International Journal of Nursing and Midwifery Science (IJNMS)

http://ijnms.net/index.php/ijnms
ORIGINAL RESEARCH

e- ISSN: 2686-2123
p- ISSN: 2686-0538

THE EFFECT OF LAVENDER AROMATHERAPY ON SLEEP QUALITY AMONG ADOLESCENTS WITH SLEEP DISTURBANCES AT SMK MUHAMMADIYAH 07 GONDANGLEGI MALANG

Ayunda Aprilia[1*], Nila Widya Keswara[2], Rifzul Maulina[3].
[1,2,3]Prodi Sarjana Kebidanan, Fakultas Ilmu Kesehatan, Institut Teknologi Sains dan Kesehatan RS dr. Soepraoen Kesdam V/Brw Malang
Corresponding Email: aayunda704@gmail.com*

ABSTRACT

Sleep disorders in adolescents are common health problems that can affect physical health, emotional well-being, and learning ability. One non-pharmacological therapy that can be used to help improve sleep quality is lavender aromatherapy, which has a relaxing effect on the nervous system. This study aimed to determine the effect of lavender aromatherapy on sleep quality among adolescents at SMK Muhammadiyah 7 Gondanglegi. This study used a pre-experimental design with a one group pretest - posttest approach. The population in this study consisted of 60 twelfth-grade nursing students at SMK Muhammadiyah 7 Gondanglegi, while the sample included 43 respondents selected using purposive sampling technique. Sleep quality was measured using the Pittsburgh Sleep Quality Index (PSQI) questionnaire before and after the intervention of lavender aromatherapy for seven days. Data were analyzed using the paired sample t-test with a significance level of $\alpha = 0.05$. The results showed that the mean PSQI score before the intervention was 12.35, while after the intervention it decreased to 5.23, indicating an average reduction of 7.12 points. The statistical test showed a p-value = 0.000 ($p < 0.05$), which means that there was a significant effect of lavender aromatherapy on improving adolescents' sleep quality. Based on these results, it can be concluded that lavender aromatherapy has an effect on improving sleep quality in adolescents and can be used as a non-pharmacological alternative therapy to help overcome sleep disorders.

Keywords

Lavender aromatherapy, Sleep quality, Adolescents

INTRODUCTION

Adolescence is a developmental period characterized by significant biological, psychological, and social changes. These changes often influence adolescents' lifestyles, including their sleep patterns (Valerie et al., 2024). During this phase, adolescents experience alterations in circadian rhythms due to hormonal changes, while also facing increasing academic and social demands. These conditions make adolescents more vulnerable to sleep disturbances, which can impact their physical, emotional, and cognitive health (Lauwsen & Dwiana, 2019).

Sleep is a fundamental physiological need that plays a crucial role in bodily recovery and brain function. Adequate and good-quality sleep enhances concentration, memory, and emotional stability. Conversely, sleep disturbances can lead to decreased learning concentration, mood changes, and an increased risk of psychological disorders in the future. One of the most common sleep disorders among adolescents is insomnia, a condition characterized by difficulty initiating or maintaining sleep (Wulandari et al., 2024).

The issue of insomnia among adolescents has become an increasingly significant global health concern. In Indonesia, the 2023 National Basic Health Research (Riskesdas) reported that approximately 28% of adolescents aged 15 - 19 experienced sleep disturbances, including insomnia, at least three times per week. This condition is influenced by various factors, including late-night gadget use, academic pressure, and irregular sleep habits.

Several studies in Indonesia have shown a high prevalence of sleep disturbances among adolescents. A study by Riana (2024) found that more than 70% of high school students experienced mild to moderate sleep problems, largely triggered by social media use before bedtime. Another study by Muntomimah and Syahrul Mubarok (2025), involving 884 adolescents in East Java, revealed that 83% actively used social media before sleep, with the majority reporting poor sleep quality. Additionally, research among nursing students in Malang showed that approximately 62% of respondents experienced insomnia and poor sleep quality (Ulum, 2016).

Modern lifestyle changes, particularly the high use of digital devices, are among the main factors affecting adolescents' sleep quality. Blue light emitted from gadget screens can inhibit the production of melatonin, a hormone that regulates the sleep cycle. As a result, adolescents tend to have difficulty initiating sleep and experience poor sleep quality. If this condition persists over time, sleep disturbances may develop into chronic insomnia, which can negatively affect mental health, metabolism, and the cardiovascular system (Lillehei et al., 2015).

Management of sleep disturbances can be approached through pharmacological and non - pharmacological methods. Pharmacological therapy generally involves the use of sleeping medications; however, long-term use may cause side effects such as dependency and organ dysfunction. Therefore, non-pharmacological therapy is considered a safer alternative for managing mild to moderate sleep disturbances. One simple and practical non-pharmacological method is the use of aromatherapy, particularly lavender aromatherapy.

Lavender (Lavandula angustifolia) is a plant that produces essential oil containing linalool and linalyl acetate, which have relaxing effects on the central nervous system. The aroma of lavender can stimulate the limbic system in the brain, which plays a role in regulating emotions and stress, thereby promoting relaxation and improving sleep quality. A study by Ko et al. (2021) showed that exposure to lavender aroma during sleep increased delta wave (slow-wave sleep) activity from 19.4% to 21.9% of total sleep duration. Furthermore, a study by Nurfadilla et al. (2025) reported that after seven days of lavender aromatherapy use, 81.6% of adolescents who previously experienced insomnia no longer showed symptoms of sleep disturbances.

Based on a preliminary study conducted at SMK Muhammadiyah 7 Gondanglegi on November 10, 2025, among 60 twelfth-grade nursing students, nearly 50% were reported to experience sleep disturbances. This indicates that sleep

quality problems among adolescents remain relatively high and require effective and easily applicable interventions.

Despite these findings, although lavender aromatherapy has demonstrated potential benefits in improving sleep quality, evidence regarding its effectiveness among adolescents in school settings using standardized sleep assessment measures remains limited. Therefore, further research is needed to evaluate the effect of lavender aromatherapy on sleep quality among adolescents experiencing sleep disturbances as a safe, practical, and Evidence Based non-pharmacological intervention.

METHOD

This study employed a pre-experimental design using a One-Group Pretest - Posttest approach. In this design, the research was conducted on a single group of respondents without a comparison control group. Measurements were carried out twice: before the intervention (pretest) and after the intervention (posttest). The pretest was conducted to determine the baseline sleep quality of the respondents prior to treatment, while the posttest was used to assess changes in sleep quality after the administration of lavender aromatherapy. This design was used to evaluate the effect of lavender aromatherapy on the sleep quality of adolescents experiencing sleep disturbances. The absence of a control group limits causal inference, and therefore the findings should be interpreted with caution. This design was chosen due to feasibility considerations within the school setting and limited resources.

The population in this study consisted of all twelfth-grade nursing students at SMK Muhammadiyah 7 Gondanglegi, Malang Regency, totaling 60 individuals aged 17 - 19 years. The sample was determined using a purposive sampling technique based on predefined inclusion and exclusion criteria. The inclusion criteria were adolescents in grade XII aged 17 - 19 years, both male and female, and experiencing mild sleep disturbances as determined through screening using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. The exclusion criteria included respondents who were currently using sleeping medications or other therapies that could affect sleep quality, as well as those with severe physical or psychological disorders. Based on calculations using the Slovin formula from a population of 60 students, a sample size of 38 respondents was obtained. The final sample included 43 respondents, as additional eligible participants meeting the inclusion criteria were recruited during the data collection period to increase statistical power.

Data collection was conducted using the Pittsburgh Sleep Quality Index (PSQI) questionnaire to measure respondents' sleep quality before and after the intervention. The PSQI is a widely used and validated instrument for assessing sleep quality, including in adolescent populations, with good reliability (Cronbach's alpha > 0.70). A global PSQI score > 5 indicates poor sleep quality. The intervention consisted of administering lavender (Lavandula angustifolia) aromatherapy through inhalation using a diffuser for 15 - 20 minutes before bedtime each night for seven consecutive days. The lavender essential oil used had a concentration of 100% pure lavender oil, administered using an electric ultrasonic diffuser (capacity ±100 ml) with 3 - 5 drops diluted in water. The diffuser was placed approximately 1 - 2 meters from the participant's sleeping position. Compliance was monitored through daily self-report checklists completed by respondents. After the intervention period, respondents were asked to complete the PSQI questionnaire again as posttest data. The collected data were then analyzed using univariate analysis to describe respondent characteristics and sleep quality, and bivariate analysis using the Paired Sample t-test with a significance level of $\alpha = 0.05$ to determine the effect of lavender aromatherapy on adolescents' sleep quality. In addition to p-values, effect size (Cohen's d), mean differences, and 95% confidence intervals were calculated to provide a more comprehensive interpretation of the intervention effect.

RESULTS

Table 1. Mean PSQI Scores of Adolescents' Sleep Quality Before Lavender Aromatherapy at SMK Muhammadiyah 7.

Variable	Min-Max	Mean	Median	SD	95% CI
Before Intervention	10 - 15	12.35	12.00	1.950	11.75 - 12.95

Based on Table 1, the mean PSQI score of adolescents' sleep quality before the administration of lavender aromatherapy at SMK Muhammadiyah 7 was 12.35, with a median of 12.00 and a standard deviation of 1.950. The minimum score was 10 and the maximum score was 15, indicating that the respondents' sleep quality prior to the intervention tended to be poor. The 95% confidence interval (CI) indicates that the true mean PSQI score is likely to fall between 11.75 and 12.95, reinforcing the consistency of poor baseline sleep quality among respondents.

Table 2. Mean PSQI Scores of Adolescents' Sleep Quality After Lavender Aromatherapy at SMK Muhammadiyah 7.

Variable	Min-Max	Mean	Median	SD	95% CI
After Intervention	2 - 14	5.23	3.00	3.747	4.10 - 6.36

Based on Table 2, the mean PSQI score of adolescents' sleep quality after the administration of lavender aromatherapy at SMK Muhammadiyah 7 was 5.23, with a median of 3.00 and a standard deviation of 3.747. The minimum score was 2 and the maximum score was 14. This indicates a decrease in PSQI scores after the intervention, suggesting an improvement in respondents' sleep quality. However, the relatively large standard deviation (SD = 3.747) indicates considerable variability in post-intervention responses, suggesting that the effect of lavender aromatherapy may differ among individuals. This variability could be influenced by factors such as individual sensitivity to aromatherapy, lifestyle differences, or uncontrolled variables such as screen time, caffeine intake, and stress levels.

Table 3. Normality Test of PSQI Score Differences.

Test	Statistic	df	Sig.
Shapiro-Wilk	0.951	43	0.064

Based on Table 3, the normality test of the PSQI score differences using the Shapiro-Wilk test yielded a statistic value of 0.951 with df = 43 and a significance value of 0.064. Since the significance value is greater than 0.05 ($p > 0.05$), it can be concluded that the data are normally distributed. Therefore, the analysis can proceed using a parametric test, namely the paired t-test.

Table 4. Results of Paired t-test on PSQI Scores Before and After Lavender Aromatherapy at SMK Muhammadiyah 7.

Variable	Mean Before	Mean After	t	df	Sig. (2-tailed)

PSQI Scores Before and After	12.35	5.23	13.973	42	0.000

Based on Table 4, the results of the paired t-test show that the mean PSQI score before the intervention was 12.35, while after the intervention it decreased to 5.23, indicating a mean reduction of 7.12. The statistical test results show a t-value of 13.973 with df = 42 and a significance value (2-tailed) of 0.000 ($p < 0.05$). This indicates a statistically significant difference between PSQI scores before and after the administration of lavender aromatherapy. The 95% confidence interval (6.09 - 8.15) confirms that the reduction in PSQI scores is consistent and meaningful. Furthermore, the effect size (Cohen's d = 2.13) indicates a large effect, suggesting that lavender aromatherapy has a substantial impact on improving sleep quality. In addition to statistical significance, this finding also demonstrates clinical relevance, as the post-intervention mean PSQI score approaches the threshold for good sleep quality (PSQI ≤ 5).

DISCUSSION

Identifying Sleep Quality Before the Administration of Lavender Aromatherapy

Based on the results of a study conducted among twelfth-grade nursing students at SMK Muhammadiyah 7 Gondanglegi, it was found that the respondents' sleep quality prior to the administration of lavender aromatherapy tended to be poor. Measurements using the Pittsburgh Sleep Quality Index (PSQI) showed that the mean sleep quality score before the intervention was 12.35, with a median of 12.00, a standard deviation of 1.950, a minimum score of 10, and a maximum score of 15. This finding confirms that sleep disturbances were prevalent among the study population and provides a clear baseline for evaluating changes after the intervention.

These findings suggest that the majority of respondents experienced various sleep disturbances, such as difficulty initiating sleep, frequent awakenings during the night, and feeling unrefreshed upon waking in the morning. These conditions may lead to decreased concentration in learning, daytime fatigue, and reduced productivity in daily activities. Sleep quality is an important indicator in assessing an individual's physical and psychological health. Good sleep quality is reflected in the ability to fall asleep easily, maintain sleep throughout the night, and wake up feeling refreshed and energized (Akbar et al., 2024).

Before administering the lavender aromatherapy intervention, it was essential for the researchers to identify the baseline sleep quality of the respondents. This baseline data is important to determine the level of sleep disturbances experienced and to allow comparison with post-intervention conditions. Sleep quality in this study was assessed using the Pittsburgh Sleep Quality Index (PSQI), which consists of several components, including subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction (Nafsiyah & Kamidah, 2024).

The findings of this study are consistent with previous research indicating that, prior to the administration of lavender aromatherapy, most respondents had poor sleep quality, as reflected by high PSQI scores. This condition may be influenced by various factors such as stress, anxiety, heavy academic workloads, and the habit of using electronic devices before bedtime, which can disrupt sleep patterns (Akbar et al., 2024).

From a contextual perspective, the poor sleep quality observed in this study may be related to academic demands, clinical practice activities, and examination preparation, as well as nighttime smartphone use, which may delay sleep onset and reduce total sleep duration.

Identifying Sleep Quality After the Administration of Lavender Aromatherapy

Based on the results of the study, it was found that after the administration of lavender aromatherapy, there was an improvement in the respondents' sleep quality. Measurements using the Pittsburgh Sleep Quality Index (PSQI) showed that the mean sleep quality score decreased to 5.23, with a median of 3.00, a standard deviation of 3.747, a minimum score of 2, and a maximum score of 14. This reduction suggests that participants experienced better sleep outcomes following the intervention.

The decrease in PSQI scores indicates an improvement in sleep quality following the intervention. Several respondents reported that they found it easier to fall asleep, experienced fewer awakenings during the night, and felt more refreshed upon waking in the morning. These findings suggest that lavender aromatherapy has a positive effect on adolescents' sleep quality.

The identification of sleep quality after the administration of lavender aromatherapy was conducted to determine changes in respondents' sleep conditions following the intervention. The same PSQI instrument was used as in the pre-intervention measurement to ensure objective comparison. This measurement helps identify improvements in sleep quality, such as reduced difficulty in initiating sleep, increased sleep duration, and decreased nighttime disturbances (Putranto et al., 2025).

Lavender aromatherapy is known to have a relaxing effect that can help improve sleep quality. Active compounds such as linalool and linalyl acetate found in lavender provide a calming effect on the central nervous system, promoting relaxation and facilitating sleep (Nafsiyah & Kamidah, 2024).

These findings are consistent with previous studies showing that the use of lavender aromatherapy before bedtime can significantly improve sleep quality, as indicated by a decrease in PSQI scores after the intervention compared to before (Nafsiyah & Kamidah, 2024). Nevertheless, the improvement should be interpreted cautiously, as non-specific effects such as increased relaxation before bedtime may also contribute.

Analyzing the Effect of Lavender Aromatherapy on Sleep Quality

Based on statistical analysis using the paired t-test, it was found that there was a significant difference in sleep quality before and after the administration of lavender aromatherapy. The mean PSQI score before the intervention was 12.35, which decreased to 5.23 after the intervention, indicating an average reduction of 7.12. The statistical test results showed a t-value of 13.973 with a p-value of 0.000 ($p < 0.05$). This indicates that lavender aromatherapy has a significant effect on improving adolescents' sleep quality at SMK Muhammadiyah 7 Gondanglegi.

The reduction in PSQI scores indicates that after the intervention, most respondents experienced improvements in several components of sleep quality, such as shorter sleep latency, longer sleep duration, and fewer sleep disturbances during the night. Additionally, respondents reported feeling more refreshed upon waking in the morning after using lavender aromatherapy before bedtime.

Lavender aromatherapy is a non-pharmacological therapy that can be used to improve sleep quality. It works by stimulating the olfactory system, which then transmits signals to the limbic system in the brain, responsible for regulating emotions, relaxation, and stress responses. The aroma of lavender produces a calming effect on the body, helping individuals fall asleep more easily and maintain sleep throughout the night (Akbar et al., 2024).

However, several alternative explanations should be considered. The observed improvements may be influenced by the placebo effect, where participants expect benefits from the intervention, or the Hawthorne effect, in which participants modify their behavior because they are being observed. Additionally, natural variations in sleep patterns over time may also contribute to the changes observed.

These findings are consistent with previous research indicating that lavender

aromatherapy can significantly improve sleep quality. It can serve as an effective non-pharmacological alternative therapy to enhance sleep quality without causing side effects commonly associated with sleeping medications (Nafsiyah & Kamidah, 2024).

This study has several limitations. First, the absence of a control group limits causal inference. Second, the relatively small sample size may reduce generalizability. Third, sleep quality was measured using self-reported data, which is subject to response bias. Fourth, the short duration of the intervention (seven days) may not capture long-term effects. Additionally, potential confounding variables such as screen time, caffeine intake, and stress levels were not controlled.

Despite these limitations, this study provides preliminary evidence that lavender aromatherapy may be a practical and safe complementary approach to improve sleep quality among adolescents, particularly in school settings. Further studies using randomized controlled designs are recommended to strengthen the evidence.

CONCLUSIONS

Based on the results of the study on the effect of lavender aromatherapy on adolescents' sleep quality at SMK Muhammadiyah 7 Gondanglegi, it can be concluded that prior to the intervention, most respondents had poor sleep quality, with a mean Pittsburgh Sleep Quality Index (PSQI) score of 12.35. After the administration of lavender aromatherapy, the respondents' sleep quality improved, as indicated by a decrease in the mean PSQI score to 5.23.

The results of the statistical analysis using the paired t-test showed a p-value of 0.000 ($p < 0.05$), indicating a statistically significant difference in sleep quality before and after the intervention. However, lavender aromatherapy was associated with improved sleep quality among adolescents in this study rather than definitively causing it. Therefore, lavender aromatherapy may be considered a potential non-pharmacological approach to help improve sleep quality in adolescents.

Respondents are encouraged to utilize lavender aromatherapy as a non-pharmacological therapy to improve sleep quality, accompanied by the adoption of healthy lifestyle habits such as maintaining a regular sleep schedule and creating a comfortable sleep environment. However, these recommendations should be applied cautiously, considering the study limitations. Future researchers are recommended to develop further studies with larger sample sizes, controlled or randomized research designs, and longer intervention durations in order to obtain more comprehensive and generalizable results regarding the effectiveness of aromatherapy in improving sleep quality.

REFERENCES

Ko, L. W., Su, C. H., Yang, M. H., Liu, S. Y., & Su, T. P. (2021). A pilot study on essential oil aroma stimulation for enhancing slow-wave EEG in sleeping brain. *Scientific Reports*, *11*(1), 1–11. https://doi.org/10.1038/s41598-020-80171-x

Lauwsen, R., & Dwiana, A. (2019). Pengaruh aroma terapi lavender terhadap peningkatan kualitas tidur mahasiswa Fakultas Kedokteran Universitas Tarumanagara. *Tarumanagara Medical Journal*, *2*(1), 152–159.

Lillehei, A. S., Halcón, L. L., Savik, K., & Reis, R. (2015). Effect of inhaled lavender and sleep hygiene on self-reported sleep issues: A randomized controlled trial. *Journal of Alternative and Complementary Medicine*, *21*(7), 430–438. https://doi.org/10.1089/acm.2014.0327

Muntomimah, S., & Syahrul Mubarok. (2025). Analisis Faktor-Faktor yang Mempengaruhi Kualitas Tidur pada Remaja berskala Biner. *Efektor*, *12*(1), 63–74.

https://doi.org/10.29407/e.v12i1.24850

Nafsiyah, L., & Kamidah. (2024). Pengaruh Pemberian Aromaterapi Lavender terhadap Peningkatan Kualitas Tidur Ibu Hamil Trimester III. *Antigen: Jurnal Kesehatan Masyarakat Dan Ilmu Gizi*, *2*(3).

Nurfadilla, S. B., Sugiharti, R. K., Kania, I., & Wardani, F. (2025). *Pengaruh Pemberian Aromaterapi Lavender Terhadap Tingkat Insomnia pada Remaja di Kelas SMAN 1 Cikarang Timur Tahun 2025 JURNAL MEDIA INFORMATIKA [JUMIN]*. *6*(5), 2639–2643.

Putranto, A. A. D., Hidayati, A. B. S., & Wati, I. S. (2025). Efektifitas Kombinasi Murottal Al-Qur'an dan Aromaterapi Lavender terhadap Gangguan Tidur Pada Pasien Hemodialisa. *Sci-Tech Journal*, *4*, 164–172.

Riana. (2024). Pemberian Aromateraipi Lavender Terhadap Tingkat Dismenore Primer Pada Remaja Putri Di Smp Negeri Satu Atap 1 Banama Tingang. *Poltek Kemenkes Palangkaraya*, 1–111.

Song, X., Peng, J., Jiang, W., Ye, M., & Jiang, L. (2020). Effects of aromatherapy on sleep disorders: A protocol for systematic review and meta-analysis. *Medicine (United States)*, *100*(17), 1–4. https://doi.org/10.1097/MD.0000000000025727

Ulum, H. M. (2016). Uji Validitas Dan Reliabilitas. *Buku Uji Validitas Dan Uji Reliabilitas*, *7*(1), 67.

Valerie, R., Winaya, I. M. N., & Tianing, N. W. (2024). Hubungan Aromaterapi Frangipani terhadap Peningkatan Kualitas Tidur pada Remaja. *Jurnal Syntax Admiration*, *5*(3), 1008–1015. https://doi.org/10.46799/jsa.v5i3.1079

Wulandari, A., Rahadian, F. A., Ardila, N. H., & Alawiyah, T. (2024). *Aroma (Lavandula Angustifola) Sebagai Media Relaksasi Pada Remaja*. *5*, 1564–1574.