analyzed, high postoperative anxiety was the only significant prognostic factor affecting sleep quality in patients after hip replacement surgery. Our results indicate that patients with high postoperative anxiety had a 1.152 times higher risk of experiencing sleep disturbances compared to those with lower anxiety levels. These findings align with previous studies by Sveinsdóttir et al. (2012),[25] and Longo et al. (2021),[26] both of which demonstrated a strong relationship between postoperative anxiety and sleep quality deterioration. Postoperative anxiety and poor sleep quality not only impair patient well-being but also negatively impact recovery outcomes.[29] Anxiety-induced stress responses may lead to higher anesthetic requirements during surgery, a lower pain threshold, and an increased need for postoperative analgesics, all of which further contribute to sleep disturbances.[26] These findings highlight the critical role of nursing interventions, particularly in health education, psychological counseling, and emotional support, in improving both sleep quality and overall recovery. Therefore, addressing postoperative anxiety through early psychological interventions and personalized nursing care plans may be an effective strategy to enhance patient recovery and overall surgical outcomes.

This study was conducted in two hospitals, which may limit the generalizability of the findings to all patients undergoing hip replacement surgery. Additionally, due to the cross-sectional descriptive study design, sleep quality was assessed at a single point in time, rather than tracking changes over the postoperative recovery period. However, many patients continue to experience sleep disturbances even after hospital discharge, which this study did not capture. Future research should be conducted on a larger scale and adopt a prospective study design to provide a more comprehensive understanding of postoperative sleep quality. This approach will facilitate the development of targeted nursing interventions to enhance patient care and treatment outcomes.

5. Conclusion

This study of 393 hip arthroplasty patients in Vietnam revealed that 63.4% experienced poor postoperative sleep quality, driven by severe pain, high anxiety, and environmental disturbances. High anxiety increased the risk of sleep disturbances by 1.152 times compared to low anxiety. These insights highlight the need for robust pain management, quieter hospital settings, and psychological support to boost recovery. Larger, prospective studies could further refine these findings for broader application.

Conflict of Interest: There are no conflicts of interest in this study.

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