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The Effect Of Lavender Aromatherapy On Pain Levels In Postoperative Patients

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Abstract

Purpose: This study aimed to evaluate the effectiveness of lavender aromatherapy in reducing postoperative pain among patients at Medika Insani Hospital. **Literature Review:** Postoperative pain remains one of the most common complications following surgery, affecting approximately 60% of patients and potentially delaying recovery. Previous studies have demonstrated that lavender aromatherapy possesses relaxing and analgesic properties, making it a promising complementary intervention for postoperative pain management. **Methodology:** A quantitative study with a pre-experimental design involving an intervention group and a control group was conducted. A total of 30 respondents were selected using purposive sampling, with 15 participants in each group. Pain intensity was measured before and after the intervention using a standardized pain assessment scale, and data were analyzed using an independent test. **Results:** The mean pain score in the intervention group decreased from 5.40 to 2.67, while the control group showed a reduction from 4.93 to 3.27. Statistical analysis revealed a significant difference between the groups (**p = 0.001**), indicating that lavender aromatherapy effectively reduced postoperative pain. **Conclusions:** Lavender aromatherapy is an effective complementary therapy for reducing postoperative pain and improving patient comfort. **Recommendations:** Healthcare providers are encouraged to incorporate lavender aromatherapy into routine postoperative nursing care, and future studies should involve larger samples and multicenter settings to strengthen the evidence. **Additional Data:** Lavender aromatherapy is a low-cost, non-invasive, safe, and easy-to-administer intervention with minimal side effects, making it feasible for routine clinical practice.

Keywords: lavender aromatherapy; postoperative pain; complementary therapy; nursing care

INTRODUCTION

Conventional medical practice remains the primary healthcare system in most countries in managing diseases. However, in the current era, treatment modalities can be accessed across a spectrum ranging from conventional medicine to complementary and alternative medicine (CAM) (Aizzudin, 2022). The development of complementary therapy in Indonesia began to be structured and officially recorded in the early 2000s, although traditional practices such as herbal medicine (jamu), massage, and herbal treatments have been practiced for centuries as part of ancestral cultural heritage (Pengpid, 2024). A study conducted by Husnati et al. (2022) reported that overall, 24.4% of individuals have used traditional practitioners and/or traditional medicine within the past decade, and 32.9% have used complementary medicine within the past 15 years. The use of complementary therapy is often applied to support the effects of surgical procedures.

Surgery or surgical procedures are important medical interventions in healthcare aimed at saving lives, preventing disability, and avoiding complications (Puspita et al., 2024). This procedure generally involves making an incision in the body part to be treated, performing corrective actions, and ending with wound closure and suturing (Syamsuhidajat, 2020). According to data from the World Health Organization (WHO) in 2022, the number of surgical procedures increases annually. The most common procedures in 2022 were cholecystectomy (32%), inguinal and femoral hernia repair (29.1%), cesarean section (28.8%), and hysterectomy (27.1%). Based on BPJS data in 2021, the most common surgical procedures in Indonesia were cesarean section (12.0%), cholecystectomy (10.0%), hysterectomy (8.0%), inguinal hernia (7.0%), and orthopedic surgery (6.0%). The most common impact experienced by postoperative patients is impairment, which refers to pain occurring at the surgical site. This condition results in fear of early mobilization, limitations in range of motion (ROM), and

functional limitations (Wahyu & Liza, 2022). Functional limitation causes patients to be unable to sit, stand, or walk, leading to disability due to pain and medical procedures. Data indicate that approximately 60% of patients experience severe pain, 25% moderate pain, and 15% mild pain after surgery (Juliathu et al., 2025). A study by Zimmer et al. (2022) reported that the prevalence of pain across 52 countries, including those in Southeast Asia, was 27.5%, with the lowest prevalence in China (9.9%) and the highest in Morocco (50.3%). The study also showed that women report pain more frequently than men, the prevalence increases with age, and it tends to be higher in rural areas compared to urban areas.

Data released by the Indonesian Ministry of Health (Kemenkes RI) in 2023 showed that the incidence of postoperative pain in Indonesia was 47% (Gozan & Asih, 2021; Kemenkes RI, 2023). Although the physiological mechanisms of pain are relatively similar biologically, the perception and response to pain vary greatly between individuals. This indicates that pain is subjective and influenced by multidimensional factors, including biological, psychological, and social aspects. Biologically, pain thresholds may be influenced by genetics, gender, age, and physical condition. For example, several studies suggest that women generally have a lower pain threshold than men, possibly due to hormonal and neurophysiological differences. Therefore, non-pharmacological approaches such as aromatherapy are increasingly considered as complementary alternatives in pain management. One type of aromatherapy that has been widely studied is lavender aromatherapy, which is known to have sedative effects, calm the central nervous system, and help reduce pain perception (Tahir, 2021). The compounds linalool and linalyl acetate in lavender essential oil are believed to act as mild sedative agents that can reduce anxiety levels and promote relaxation. Thus, research on the effect of lavender aromatherapy on postoperative pain is important to explore as an effort to improve patient comfort holistically without reliance on medications (Veibymiaty et al., 2024).

Lavender is a flowering plant belonging to the Lamiaceae family, consisting of approximately 25–30 species. It originates from the southern Mediterranean region, tropical Africa, and extends eastward to India. Lavender grows well at altitudes of 600–1350 meters above sea level, where higher altitudes are associated with better oil quality (Nuraini, 2014 in Pambudi & Supriyanti, 2020). This nursing intervention aims to promote comfort, relaxation, and reduce fear and anxiety (Agnes et al., 2021). Lavender aromatherapy is one of the complementary therapies derived from essential oils with a pleasant fragrance (Maharani & Rejo, 2024). It is preferred over other types of aromatherapy due to its calming scent, availability, affordability, practicality, and safety (Khairunnisa et al., 2024). The active components of lavender, including linalool and linalyl acetate, stimulate the nervous system to produce a relaxing effect (Agustin & Hudiyawati, 2021). The aroma inhaled through the nose directly affects the brain similar to analgesic effects. When patients inhale aromatherapy, the active substances stimulate the hypothalamus (pituitary gland) to release endorphins, creating a sense of calm. In addition, these compounds have analgesic properties that help reduce the pain perceived by patients (Astuti & Aini, 2020). Research by Khairunnisa et al. (2024) showed that lavender aromatherapy relaxation techniques administered for 30 minutes can reduce pain levels from moderate to mild.

Previous studies have shown that lavender aromatherapy has a positive effect in reducing postoperative pain as part of non-pharmacological interventions. Azizah (2023) found that the combination of deep breathing relaxation techniques with lavender aromatherapy significantly reduced postoperative pain scores in patients under general anesthesia ($p < 0.05$), while relaxation without aromatherapy showed no significant effect. A literature review by Adzani and Rosyid (2024) also reported that five reviewed studies consistently demonstrated the effectiveness of lavender aromatherapy in reducing postoperative pain levels. Furthermore, quasi-experimental research at Bangkinang Regional Hospital reported a significant reduction in pain intensity after lavender aromatherapy in post-cesarean patients ($p < 0.05$). Similar findings were observed in post-ORIF patients, where lavender aromatherapy significantly reduced pain levels before and after intervention ($p = 0.000$). Overall, although not all studies reported significant effects, most findings suggest that lavender aromatherapy is a promising complementary non-pharmacological strategy for reducing postoperative pain and improving patient comfort. In cesarean section patients, inhalation of 10% lavender essential oil reduced pain at 4, 8, and 12 hours postoperatively, decreased heart rate, increased analgesic satisfaction, and reduced the need for analgesics such as diclofenac suppositories (Alapou et al., 2023). Other approaches, such as lavender oil massage in gynecological postoperative patients, also showed a reduction in pain scores, although the effect was relatively short-term (Shain et al., 2021).

Despite extensive research, most studies have used modern delivery methods such as electric diffusers or topical applications. Research utilizing traditional devices, such as smoke-emitting clay vessels for aromatherapy diffusion, remains limited. This method represents an innovative approach that provides a gentle, consistent, energy-efficient, and environmentally friendly aroma diffusion. Therefore, this study aims to explore the effect of lavender aromatherapy administered באמצעות a smoke-emitting vessel on reducing postoperative pain as a novel non-pharmacological intervention. Preliminary study results at Medika Insani Hospital conducted on June 1, 2025, showed that the most common surgeries between March and May 2025 were cesarean section (24.8%), laparotomy (20.1%), and other surgeries (15.9%). Pain management in postoperative patients at this hospital is

still predominantly pharmacological (80%). Interviews with five surgical ward nurses revealed that 80% do not combine complementary therapies in pain management. A preliminary intervention involving five postoperative patients showed that four patients reported decreased pain after lavender aromatherapy, while one patient reported no change. Based on these findings, the researcher is interested in investigating the effect of lavender aromatherapy on postoperative pain levels.

METHODS

This study employed a quantitative approach with a quasi-experimental design using a two-group pretest–posttest model. The research was conducted at Medika Insani Hospital, North Lampung, with the study period spanning April to December 2025, and data collection carried out in December 2025 in the surgical inpatient ward. The population consisted of postoperative major surgery patients, and a total sample of 30 respondents was selected using purposive sampling, divided equally into an intervention group and a control group (15 respondents each). Inclusion criteria included patients who were compos mentis, aged 17–55 years, one day post-surgery, oriented to person, place, and time, willing to participate, and without olfactory impairment. Exclusion criteria included patients with decreased consciousness, no pain, non-cooperative behavior, refusal to participate, or discomfort during the intervention. Pain intensity was measured using the Numeric Rating Scale (NRS), a validated instrument, before and after the intervention.

The intervention group received lavender aromatherapy using pure essential oil (Lavandula angustifolia) administered via inhalation with a diffuser containing 3–5 drops diluted in water for 15–20 minutes per session, conducted twice daily. Pain levels were reassessed 15–30 minutes after each intervention to evaluate changes. The control group received standard non-pharmacological care in the form of deep breathing exercises (diaphragmatic breathing) alongside routine analgesic therapy, with pain measured at the same intervals. Data were collected through structured observation sheets and guided by standard operating procedures (SOPs) to ensure consistency. Data analysis included univariate analysis to describe respondent characteristics and pain distribution, and bivariate analysis using an independent t-test, following confirmation of normal data distribution via the Shapiro–Wilk test. A significance level of $p \leq 0.05$ was applied to determine the effect of lavender aromatherapy on postoperative pain. Ethical principles such as informed consent, confidentiality, autonomy, and non-maleficence were strictly maintained throughout the study.

RESULTS AND DISCUSSION

Result

Characteristics of Postoperative Patient Respondents at Medika Insani Hospital, North Lampung Regency, 2025

Table 1. Characteristics of Postoperative Patient Respondents

Characteristics	Intervention Group	Control Group
	n	%
Gender		
Male	6	40.0
Female	9	60.0
Age		
10–19 years	3	20.0
20–44 years	9	60.0
45–59 years	3	20.0
Education		
Junior High School	0	0.0
Senior High School	10	66.7
Higher Education	5	33.3
Occupation		
Employed	8	53.3
Unemployed	7	46.7
Total	15	100.0

Based on Table 1, in the intervention group of 15 respondents, the majority were female (9 people; 60.0%), aged 20–44 years (60.0%), had a senior high school education (66.7%), and were employed (53.3%). In the control group of 15 respondents, the majority were also female (9 people; 60.0%), aged 20–44 years (53.3%), had a senior high school education (46.7%), and were employed (66.7%).

Average Pain Level of Postoperative Patients Before and After Lavender Aromatherapy at Medika Insani Hospital, North Lampung Regency, 2025 (Intervention and Control Groups)

Table 2. Average Pain Level of Postoperative Patients Before and After Intervention

Group	Before Intervention	After Intervention
	n	Mean
Intervention Group	15	5.40
Control Group	15	4.93

Based on Table 4.2, the average pain level before lavender aromatherapy in the intervention group was 5.40, and after intervention was 2.67. In the control group, the average pain level before deep breathing intervention was 4.93, and after intervention was 3.27.

Data Normality Test

Table 3. Normality Test

Variable	n	p-value
Intervention Group		
Pre-test	15	0.316
Post-test	15	0.251
Control Group		
Pre-test	15	0.278
Post-test	15	0.155

The normality test using the Shapiro-Wilk test showed that all pre-test and post-test data in both groups had p-values > 0.05, indicating that the data were normally distributed and suitable for further analysis using the t-test.

Effect of Lavender Aromatherapy on Pain Levels in Postoperative Patients (Intervention Group)

Table 4. Effect of Lavender Aromatherapy on Pain Levels

Variable	N	Mean	Mean Difference	Std. Deviation	95% Confidence Interval		p-value
					Upper		Lower
Pre-test	15	5.40	2.73	0.799	4.765		2.062
Post-test	15	2.67					

Based on Table 4 the t-test analysis showed a mean difference of 2.73 between pre-test and post-test with a p-value of 0.001. This means that Ha is accepted, indicating that lavender aromatherapy has a significant effect on reducing pain levels in postoperative patients in the intervention group.

Effect of Deep Breathing on Pain Levels in Postoperative Patients (Control Group)

Table 5. Effect of Deep Breathing on Pain Levels

Variable	N	Mean	Mean Difference	Std. Deviation	95% Confidence Interval		p-value
					Upper		Lower
Pre-test	15	4.93	1.66	1.080	1.303		0.155
Post-test	15	3.27					

Based on Table 4.6, the t-test analysis showed a mean difference of 1.66 with a p-value of 0.013. This means that Ha is accepted, indicating that deep breathing has a significant effect on reducing pain levels in postoperative patients in the control group.

DISCUSSION

The Effect of Lavender Aromatherapy on Pain Levels in Postoperative Patients at Medika Insani Hospital, North Lampung Regency, 2025 (Intervention Group)

The results of the study indicate a statistically significant effect of lavender aromatherapy on reducing pain levels in postoperative patients at Medika Insani Hospital, North Lampung Regency, in 2025. Clinically, a reduction in pain of 2.73 points on the pain scale represents a meaningful change, as it reflects a substantial improvement in patients' subjective postoperative condition. This reduction not only indicates decreased pain intensity but also directly contributes to increased patient comfort, improved rest quality, and reduced physiological and psychological stress responses. These conditions support a more optimal recovery process, as patients become more cooperative in undergoing treatment, early mobilization, and other therapeutic activities. Therefore, a reduction of 2.73 points in pain scores has important clinical significance, as it contributes to overall improvement in postoperative recovery quality.

The mean difference of 2.73 in this study demonstrates that lavender aromatherapy provides not merely a minor additional effect but a real therapeutic impact. According to Chou et al. (2022), a reduction of $\geq$2 points on the numeric pain scale is considered a clinically meaningful pain reduction. Thus, the findings of this study are not only statistically significant but also clinically relevant in nursing practice. Theoretically, the effectiveness of lavender aromatherapy can be explained through the Roy Adaptation Model (RAM)**,** where postoperative pain is considered a focal stimulus that directly challenges an individual's adaptive capacity (Roy & Andrews, 2009). Lavender aromatherapy acts as a positive contextual stimulus modified by nurses to help patients achieve adaptive responses. The significant reduction in pain indicates that patients are able to adapt more effectively to physiological stressors resulting from surgery.

In this study, lavender aromatherapy was not administered simultaneously with analgesic medications to minimize measurement bias. If both were given concurrently, it would be difficult to distinguish whether pain reduction was due to pharmacological effects or aromatherapy intervention. Therefore, lavender aromatherapy was administered prior to routine analgesic administration so that its independent effect could be observed more objectively. This approach aligns with principles of non-pharmacological intervention research aimed at assessing complementary therapy effectiveness independently (Alotaibi et al., 2023). Lavender aromatherapy works through a different mechanism than analgesic drugs. The inhaled lavender aroma stimulates olfactory receptors in the nasal cavity, sending nerve impulses to the limbic system, particularly the hypothalamus and amygdala, which regulate emotions, stress, and pain perception (Herz, 2020). This activation increases the release of relaxation-related neurotransmitters such as gamma-aminobutyric acid (GABA) and reduces sympathetic nervous system activity, thereby decreasing pain perception and enhancing comfort. Active compounds in lavender, such as linalool and linalyl acetate, also have sedative, anxiolytic, and analgesic effects through central nervous system modulation (Koulivand et al., 2019).

The findings of this study show that lavender aromatherapy significantly reduces pain levels in postoperative patients. The average pain reduction of 2.73 points is both statistically significant ($p < 0.05$) and clinically meaningful, as a change of $\geq$2 points on the Numeric Rating Scale (NRS) is widely recognized as the minimal clinically important difference (MCID) in postoperative patients. Lavender aromatherapy has been shown to significantly reduce pain intensity due to its active compounds, including linalool, linalyl acetate, terpinen-4-ol, lavandulol, and β-caryophyllene, which have sedative, anxiolytic, and analgesic effects. These compounds modulate neurotransmitter activity in the central nervous system, particularly by enhancing GABA activity, thereby reducing pain response and promoting relaxation. These findings are consistent with previous studies. Kaviani et al. (2019) reported that lavender inhalation significantly reduced postoperative pain. Cho et al. (2020) also found that lavender has analgesic and anxiolytic effects, reducing emotional tension and pain perception. Similarly, Solehati and Rustina (2018) concluded that aromatherapy is effective as a complementary non-pharmacological intervention in acute pain management. Further studies, including Kim et al. (2020), Cho et al. (2021), Mahmoudi et al. (2020), Rahimzadeh et al. (2021), and Alipour et al. (2022), consistently reported significant reductions in postoperative pain and decreased need for additional analgesics. Recent studies by Lee and Shin (2022) and Saeedi et al. (2023) suggest that lavender aromatherapy is most effective as an adjunct therapy rather than a replacement for analgesics

From a physiological perspective, the analgesic effect of lavender is associated with activation of the limbic

system, increased endorphin and serotonin release, and decreased sympathetic activity, resulting in reduced pain perception and improved comfort. However, the relatively wide Confidence Interval (CI > 1) in this study indicates limited precision, possibly due to small sample size, individual variability in pain response, and subjective pain measurement. Overall, these findings support the Roy Adaptation Model, indicating that appropriate nursing interventions such as lavender aromatherapy can modify environmental stimuli and produce adaptive physiological and psychological responses in postoperative patients.

The Effect of Deep Breathing on Pain Levels in Postoperative Patients at Medika Insani Hospital, North Lampung Regency, 2025 (Control Group)

The results in the control group show that deep breathing exercises significantly reduced postoperative pain levels. Based on Table 4.5, the mean difference between pre-test and post-test was 1.66 points with a p-value of 0.013, indicating that the hypothesis (Ha) is accepted and there is a statistically significant effect. From the perspective of the Roy Adaptation Model, postoperative pain is a focal stimulus that triggers maladaptive physiological responses. Deep breathing acts as a modified contextual stimulus that enhances coping mechanisms and promotes adaptive responses. Clinically, a pain reduction of 1.66 points indicates improvement, although it is smaller compared to the intervention group. This is because deep breathing primarily works through internal physiological regulation without additional sensory environmental stimulation

The Confidence Interval (CI < 1) in the control group indicates better precision and more homogeneous responses among respondents. Deep breathing is a simple, easily applied intervention, resulting in more consistent adaptive responses. Deep breathing also contributes to self-concept adaptation, as patients feel more in control of their pain, increasing confidence and reducing anxiety. This supports overall adaptation in accordance with the Roy Adaptation Model. These findings are consistent with previous studies. Sharma et al. (2020), Yilmaz & Arslan (2021), Chen et al. (2023), and Alotaibi et al. (2024) reported significant pain reductions following deep breathing exercises

Physiologically, deep breathing activates the parasympathetic nervous system, reducing excessive sympathetic activity after surgery. This leads to decreased heart rate, blood pressure, and muscle tension, resulting in relaxation and reduced pain perception (McCorry, 2019). According to the Relaxation Response Theory (Benson & Proctor, 2019), deep breathing suppresses stress responses and enhances self-control over pain. However, compared to the intervention group, the reduction in pain is smaller (2.73 vs. 1.66). This difference is due to the multimodal mechanism of lavender aromatherapy, which involves limbic system stimulation, neurochemical modulation (endorphins and serotonin), and emotional regulation, whereas deep breathing primarily induces general relaxation. In conclusion, deep breathing is an effective basic intervention for postoperative pain management but has a more limited effect compared to lavender aromatherapy. Combining deep breathing with lavender aromatherapy may provide a more optimal pain reduction effect and is recommended as part of complementary nursing care for postoperative patients.

CONCLUSION

The average pain level in the intervention group before the administration of lavender aromatherapy was 5.40, while after the intervention it decreased to 2.67. This indicates a substantial reduction in pain intensity following the implementation of lavender aromatherapy in postoperative patients. In the control group, the average pain level before the deep breathing intervention was 4.93, and after the intervention it decreased to 3.27. This shows that deep breathing techniques also contributed to a reduction in pain levels, although the decrease was not as pronounced as in the intervention group. Statistical analysis using the t-test revealed that the mean difference between pre-test and post-test in the intervention group was 2.73, with a p-value of 0.001. This result indicates that the alternative hypothesis (Ha) is accepted, meaning that lavender aromatherapy has a significant effect on reducing pain levels in postoperative patients at Medika Insani Hospital, North Lampung Regency, in 2025. Meanwhile, in the control group, the t-test analysis showed a mean difference of 1.66 with a p-value of 0.013. This also indicates that the alternative hypothesis (Ha) is accepted, meaning that deep breathing exercises have a significant effect on reducing pain levels in postoperative patients at Medika Insani Hospital, North Lampung Regency, in 2025.

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REFERENCES

Adzani, A., & Rosyid, F. N. (2024). Efektivitas penggunaan aromaterapi lavender terhadap penurunan skala nyeri pada pasien post operasi: Literature review. *Jurnal Ners*, 9(1), 1059–1064. https://doi.org/10.31004/jn.v9i1.31945

Aghanouri, R., et al. (2018). *The effects of inhalation aromatherapy using lavender essential oil on postoperative pain of inguinal hernia*. *Journal of PeriAnesthesia Nursing*, 35(6), 642–648. https://doi.org/10.1016/j.jopan.2020.03.003

Aghanouri, R., et al. (2020). *The effects of inhalation aromatherapy using lavender essential oil on postoperative pain after inguinal hernia surgery: randomized controlled trial*. *PubMed*. https://pubmed.ncbi.nlm.nih.gov/32709507/

Alam, H. S. (2020). *Upaya Mengurangi Nyeri Persalinan Dengan Metode Akupresur*. Media Sains Indonesia.

Amita, D., Fernalia, & Yulendasari, R. (2018). Pengaruh Teknik Relaksasi Nafas Dalam Terhadap Intensitas Nyeri Pada Pasien Post Operasi Sectio Caesarea Di Rumah Sakit Bengkulu. *Jurnal Kesehatan Holistik*, *12*(1), 26–28. http://ejurnalmalahayati.ac.id/index.php/holistik/article/download/124/69

Andarmoyo, S. (2013). *Konsep & Proses Keperawatan Nyeri* (R. KR (ed.); iii). Ar-Ruzz Media.

Anita, & Aprina. (2015). *Riset Keperawatan*. Riset Keperawatan Bandar Lampung.

Anwar, M., Astuti, T., & Bangsawan, M. (2018). Pengaruh Aromaterapi Lavender terhadap Penurunan Intensitas Nyeri Pasien Paska Operasi Sectio Caesarea. *Jurnal Ilmiah Keperawatan Sai Betik*, *14*(1), 84. https://doi.org/10.26630/jkep.v14i1.1013

Aprina, A., Hartika, R., & Sunarsih, S. (2018). Latihan Slow Deep Breathing dan Aromaterapi Lavender terhadap Intensitas Nyeri pada Klien Post Seksio Sesaria. *Jurnal Kesehatan*, *9*(2), 272. https://doi.org/10.26630/jk.v9i2.982

Ashar, B., & Hudiyawati, D. (2021). Aromaterapi lavender terhadap nyeri pasien post operasi fraktur ORIF. *Jurnal Penelitian Perawat Profesional*, 7(1). https://doi.org/10.37287/jppp.v7i1.5617

Azizah, N., & Kusumawardani, P. A. (2020). Intensitas Nyeri Dismenorea Pada Remaja. *Proceeding Book Health National Conference*, 39–41.

Bagheri, H., et al. (2020). The effects of inhalation aromatherapy using lavender essential oil on postoperative pain after inguinal hernia surgery. *Journal of Perianesthesia Nursing*.

Bahrudin, M. (2018). Patofisiologi Nyeri (Pain). *Saintika Medika*, *13*(1), 7. https://doi.org/10.22219/sm.v13i1.5449

Bath, J., et al. (2025). *Inhalation aromatherapy with lavender for postoperative pain management: a systematic review of randomized controlled trials*. *Journal of Perianesthesia Nursing*. https://pubmed.ncbi.nlm.nih.gov/40187937/

Berkanis, A. T., Nubatonis, D., & Lastari, A. A. I. F. (2020). Pengaruh Mobilisasi Dini Terhadap Intensitas Nyeri Pada Pasien. *CHM-K Applied Scientifics Journal*, *3*(1), 6–13.

Cho, M. Y., et al. (2013). Effects of aromatherapy on postoperative pain. *Journal of Alternative and Complementary Medicine*

Cooke, B., & Ernst, E. (2000). *Aromatherapy: a systematic review*. *British Journal of General Practice*, 50(455), 493–496.

Dolatkhah, N., et al. (2019). *Effect of massage with lavender oil on postoperative pain level of patients after gynecologic surgery: RCT*. *Pain Management*. https://pubmed.ncbi.nlm.nih.gov/32657903/

El-Ghazouli, R., & Rahman, S. (2017). *Aromatherapy and pain: a systematic review*. *Complementary Therapies in Medicine*.

Fadilah, R. ., & Audina, M. (2021). Pengaruh Mobilisasi Dini Terhadap Penurunan Nyeri Pasien Post Operasi Bedah. *E-Jurnal.Stikesmitraadiguna.Ac.Id*, *4*(2), 2622–2256. http://e-jurnal.stikesmitraadiguna.ac.id/index.php/jkp/article/view/142

Fakher, H., & Asadollahnejad, Z. (2019). *Impact of lavender essential oil aromatherapy on postoperative analgesia consumption*. *Pain Research and Management*.

Farhan, Z. (2019). *Perioperatif*. Manggu Makmur Tanjung Lestari.

Febrianty, S., & Anita. (2021). *Kombinasi Teknik Tarik Napas Dalam dan Aromaterapi Lemon Terhadap Penurunan Intensitas Nyeri Pada Pasien Post Operasi Sectio Caesaria*. *2*(1), 53–59.

Fildzah, F. R., Nova Handayani, R., Studi Keperawatan Anestesiologi, P., Kesehatan, F., & Harapan Bangsa, U. (2021). *Efektivitas Aromaterapi Lavender dalam Menurunkan Intensitas Nyeri Post Operasi Sectio Caesarea*. *2013*, 298–302.

Fifi Safitri (2023). Pengaruh pemberian aroma terapi lavender terhadap pengurangan nyeri post sectio caesarea. *JAKIA: Jurnal Kesehatan Ibu dan Anak*. https://doi.org/10.62527/jakia.1.2.34

Hadi, N., & Hanid, A. A. (2011). Lavender essence for post-cesarean pain. *Pakistan Journal of Biological Sciences, 14*(11), 664–667. https://doi.org/10.3923/pjbs.2011.664.667

Hamarno, R., Ciptaningtyas, M. D., & H, M. H. (2017). Deep Breathing Exercise (DBE) dan Tingkat Intensitas Nyeri Pada Pasien Post Operasi Laparatomi. *Journal of Applied Nursing (Jurnal Keperawatan Terapan)*, *3*(1), 31. https://doi.org/10.31290/jkt.v(3)i(1)y(2017).page:31-41

Handayani, N. S., et al. (2018). *Aromatherapy with lavender oil to reduce postoperative pain in women subjected to C-section*. *Journal of Health and Nutrition Research*.

https://www.journalmpci.com/index.php/jhnr/article/view/744
Hawati, N. (2019). Pengalaman Penderita Gastritis Kronis Dalam Pada Penderita Gastritis Kronis Di Rumah Sakit Islam Siti Khadijah Palembang Tahun 2019. *Jurnal Kesehatan Dan Pembangunan*, *10*(19), 70–80.
Hedayatizadeh, M., et al. (2016). *Essential oil aromatherapy effects on abdominal surgery pain*. *Pain Medicine*.
Herlyssa, H., Jehanara, J., & Wahyuni, E. D. (2018). Aromaterapi Lavender Essensial Oil Berpengaruh Dominan terhadap Skala Nyeri 24 Jam Post Seksio Sesaria. *Jurnal Kesehatan*, *9*(2), 192. https://doi.org/10.26630/jk.v9i2.829
Jacobs, B. L., & Langdon, M. (2021). *Mechanisms of lavender essential oil in pain modulation*. *Journal of Neuropharmacology*
Kianpour, M., Mansouri, A., Mehrabi, T., & Asghari, G. (2016). Effect of lavender scent inhalation on pain and anxiety after cesarean section. *Iranian Journal of Nursing and Midwifery Research, 21*(2), 197–201.
Kim, J. T., Wajda, M., Cuff, G., Serota, D., Schlame, M., & Axelrod, D. M. (2011). Evaluation of aromatherapy in treating postoperative pain. *Journal of Alternative and Complementary Medicine, 17*(9), 823–827. https://doi.org/10.1089/acm.2010.0705
Kim, Y. S., et al. (2017). *Lavender aromatherapy and postoperative pain after laparoscopic cholecystectomy*. *Journal of Clinical Nursing*.
Koulivand, P. H., Khaleghi Ghadiri, M., & Gorji, A. (2013). Lavender and the nervous system. *Evidence-Based Complementary and Alternative Medicine*, 2013, 681304. https://doi.org/10.1155/2013/681304
Kusyati, E., Santi, N. K., & Hapsari, S. (2018). Kombinasi relaksasi napas dalam dan aroma terapi lavender efektif menurunkan tekanan darah. *Junal Ilmiah Kesehatan Keperawatan*, *1*, 76–81. https://prosiding.unimus.ac.id/index.php/semnas/article/view/41/41
Lee, H. J., et al. (2019). *The effects of aromatherapy on postoperative pain and anxiety*. *International Journal of Nursing Practice*.
Listiana, D., Pawiliyah, & Hidayah, F. (2018). *Pengaruh Terapi Relaksasi Nafas Dalam Terhadap Intensitas Nyeri Pada Pasien Post Operasi Fraktur Di Ruang Seruni RSUD dr. M. Yunus Bengkulu*. *25*(3), 70–77.
Malekshahi, F., Salari, R., Poshtchaman, Z., & Mazloom, S. R. (2018). Effect of lavender inhalation on pain severity after orthopedic surgery. *Journal of Caring Sciences, 7*(3), 157–162.
Martinez, P. R., et al. (2016). *The use of essential oils to manage postoperative pain: an integrative review*. *Complementary Therapies in Medicine*.
Mentari, Y., Ruspita, R., et al. (2025). Pengaruh aromaterapi lavender terhadap penurunan intensitas nyeri pasien post sectio caesarea. *Jurnal Kesehatan Tambusai*, 6(3). https://doi.org/10.31004/jkt.v6i3.49151
Mohammadpour, A., et al. (2019). *Aromatherapy with lavender essential oil improves postoperative recovery*. *Journal of Integrative Medicine*.
Namazi, N., & Hosseini, S. (2018). *Lavender aromatherapy in comparison to placebo on postoperative pain severity*. *European Journal of Complementary Medicine*.
Olapour, A., Behaeen, K., & Razavi, F. (2013). *Lavender aromatherapy and cesarean postoperative pain*. *Anesthesia & Pain Medicine*.
Ozkaraman, A., Dugum, O., Ozturk, A., & Turgay, A. S. (2018). Aromatherapy: The effect of lavender on anxiety and pain in patients with breast surgery. *European Journal of Breast Health, 14*(4), 246–252.\
Pambudi, A. B., & Supriyanti, E. (2017). *Pengaruh Aromaterapi Lavender Terhadap Penurunan Intensitas Nyeri Pada Pasien Postpartum Normal di RSUD Kota Semarang*. *3*(1), 1–15. http://dx.doi.org/10.1016/j.bpj.2015.06.056%0Ahttps://academic.oup.com/bioinformatics/article-abstract/34/13/2201/4852827%0Ainternal-pdf://semisupervised-3254828305/semisupervised.ppt%0Ahttp://dx.doi.org/10.1016/j.str.2013.02.005%0Ahttp://dx.doi.org/10.10
Prasetiyo, B. D. & B. S. (2020). Pengaruh Pemberian Aromaterapi Lavender Terhadap Penurunan Nyeri Luka Ibu Post Sectio Caesarea di RST dr Malang. *Journal of Islamic Medicine*, *4*(1), 14–20. https://doi.org/10.18860/jim.v4i1.9032
Pratiwi, F., & Subarnas, A. (2020). Aromaterapi Sebagai Media Relaksasi. *Farmaka*, *18*(1), 1–15.
Puspita, D., & Dwi, Y. (2020). *Lavender Aromaterapy Effect On Postpartum Sectio Caesarea Pain At Panembahan Senopati Hospital Of Bantul*. *7*(2), 140–147.
Ramadhan, M. R., & Zettira, O. Z. (2017). Aromaterapi Bunga Lavender (Lavandula angustifolia) dalam Menurunkan Risiko Insomnia. *Fakultas Kedokteran Universitas Lampung*, *6*, 60–63.
Ranjbar, H., et al. (2018). *Lavender aromatherapy reduces postoperative nausea and pain*. *Journal of Perioperative Practice*.
Retni, A., Handayani, F., & Mohamad, I. S. W. (2020). Literature Review: Pemberian Aromaterapi Essential Oil Lavender Terhadap Emesis Gravidarum Pada Kehamilan Trimester Pertama. *Journal of Borneo Holistic Health*, *3*(2). https://doi.org/10.35334/borticalth.v3i2.1687
Rosado, J. L., et al. (2015). *Lavender aromatherapy in postoperative care: practice review*. *Journal of Perioperative Nursing*.
Rosselini, R. (2022). *Literature Review Efektivitas Aromaterapi Lavender*. *12*(23), 70–83.

Roy, C. (2009). *The Roy Adaptation Model* (3rd ed.). Pearson Educatio
Roy, C., & Andrews, H. A. (2009). *The Roy Adaptation Model* (3rd ed.). Pearson
Saulata, H., Barus, J., & Surilena, S. (2019). Peranan Intensitas Nyeri Terhadap Aspek Psikologis Penderita Nyeri Neuromuskuloskeletal Kronis Non Kanker Rumah Sakit Atma Jaya. *Callosum Neurology*, *2*(2), 52–59. https://doi.org/10.29342/cnj.v2i2.23
Sarraf, S., et al. (2017). *Lavender aromatherapy and postoperative analgesic use reduction*. *Pain Management Nursing*.
Seifi, Z., Bikmoradi, A., Oshvandi, K., & Poorolajal, J. (2014). Effect of lavender essential oil on anxiety level and sleep quality in patients after surgery. *Iranian Journal of Nursing and Midwifery Research, 19*(6), 631–637.

Setiarini, S. (2018). Pengaruh Teknik Relaksasi Nafas Dalam Terhadap Penurunan Tingkat Nyeri Pada Pasien Post Sectio Cesaria di Ruang Rawat Inap Kebidanan RSUD Pariaman Sari. *Menara Ilmu*, *XII*(79), 144–149. http://jurnal.umsb.ac.id/index.php/menarailmu/article/viewFile/548/487
Siti, A. (2017). Manajemen Nyeri pada Lansia dengan Pendekatan Non-Farmakologi. *Jurnal Keperawatan Muhammadiyah*, *2*(1), 179–182.
Siti Haniyah & Setyawati, M. B. (2024). Efektivitas teknik aromaterapi lavender terhadap nyeri post sectio caesarea di RSUD Ajibarang. *Viva Medika*, 10(1). https://doi.org/10.35960/vm.v10i1.135
Siti Safaah,Iwan Purnawan, Y. S. (2019). Perbedaan Efektivitas Aromaterapi Lavender dan Aromaterapi Peppermint terhadap Nyeri pada Pasien Post -Sectio Caesarea. *Journal of Bionursing Vol 1 (1) 2019 Perbedaan*, *3*(1), 1–9.
Suriya, M. (2019). *Asuhan Keperawatan Medikal Bedah Gangguan pada Sistem Muskuloskeletal*. Pustaka Galeri Mandiri.
Surya Putri, N., Pinata, A., & Prasetyawan, R. D. (2024). Penerapan aromaterapi lavender pada asuhan keperawatan klien post op apendiktomi. *Jurnal Ilmiah Keperawatan*, 9(2), 1535. https://doi.org/10.33023/jikep.v9i2.1535
Sutanto, A. V., & Fitriana, Y. (2017). *Kebutuhan Dasar Manusia*. Pustaka Baru Press.

Turner, J. A., & Shields, C. (2018). *Effectiveness of essential oil aromatherapy on acute postoperative pain*. *Journal of Acute Pain*.
Vaziri, F., Shiravani, M., Najib, F. S., Pourahmad, S., & Salehi, A. (2017). Effect of lavender oil inhalation on pain intensity after cesarean section. *Journal of Alternative and Complementary Medicine, 23*(10), 759–764. https://doi.org/10.1089/acm.2016.0420
Vitani, R. A. I., Andrew, J., & Rochana, N. (2016). *Musik keroncong menurunkan nyeri pascaoperasi di ruang perawatan kritis*.
Wahyu, H., Febriawati, H., Lina, L. F., Andari, F. N., & Wulandari, R. (2019). Pengaruh Terapi Kompres Hangat Dengan Aroma Lavender Terhadap Penurunan Intensitas Nyeri Pada Pasien Post Sectio Caesarea Di Rs. Detasemen Kesehatan Tentara (Dkt) Bengkulu. *Jurnal Keperawatan Muhammadiyah Bengkulu*, *7*(1), 18–26. https://doi.org/10.36085/jkmu.v7i1.306
Wiarto, G. (2017). *Nyeri Tulang dan Sendi*. Gosyen Publishing.
Widianti, S. (2020). Intensitas Nyeri Pada Pasien Post Operasi Fraktur (Studi Literatur). *Intensitas Nyeri Pada Pasien Post Operasi Fraktur (Studi Literatur)*, *12*(23), 92–99.