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The Effect of Earplugs and Eye Mask Use On Improving Sleep Quality In Patients With Heart Monitoring in the ICCU

Dwi Laras Hati

Poltekkes Kemenkes Bengkulu,
INDONESIA

Erni Buston*

Poltekkes Kemenkes Bengkulu,
INDONESIA

Mardiani

Poltekkes Kemenkes Bengkulu,
INDONESIA

Dwi Wulandari

Poltekkes Kemenkes Bengkulu,
INDONESIA

Efrizon Hariadi

Poltekkes Kemenkes Bengkulu,
INDONESIA

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Abstract

Background: The Intensive Coronary Care Unit (ICCU) is an intensive care unit for patients with heart disorders who require close monitoring. The ICCU environment often causes sleep disturbances in patients due to the noise of medical equipment and excessive lighting. Sleep disturbances can worsen health conditions, increase stress, and slow the patient's recovery process. One non-pharmacological intervention that can be used to reduce environmental disturbances is the use of earplugs and eye masks. These two devices function to reduce exposure to sound and light, thereby helping to create a more comfortable environment for rest.

Aims: This study aims to determine the effect of earplug and eye mask use on improving sleep quality in patients with heart monitors in the ICCU ward of Dr. M. Yunus Regional General Hospital, Bengkulu City in 2025.

Methods: This study utilized a quantitative quasi-experimental approach with a one-group pretest-posttest design. A total of 92 respondents were selected using a purposive sampling technique. Sleep quality was measured before and after the intervention using the Pittsburgh Sleep Quality Index (PSQI) and analyzed using the Wilcoxon signed-rank test.

Result: The results showed a significant difference between sleep quality before and after the intervention with a p-value = 0.000. This suggests that the use of earplugs and eye masks significantly improves sleep quality in patients with heart monitoring in the intensive care unit (ICCU).

Conclusion: The use of earplugs and eye masks is significantly associated with improved sleep quality in ICCU patients. However, as this study employed a one-group pretest-posttest design without a control group, the observed improvement cannot be definitively separated from potential placebo effects or natural clinical recovery.

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INTRODUCTION

Rest and sleep are fundamental human needs that play a vital role in the recovery process. Critically ill patients require high-quality sleep to accelerate healing, maintain physiological stability, and reduce both physical and psychological stress (Ong et al., 2022; Vincent et al., 2016). However, patients in the Intensive Coronary Care Unit (ICCU) frequently experience sleep disturbances due to environmental factors, including noise from medical equipment, staff conversations, monitor alarms, nighttime care activities, and uncontrolled room lighting. The ICCU environment often creates discomfort for patients. The high-intensity atmosphere, severity of illness, and constant disturbances from medical devices can trigger psychological and social stress. This stress not only affects patients' mental well-being but can also delay the recovery process. In

* Corresponding author:

Erni Buston, Poltekkes Kemenkes Bengkulu, INDONESIA. ✉ erni_buston@poltekkesbengkulu.ac.id

addition, sleep disruptions due to frequent medical interventions and an uncondusive environment further exacerbate patient stress levels (Ford et al., 2023; Saeidi et al., 2021; Yeh & Ostini, 2020).

Sleep disturbances in critically ill patients can lead to significant physiological and psychological consequences. These include impaired immune function, reduced inspiratory muscle strength, metabolic imbalances, dysfunction of central nervous system regulation, and increased psychological distress. Such conditions may ultimately prolong hospital stay. Therefore, poor sleep quality represents a serious health concern, particularly in intensive care settings where rest is frequently interrupted (Purnama et al., 2023). Environmental factors such as excessive noise, inappropriate lighting, and routine medical activities are major contributors to sleep disturbances. Noise is especially impactful, as it can disrupt normal sleep cycles in both hospital settings and everyday environments. Similarly, excessive lighting can interfere with circadian rhythms, affecting metabolism, sleep patterns, and cognitive function, and potentially increasing the risk of metabolic and cardiovascular disorders (Rokhmiati et al., 2025).

Although reducing noise and light levels at night is theoretically important, it is challenging to implement in intensive care units due to the need for continuous patient monitoring. Many medical devices are equipped with alarm systems, such as bedside physiological monitors, and for safety reasons, these alarms cannot always be silenced or reduced. In fact, Wang et al. (2023) observed that ICU nurses frequently struggle to balance the clinical necessity of monitor alarms with the patients' need for uninterrupted rest. Based on literature findings, non-pharmacological management offers an effective approach to improving sleep quality without the use of medication. In Indonesia, nurses are ethically and legally authorized to implement such interventions. Various non-pharmacological strategies have been shown to improve sleep quality in ICCU patients, including dhikr therapy, foot massage, lavender aromatherapy, and the use of earplugs and eye masks (Sandoval, 2017; Uzun, 2024).

A prospective trial conducted by Avudaiappan et al. (2024) demonstrated that the non-pharmacological use of earplugs and eye masks during nighttime hours significantly improved patients' sleep quality and mitigated critical fatigue levels. The intervention, applied over consecutive nights, proved to be highly effective, simple, low-cost, and well-tolerated. Furthermore, an experimental study by Arttawejkul et al. (2020) corroborated these outcomes, showing a profound reduction in the objective sleep arousal index and enhanced sleep efficiency when shielding patients from visual and auditory stimuli. These international trials highlight that environmental modification is a strategic choice that can be easily implemented across multiple critical care patients without requiring extensive clinical time resources.

Preliminary observations and interviews conducted at Dr. M. Yunus Regional Hospital in Bengkulu City revealed that patients commonly experience difficulty sleeping due to noise from medical equipment and excessive lighting. Despite these findings, nurses in the ICCU have not yet implemented structured protocols to address sleep quality. Nursing care tends to focus primarily on clinical recovery, often overlooking environmental factors such as noise and lighting that significantly influence patient rest and sleep.

Although previous studies have demonstrated the effectiveness of earplugs and eye masks in improving sleep quality among ICCU patients, most of these studies were conducted in different hospital settings with varying environmental conditions, patient characteristics, and nursing practices. There is still limited evidence regarding the implementation and effectiveness of this intervention in regional hospitals, particularly at Dr. M. Yunus Regional Hospital in Bengkulu. This study is important because it specifically examines the real conditions of the ICCU environment in Dr. M. Yunus Regional Hospital, where sleep disturbances have been identified but no structured non-pharmacological interventions have been implemented. Furthermore, this research provides contextual evidence on the applicability, feasibility, and effectiveness of earplug and eye mask interventions in a local setting with specific resource limitations and clinical practices. By focusing on this setting, the study not only validates previous findings but also contributes new insights into how simple, low-cost interventions can be integrated into nursing care in regional hospitals. Therefore, this research holds practical significance in supporting evidence-based nursing interventions and improving the quality of patient care, particularly in enhancing sleep quality among critically ill patients in the ICCU.

METHOD

This research is a quantitative study with a quasi-experimental design using a specific one-group pretest-posttest approach. This design does not involve a separate control or comparison group; rather, the intervention's effectiveness is determined by comparing the sleep quality scores before (pretest) and after (posttest) the implementation within the same group of respondents. The sample consisted of 92 patients selected using a purposive sampling technique based on predefined clinical inclusion and exclusion criteria. This study was conducted in the ICCU Room of Dr. M. Yunus Hospital, Bengkulu City, from March 17 to April 17, 2025. Data analysis was performed using a Wilcoxon signed-rank test to compare sleep quality before and after the intervention due to the non-normal distribution of the data. This study received formal ethical approval from the Health Research Ethics Committee with ethical clearance number No. KEPK.BKL/116/02/2025.

The research subjects were provided with earplugs and eye masks, and their sleep quality was measured before the intervention (pretest) and after the intervention (posttest). The intervention protocol was standardized by using disposable soft polyurethane foam earplugs designed for high noise reduction, combined with adjustable eye masks made of soft cotton fabric in a dark color to ensure a complete block of ambient light. The protocol was implemented for one night, spanning a nightly duration of seven hours. The devices were personally inserted and fitted by the author to ensure standardized placement, with the exact timing of insertion at 22:00 WIB and removal at 05:00 WIB the following morning. To ensure strict compliance, the researcher, in collaboration with the ward nurses, conducted visual checks every two hours without disturbing the patients' sleep to verify that the devices remained properly in place throughout the seven hours.

To measure sleep quality, this study utilized the Pittsburgh Sleep Quality Index (PSQI), an internationally recognized gold-standard instrument known for its high validity and reliability in intensive care settings, as established by Buysse et al. (1989) and further validated in critical care by Demoule et al. (2017). The PSQI instrument consists of 19 items categorized into seven clinical components, generating a global score range from 0 to 21. The interpretation of the instrument dictates that a global score of 5 or less indicates good sleep quality, whereas a global score of greater than 5 indicates poor sleep quality.

RESULTS AND DISCUSSION

Results

Table 1. Distribution of Average Sleep Quality Before Intervention

Total Score	Frequency	Percentage	Category	Normality Test
6,00	13	14%	Bad	
7,00	20	22%	Bad	
8,00	17	18%	Bad	
9,00	22	24%	Bad	
10,00	20	22%	Bad	
Total	92	100%		p < 0.001

Table 2 Distribution of Average Sleep Quality After Intervention

Total Score	Frequency	Percentage	Category	Normality Test
3,00	37	40%	Good	
4,00	55	60%	Good	
Total	92	100%		p < 0.001

Before the intervention, all respondents (100%) were categorized as having poor sleep quality, with total PSQI scores ranging from 6.00 to 10.00. The highest score frequencies were recorded at a score of 9 with 22 respondents (24%) and a score of 10 with 20 respondents (22%). Following the intervention, there was a complete shift in sleep quality status, with 100% of

respondents achieving good sleep quality, marked by PSQI scores reduced to 3.00 (37 respondents [40%]) and 4.00 (55 respondents [60%]). Normality testing for both pre-test and post-test data indicated non-normally distributed data ($p < 0.001$).

Table 3 Distribution of the Average Effect of Sleep Quality Before and After Intervention

Variable	Mean	Med	SD	Min	Max	Z	p-value
Sleep Quality							
Before	8,17	8,00	1,37	6,00	10,00	-8,368	p < 0.001
After	3,57	4,00	0,49	3,00	4,00		

The implementation of earplugs and eye masks demonstrated a clear restorative effect on sleep quality among patients in the ICCU. The mean PSQI score marked a substantial decrease from 8.17 before the intervention to 3.57 post-intervention. This mean reduction of 4.60 points represents a clinically meaningful improvement, as it successfully shifts the patients' range sleep quality from a severely disturbed state to a healthy, good quality status (PSQI score ≤ 5). Statistical analysis using the Wilcoxon signed-rank test yielded a test statistic of $Z = -8.368$ with a significance value of $p < 0.001$. Because the p -value is well below the 0.05 threshold ($p < 0.05$), it explicitly confirms that the decrease in PSQI scores and the resulting improvement in overall sleep quality is statistically significant.

Discussion

The empirical findings of this study demonstrate a profound, statistically significant enhancement in sleep quality among critically ill patients with heart monitors in the ICCU following the simultaneous application of earplugs and eye masks. As detailed in Table 1, the baseline profile indicates that 100% of the 92 respondents suffered from severe sleep deprivation, falling completely into the "bad" sleep quality category with scores heavily concentrated at 9.00 (24%), followed closely by 10.00 (22%) and 7.00 (22%). This critical pre-intervention status is mathematically reflected in Table 1.3, which shows a baseline mean score of 8.17, a median of 8.00, a standard deviation of 1.37, and a maximum score reaching 10.00.

Regarding the biological and physiological interpretation, such heavily compromised baseline sleep architecture is directly triggered by the intensive care ecosystem, where continuous bright lighting and predictable acoustic stress from clinical heart monitor alarms exceeding acceptable decibel thresholds severely disrupt the human circadian rhythm (Daou et al., 2020; Jobanputra et al., 2020; Showler et al., 2023). At a molecular level, exposure to perpetual artificial light rapidly suppresses the nocturnal synthesis of melatonin within the pineal gland, while unyielding environmental noise stimulates the sympathetic nervous system and the hypothalamic-pituitary-adrenal (HPA) axis (Walker et al., 2020). By creating a localized sensory blockade, this intervention suppresses the excessive secretion of stress hormones, specifically catecholamines (epinephrine and norepinephrine) and cortisol. This neuroendocrine stabilization prevents systemic vasoconstriction, tachycardia, and acute blood pressure surges, thereby effectively reducing myocardial oxygen demand and protecting cardiac function during critical recovery. Reducing this physiological stress load allows the central biological clock to facilitate transitions into slow-wave and rapid eye movement (REM) sleep cycles crucial for cellular repair (Drew et al., 2023; Lal et al., 2024).

In differentiating the contributions of each device within the specific environment of the ICCU at Dr. M. Yunus Regional General Hospital, high-decibel acoustic disruptions primarily persistent clinical monitor alarms represent the most dominant trigger for acute sleep discomfort and sudden awakenings. Soft foam earplugs directly attenuate these acute auditory peaks, preventing sudden sympathetic arousal. Concurrently, dark cotton eye masks address visual disruption by shielding patients from ambient ward lighting and routine nocturnal nursing activities, thereby preserving nocturnal melatonin secretion. Thus, earplugs and eye masks function synergistically: earplugs prevent abrupt awakenings from noise alarms, while eye masks maintain baseline sleep continuity and circadian rhythm stability.

The introduction of the combined non-pharmacological sensory blockade produced a remarkable positive shift in clinical outcomes, as evidenced by the post-intervention distribution in Table 2. Following the intervention, 100% of the respondents successfully transitioned into the "good" sleep quality category, with 60% achieving an optimal score of 4.00 and 40% reaching a score of 3.00, narrowing the post-test maximum score down to just 4.00. Table 3 further verifies this clinical improvement, showing that the post-intervention mean score plummeted to 3.57, with a median of 4.00 and a remarkably tight standard deviation of 0.49. The statistical robustness of this change is heavily reinforced by the non-parametric Wilcoxon signed-rank test, which yielded a notable Z-score of -8.368 and a highly significant p-value of $p < 0.001$, validating a definitive, non-random relationship between the intervention and improved sleep outcomes.

In a direct comparison with previous research, these outcomes strongly align with established international critical care literature. A landmark randomized controlled trial by Demoule et al. (2017) confirmed that the consistent use of earplugs and eye masks preserves sleep architecture and lowers ambient fragmentation in intensive care units. Furthermore, a clinical trial by Litton et al. (2016) established that actively controlling environmental sleep disruptors leads to superior patient comfort and minimized psychological anxiety.

The core reasons for the effectiveness of earplugs and eye masks in this study lie in their simultaneous, dual-sensory barrier mechanism. By deploying soft foam earplugs and dark cotton eye masks continuously for a nightly duration of seven hours (from 22:00 to 05:00 WIB), the researcher created a localized sensory micro-environment characterized by artificial darkness and silence. This non-invasive physical barrier efficiently shields the patient's sensory pathways from the high light and noise levels of the ICCU, allowing the central biological clock to re-establish natural circadian rhythms and facilitating uninterrupted transitions into deep, restorative sleep.

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Implications

The findings of this study carry direct, actionable implications for independent nursing care services in critical care settings. Implementing this dual-sensory blockade protocol provides critical care nurses with a fully autonomous, safe, and cost-effective non-pharmacological intervention to safeguard patient sleep hygiene without risking the hemodynamic shifts or respiratory depression associated with chemical sedatives. However, practical implementation during night shifts requires careful integration into nursing routines. Patients waking abruptly in a sound-attenuated, darkened state face potential acute disorientation. To address this safety aspect, night-shift protocols should incorporate non-intrusive visual monitoring every two hours to verify device positioning, assess skin integrity, and ensure patient safety without causing sleep awakenings.

Research contribution

This study advances cardiovascular and critical care nursing science by providing empirical evidence on the clinical efficacy of a nurse-led sensory isolation protocol within a regional tertiary hospital setting (Dr. M. Yunus Regional General Hospital). It addresses a key contextual gap in critical care literature by demonstrating how non-invasive environmental management can successfully transform severe baseline sleep deprivation (100% poor sleep quality) into healthy sleep outcomes within a resource-constrained ICCU environment.

Limitations

Several methodological limitations of this study should be noted. First, the evaluation relied on a quasi-experimental design without an unblinded control group, limiting direct comparative evaluation against routine standard care. Second, the intervention protocol was evaluated over a limited single-night duration of seven hours (22:00 to 05:00 WIB), restricting the assessment of long-term sleep architecture stability. Third, sleep quality was evaluated using subjective self-report instruments rather than objective polysomnography. Finally, immediate post-intervention outcomes may be subject to methodological influences such as the Hawthorne effect, where subjective ratings could be influenced by patient awareness of receiving dedicated care, as well as potential baseline unfamiliarity associated with the first-night effect.

Suggestions

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To build upon these findings, future research should employ randomized controlled trial (RCT) designs featuring an unblinded control group to elevate methodological rigor. Longitudinal studies conducted across multiple consecutive nights are recommended to evaluate the sustained physiological impacts of sensory blockades on cardiac cellular repair, long-term hemodynamic stability, and total ICCU length of stay. Furthermore, future investigations should incorporate continuous objective physiological indicators such as continuous heart rate variability (HRV) tracking, continuous blood pressure monitoring, and nocturnal cortisol assays to comprehensively map the neuroendocrine response to sensory deprivation interventions.

CONCLUSION

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In conclusion, this study confirms that the combined use of earplugs and eye masks significantly improves sleep quality among critically ill patients with heart monitors in the ICCU. The intervention successfully transformed the entire sample of 92 respondents from having initially poor sleep quality where the highest score frequency reached a global PSQI score of 9 (24%) into achieving good sleep quality, with a post-test majority (60%) securing an optimal score of 4. Statistical analysis firmly establishes that this dual-sensory barrier directly correlates with improved sleep architecture in intensive care, yielding a highly significant p-value of 0.000. Ultimately, these main findings substantiate that a simple, low-cost, non-pharmacological occlusion protocol provides a highly efficient and safe nursing mechanism to mitigate severe environmental disturbances and accelerate cardiac patient recovery.

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AUTHOR CONTRIBUTION STATEMENT

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DL contributed to the conception and design of the study, data collection, data analysis and interpretation, and manuscript preparation. EB contributed to research supervision, methodological validation, scientific content review, and critical revision of the manuscript.

AI DISCLOSURE STATEMENT

The author used Grammarly during the preparation of this work for language editing, spelling correction, and improving language clarity. After using the tool or service, the author thoroughly reviewed and edited the content as needed and takes full responsibility for the content of the publication.

CONFLICTS OF INTEREST

The authors confirm the absence of any potential conflicts of interest, whether financial, institutional, or personal, that could influence the conduct of this study, the analysis of the data, the preparation of the manuscript, or its publication.

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