

The Effectiveness of Peppermint Aromatherapy on Physiological and Emotional Arousal in Preoperative Patients

Muhlisoh^{1*}, Asni Hasaini², Martini Nur Sukmawaty³

¹Professional Nurse Education Program, Intan Martapura School of Health Sciences, Samadi Street No. 1, RT 001 RW 01, Jawa Laut Subdistrict, Martapura City District, Banjar Regency, South Kalimantan, Indonesia, 70611

²Diploma III in Nursing Program, Intan Martapura School of Health Sciences, Samadi Street No. 1, RT 001 RW 01, Jawa Laut Subdistrict, Martapura City District, Banjar Regency, South Kalimantan, Indonesia, 70611

³Bachelor of Nursing Program, Intan Martapura School of Health Sciences, Samadi Street No. 1, RT 001 RW 01, Jawa Laut Subdistrict, Martapura City District, Banjar Regency, South Kalimantan, Indonesia, 70611

*Corresponding email: muhlisoh.30@gmail.com

ABSTRACT

Surgical procedures often pose significant physiological and psychological stress for patients. The number of surgical cases continues to increase annually. This study aimed to analyze the effectiveness of peppermint aromatherapy in reducing physiological and emotional arousal among preoperative patients. A quasi-experimental design with a pretest-posttest control group was employed, involving 20 respondents at Ratu Zalecha General Hospital Martapura. The results showed significant differences in blood pressure and pulse rate before and after the administration of aromatherapy ($p < 0.05$), although no significant difference was found between the intervention and control groups. The study concluded that peppermint aromatherapy did not produce a significant effect when comparing the intervention group with the control group. Therefore, future studies with stronger methodological control and more precise timing are recommended.

Keywords: Emotional Arousal, Peppermint Aromatherapy, Physiological Arousal, Preoperative

Cite this as: Muhlisoh., Hasaini A., and Sukmawaty MN. (2025). The Effectiveness of Peppermint Aromatherapy on Physiological and Emotional Arousal in Preoperative Patients. *Dunia Keperawatan*; 13(2): 222-228. DOI: 10.20527/dk.v13i2.918

INTRODUCTION

Perioperative care is a comprehensive approach that requires a multidisciplinary team to prepare patients for surgery, beginning from the time the surgery is considered until postoperative recovery. According to WHO data, the number of surgical patients increases annually, with over 15 million surgical cases reported in developed countries in 2017, and more than 2 million surgical procedures performed in Asia in 2019 (1). In Indonesia, approximately 1.2 million surgeries were performed in 2020 (2). In South Kalimantan, 41.87% of treatments in 2018 were surgical procedures (3).

Globally, the prevalence of preoperative anxiety is reported to be around 48% among 14,000 surgical patients. The psychological conditions underlying this include fear of surgical complications, concerns about the duration and extent of disability after the procedure, fear of general anesthesia, and apprehension about discomfort and pain during or after surgery (4).

Surgical procedures often represent a highly stressful experience for patients. Many patients report experiencing anxiety and fear during the preoperative phase. Concerns related to their illness, surgical outcomes, or fear of anesthesia can contribute to these emotional

responses. Such anxiety and fear can lead to both psychological and physiological disturbances, negatively affecting patient comfort (5). Preoperative psychological conditions such as surgical anxiety and fear related to anesthesia are common, with a prevalence ranging from 25% to 80% (6). Anxiety is associated with elevated levels of plasma epinephrine and norepinephrine, affecting physiological indicators such as blood pressure, heart rate, and respiratory rate, and increasing myocardial oxygen demand. As a result, anxiety is considered a contributing factor in disease progression and the exacerbation of clinical symptoms (7). This demonstrates how psychological conditions can influence physiological disturbances in preoperative patients.

Aromatherapy is one of the simple and effective methods used to reduce anxiety. Aromatherapy involves the use of essential oils with psychological, physiological, and therapeutic effects to improve patient well-being. Some specialists view aromatherapy as a holistic intervention that heals both body and mind, while others regard aromatic compounds and essential oils as therapeutic agents and evaluate their efficacy in clinical settings (8).

Peppermint is a well-known aromatherapy agent due to its antispasmodic, analgesic, anti-inflammatory, decongestant, and antioxidant properties. Studies have shown that peppermint can reduce anxiety in patients with myocardial infarction, as well as in women during labor (8). However, there is limited research investigating the effect of peppermint aromatherapy on physiological and emotional arousal in preoperative cataract patients.

A preliminary study revealed a lack of knowledge among patients regarding

non-pharmacological interventions such as peppermint aromatherapy to reduce physiological and emotional arousal in preoperative settings. Therefore, this study aims to examine the effect of peppermint aromatherapy on reducing physiological and emotional arousal in preoperative patients at Ratu Zalecha Hospital Martapura.

METHODS

This study employed a pretest-posttest control group design. The independent variable was the peppermint aromatherapy intervention, while the dependent variable was physiological and emotional arousal. Confounding variables included age and gender. The study was conducted at Ratu Zalecha Regional Hospital, Martapura.

The sample consisted of 20 preoperative patients. A non-probability sampling technique was applied using purposive sampling, followed by inclusion and exclusion criteria. Inclusion criteria: patients scheduled for surgery, patients who provided informed consent, preoperative patients approximately one hour before entering the operating room, and patients with no prior surgical history. Exclusion criteria: patients with dizziness, olfactory disorders, allergies to essential oils, or those who did not complete the intervention.

According to Borg and Gall (2007), a sample size of 15–30 respondents per group is recommended for experimental and comparative studies. In this study, 20 respondents were divided equally into two groups of 10 participants each. The intervention group received peppermint aromatherapy (5 mL) for 5 minutes daily over a period of 21 days, while the control group did not receive any aromatherapy (9).

The instruments used included observation sheets and questionnaires. Blood pressure was measured using a digital sphygmomanometer, heart rate was monitored using a wristwatch, and psychological responses, particularly anxiety, were assessed using the Amsterdam Preoperative Anxiety and Information Scale (APAIS), which consists of six items.

Univariate analysis included frequency distribution, mean, median, standard deviation, and minimum–maximum values. Bivariate analysis used the Paired t-test and Independent t-test. This study received ethical approval from the Ethics Review Committee of Stikes Kendal, under approval number 002/EC/KEPK_STIKES_KENDAL/II/2025.

RESULTS AND DISCUSSION

Based on Table 1, the average age of respondents in the intervention group was 45.60 years, with the youngest being 19 and the oldest 63 years. In the control group, the average age was 46.60 years, with ages ranging from 23 to 63 years. The majority of respondents were male in both groups, accounting for 60% in

Table 3. Normality Test Results of Physiological and Emotional Arousal Data Before and After Peppermint Aromatherapy Administration Using Shapiro-Wilk Test among Preoperative Patients at Ratu Zalecha General Hospital Martapura (n = 20)

Variables	p-value
Systolic (Pre)	0.054
Diastolic (Pre)	0.070
Heart Rate (Pre)	0.170
Emotional Arousal (Pre)	0.051
Systolic (Post)	0.102
Diastolic (Post)	0.119
Heart Rate (Post)	0.573
Emotional Arousal (Post)	0.381

Source: Primary Data, 2025

the intervention group and 50% in the control group, as presented in Table 2. Table 3 presents the results of the normality test using the Shapiro-Wilk test, showing p-values > 0.05 for physiological and emotional arousal data, indicating that the data were normally distributed both before and after the intervention.

Table 4 displays physiological changes, including reductions in systolic and diastolic blood pressure and heart rate in both the intervention and control groups. These changes were statistically

Table 1. Frequency Distribution of Preoperative Patient Characteristics by Age at Ratu Zalecha General Hospital Martapura

Age Group	Mean	Median	SD	Min-Max
Intervention Group	45.60	47	14.99	19-63
Control Group	46.60	52	16.30	23-62

Source: Primary Data, 2025

Table 2. Frequency Distribution of Preoperative Patient Characteristics by Gender at Ratu Zalecha General Hospital Martapura (n = 20)

Gender	Intervention Group		Control Group	
	f	%	f	%
Male	6	60	5	50
Female	4	40	5	50
Total	10	100	10	100

Source: Primary Data, 2025

Table 4. Paired t-Test Analysis of Blood Pressure (Systolic–Diastolic), Heart Rate, and APAIS Scores in the Intervention and Control Groups among Preoperative Patients at Ratu Zalecha General Hospital Martapura (n = 20)

Variable	Group	Mean	SD	95% CI (Min–Max)	p-value
Systolic	Intervention Group				0.001*
	Before	141.60	30.20	(0.974-18.026)	
	After	132.10	21.24		
	Control Group				0.002*
	Before	166.60	16.37	(1.191-14.009)	
	After	159.00	15.48		
Diastolic	Intervention Group				0.012*
	Before	83.20	16.33	(-10.645-4.845)	
	After	86.10	10.74		
	Control Group				0.003*
	Before	104.30	12.97	(-4.625-6.425)	
	After	103.40	13.12		
Heart Rate	Intervention Group				0.020*
	Before	82.70	11.55	(-1.483-10.083)	
	After	78.40	8.52		
	Control Group				0.001*
	Before	80.50	11.21	(-1.231-4.831)	
	After	78.70	9.29		
Emotional Arousal	Intervention Group				0.751
	Before	17.20	3.74	(-2.967-4.567)	
	After	16.40	3.31		
	Control Group				0.115
	Before	18.80	2.82	(0.231-0.969)	
	After	18.20	2.57		

*p-value < 0.05

Source: Primary Data, 2025

Table 5. Independent t-Test Analysis of Mean Differences Between the Intervention and Control Groups on Blood Pressure (Systolic–Diastolic), Heart Rate, and Emotional Arousal in Preoperative Patients at Ratu Zalecha General Hospital Martapura (n = 20)

Variables	Intervention Group (Mean ± SD)	Control Group (Mean ± SD)	p-value
Systolic	132.10 ± 21.24	159.00 ± 15.48	0.239
Diastolic	86.10 ± 10.74	103.40 ± 13.12	0.449
Heart Rate	78.40 ± 8.53	78.70 ± 9.29	0.751
Emotional Arousal	16.40 ± 3.31	18.20 ± 2.57	0.693

*p-value < 0.05

Source: Primary Data, 2025

significant between pre- and post-intervention ($p < 0.05$). However, in terms of emotional arousal, there were no statistically significant changes between the pre- and post-intervention measurements ($p > 0.05$). Table 5

indicates that there were no significant differences in physiological responses (blood pressure, heart rate, and emotional arousal) between the control and intervention groups ($p > 0.05$).

Aromatherapy involves the use of the psychological, physiological, and therapeutic effects of essential oils to improve patient well-being. Some experts view aromatherapy as a holistic intervention that heals both body and mind, while others consider aromatic compounds and essential oils as therapeutic agents and assess their efficacy in medical treatments (8).

In this study, the aromatherapy administered was peppermint. Peppermint is a well-known natural herbal plant that grows in many countries across various climates. It exhibits a range of biological activities including digestive stimulation, choleric, antiseptic, antibacterial, antiviral, antispasmodic, antioxidant, anti-inflammatory, muscle relaxant, expectorant, analgesic, tonic, and vasodilatory effects (10).

The results demonstrated significant differences in systolic and diastolic blood pressure, heart rate, and anxiety levels before and after the administration of peppermint aromatherapy, as shown in Table 1 ($p < 0.05$). However, no significant differences were observed between the intervention and control groups in terms of blood pressure, heart rate, or anxiety levels, as indicated in Table 5. These findings are consistent with the study by Park et al. (2020), which reported that inhaled peppermint does not have systemic effects (11).

Literature suggests that inhaled aromatherapy is transmitted to the central nervous system via the olfactory bulb and may alter the activity of various nuclei, including the vasomotor center, emotional and motivational centers in the hypothalamus, and the limbic system (11). These findings contrast with the study by Meamarbashi (2014), which found that oral administration of peppermint significantly affected both

diastolic and systolic blood pressure, likely due to a reduction in vascular smooth muscle tone (10). This suggests that peppermint may effectively reduce blood pressure as a physiological response in preoperative patients if administered orally.

In addition to physiological responses, emotional arousal was also examined before and after aromatherapy administration. Emotional arousal is defined as a state of physiological activation; higher levels result in feelings of excitement, nervousness, or alertness that lead to readiness for action, whereas lower levels result in relaxation or boredom (12). Anxiety is a form of emotion that can produce negative arousal (12,13). Preoperative anxiety is a significant issue for patients and should be managed appropriately, as it may negatively impact physical recovery or rehabilitation. Inhaling aromatic oils has been reported to produce numerous positive effects on emotional states, such as reducing anxiety, enhancing alertness, and promoting relaxation (15).

This study found no significant effect of aromatherapy on reducing anxiety. This result is consistent with the findings of Meşe & Sarıtaş (2024), who reported no significant difference between the intervention and control groups in anxiety levels after two hours post-surgery, although differences became apparent at the third and fourth hours postoperatively. This indicates that the duration of aromatherapy exposure may influence anxiety outcomes (14). In the present study, the aromatherapy was administered one hour prior to surgery. Aromatherapy may serve as an effective complementary treatment for preoperative anxiety. However, due to methodological limitations in the included clinical trials, further research with more rigorous design and controls

is necessary to provide stronger recommendations (15).

Several mechanisms may influence the effectiveness of inhaled aromatherapy. These include the activation of olfactory receptors and their signaling pathways to the brain, cellular and molecular processes triggered by essential oils entering the olfactory nerves connected directly to brain regions, and the absorption of essential oil molecules into the alveoli during inhalation, which then cross the blood–brain barrier (16). These mechanisms highlight that the effectiveness of aromatherapy may depend on several factors, such as dosage, molecular size of the inhaled essential oil, nasal anatomy, and olfactory physiology.

ACKNOWLEDGEMENTS

The researchers would like to express their sincere gratitude to all parties who contributed to the completion of this study, particularly to Sekolah Tinggi Ilmu Kesehatan Intan Martapura for providing the opportunity and funding for this research, as well as to Ratu Zalecha General Hospital for granting permission to conduct the study.

CONCLUSION

There was a physiological response change, specifically a decrease in systolic and diastolic blood pressure and heart rate, observed before and after the intervention in both the control and intervention groups. These findings indicate that peppermint aromatherapy has the potential to help stabilize patients' emotional conditions prior to surgical procedures.

It is recommended that nurses in inpatient or preoperative units administer peppermint aromatherapy to preoperative patients, especially those

undergoing cataract surgery, as it can help reduce psychological responses such as elevated blood pressure and heart rate. Furthermore, it is suggested to establish an evidence-based standard operating procedure for peppermint aromatherapy administration as a guideline for healthcare professionals to enhance patient comfort and physiological stability prior to invasive procedures.

REFERENCES

1. World Health Organization (WHO). Total Number of Inpatient Surgical Procedures Per Year [Internet]. 2024. Available from: https://gateway.euro.who.int/en/indicators/hfa_539-6031-total-number-of-inpatient-surgical-procedures-per-year/#id=20118
2. Kementerian Kesehatan Republik Indonesia. Profil Kesehatan Indonesia 2020 [Internet]. 2020. Available from: <https://layanandata.kemkes.go.id/katalog-data/profil-kesehatan/ketersediaan-data/profil-kesehatan-2020>
3. Badan Penelitian dan Pengembangan Kesehatan. Risetdas Provinsi Kalimantan Selatan 2018 [Internet]. 2019. Available from: <https://repository.badankebijakan.kemkes.go.id>
4. Tütüncü Z, ŞG Tütüncü, Cavdar I, Sengul E. Pre-operative comfort levels of patients undergoing surgical intervention. *Int J Caring Sci*. 2020;13:1339–45.
5. Friedrich S, Reis S, Meybohm P, Kranke P. Preoperative anxiety. *Curr Opin Anaesthesiol*. 2022;35(6):674–8.
6. Gu X, Zhang Y, Wei W, Zhu J. Effects of preoperative anxiety

- on postoperative outcomes and sleep quality in patients undergoing laparoscopic gynecological surgery. *J Clin Med*. 2023;12(5):1835. doi: 10.3390/jcm12051835.
7. Musey PI Jr, Lee JA, Hall CA, Kline JA. Anxiety about anxiety: a survey of emergency department provider beliefs and practices regarding anxiety-associated low risk chest pain. *BMC Emerg Med*. 2018;18(1):10. doi: 10.1186/s12873-018-0161-x.
8. Soleimani M, Kashfi LS, Mirmohamadkhani M, Ghods AA. The effect of aromatherapy with peppermint essential oil on anxiety of cardiac patients in emergency department: a placebo-controlled study. *Complement Ther Clin Pract*. 2022;46:101533. doi: 10.1016/j.ctcp.2022.101533.
9. Gall M, Gall J, Borg R. Educational research: an introduction. 8th ed. New York (NY): Pearson Education; 2007.
10. Meamarbashi A. Instant effects of peppermint essential oil on the physiological parameters and exercise performance. *Avicenna J Phytomed*. 2014;4(1):72–8.
11. Park SH, Kim KH, Park JS. Does inhaled peppermint essential oil affect blood pressure? *J Chosun Nat Sci*. 2021;14(3):95–8. doi: 10.13160/RICNS.2021.14.3.95.
12. Zsidó AN. The effect of emotional arousal on visual attentional performance: a systematic review. *Psychol Res*. 2024;88:1–24. doi: 10.1007/s00426-023-01852-6.
13. Cisler JM, Olatunji BO, Feldner MT, Forsyth JP. Emotion regulation and the anxiety disorders: an integrative review. *J Psychopathol Behav Assess*. 2010;32(1):68–82. doi: 10.1007/s10862-009-9161-1.
14. Meşe M, Sarıtaş S. Effects of inhalation of peppermint oil after lumbar discectomy surgery on pain and anxiety levels of patients: a randomized controlled study. *Explore (NY)*. 2024;20(4):527–34. doi: 10.1016/j.explore.2023.12.002.
15. Huang H, Wang Q, Guan X, Zhang X, Kang J, Zhang Y, et al. Effect of aromatherapy on preoperative anxiety in adult patients: a meta-analysis of randomized controlled trials. *Complement Ther Clin Pract*. 2021;42:101302. doi: 10.1016/j.ctcp.2021.101302.
16. Vora LK, Gholap AD, Hatvate NT, Naren P, Khan S, Chavda VP, et al. Essential oils for clinical aromatherapy: a comprehensive review. *J Ethnopharmacol*. 2024;330:118180. doi: 10.1016/j.jep.2024.118180.