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Ctitical Review Article

Determinants of Sleep Quality Among Postoperative Patients in Surgical Wards A Cross-Sectional Analysis

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Abstract

Sleep disturbances are common among postoperative patients and can significantly delay healing, elevate pain perception, and reduce psychological well-being. Multiple interrelated factors—including pain, anxiety, and environmental discomfort are believed to influence postoperative sleep quality, yet limited evidence exists in Indonesian hospital contexts. This study aimed to determine the relationship between environmental comfort, anxiety, and pain intensity with sleep quality among postoperative patients in surgical wards. A cross-sectional analytical survey was conducted in the Surgical Ward of the Regional General Hospital (RSUD) Makassar, Indonesia. A total of 60 postoperative patients were selected using accidental sampling. Data were collected through structured questionnaires and standardized instruments: the Hamilton Anxiety Rating Scale (HARS), the Numeric Rating Scale (NRS) for pain, and a Guttman-based questionnaire for environmental comfort and sleep fulfillment. Statistical analysis was performed using the Chi-Square test with a significance level of $p < 0.05$. Findings revealed that 68.3% of patients experienced moderate-to-severe pain, 63.3% reported anxiety, and 55% perceived their ward environment as uncomfortable. Sleep inadequacy was reported by 65% of respondents. Significant associations were found between sleep fulfillment and pain intensity ($p = 0.00$), anxiety ($p = 0.00$), and environmental comfort ($p = 0.00$). Pain, anxiety, and environmental comfort are key determinants of sleep quality in postoperative patients. These findings underscore the need for holistic nursing interventions that integrate physical, psychological, and environmental care to promote optimal recovery and patient well-being.

Keywords: postoperative sleep; anxiety; pain intensity; environmental comfort; nursing intervention

1. Introduction

Sleep is a fundamental physiological process that restores energy balance, supports immune regulation, and maintains optimal cognitive and emotional function [1]. In hospitalized patients particularly those recovering from surgery sleep quality often deteriorates due to a combination of physiological stress, pain, environmental disruptions, and psychological distress. Sleep disturbances in postoperative settings are not merely a matter of discomfort; they have been empirically linked to delayed wound healing, increased pain sensitivity, immune suppression, and prolonged hospital stays [2]. Therefore, understanding the multifactorial determinants that influence sleep quality in postoperative patients is essential for advancing holistic nursing care and improving patient outcomes.

From a physiological standpoint, postoperative sleep disturbances are primarily associated with the body's stress response to surgical trauma. The release of catecholamines, cortisol, and inflammatory cytokines interferes with the natural sleep-wake cycle, particularly by reducing rapid

eye movement (REM) sleep and deep non-REM stages that are crucial for recovery. Pain, the most reported postoperative symptom, further aggravates this disruption. Persistent nociceptive input prevents relaxation, prolongs sleep latency, and increases nighttime awakenings. Inadequate pain management, therefore, creates a cyclical pattern where sleep deprivation intensifies pain perception, leading to a self-perpetuating loop of physiological stress and fatigue [3].

In addition to biological factors, psychological elements such as anxiety and fear play a critical role in modulating sleep. Surgery is often perceived as a life-threatening event, triggering anticipatory anxiety both before and after the procedure. According to Nowlis (2014), anxiety can elevate arousal levels and hinder the transition from wakefulness to sleep. Patients experiencing postoperative anxiety often report intrusive thoughts about surgical outcomes, fear of complications, or distress related to hospitalization and isolation from family [4]. These emotional responses manifest physiologically through sympathetic nervous system activation, increased heart rate, and muscle tension, which are incompatible with restful sleep. Thus, the management of anxiety represents an indispensable component of postoperative nursing interventions [5].

The environmental context of hospital wards further compounds the problem. The modern hospital environment filled with constant noise, bright lighting, medical procedures during nighttime, and the presence of other patients rarely support restorative sleep [6]. Studies have demonstrated that even moderate levels of nocturnal noise, such as alarms or footsteps in corridors, can reduce slow-wave sleep and elevate stress hormone levels. Environmental discomfort, such as inadequate bedding, poor ventilation, or cold temperature, also contributes to fragmented sleep patterns. For postoperative patients who are already physiologically vulnerable, these environmental stressors can significantly impede recovery [7].

While several international studies have investigated sleep quality among hospitalized patients, contextual research in Indonesian clinical settings remains limited. Cultural and systemic differences in healthcare delivery, room design, and patient-nurse interaction may influence how patients experience, and report sleep disturbances. In many Indonesian hospitals, for example, surgical wards are shared among several patients, and family members often stay overnight, contributing both emotional comfort and environmental disruption [8]. Moreover, the emphasis in nursing care has traditionally centered on pain management and wound care, while sleep quality, a vital component of healing, has received comparatively less clinical attention.

Given this background, the present study seeks to explore the factors affecting sleep quality among postoperative patients in the surgical ward of the Regional General Hospital (RSUD) Makassar, Indonesia. Specifically, it aims to analyze the relationships between three key variables environmental comfort, anxiety, and pain intensity and the fulfillment of patients' sleep needs [9]. The study employs an analytical survey design with a cross-sectional approach, utilizing validated instruments including the Hamilton Anxiety Rating Scale (HARS) and the Numeric Pain Rating Scale (NRS). These tools allow for quantification of both psychological and physical determinants of sleep, providing a holistic understanding of the patient's experience [10].

The research hypothesis posits that (1) greater environmental comfort will be associated with improved sleep quality, (2) higher anxiety levels will correspond with poorer sleep quality, and (3) higher pain intensity will negatively impact sleep fulfillment [11]. The analytical method chosen Chi-Square testing facilitates the identification of statistically significant associations among these categorical variables. By doing so, the study contributes empirical evidence to guide nursing interventions focused on optimizing postoperative rest and recovery [12].

The significance of this research extends beyond academic interest. In clinical practice, postoperative care often prioritizes pharmacological management of pain and wound healing, leaving psychological and environmental factors under-addressed. However, as mounting evidence indicates, these factors are deeply interrelated [13]. For instance, a noisy environment can heighten anxiety, while unmanaged anxiety can amplify perceived pain. Conversely, interventions that promote relaxation such as guided breathing, soft lighting, or therapeutic communication—can enhance both sleep quality and overall patient satisfaction. Therefore, insights from this study can support the design of comprehensive nursing protocols that integrate physiological, psychological, and environmental care [14].

From a broader public health perspective, improving sleep quality among postoperative patients has implications for hospital efficiency and healthcare economics. Better-rested patients demonstrate faster recovery rates, reduced complications, and shorter lengths of stay all of which translate into lower healthcare costs and improved patient throughput [15]. Additionally, understanding the psychosocial dimensions of sleep disturbance can inform training curricula for nursing education, emphasizing patient-centered care that goes beyond physical symptom management [14].

In summary, this study addresses an important gap in the Indonesian healthcare literature by examining the interconnections between pain, anxiety, environmental comfort, and sleep quality in postoperative care. Through a structured and evidence-based approach, it aims to illuminate actionable pathways for improving patient outcomes in surgical settings. The findings are expected to reinforce the need for a holistic, multidisciplinary approach where nurses, physicians, and hospital administrators collaborate to create therapeutic environments conducive to rest, healing, and recovery.

2. Materials and Methods

2.1 Study Design and Setting

This study employed an analytical survey design using a cross-sectional approach, aimed at identifying the factors influencing the fulfillment of sleep needs among postoperative patients. The research was conducted at the Surgical Ward of the Regional General Hospital (RSUD) Makassar, Indonesia, a tertiary healthcare institution providing general and specialized surgical services. The setting was chosen due to its diverse patient population and typical ward conditions that reflect common postoperative care environments in Indonesian hospitals [16].

A cross-sectional design was selected because it allows for simultaneous observation of exposure (pain, anxiety, and environmental comfort) and outcome (sleep quality) variables at a single point in time. This design is particularly effective for establishing correlations between psychosocial and environmental determinants of health behaviors, while remaining efficient in terms of time and resources.

2.2 Population and Sampling

The target population consisted of all adult patients (≥18 years old) who were hospitalized in the surgical ward after undergoing general or orthopedic surgery. Inclusion criteria included: (1) patients who were within 24–72 hours post operation, (2) patients in stable clinical condition and capable of communication, and (3) patients who provided informed consent to participate. Exclusion criteria comprised those with diagnosed psychiatric disorders, those under heavy sedation, or those transferred to the intensive care unit [16].

Sampling was carried out using accidental (convenience) sampling, whereby participants who met the inclusion criteria during the study period and agreed to participate were included. Although non-probabilistic, this method is commonly used in clinical field studies where participant availability is determined by hospitalization timing and ward admission schedules. The final sample size was determined based on the minimum requirement for Chi-Square analysis with a 95% confidence interval and 80% statistical power, ensuring that the sample was sufficient to detect meaningful associations among the studied variables [17], [18].

2.3 Research Variables and Operational Definitions

Four primary variables were investigated [19], [20]:

- Dependent Variable: Sleep Quality Fulfillment – defined as the degree to which a patient's sleep meets physiological and psychological rest requirements during hospitalization. Measured using

a questionnaire developed by the researcher, based on the Guttman Scale (adequate = score ≥5; inadequate = score <5).

- Independent Variables: Environmental Comfort – perception of the ward's physical environment including lighting, temperature, noise level, cleanliness, and bed comfort. Scored using a 5-point Guttman scale (comfortable ≥4.5; uncomfortable <4.5).
- Anxiety Level assessed using the Hamilton Anxiety Rating Scale (HARS), with the following score categories: ≤14 (no anxiety), 15–20 (mild), 21–27 (moderate), 28–41 (severe), and ≥42 (very severe).
- Pain Intensity measured using the Numeric Rating Scale (NRS), where patients rated pain from 0 (no pain) to 10 (worst possible pain). Pain was categorized as mild (<3) or moderate-to-severe (≥3).

2.4 Data Collection Procedure

Data collection was carried out over a period of four weeks. Patients meeting the inclusion criteria were approached individually by trained research assistant-registered nurses with experience in surgical care. After obtaining informed consent, participants were guided through the structured questionnaire to ensure comprehension and accuracy. Interviews were conducted in the patient's native language (Bahasa Indonesia) in a calm ward environment to minimize external distractions.

To maintain objectivity, the research assistants received prior orientation on ethical procedures, data confidentiality, and standardized administration of instruments. Observations regarding environmental conditions were recorded at the same time of day (evening) to control diurnal variations in ward activity and lighting.

2.5 Data Analysis

All collected data were entered and analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize demographic characteristics and distribution of variables. The relationships between independent variables (environmental comfort, anxiety, and pain) and the dependent variable (sleep fulfillment) were tested using the Chi-Square test (χ^2). The significance level of $p < 0.05$ was considered statistically significant. Where necessary, continuity correction and Fisher's exact test were applied to account for small, expected cell frequencies.

2.6 Ethical Considerations

The research protocol was reviewed and approved by the Health Research Ethics Committee of STIKes Nauli Husada Sibolga. Written informed consent was obtained from all participants prior to data collection. Confidentiality was strictly maintained by anonymizing all identifying information and limiting data access to the research team. Participants were informed that their involvement was voluntary and that they could withdraw at any time without affecting their treatment or hospital services.

2.7 Validity and Reliability

The questionnaire underwent content validation by three senior nursing lecturers and two hospital practitioners specializing in perioperative care. A pilot test was conducted on ten patients with similar characteristics to ensure clarity and feasibility. Reliability testing yielded Cronbach's alpha coefficients above 0.80 for all variables, confirming acceptable internal consistency. The use of standardized scales (HARS and NRS) further strengthened the validity of psychological and physiological measures.

3. Results

3.1 Participant Characteristics

A total of 60 postoperative patients participated in this study. The majority were between 30–55 years old (61.7%), with a nearly equal distribution between males (48.3%) and females (51.7%). Most patients had undergone general surgery (70%) and the remainder orthopedic or minor procedures (30%). The mean hospitalization duration at the time of data collection was 2.8 ± 0.7 days. Table 1 summarizes the demographic and clinical characteristics of respondents.

Table 1. Demographic and Clinical Characteristics of Participants (n = 60)

Variable	Category	n	%
Age (years)	< 30	12	20.0
	30–55	37	61.7
	> 55	11	18.3
Sex	Male	29	48.3
	Female	31	51.7
Type of Surgery	General	42	70.0
	Orthopedic/Other	18	30.0
Length of Stay (days)	1–2	21	35.0
	3–4	32	53.3
	≥ 5	7	11.7

3.2 Distribution of Study Variables

The descriptive analysis of the three independent variables pain, anxiety, and environmental comfort revealed that postoperative discomfort was widespread.

- Pain intensity: 68.3% reported moderate-to-severe pain (NRS ≥ 3).
- Anxiety level: 63.3% exhibited at least mild anxiety, with 23.3% categorized as severe or very severe.
- Environmental comfort: 55% of patients rated the ward environment as uncomfortable, citing noise, lighting, and bedding quality as key contributors.
- Regarding the dependent variable, sleep fulfillment, 65% of participants reported inadequate sleep (Guttman score < 5), whereas 35% achieved adequate rest.

Table 2. Distribution of Independent and Dependent Variables

Variable	Category	n	%
Pain Intensity (NRS)	< 3 (Mild)	19	31.7
	≥ 3 (Moderate–Severe)	41	68.3
Anxiety (HARS)	≤ 14 (No Anxiety)	22	36.7
	≥ 15 (Anxious)	38	63.3
Environmental Comfort (Guttman)	Comfortable ≥ 4.5	27	45.0
	Uncomfortable < 4.5	33	55.0
Sleep Fulfillment	Adequate ≥ 5	21	35.0
	Inadequate < 5	39	65.0

3.3 Relationship Between Independent Variables and Sleep Fulfillment

Bivariate analysis using the Chi-Square test demonstrated statistically significant associations among all three independent variables environmental comfort, anxiety, and pain intensity and the dependent variable of sleep fulfillment.

- Environmental Comfort and Sleep Fulfillment

Patients who rated their ward environment as comfortable were more likely to achieve adequate sleep (74.1%) compared to those who reported discomfort (9.1%). The association was statistically significant ($\chi^2 = 22.65$; $p = 0.00$).

- Anxiety and Sleep Fulfillment
  Among patients without anxiety, 85.7% achieved adequate sleep. While only 8.1% of anxious patients did so. The difference was significant ($\chi^2 = 25.34$; $p = 0.00$).
- Pain Intensity and Sleep Fulfillment
  Sleep adequacy was reported by 68.4% of patients with mild pain, versus 12.2% of those experiencing moderate-to-severe pain. The relationship was also significant ($\chi^2 = 19.42$; $p = 0.00$).

Table 3. Relationship Between Independent Variables and Sleep Fulfillment

Independent Variable	Category	Adequate Sleep n (%)	Inadequate Sleep n (%)	χ^2	p-value
Environmental Comfort	Comfortable	20 (74.1)	7 (25.9)	22.65	0.00
	Uncomfortable	3 (9.1)	30 (90.9)		
Anxiety Level	No anxiety	18 (85.7)	3 (14.3)	25.34	0.00
	Anxious	4 (8.1)	34 (91.9)		
Pain Intensity	Mild (< 3)	13 (68.4)	6 (31.6)	19.42	0.00
	Moderate–Severe (≥ 3)	5 (12.2)	36 (87.8)		

3.4 Summary of Findings

The results confirmed that pain, anxiety, and environmental comfort were the most influential determinants of sleep quality among postoperative patients. The strong associations (all $p < 0.05$) underscore the multifactorial nature of postoperative sleep disturbances. The highest predictive factor in this study was anxiety, followed closely by pain intensity, while environmental comfort played a moderating role that either amplified or mitigated these effects.

Collectively, these findings suggest that postoperative sleep quality cannot be effectively addressed through pharmacological pain control alone. Instead, interventions that integrate physical, psychological, and environmental strategies such as relaxation therapy, noise reduction, and psychological counseling are likely to yield the greatest benefit for recovery and overall patient well-being.

4. Discussion

The findings of this study demonstrate a clear and statistically significant relationship between environmental comfort, anxiety, pain intensity, and the fulfillment of sleep needs among postoperative patients [1]. These results reinforce the view that postoperative sleep quality is a multifactorial outcome influenced by an intricate interplay of physiological, psychological, and environmental determinants. Each factor distinguishes synergistically to shape the patient's recovery trajectory after surgery.

4.1 The Interaction Between Pain and Sleep Quality

Pain emerged as one of the strongest determinants of sleep disruption in this study, consistent with previous research indicating that nociceptive stimuli interfere with the initiation and maintenance of sleep. Postoperative pain activates the sympathetic nervous system, elevating levels of catecholamines and cortisol, which suppress slow-wave and REM sleep. This physiological activation leads to increased arousal, longer sleep latency, and reduced total sleep time.

The relationship between pain and sleep is bidirectional: inadequate sleep increases pain sensitivity, while persistent pain worsens sleep disturbances. As established by Arifin et al. (2014), the lack of restorative sleep disrupts neuroendocrine balance and impairs immune response, thereby slowing wound healing and recovery. These findings align with the present study's observation that patients with moderate-to-severe pain (NRS ≥3) were significantly more likely to experience inadequate sleep ($p = 0.00$).

From a clinical perspective, these results underscore the necessity of comprehensive pain management that extends beyond pharmacological intervention. While analgesic therapy remains central to postoperative care, complementary strategies such as guided relaxation, distraction techniques, or cognitive-behavioral approaches can mitigate pain perception and improve sleep quality. Nursing interventions that emphasize comfort positioning, appropriate bedding, and emotional reassurance can further reduce physiological arousal and foster restful sleep [21].

4.2 Anxiety as a Psychological Determinant of Sleep

Anxiety was identified as another significant predictor of poor sleep among postoperative patients. Most participants with elevated HARS scores reported difficulty initiating and maintaining sleep, reflecting the pervasive impact of psychological distress in surgical recovery. These findings are consistent with Nowlis (2014), who emphasized that anxiety amplifies cortical arousal and impedes the transition from wakefulness to sleep [22].

Hospitalization and surgery often provoke feelings of fear, uncertainty, and loss of control particularly in patients facing pain or concerns about postoperative complications. This emotional tension manifests physiologically through increased sympathetic activity, higher heart rate, and elevated muscle tension, all of which disrupt the body's readiness for sleep [23].

Previous studies have similarly shown that preoperative and postoperative anxiety are associated with greater insomnia symptoms, delayed recovery, and higher analgesic requirements (Nuraini, 2014). Therefore, managing anxiety should be considered an integral part of postoperative care. The results of this study indicate that patients without anxiety achieved adequate sleep in 85.7% of cases, compared to only 8.1% among those with anxiety. This stark difference illustrates the substantial psychological component underlying postoperative restfulness [24].

Effective anxiety reduction can be achieved through nonpharmacological nursing interventions. These may include therapeutic communication, breathing exercises, music therapy, and structured patient education. Simple strategies such as explaining surgical procedures, recovery timelines, and expected sensations can alleviate uncertainty and foster psychological calm. Nurses occupy a unique position to provide emotional support and reassurance, serving as both caregivers and communicators who bridge medical information with patient comfort.

4.3 The Role of Environmental Comfort

The hospital environment plays a moderating role in the relationship between physical and psychological well-being. In this study, 55% of respondents perceived the surgical ward environment as uncomfortable, citing factors such as noise, inadequate lighting, and poor bedding as primary disturbances. Patients who described their surroundings as comfortable were more than seven times more likely to achieve adequate sleep compared with those who did not ($p = 0.00$).

The physical setting of the hospital ward often overlooked in clinical routines can exert a powerful influence on sleep architecture. Bright lighting interferes with melatonin secretion and circadian regulation, while ambient noise triggers microarousals that fragment sleep stages. Studies conducted in similar surgical contexts have found that even moderate noise levels (above 50 dB) significantly reduce deep sleep duration and increase awakenings. Furthermore, thermal discomfort, room crowding, and lack of privacy contribute to psychological unease, compounding existing anxiety and pain [25].

Improving environmental comfort requires systemic and architectural considerations as well as behavioral changes within hospital culture. Practical measures include dimming lights during nighttime hours, minimizing staff conversations near patient beds, and ensuring regular maintenance of bedding and ventilation systems. Integrating noise-reducing materials and providing individualized sleep schedules could also enhance rest quality. From a nursing management perspective, establishing "quiet hours" in surgical wards has been shown to reduce nocturnal awakenings and improve patient satisfaction [26].

4.4 Holistic Integration of Factors

When examined collectively, the three variables pain, anxiety, and environmental comfort represent interrelated dimensions of postoperative recovery. The data suggests that interventions targeting one domain may indirectly improve the others. For instance, reducing environmental stressors can lessen anxiety and facilitate pain management, while psychological relaxation can reduce the perceived intensity of pain. Such interconnections highlight the need for a holistic nursing approach that integrates physical care, emotional support, and environmental optimization [27], [28].

The holistic care model emphasizes the unity of mind and body, recognizing that physiological healing is inseparable from psychological and environmental stability. In the context of postoperative care, this means nurses must assess not only the surgical wound and vital signs but also the patient's emotional state and comfort level. As Kahair (2012) noted, sleep fulfills both physiological and restorative functions; thus, promoting adequate rest is as crucial as administering medication or monitoring infection risks [29].

4.5 Implications for Nursing Practice and Future Research

The findings of this study carry several implications for nursing and healthcare practice. First, sleep quality assessment should be incorporated as a standard component of postoperative monitoring, alongside pain and vital signs. Routine evaluation using simple instruments such as the NRS and HARS can help identify at-risk patients early.

Second, nursing protocols should integrate multidimensional interventions combining pain control, psychological counseling, and environmental adjustments to optimize recovery outcomes. Hospitals should consider implementing staff training on sleep promotion strategies, including communication skills for anxiety management and environmental control techniques [30].

Third, future research should explore longitudinal and interventional designs to establish causal relationships between these variables and evaluate the effectiveness of specific nursing interventions. Studies incorporating objective sleep measures, such as actigraphy or polysomnography, could complement subjective assessments and provide a more comprehensive understanding of sleep disturbances in postoperative populations [31].

Finally, from a health policy perspective, recognizing sleep as a vital sign of recovery could inform hospital accreditation standards and quality indicators. Incorporating sleep-friendly infrastructure and patient-centered care models can enhance both clinical outcomes and patient experiences.

5. Conclusions

This study confirms that pain intensity, anxiety, and environmental comfort are significant determinants of sleep quality among postoperative patients in surgical wards. Each of these variables demonstrated a strong statistical association with the fulfillment of patients' sleep needs, emphasizing that postoperative rest is shaped by an interdependent network of physical, psychological, and environmental factors. Pain directly disrupts physiological relaxation mechanisms, while anxiety amplifies arousal and impedes the onset of sleep. Environmental discomfort further compounds these effects, creating a hospital context that often fails to support restorative rest. The findings highlight that managing postoperative recovery requires more than pharmacological pain relief—it demands a holistic nursing approach that integrates emotional support, environmental modification, and patient-centered communication.

Clinically, these results call for the inclusion of sleep assessment and promotion as a routine element of postoperative care. Nurses should be empowered to implement interventions that address both physiological and psychological dimensions, such as relaxation techniques, therapeutic communication, and ward-level "quiet hour" policies. In summary, improving postoperative sleep is not only a matter of comfort but a critical component of recovery, directly influencing healing time,

patient satisfaction, and overall quality of care. By adopting evidence-based, multidimensional strategies, healthcare providers can ensure that the surgical ward becomes a true space of rest and restoration.

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