

Effectiveness of Pandan Leaf Decoction on Sleep Quality among Nursing Students

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ABSTRACT

Nursing students are a productive population that often experiences sleep disturbances triggered by academic pressure, social demands, and emotional stress. When left unmanaged, sleep problems can impair concentration, academic achievement, and overall mental well-being. Pandan leaves contain various bioactive constituents, including flavonoids, alkaloids, tannins, saponins, and 2-acetyl-1-pyrroline, which may provide calming and sedative effects that support better sleep. This study aimed to examine the effectiveness of pandan leaf decoction in improving sleep quality among nursing students. A pre-experimental one-group pretest-posttest design was used with 30 students from the Indonesian University of Education, selected via quota sampling. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI). Prior to the intervention, 83.3% of participants exhibited poor sleep quality with a mean PSQI score of 7.23. After consuming the pandan leaf decoction for 14 days, 73.3% of participants shifted into the good sleep category, yielding a reduced mean posttest score of 4.73. A paired sample t-test indicated a significant improvement in sleep quality ($p=0.000$; $p<0.05$). These findings show that pandan leaf decoction can help improve sleep quality among nursing students. As a safe and natural herbal option, it may be recommended as a complementary strategy to support holistic nursing care for managing sleep disturbances.



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INTRODUCTION

Sleep is a basic physiological requirement essential for maintaining physical and psychological well-being. Rather than being a passive activity, sleep involves the coordinated regulation of the central nervous system, the endocrine system, and various metabolic processes (Arendt & Aulinas, 2022). The sleep-wake cycle is directed by circadian rhythms controlled by the suprachiasmatic nucleus (SCN) in the hypothalamus, with melatonin serving as a key hormone in this regulation. Structured NREM and REM sleep stages play an important role in restoring bodily functions, strengthening memory, and supporting immune performance (Chong et al., 2024). When sleep quality declines, individuals may experience reduced concentration, impaired learning capacity, and an increased risk of mental health problems such as anxiety and depression.

These impacts are particularly evident among university students, who are highly vulnerable to sleep disturbances due to academic workloads, social adjustments, and emotional stressors. The demands of early adulthood, such as managing study pressures, maintaining social relationships, and planning future careers, often lead to irregular sleep duration and reduced sleep quality. Despite recommendations of 7–9 hours of sleep per night, many students fail to achieve adequate rest (Mbous et al., 2022).

Epidemiological data further support the prevalence of sleep disturbances among university students. The World Health Organization (WHO) reports that approximately 18% of the global population experiences sleep disorders that affect quality of life (Mindayani et al., 2021). Rahman et al. (2024) found that 62.3% of students reported poor sleep quality, while

Hutagalung et al. (2022) reported an even higher figure of 72.3%. Among final-year students working on their theses, the prevalence reached 68.7% (Hidayati et al., 2019). These findings demonstrate that sleep disturbances are not just personal issues but represent a significant public health concern.

Pharmacological sleep aids may provide temporary relief but carry the risk of dependence and cognitive side effects. Therefore, pharmacological alternatives continue to gain attention, including herbal complementary therapies aligned with holistic nursing principles that integrate physical, emotional, and spiritual health. Indonesia's biodiversity, with approximately 7,500 recognised medicinal plants, supports the development of culturally relevant herbal interventions (Sukandar et al., 2022).

Pandanus amaryllifolius, commonly known as pandan leaf, is widely used in traditional practices and is believed to promote relaxation (Rozi, 2024). Flavonoids and alkaloids may influence neurotransmitters such as serotonin and dopamine, supporting mood regulation and sleep-wake balance (Alizadeh et al., 2024). Tannins and polyphenols help reduce oxidative stress in neural tissue, while the aroma compound 2-AP can stimulate the limbic system and induce relaxation (Yan et al., 2025).

Previous research provides preliminary evidence of pandan's sleep-enhancing potential. Rozi (2024) found that pandan extract prolonged sleep duration in animal models. Sulistiyati et al. (2019) reported reduced sleep latency in mice, while Idhayanti et al. (2022) demonstrated improved sleep quality in preschoolers using a combination of pandan and lemongrass. However, most of these studies were conducted on non-student populations or focused on herbal extracts or combinations, rather than fresh pandan leaf decoction.

From a theoretical perspective, Roy's Adaptation Model explains that individuals constantly adapt to internal and external stimuli. Poor sleep quality among nursing students represents a maladaptive response to stressors, while pandan leaf decoction may function as a focal stimulus that enhances physiological adaptation and supports better sleep (Wang, 2025). This theoretical link strengthens the rationale for integrating herbal complementary therapy within holistic nursing practice.

Given its accessibility, cultural acceptance, and potential therapeutic benefits, pandan leaf decoction offers promise as a complementary herbal therapy for improving sleep. Therefore, this study aims to evaluate the effectiveness of pandan leaf decoction in improving sleep quality among nursing students.

METHOD

This study utilized a pre-experimental one-group pretest-posttest design. The target population consisted of actively enrolled nursing students from the 2023 and 2024 academic cohorts. A total of 30 participants were selected using quota sampling. Eligible participants were those experiencing mild to moderate sleep disturbances, as measured by the Pittsburgh Sleep Quality Index (PSQI), and who provided informed consent. Exclusion criteria included the use of pharmacological sleep medications, severe insomnia, and diagnosed psychiatric disorders. Participants were also advised to avoid caffeine and other herbal sleep aids during the intervention to prevent confounding.

The intervention involved administering a pandan leaf decoction prepared with simple household kitchen tools, including a pot, strainer, digital scale, and measuring utensils. Two fresh pandan leaves (approximately 6 grams) were boiled in 400 mL of clean water until the volume was reduced to 200 mL. Each participant consumed 200 mL of this decoction nightly before going to sleep for 14 consecutive days. This preparation method was intentionally chosen to mirror traditional home-based practices, ensuring practicality and ease of implementation for student participants.

Sleep quality was evaluated using the PSQI, a 19-item questionnaire scored on a Likert scale. This study used the Indonesian version of the Risda (2019) Likert scale. Measurements were conducted twice—before the intervention (pretest) and after the 14-day intervention (posttest). The PSQI produces a global score ranging from 0 to 21, with scores above 5 indicating poor sleep quality. The instrument has demonstrated good psychometric properties, including a validity

coefficient of 0.90 (Wang et al., 2022) and a Cronbach's alpha reliability of 0.83 across its components (Buysse et al., 1989).

Ethical approval for this study was obtained from the Health Research Ethics Committee of the Faculty of Health and Technology Sciences, Universitas Jenderal Achmad Yani, Cimahi (Ref: 147/KEPK/FITKes-Unjani/VI/2025; June 27, 2025). All procedures adhered to ethical standards, including informed consent, anonymity, confidentiality, and the right of participants to withdraw at any time.

This study has several limitations. The absence of a control group reduces the ability to establish causality and limits the generalizability of the findings. Additionally, external factors, such as academic workload, daily routines, and environmental influences, could not be fully controlled and may have affected participants' sleep quality.

RESULTS

Table 1. Frequency distribution of respondents by age and sex

Characteristics	f	%
Age		
19 years	13	43.3
20 years	15	50.0
21 years	2	6.7
Sex		
Male	3	10.0
Female	27	90.0

The demographic profile shows that most respondents were young adults aged 19–20 years, with only a small proportion aged 21. The sample was predominantly female, which is consistent with the gender distribution commonly observed in nursing programs. This demographic pattern indicates that the participants represent a typical nursing student population in early adulthood.

Table 2. Distribution of sleep quality before and after intervention

Sleep quality	Before intervention		After intervention	
	f	%	f	%
Good	5	16.7	22	73.3
Poor	25	83.3	8	26.7

The distribution of sleep quality shows a clear shift toward improvement after the 14-day pandan decoction intervention. The substantial increase in participants with good sleep quality, accompanied by a notable reduction in poor sleep quality, indicates a positive response to the treatment. These findings suggest that the intervention improved overall sleep quality among the students.

Table 3. Normality test results

Variable	n	Shapiro-Wilk	
		Statistic	Sg. (p-value)
Pre-test	30	0.953	0.208
Post-test	30	0.942	0.102

The normality assessment showed that both pretest and posttest PSQI scores followed a normal distribution. This indicates that the data met the assumptions required for parametric analysis. Accordingly, a paired-samples t-test was used to examine differences in sleep quality before and after the intervention.

Table 4. Frequency distribution of PSQI scores of nursing students before and after being given pandan leaf decoction

Variable	Mean	n	Std. Deviation	Std. Error Mean
Pre-test	7.23	30	1.63	0.30
Post-test	4.73	30	1.23	0.22

The comparison of mean PSQI scores shows an apparent decrease from pretest to posttest, indicating an overall improvement in sleep quality after 14 days of consuming pandan leaf decoction. This reduction suggests that participants experienced fewer sleep-related difficulties and better overall rest, supporting the intervention's effectiveness.

Table 5. Effectiveness of pandan leaf decoction on nursing students' sleep quality before and after treatment

Variable	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pre-test	2.50	2.02	0.37	1.74	3.26	6.75	29	0.000
Post-test								

The paired sample t-test demonstrated a statistically significant difference in sleep quality scores before and after the pandan leaf decoction intervention. With a mean difference of 2.50 and a p-value of 0.000 ($p < 0.05$), the intervention produced a significant improvement in sleep quality. The confidence interval (1.74–3.26), which did not include zero, together with the t-value of 6.75, provides strong evidence that the observed changes were not due to chance. These results confirm the effectiveness of pandan leaf decoction in improving sleep quality among nursing students.

DISCUSSION

The results of this study demonstrate a significant improvement in sleep quality among students after a 14-day intervention using pandan leaf decoction. The proportion of participants reporting good sleep quality increased from 16.7% to 73.3%, while those experiencing poor sleep quality decreased from 83.3% to 26.7%. The paired t-test confirmed a statistically significant difference in Pittsburgh Sleep Quality Index (PSQI) scores before and after the intervention ($p=0.000$; $p<0.005$). These findings suggest that pandan leaf decoction can effectively enhance sleep quality among students, a population commonly vulnerable to sleep disturbances due to academic stress, irregular sleep patterns, and demanding study workloads. The notable shift from poor to good sleep quality suggests that pandan leaf decoction may serve as a beneficial complementary therapy to support sleep regulation among young adults in academic environments.

The improvement observed in this study can be attributed to the bioactive compounds naturally present in pandan leaves, including flavonoids, alkaloids, saponins, tannins, and 2-acetyl-1-pyrroline (2-AP). Flavonoids, known for their antioxidant and anti-inflammatory properties, interact with multiple enzyme systems and cellular pathways that contribute to physiological relaxation (Safe et al., 2021). Alkaloids exhibit diverse pharmacological activities, particularly those affecting the nervous system, which may support neural relaxation processes (Bufo et al., 2020). Saponins, with their amphiphilic molecular structure, influence cell membrane permeability and have been associated with calming biological effects (Timilsena et al., 2023). Tannins, known for their ability to bind to proteins, also have antioxidant and antimicrobial properties (Cosme et al., 2025). The compound 2-AP emits a distinctive aroma that interacts with the limbic system, producing a calming effect that facilitates relaxation before bedtime. The synergistic effects of these compounds likely contributed to the improved sleep quality observed in the participants after consuming pandan leaf decoction.

In addition to these biochemical mechanisms, the aroma released during the boiling of pandan leaves may act as a natural, mild sedative, helping reduce anxiety and promote relaxation before bedtime (Azhar et al., 2022). Furthermore, the consistent consumption of pandan leaf

decoction over 2 weeks aligns with the general principle that herbal interventions require repeated, sustained administration to achieve stable physiological effects (Latif & Nawaz, 2025). This highlights the importance of routine and consistency in obtaining therapeutic outcomes from herbal preparations.

The findings of this study are supported by previous research. Sulistiyati et al. (2019) reported that pandan leaf decoction reduced muscle tension and improved sleep duration among students. Moreover, flavonoids in pandan leaves have been suggested to act like GABA agonists, contributing to mild anxiolytic effects that help alleviate pre-sleep anxiety, one of the most common causes of poor sleep quality among university students (Hidayati et al., 2019). These biological and empirical explanations strengthen the conclusion that the decline in PSQI scores in this study reflects genuine improvements attributable to the pandan leaf intervention.

Compared with other herbal therapies, pandan leaf decoction shows effects similar to those reported for lavender and chamomile essential oils, both of which have been shown to improve sleep quality in chronic and elderly populations (Xu et al., 2024). Although these studies focus on older adults, the consistent sleep-enhancing outcomes suggest that pandan leaves may provide comparable benefits for younger populations, including university students. Additionally, pandan leaves offer several advantages, such as high accessibility, affordability, and strong cultural acceptance, making them a practical complementary therapy option in local communities.

Despite the promising results, several limitations must be acknowledged. This study employed a one-group pretest-posttest design without a control group, limiting the ability to confirm that improvements were caused solely by the pandan leaf intervention. External factors such as lifestyle changes, psychological conditions, or environmental differences may have influenced sleep quality independently of the treatment. The relatively small, homogeneous sample of nursing students further limits the generalizability of the findings. Additionally, the study relied solely on the PSQI as a subjective measure, without supporting objective assessments, such as actigraphy or daily sleep logs, which could have provided more comprehensive insights.

Nevertheless, this study provides meaningful preliminary evidence that pandan leaf decoction is a simple, safe, culturally relevant, and cost-effective non-pharmacological intervention for improving sleep quality among students. Future studies should consider involving larger, more diverse samples, integrating objective sleep assessments, and using controlled experimental designs to strengthen the validity and broader applicability of the findings.

CONCLUSION

This study demonstrates that a decoction of fragrant pandan leaves (*Pandanus amaryllifolius*) effectively improves sleep quality among nursing students experiencing mild to moderate sleep disturbances. These findings highlight its potential as a complementary herbal therapy to enhance sleep quality in young adults. However, several limitations should be acknowledged. The relatively small sample size may limit the generalizability of the findings, and the absence of a control group makes it difficult to determine whether the observed improvements were attributable solely to the pandan leaf intervention. Additionally, the lack of blinding in the study design may have introduced bias into participants' responses.

To strengthen and extend these findings, future research should utilize larger and more diverse samples, incorporate rigorous experimental designs with appropriate control groups, and employ longitudinal approaches to examine the sustained effects of pandan leaf decoction on sleep quality. Overall, the present study provides encouraging evidence supporting the use of pandan leaves as a natural, accessible, and culturally relevant approach to improving sleep quality. Nonetheless, further research is needed to validate and broaden the applicability of this herbal remedy.

AUTHOR'S DECLARATION

Authors' contributions and responsibilities

RNA: Writing original draft, visualization, funding acquisition, conceptualization; **AS:** Supervision, validation, review and editing; **SS:** Supervision, validation, review and editing.

Availability of data and materials

All data supporting the findings of this study are available from the authors upon reasonable request.

Competing interests

The authors declare no competing interests.

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