

The Relationship between Post-Appendectomy Pain and Sleep Quality among Surgical Patients

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ABSTRACT

Background: Acute appendicitis is among the most common causes of acute abdominal surgery and is managed through appendectomy. Postoperative pain is a primary complaint that may affect patients' sleep quality during recovery, and poor sleep quality can hinder healing and increase the risk of postoperative complications. **Objective:** This study aimed to determine the relationship between post-appendectomy pain and sleep quality among surgical patients at Bhayangkara Hasta Brata Batu Hospital. **Methods:** A quantitative correlational design with a cross-sectional approach was used, involving 22 respondents selected through total sampling based on inclusion and exclusion criteria. Pain was measured using the Numeric Rating Scale (NRS), while sleep quality was measured using the Richards-Campbell Sleep Questionnaire (RCSQ). Data were analyzed using Spearman's Rho correlation test. **Results:** Most respondents experienced moderate pain (40.9%) and had good sleep quality (40.9%). The statistical test obtained a correlation coefficient (r) of -0.962 with a significance value (p) of 0.000 ($p < 0.01$). **Conclusion:** There is a significant and very strong negative relationship between post-appendectomy pain and sleep quality; the higher the pain intensity, the lower the sleep quality achieved. Health care providers are advised to implement adequate pain management to support improved sleep quality in post-appendectomy patients.

Keywords: pain; appendectomy; sleep quality; surgical patients

Background

Acute appendicitis is one of the most common causes of acute abdominal surgical cases, and its primary management is appendectomy, performed either conventionally (open appendectomy) or laparoscopically, to prevent serious complications such as perforation and peritonitis (1). Although appendectomy is classified as a minor surgical procedure with a high success rate, postoperative patients generally experience pain at the incision site as the main complaint, which not only causes physical discomfort but also affects various aspects of recovery, including early mobilization, respiratory function, and sleep quality during the recovery period (2).

Postoperative pain is a complex physiological response to tissue injury that has sensory, cognitive, and emotional components. If not properly managed for more than 72 hours, pain can disrupt brain function, leading to sleep disturbances, lack of concentration, mental distress, anxiety, and decreased appetite; patients with moderate pain scores have even been reported to experience poor sleep quality in 55.6% of cases (3). Syndromes accompanying pain may include sleep disturbances, anxiety, mental distress, anorexia, and decreased mobility (4).

Rest and sleep are basic human needs, and their reduction can make individuals more irritable, depressed, fatigued, and less able to control their emotions (5). Various studies report that postoperative sleep disturbance remains a substantial problem; more than half of patients undergoing major surgery have been reported to experience poor sleep quality, with pain being one of the factors significantly associated with it (6). Other studies have also found a strong relationship between moderate-to-severe pain intensity and decreased sleep quality in postsurgical patients (7), consistent with findings of a significant relationship between pain level and sleep quality among postoperative patients in surgical wards (8).

The importance of effective pain management in improving postoperative patients' sleep quality is further supported by intervention studies. Melatonin administration has been shown to be effective in reducing post-appendectomy pain intensity while improving sleep comfort (9), as has the Benson relaxation technique, which has been shown to be effective in reducing pain and improving sleep quality in post-appendectomy patients (10). However, a study on post-appendicitis surgery patients found no

significant relationship between pain intensity and sleep patterns, in contrast to findings among general postoperative patients (3), indicating the need for further research in the appendectomy population, given that the characteristics of pain and recovery in this group differ from those of other types of surgery.

A deeper understanding of the relationship between postoperative pain and sleep quality will help health care providers, particularly nurses, design holistic pain management strategies that focus not only on pain control but also on improving sleep quality to accelerate patient recovery (11). Bhayangkara Hasta Brata Batu Hospital, as a referral hospital in Batu City and its surrounding areas, recorded 123 appendectomy cases in 2023, 88 cases in 2024, and 115 cases during the January-August 2025 period. A preliminary study conducted by the researchers in September 2024 found that no standard protocol yet existed specifically for monitoring postoperative patients' sleep quality, and that pain management still focused on routine analgesic administration without considering its impact on sleep quality; of 10 post-appendectomy patients observed, 8 reported sleep disturbances and 7 experienced moderate-to-severe pain during the first 48 hours after surgery. Based on the description above, this study aimed to determine the relationship between post-appendectomy pain and sleep quality among surgical patients at Bhayangkara Hasta Brata Batu Hospital.

Methods

This study used a quantitative correlational design with a cross-sectional approach, in which the independent variable (pain) and the dependent variable (sleep quality) were measured once and simultaneously. The study was conducted at Bhayangkara Hasta Brata Batu Hospital in June-July 2026. The study population consisted of all patients undergoing appendectomy at the hospital, averaging 22 patients per month based on medical record data from the previous three months. The study sample comprised 22 respondents selected using a total sampling technique based on inclusion criteria (post-appendectomy patients, in the morning after having passed through a night's sleep without additional analgesic administration, in a conscious/compos mentis condition, aged ≥ 17 years, able to communicate verbally and cooperatively, and willing to participate as respondents by signing informed consent) and exclusion criteria (experiencing severe postoperative complications, cognitive/psychological impairment, receiving heavy sedation or high-dose analgesics affecting consciousness, not completing the questionnaire, or withdrawing during the study).

The independent variable in this study was post-appendectomy pain, and the dependent variable was sleep quality. Pain was measured using the Numeric Rating Scale (NRS) with a range of 0-10, categorized as no pain (0), mild pain (1-3), moderate pain (4-6), and severe pain (7-10). The NRS is considered practical and easy to understand, thereby minimizing measurement error(12), with reported reliability values (Intraclass Correlation Coefficient, ICC) ranging from 0.90-0.96(13) to 0.95 in other studies. Sleep quality was measured using the Richards-Campbell Sleep Questionnaire (RCSQ), consisting of 5 items covering sleep depth, sleep latency, frequency of awakening, ability to return to sleep, and overall sleep quality, with scores ranging from 0-100; higher scores indicate better sleep quality. The RCSQ instrument has been shown to have good interrater reliability between patients and nurses. Both instruments are standardized instruments widely used in previous studies, so no repeated validity and reliability testing was performed.

Data collection was carried out through a preparation stage (obtaining research permits, preparing instruments, and coordinating schedules with the hospital), an implementation stage (identifying respondents according to the criteria, explaining the study's purpose and procedures, obtaining signed informed consent, measuring pain using the NRS, and administering the RCSQ questionnaire with researcher assistance), and a final stage involving data completeness checks. Data were processed through editing, coding, tabulating, entry, and cleaning stages, then analyzed univariately (frequency distribution and percentage of respondent characteristics and each variable) and bivariately using Spearman's Rho correlation test with a 95% confidence level ($\alpha = 0.05$) to determine the strength and direction of the relationship between post-appendectomy pain and sleep quality among surgical patients.

Results

Table 1. Frequency distribution of respondents' demographic characteristics

Characteristic	Category	Frequency (n)	Percentage (%)
Sex	Male	12	54.5
	Female	10	45.5
Age	< 20 years	5	22.7
	21-35 years	6	27.3
	> 36 years	11	50.0
Education Level	Elementary School	1	4.5
	Junior High School	5	22.7
	Senior High/Vocational School	11	50.0
	Higher Education	5	22.7
Occupation	Civil	3	13.6
	Servant/Military/Police		
	Private Employee	8	36.4
	Self-employed	6	27.3
	Farmer/Laborer	1	4.5
	Unemployed/Housewife	4	18.2
Total		22	100.0

The demographic characteristics of the 22 study respondents are shown in Table 1. Most respondents were male (54.5%), aged over 36 years (50.0%), had a senior high/vocational school education (50.0%), and worked as private employees (36.4%).

Table 2. Frequency distribution of respondents' pain scale

Table 2. Cross-tabulation of post-appendectomy pain scale with surgical patients' sleep quality

Pain Scale	Sleep Quality								Total (n)	%
	Very Good (n)	%	Good (n)	%	Poor (n)	%	Very Poor (n)	%		
Mild Pain	5	71.4	2	28.6	0	0.0	0	0.0	7	100.0
Moderate Pain	0	0.0	7	77.8	2	22.2	0	0.0	9	100.0
Severe Pain	0	0.0	0	0.0	4	66.7	2	33.3	6	100.0
Total	5	22.7	9	40.9	6	27.3	2	9.1	22	100.0

The cross-tabulation between pain scale and sleep quality is shown in Table 2. All respondents with severe pain (100%) experienced poor (66.7%) to very poor (33.3%) sleep quality, whereas the majority of respondents with mild pain (71.4%) had very good sleep quality. This trend indicates that the more severe the pain experienced by post-appendectomy patients, the lower the sleep quality achieved. The Spearman's Rho correlation test results showed a correlation coefficient (r) of -0.962 with a significance value (p) of 0.000 ($p < 0.01$). A p-value smaller than 0.05 indicates a statistically significant relationship, and a correlation coefficient in the range of 0.80-1.00 indicates a very strong relationship with a negative direction, meaning that the higher the pain intensity felt by patients, the lower the sleep quality achieved.

Discussion

The demographic characteristics of respondents in this study, dominated by males, adult to late-adult age groups, and secondary education level, are consistent with the epidemiological profile of appendicitis in the productive-age population reported among post-appendectomy patients (12).

Demographic characteristics such as age and sex are known to act as individual factors influencing a person's pain threshold and perception, meaning that two patients undergoing the same type of surgery may show different postoperative pain responses.

The postoperative pain level in this study was dominated by the moderate category, indicating that most post-appendectomy patients still experienced pain at a level requiring adequate attention and management. This finding is consistent with a study of post-appendectomy patients that found nearly balanced proportions of moderate and severe pain during the acute postoperative phase (13), given that the incision site in the abdominal area is rich in both visceral and somatic pain receptors, and that measurements were taken as anesthetic effects began to wear off. In addition to pain at the surgical site, postoperative patients also experience discomfort, one cause of which is a drop in hemoglobin levels. Research indicates that a decrease in hemoglobin levels in patients following a Caesarean section leads to discomfort (14).

The sleep quality of respondents in this study was mostly in the good category, although a substantial proportion still experienced poor to very poor sleep disturbances. This finding is consistent with studies reporting that more than half of patients undergoing major surgery experience poor sleep quality closely associated with inadequate pain control (6), and with findings of poor sleep pattern disturbances in more than half of post-appendectomy patients (13). Theoretically, the relationship between pain and postoperative sleep quality can be explained through a bidirectional mechanism, in which uncontrolled pain activates the sympathetic nervous system and suppresses slow-wave and REM sleep, resulting in fragmented sleep, while sleep deprivation in turn lowers the pain threshold and heightens pain perception (15). In addition to pain, factors influencing the sleep quality of postoperative patients include environmental comfort and anxiety (16). Research indicates a relationship between anxiety levels and the sleep quality of patients following laparotomy in the inpatient ward of Nurdin Hamzah Regional General Hospital (RSUD) (17). Meanwhile, other studies suggest that modifying the environment to ensure comfort for postoperative patients improves their sleep quality (18).

This study found a significant and very strong negative relationship between post-appendectomy pain and sleep quality among surgical patients, consistent with various studies on postoperative patients in surgical wards that also found a significant relationship between pain level and sleep quality (8)(19). The higher the pain intensity felt by patients, the lower the sleep quality achieved, and vice versa. These findings confirm that pain is a major determinant influencing patients' sleep quality during the acute post-appendectomy period, so that effective and timely pain management interventions have great potential to significantly improve patients' sleep quality and accelerate the postoperative recovery process. Previous research involved implementing ergonomic sleeping positions for postoperative patients over two consecutive days, resulting in reduced postoperative pain and increased patient comfort. This simple, safe, and practical nursing intervention can support postoperative recovery (20).

This study has several limitations, including a relatively small sample size (22 respondents), which limits the generalizability of the findings; a cross-sectional design that can only demonstrate correlation without explaining a causal relationship; subjective measurements based on respondents' self-reports; the presence of confounding variables that were not strictly controlled (inpatient environment, medication effects, anxiety); a study location limited to a single hospital; and the absence of a control group or comparative intervention.

Conclusions and Recommendations

The postoperative pain level among respondents was mostly in the moderate category, followed by mild and severe pain. Most respondents' sleep quality was in the good category, although some respondents experienced poor to very poor sleep quality. There was a significant and very strong negative relationship between post-appendectomy pain and sleep quality among surgical patients, meaning that the higher the pain intensity felt by patients, the lower the sleep quality achieved.

Hospitals, particularly nurses and health care providers in surgical wards, are advised to routinely evaluate pain using standardized instruments such as the NRS and to implement adequate pharmacological and nonpharmacological pain management to support improved sleep quality in postoperative patients, as well as to develop an integrated pain and sleep quality assessment protocol for post-appendectomy patients. Patients and families are expected to openly report pain complaints to health care providers and apply

simple pain management techniques to enable more optimal rest and sleep during recovery. Nursing education institutions may use the results of this study as an additional reference in developing perioperative nursing care learning materials, particularly regarding pain management and meeting postsurgical patients' rest and sleep needs. Future researchers are advised to conduct studies with larger sample sizes, longitudinal designs, and control of other confounding variables such as anxiety, inpatient environment, and type of anesthesia, to obtain a more comprehensive picture of the relationship.

Ethical Consideration and Competing Interest

This study adhered to basic research ethics principles, including informed consent, anonymity, and voluntary participation of respondents. All respondents were given an explanation of the study's purpose and procedures before data collection, and consent was obtained prior to the interview/measurement. Respondents' identities were kept confidential by not including personal identifying information in the reporting of results. All collected data were used solely for research purposes, thereby safeguarding respondents' rights and the integrity of the research process. There is no conflict of interest related to this publication.

This study adhered to research ethics principles, including informed consent, anonymity, confidentiality, justice, beneficence, and non-maleficence. All respondents were given an explanation of the study's purpose, benefits, and procedures before signing the consent form, had the right to refuse or withdraw at any time without affecting the care they received, and the collected data were kept confidential and presented in aggregate form.

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Conflicts of Interest

The authors declare no conflict of interest related to this study.

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