Effect of Lavender (*Lavandula angustifolia*) Aromatherapy among Medical Students with Insomnia

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ABSTRACT

Introduction: The first line of therapy for insomnia disorders is a psychological approach and anti-insomnia drugs. One of the recommended alternative therapies is lavender aromatherapy (*Lavandula angustifolia*). This study aimed to determine the effect of lavender aromatherapy on insomnia among medical students of the Faculty of Medicine and Health Sciences, Universitas Lambung Mangkurat, Banjarmasin, Indonesia. **Methods:** The design was a clinical trial with a one-group pretest-posttest design involving 48 students in October 2023. Subjects were selected by consecutive sampling techniques, and data were collected online by Google Form. The Jakarta biological psychiatry study group questionnaire–insomnia rating scale (KSPBJ-IRS) was used to assess the level of insomnia before and after aromatherapy. Data were analyzed using the Wilcoxon signed-rank statistical test with a 95% confidence level. **Results:** This study showed that before aromatherapy, 50% of subjects experienced mild and severe insomnia. After aromatherapy, 39.6% of subjects did not experience insomnia, while 56.2% and 4.2% experienced mild insomnia and severe insomnia, respectively. This relationship was statistically significant (p = 0.0005). **Conclusion:** These results indicate that lavender aromatherapy can significantly improve insomnia.

Keywords: Aromatherapy, insomnia, lavender.

ABSTRAK

Pendahuluan: Terapi lini pertama insomnia adalah terapi psikologis bersama obat anti-insomnia. Salah satu terapi alternatif adalah aromaterapi bunga lavendel (*Lavandula angustifolia*). Tujuan penelitian ini adalah untuk mengetahui pengaruh aromaterapi bunga lavendel terhadap insomnia pada mahasiswa Fakultas Kedokteran dan Ilmu Kesehatan Universitas Lambung Mangkurat, Banjarmasin. **Metode:** Penelitian uji klinis dengan rancangan *one-group pretest-posttest* pada 48 mahasiswa di bulan Oktober 2023. Subjek dipilih menggunakan teknik *consecutive sampling;* data dikumpulkan secara *online* menggunakan Google form. Kuesioner kelompok studi psikiatri biologik Jakarta–*insomnia rating scale* (KSPBJ-IRS) digunakan untuk mengukur tingkat insomnia sebelum dan sesudah penggunaan aromaterapi. Data dianalisis menggunakan uji statistik Wilcoxon signed-rank dengan tingkat kepercayaan 95%. **Hasil**: Penelitian ini menunjukkan bahwa sebelum penggunaan aromaterapi, subjek mengalami insomnia ringan dan berat masing-masing sebanyak 50% subjek. Setelah penggunaan aromaterapi, 39,6% subjek tidak mengalami insomnia, serta 56,2% dan 4,2% subjek masing-masing mengalami insomnia ringan dan berat. Hubungan ini bermakna p = 0,0005. **Simpulan:** Penelitian ini menunjukkan aromaterapi lavendel dapat memperbaiki gangguan insomnia. **Mohammad Bakhriansyah, Nabilla Rizky, Sherly Limantara. Efek Aromaterapi Lavendel (*Lavandula angustifolia*) pada Insomnia di Kalangan Mahasiswa Kedokteran.**

Kata Kunci: Aromaterapi, insomnia, lavendel.

INTRODUCTION

Insomnia is a common disorder that affects a person's quality of life. People with insomnia usually have difficulty initiating sleep, maintaining sleep, or returning to sleep after waking up.[1,2] This condition can interfere with their daily performance, causing fatigue, drowsiness, mood disorders, memory disorders, and decreased concentration.[3,4]

The prevalence of insomnia worldwide and in Southeast Asia, especially during the COVID-19 pandemic, is approximately 23.50% and 31.18%, respectively.[5] In Indonesia, the prevalence is around 67%: 55.8% mild and 23.3% moderate insomnia.[6,7] Medical students are some of the highest sufferers of insomnia compared to other majors because of many activities on- and off-campus, both studying and organizations. Stressors in medical students are heavier because they participate

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in more activities, ranging from lectures and monthly block exams to the Objective Structured Clinical Examination at the end of the semester. Medical students are also more likely to consume caffeine-containing energy drinks; many studies have found a strong relationship between caffeine and sleep complaints.[8-10] A study on medical students of the Faculty of Medicine of Udayana University showed that among students with insomnia, 40.0% suffered from sub-threshold insomnia, 56.0% suffered from clinically moderate sleep disorders, and 4.0% suffered from clinically severe sleep disorders.[11] Two studies conducted at the Undergraduate Medical Study Program (PSKPS) of the Faculty of Medicine and Health Sciences (FKIK) of Universitas Lambung Mangkurat, Banjarmasin (ULM) showed that 6.48% of male and 20.69% of female students experienced insomnia.[12-13]

The first-line therapy for insomnia is cognitive-behavioral therapy (CBT) combined with short-term pharmacotherapy, such as medication from the benzodiazepine group. This combination of therapies has been proven to be effective,[14] but in long-term use, discontinuation of these drugs can cause side effects such as rebound insomnia, dependence, and withdrawal symptoms that are able to last for months.[15] Lavender contains many chemicals; its two main components are linalool (C10H18O) and linalyl acetate (C12H20O2), which provide a sedative effect. This aromatherapy creates a calm mood and relaxes the body, thus improving sleep quality.[16] Lavender aromatherapy (*Lavandula angustifolia*) is proposed as an alternative therapy with minimal side effects.[17-19]

Several recent clinical trials demonstrated the effectiveness of lavender in improving sleep quality across various groups. Patients who underwent coronary artery bypass surgery showed better sleep quality after inhaling lavender for ten hours.[20] Similarly, adult cancer patients experienced improved sleep compared to a placebo group after receiving lavender aromatherapy for seven days.[21] By the second day of treatment, lavender helped palliative care patients to sleep more deeply, fall asleep faster, and return to sleeping after waking up. It also reduced the frequency of awakenings on the first and second days, overall enhancing sleep quality.[22] Additionally, a study within infants found that lavender aromatherapy massage effectively reduced sleep disturbances, particularly in helping them fall asleep, stay asleep, and transition between sleep and wakefulness.[23]

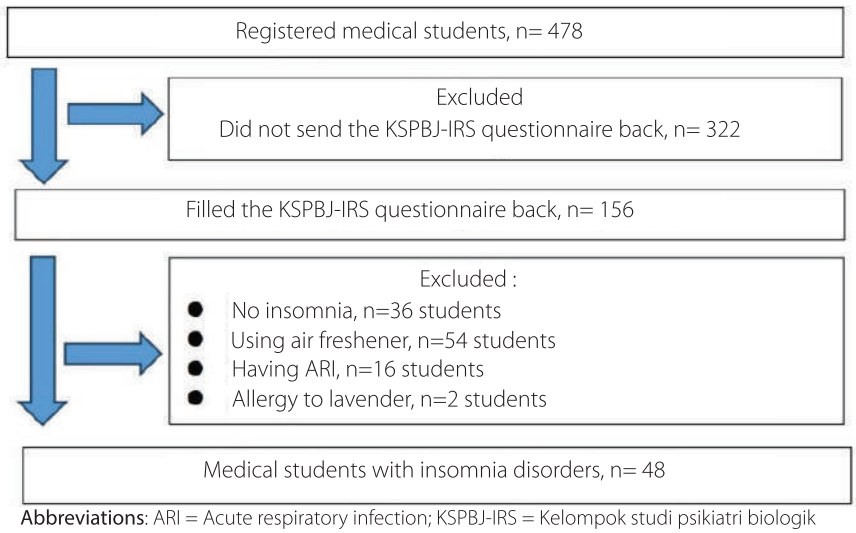
This study aims to determine whether lavender aromatherapy can help improve insomnia among PSKPS FKIK ULM Banjarmasin students.

METHODS

A clinical trial with one group pre- and post-test to determine the level of insomnia disorders before and after lavender aromatherapy was conducted at PSKPS FKIK ULM Banjarmasin in August-October 2023. The Health Research Ethics Committee of FKIK ULM has approved this research protocol with Ethical Eligibility Letter No. 450/KEPK-FK ULM/EC/XI/ 2023 issued on November 15, 2023. The total number of registered PSKPS FKIK ULM students at the time of this study was 478 students. Previous studies showed that insomnia among PSKPS FKIK ULM students was between 6.48% and 20.69%.[12-13] It is estimated that 10-67 PSKPS FK ULM students are experiencing insomnia. Sample size calculation by using the Slovin formula indicated that the minimum number of samples needed for this study was 44 students. To anticipate lost to follow-up samples, the number of samples was increased by 10%. Hence, the minimum number of samples needed was 48 students.

Samples were selected from subjects with the inclusion criteria: active students at PSKPS FKIK ULM at the time of the study, willing to participate by signing an informed consent, and having either mild, severe, or very severe insomnia according to the Jakarta biological psychiatry study group–insomnia rating scale (KSPBJ-IRS) questionnaire.[7] Insomnia is a sleep disorder. Sufferers have complaints of either difficulty starting to sleep, difficulty maintaining sleep, difficulty going back to sleep, and/or difficulty waking up early in the morning. Sufferers might also feel tired, lack concentration, and sleepy during the day. Samples were selected by the consecutive sampling technique. Subjects who were experiencing acute respiratory tract infection (ARI), allergic to lavender, and using fragrances in their bedrooms were excluded. The KSPBJ-IRS is a questionnaire used to detect insomnia disorders, including their level of severity. This questionnaire consists of 11 questions and uses an ordinal scale. Each answer is scored either 1, 2, 3, or 4. The total number was then categorized as no insomnia (score 11-19), mild insomnia (score 20-27), severe insomnia (score 28-36), and very severe insomnia (score 37-44).[7]

Variables in this study are demographic data (age and gender), semester, caffeine consumption, bedroom environment, familial history of insomnia, and hypnotic drug medication. Age refers to the length of time



Abbreviations: ARI = Acute respiratory infection; KSPBJ-IRS = Kelompok studi psikiatri biologik Jakarta-insomnia rating scale.

Scheme. Flowchart of subject selection.


of a respondent since he/she was born until the day of the study conducted (in years). Gender refers to the classification of human beings based on their reproductive anatomy (defined as either male or female). Semester is an academic term used to indicate the length of a day of the study period. At PSKPS FKIK ULM, one semester lasts around 15-18 weeks. Caffeine consumption refers to the current intake of caffeinated beverages, especially coffee, within the last 7 days prior to the study. It was defined as either often, sometimes, or no. The consumption of ≥2 cups per day and up to 1 cup per day were classified as "often" and "sometimes," respectively. A disturbing bedroom environment is defined as a noisy environment that makes a respondent not able to sleep well. Familial history of insomnia is defined as a history of insomnia in the nuclear or direct family members (i.e., parents and/or sibling). Medication of a hypnotic drug is defined as the use of a hypnotic drug (N05C) at the time of the study based on the Anatomical Therapeutic Chemical (ATC) Classification codes developed by the World Health Organization (WHO).[24] All information was collected through an online self-reported questionnaire.

Table. Baseline characteristics of subjects.

Characteristics	Total (n=48)
Age, Mean Years ± SD	19.87 ± 1.04
17 years, n (%)	1 (2.1)
18 years, n (%)	2 (4.2)
19 years, n (%)	14 (29.2)
20 years, n (%)	19 (39.6)
21 years, n (%)	9 (18.8)
22 years, n (%)	3 (6.3)
Sex, n (%)	
Male	6 (12.5)
Female	42 (87.5)
Semester, n (%)	
3	18 (37.5)
5	16 (33.3)
7	14 (29.2)
Caffeine Consumption, n (%)	
Often (≥2 cups per day),	3 (6.3)
Sometimes (up to 1 cup per day)	27 (56.3)
No	18 (37.5)
Bedroom Environment, n (%)	
Disturbing	9 (18.8)
Non-disturbing	39 (81.3)
Family History of Insomnia, n (%)	
Yes	7 (14.6)
No	41 (85.4)
Hypnotic Drug Use, n (%)	
Yes	0 (0.0)
No	48 (100.0)

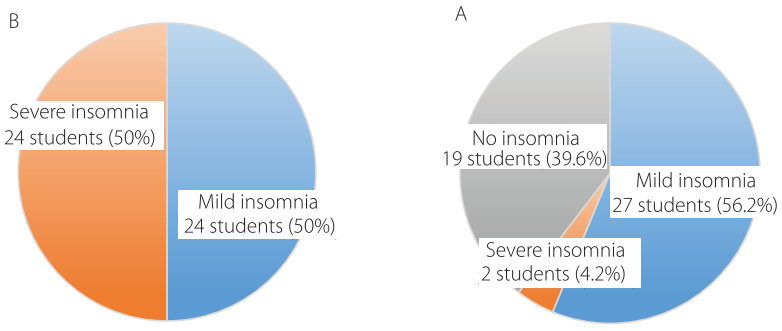


Figure. The comparison of insomnia status in the medical students between (a). Pre-treatment, and (b). Post-treatment with lavender aromatherapy.

Of the 478 registered and active medical students, 156 students responded to the questionnaire. Ninety-eight students were excluded due to no insomnia by 36 students, using air fresheners in the bedroom by 54 students, experiencing ARI by 16 students, and 2 students had a history of allergies to lavender (**Scheme**), leaving 48 students with insomnia, either mild, severe, or very severe, in the study.

Prospective subjects were contacted and met directly to explain the purpose of the research and then asked for their informed consent. After agreement, we then provided a 10 mL bottle containing 100% pure lavender essential oil. Subjects were educated on how to use aromatherapy. Two drops of lavender aromatherapy were applied to cotton and placed under the pillowcase before sleep. Subjects were asked to repeat for a week in a row without any interruption. If the interruption was for only 1 day, the subject continued using aromatherapy, but the interrupted day was not counted as a day of use. If interrupted for 2 days or more, the subject was asked to repeat and begin on the first day.[25] After all treatments with lavender aromatherapy ended (a total of 1 week of treatment), subjects were then asked to fill out the KSPBJ-IRS questionnaire again as an online post-test based on information on signs and symptoms felt by the subjects in the past week. Bivariate analysis was conducted to analyze the effect of lavender aromatherapy on the incidence of insomnia. The significance was statistically tested by the Wilcoxon Signed-Rank Test with a confidence level of 95% (α = 0.05). All statistical analyses were done with the statistical software Statistical Program for Social Science (SPSS) version 26.


RESULTS

The mean age of the subjects in this study was 19.87 years (SD ±1.04). Most subjects were female (87.5%) and in the 3rd semester (37.5%). Most subjects reported consuming up to 1 cup of caffeinated beverage per day (56.3%) within the last 7 days prior to the study and did not have a noisy or disturbing sleeping environment (81.3%). Of all the subjects, 85.4% had no history of insomnia in the family, and none of them used hypnotic drugs (100.0%). Complete data on the characteristics of the research subjects were shown in **Table**.

The level of insomnia of the PSKPS FK ULM students before lavender aromatherapy was in the mild and severe categories (pre-test) by 24 students for each group (50%). No student was in very severe insomnia. After lavender aromatherapy use, 19 students (39.6%) had no insomnia, 27 students (56.2%) had mild insomnia, and the subjects in the severe insomnia category decreased to 2 students (4.2%). Specifically, of 24 students with severe insomnia, 20 students (41.6%) improved to mild insomnia, but 2 students (4.2%) continued to suffer from severe insomnia. Furthermore, 2 students (4.2%) had significant improvement to become insomnia-free after lavender aromatherapy use. Likewise, 17 of 24 students (35.4%) who suffered from mild insomnia did not have insomnia anymore after the treatment, but 7 students (14.6%) still had mild insomnia. The Wilcoxon signed-ranks test showed a p-value <0.0005, indicating that lavender aromatherapy had a significant effect on improving insomnia for medical students. The comparison of insomnia status in the medical students who suffered from insomnia between pre- and post-treatment with lavender aromatherapy is shown in **Figure.**

DISCUSSION

These findings are consistent with previous studies. They demonstrated that lavender aromatherapy had a significant effect on reducing insomnia.[26-27] Lavender aromatherapy contains active metabolites, i.e., linalool and linalyl acetate, which can improve insomnia.[28] Its monoterpene alcohol also reduces anxiety, has a sedative effect, relieves discomfort, supports immune function, lowers blood pressure, and facilitates sleep. The compounds in lavender depend on the environmental conditions where it grows (soil type and humidity) and how it is processed. Lavender essential oil can be extracted by either hydro-distillation or steam distillation.[29] Essential oils consist of more than 300 chemical compounds, with linalool (9.3%-68.8%) as the main ingredient and linalyl acetate (1.2%-59.4%). Each species of lavender has a different composition of essential oil content. The most common species is *L. angustifolia,* with an almost balanced composition of linalool and linalyl acetate.[17-19]

Aromatherapy can be used either by inhalation, massage, or soaking. The inhalation method is more effective than the massage method.[30] The aromatherapy effect of lavender is acquired by inhalation: 2 drops of lavender aromatherapy on cotton and placing it under the pillowcase before going to bed for a week in a row.[25,31] When inhaled, the linalool and linalyl acetate compounds stimulate the olfactory nerve cilia receptors to transmit signals to the olfactory bulb and continue to the limbic system and hypothalamus. In the limbic system, linalool will reduce the release of norepinephrine and nerve excitation stimuli. Linalool also inhibits the release of glutamate and increases serotonin levels, and ultimately creates a relaxing effect. In the hypothalamus, linalool stimulates the release of cortisol-releasing factor (CRF), which in turn stimulates the formation of endorphins, thereby increasing the relaxing effect and resulting in improved sleep quality and a decrease in insomnia levels.[32-34]

This study has several strengths. A pre-test and post-test research design indicates there is a test of the dependent variable before and after the intervention with the independent variable. Hence, data variance is minimal. A pre-test and post-test evaluation also allows direct assessment of the administration of lavender aromatherapy. However, this study has limitations. First, this study involved a limited number of samples due to the low response rate (32.6%), reducing the ability to detect small differences. However, the subjects who sent back the questionnaire and fulfilled the criteria in the study had exceeded the minimum sample size calculation. Second, the questionnaire was filled out subjectively with possible different variable understandings of each subject. Third, the subjects were medical students; there is a possibility of confirmation bias because they might know that lavender aromatherapy is able to affect insomnia. Fourth, the diagnosis of insomnia is not made by a psychiatrist nor psychologist; it is determined based on the KSPBJ-IRS questionnaire. Approximately 14.6% of study subjects had a family history of insomnia, which could increase the possibility that insomnia is related to genetic factors.[35-36]

CONCLUSION

This study shows a significant improvement in insomnia in subjects who received lavender aromatherapy.

CONFLICT OF INTEREST

No conflict of interest declared.

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