



COMPARISON OF THE IMPLEMENTATION OF AROMATHERAPY OF PAPPERMINT with HAND MASSAGE ON THE PAIN OF PATIENTS AFTER CHOLELITHIASIS SURGERY : A CASE STUDY

Maya Syarivatul Azizah^{1*}, Sidik Awaludin²

¹ Department of Medical Surgical Nursing, Faculty of Health Sciences, Universitas Jenderal Soedirman, Jawa Tengah, Indonesia

² Master of Nursing Study Program, Faculty of Health Sciences, Universitas Jenderal Soedirman, Jawa Tengah, Indonesia

Keywords:

*hand massage,
pain,
peppermint aromatherapy.*

Received: 21 November 2024

Revised: 10 February 2025

Accepted: 11 February 2025

Available online: 1 May 2025

Corresponding Author:

E-mail: syarivatulazizahmaya@gmail.com

ABSTRACT

Background: *Cholelithiasis* is a gallstone disease that originates from fluid that hardens in the gallbladder. The prevalence of gallstones is increasing every year. Behavior modification in individuals is considered less successful, more aggressive actions (surgery) are needed. However, the majority of patients complain of pain after surgery. Medical treatment without complementary balance can cause problems such as decreased cardiac output. Complementary therapies that can be used are aromatherapy and hand massage. **Methods:** A case study study of 3 postoperative *cholelithiasis patients*. **Case presentation:** Peppermint aromatherapy or hand massage was used to reduce postoperative pain in three samples (two intervention, one control). Therapy was given for three days, starting on the first postoperative day with moderate pain (4-6). Interventions included measuring blood pressure and pain scale before and after therapy. Both methods subjectively reduced pain and objectively lowered blood pressure and heart rate. **Conclusion:** Peppermint *aromatherapy* with *hand massage* can be used as complementary therapy to accompany medical treatment to reduce pain in patients after *cholelithiasis* surgery. In addition, this therapy is easy to apply and does not cost much so that the patient's family can practice it at home.

Copyright ©2025 by Authors. Published by Faculty of Medicine, Universitas Diponegoro Semarang Indonesia. This is an open access article under the CC-BY-NC-SA (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)

INTRODUCTION

Cholelithiasis (gallstones) is a gallbladder disease that increases every year. Gallstone sufferers will experience pain in the bile ducts, acute cholelithiasis, and various complications that occur. Complications in the disease are due to the migration of stones in the bile ducts, so that the flow of bile in the small intestine is blocked, as a result of which it will be painful. The prevalence of cholelithiasis in the United States reaches 70 percent and 10 to 15 percent occurs in Caucasians¹. The United States is the country with the highest prevalence of gallstone disease². Cholelithiasis is the cause of more than one million individuals undergoing treatment in hospitals and outpatient³. Some of the factors that increase the prevalence of cholelithiasis are an unhealthy lifestyle such as eating fast food, lack of physical activity, changing eating habits and being overweight⁴.

According to the research of ⁵ stated that behavior modification in individuals who experience cholelithiasis is mostly less successful, because individuals cannot maintain a healthy lifestyle in the long term. Therefore, there is a need for more aggressive treatment to reduce the morbidity of cholelithiasis patients. Medical treatments that can be carried out, namely surgery, surgery are an alternative and a good solution for the long term. However, most postoperative patients say that the pain is still unresolved and they are not satisfied with the treatment that has been given. The pain is sometimes prolonged and causes complications.

Pain is the most serious problem in patients after surgery. Pain can occur due to irritation due to surgery, unresolved surgical pain can interfere with patient mobility, respiratory problems and susceptibility to complications in other organs⁶. Pain has significant effects in various aspects, namely



Maya Syarivatul Azizah, Sidik Awaludin

psychological, physiological and economic aspects. The psychological aspect is that this pain can result in anxiety and even depression in the individual. The physiological aspect is related to the increase in blood pressure and heart rate due to pain, while the economic aspect, namely uncontrolled pain, results in a longer hospital stay so that the cost of treatment will increase⁷.

Complications need to be followed up in nursing care management. Considerations in health services, a combination of pharmacological and non-pharmacological treatments can be carried out. The use of pharmacological treatment without being balanced with non-pharmacological treatment will have side effects, namely depression in breathing, gastrointestinal problems, decreased peripheral vascular resistance, and decreased cardiac output⁸. Therefore, in recent years, management has been carried out to reduce side effects due to pharmacological treatment, namely non pharmacological treatment. Non pharmacological pain treatment that can be done is aromatherapy and hand massage. According to several studies, inhaled aromatherapy can stimulate the sense of smell, change brain activity and the limbic system which can reduce pain⁹. Hand massage is a complementary therapy that is useful for improving the welfare of individuals. In addition, this hand massage can reduce muscle spasms, blood circulation becomes smoother, and make patients calm during perioperative. According to research by¹⁰ it is stated that hand massage therapy can significantly reduce postoperative pain.

This research is important to conduct because the majority of patients still experience pain after surgery. Several studies have shown that aromatherapy and hand massage can reduce complaints after surgery. However, researchers are interested in comparing between the two interventions on pain complaints after surgery. In addition, there is no journal that discusses the comparison of these non-pharmacological therapies. This case study research aims to reduce complaints in patients, reduce complications and improve more optimal nursing care.

METHODS

This research is a descriptive study with a case study approach, the research sample is post-operative cholelithiasis patients consisting of 3 research samples (2 intervention samples and 1 control sample). Implementation for patients is measuring blood pressure before the intervention, conducting a pain assessment before the intervention, carrying out the intervention, both aromatherapy and hand massage, assessing the pain scale and measuring blood pressure after the intervention. Therapy was given after the first day of surgery with a moderate pain scale⁴⁻⁶ for 3 days at 08.00-08.45 WIB. This therapy is carried out before pharmacological treatment, so that pain measurements are not biased due to treatment factors.

The pain scale assessment uses the Numeric Rating Scale (NRS) and the Wong Baker Rating Scale. This pain scale assessment (NRS) consists of 11 items, namely mild pain (0-3), moderate pain⁴⁻⁶ and severe pain⁷⁻⁹ and 10 (uncontrolled severe pain) Then another measurement is the measurement of the patient's vital signs to support objective data in pain assessment.

The application of aromatherapy in this study is sourced from the journal Ghadirian et al., (2020), previously the researcher measured pain first, then aromatherapy will be dripped on a handkerchief as many as 2 drops. The handkerchief will be inhaled at a distance of 2.5 – 5 cm from the patient's smell for 3 minutes. Pain will be measured again using NRS after 30 minutes of aromatherapy.

This hand massage intervention has 2 techniques, namely friction (gentle friction or fumigation) and squeezing (pressure). Each limb gets a 10-minute massage. The massage technique is in the form of: wipe the patient's hands with warm water using a wash cloth so that the patient becomes relaxed, warm the therapist's palms using olive oil or coconut oil by rubbing both palms before massage, use the friction technique (gentle friction/fumigation) on the thumb area, index finger then continue on the patient's palm, Perform the squeezing technique, which is to gently press the patient's hand using the therapist's thumb on the patient's finger from the base to the tip of the finger, repeat the same procedure on the right and left hand for 10 minutes, measure the pain again after hand massage therapy¹¹.



Maya Syarivatul Azizah, Sidik Awaludin

CASE STUDY

Case 1

A 35-year-old with a medical diagnosis of *cholelithiasis*. The patient came to the hospital to do routine control to the poly, previously the patient complained of pain in the right abdomen, the pain radiated to the back, the pain was felt continuously before the patient went to the hospital with a scale of 7, sometimes the patient complained of nausea but not to the point of vomiting. Then the patient was in the lotus inpatient room on the 2nd floor for surgery.

After surgery, the patient complained of postoperative pain. The patient complained of postoperative pain, feeling prickly, pain in the surgical wound, scale 6, and continuously. After surgery, the patient complained of postoperative pain. The patient complained of postoperative pain, feeling prickly, pain in the surgical wound, scale 6, and continuously. The patient said that he had a history of cyst disease in the pancreas at the age of 18 and had had surgery once. Patients said they often consumed salty and coconut milk foods.

The results of the physical examination showed that the patient was composed, weak and pale. Blood pressure : 139/90 mmHg, RR : 20x/min, SpO₂ : 99x/min, N : 100x/min. IMT = 22.64 (N). The results of the head to toe examination showed that there was a surgical wound of approximately 1 cm in the right abdomen and there was pressure pain in the abdomen. The results of the blood test showed that the patient's HB was 12 (N).

The results of a chest X-ray on August 26, 2024 showed that the Cor was not enlarged, the pulmo was within normal limits and the ultrasound results before entering the hospital showed that there was Multiple cholelithiasis with a maximum size of 10.2 x 0.71 cm. The pharmacological treatments that have been included are NaCl infusion, inj. ibu profen, inj. ceftriaxon, inj. ketolorac, inj. adona, *Hydrocortisone* and RL infusion.

Case 2

A 57-year-old with a medical diagnosis of *cholelithiasis*. The new patient came from the emergency room on August 26, 2024, a referral patient from Goeteng Hospital with complaints of heartburn to chest pain, sometimes nausea, decreased appetite, and pain since 1 year ago. Then the patient was hospitalized in the Lotus room to prepare for

surgery the next day. At the time of the assessment, the patient said that the pain after surgery, the pain was felt stabbing in the surgical wound with a scale of 6 and the pain was felt continuously. Patients said they often consumed salty and fried foods. In addition, patients said they rarely do health checkups.

After the surgery, the patient said that it was painful when moving and worried if he changed positions because he was still hesitant and worried about the wound and even the patient could not tilt right or left. ADL's scale 2 patients are assisted by people. The patient said that on the first day of surgery and the second patient, he could not sleep because he still felt pain with the wound from the surgery and the patient's eyelids were slightly blackened.

The results of the physical examination showed that the patient was composed, weak and pale. Blood pressure : 153/85 mmHg, RR : 20x/min, SpO₂ : 98x/min, N : 110x/min. BMI = 18.2(N). The results of the head to toe examination showed that there was a surgical wound of approximately 1/2 cm in the right abdomen and there was tenderness in the abdomen. The results of the blood test showed that the patient's HB was 12 (N). Ultrasound results on August 20, 2024 showed that there was a *small cholelithiasis* with a diameter of 5.1 mm, DD: Cholesterol stones. The pharmacological treatments that have been included are NaCl infusion, inj.omeprazole, inj.ceftriaxon, inj.ketolorac, amlopidine, curcuma and RL infusion.

Case 3

A 50-year-old with a medical diagnosis of *cholelithiasis*. The new patient was referred to Muh Siti Aminah Hospital with *cholelithiasis*, the patient said that he complained of pain in the right abdomen and was severe since 3 hours before entering the hospital, the abdomen felt cramped, the pain radiated to the right waist, the pain was felt continuously before the patient went to the hospital with a scale of 7. At the time of the assessment, the patient said that the pain after surgery, the pain was felt stabbing in the surgical wound with a scale of 6 and the pain was felt continuously. The patient said to have a history of *stage II* hypertension.

After the surgery, the patient said that it was painful when moving and worried if he changed positions because he was still hesitant and worried

Maya Syarivatul Azizah, Sidik Awaludin

about the wound and even the patient could not tilt right or left. ADL's scale 2 patients are assisted by people.

The results of the physical examination showed that the patient was composed, weak and pale. Blood pressure : 170/95 mmHg, RR : 20x/min, SpO2 : 98x/min, N : 109x/min. BMI = 20.8 (N). The results of the head to toe examination showed that there was a surgical wound of approximately 1 mm in the right abdomen and there was pressure pain in the abdomen. The results of the blood test showed that the patient's HB was 16 (high). The pharmacological treatments that have been included are NaCl infusion, inj.omeprazole, inj.ceftriaxon, inj.ketolorac, inj.fartisone and RL infusion.



Figure 1. Ultrasound findings of cholelithiasis in Case 1



Figure 2. Ultrasound findings of cholelithiasis in Case 2



Figure 3. Ultrasound findings of cholelithiasis in Case 3

RESULTS

The researcher conducted an assessment in the form of pain after surgery, blood pressure and heart rate. Each sample was given a different intervention, 1 sample received peppermint aromatherapy intervention, 1 sample received hand massage intervention and 1 sample did not receive intervention (control). The results of pain scale assessment using NRS in postoperative cholelithiasis patients are illustrated in the following table.

Table 1. Assessment of pain scale using NRS

Day	Provision of interventions	Intervention		Control
		Aromatherapy	Hand Massage	
1	Pre	6	6	6
	Post	5	5	6
2	Pre	4	5	5
	Post	3	4	5
3	Pre	3	4	5
	Post	2	3	4

Based on table 1. it was shown that the pain before and after giving peppermint aromatherapy and hand massage showed a decrease in the pain scale in patients. However, the decrease in pain in patients given aromatherapy was much lower than in patients given hand massage therapy. Patients who were given hand massage experienced a decrease in pain from a scale of 6 to a scale of 3 (mild), patients who were given aromatherapy experienced a decrease in pain from a scale of 6 to a scale of 2 (mild) while in the control group patients experienced a decrease in pain but not significantly compared to the intervention group.

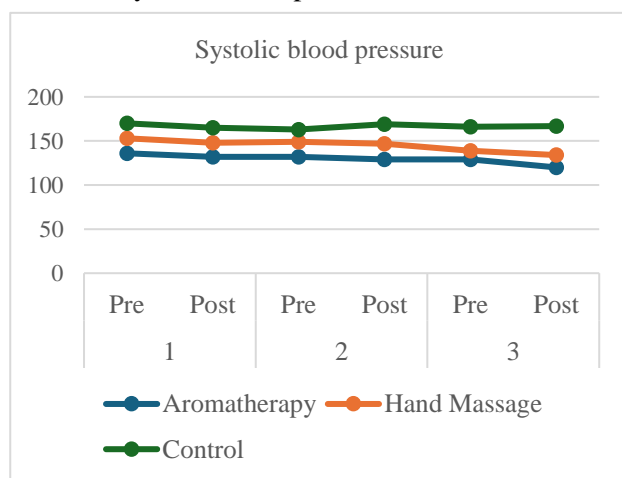


Maya Syarivatul Azizah, Sidik Awaludin

During the intervention for 3 days, the observation results showed that the patient who was given aromatherapy showed that the patient was able to mobilize gradually, the patient's anxiety had begun to decrease, the patient could tilt right and left on the second day and the treatment lasted 3 days.

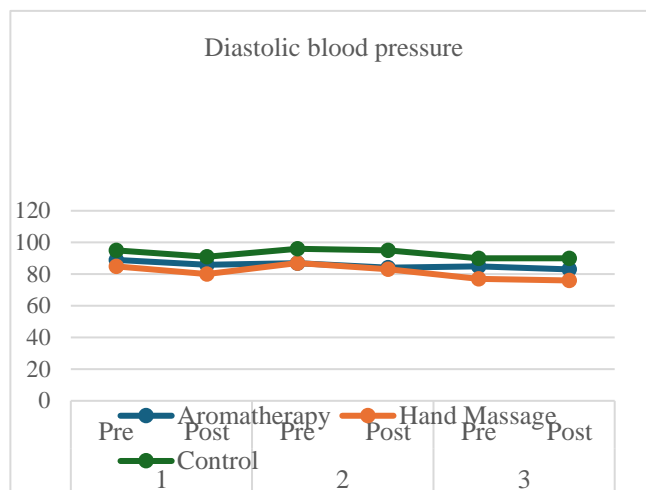
Patients who were given *hand massage therapy* showed that the patient had not been able to mobilize on the second day after the intervention, anxiety had begun to decrease, could tilt right and left on the 3rd day and the duration of treatment was 3 days. Meanwhile, the control group patients showed that the patients looked tense, anxious when asked about their pain, had sleep disturbances, and the duration of treatment in the control patients was much longer than the intervention group, which was 4 days

In addition to pain assessment, researchers also measured blood pressure before and after the intervention. Blood measurements were carried out 2 times at 3 meetings. The following is a picture of the results of systolic blood pressure measurement:



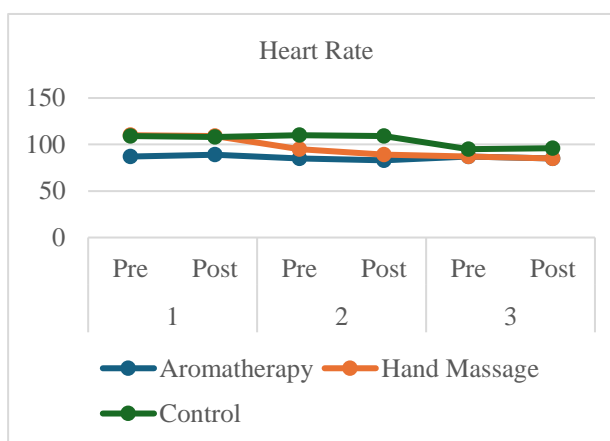
Graph 1. Changes in systolic blood pressure

Graph 1. above shows changes in systolic blood pressure of patients who are given aromatherapy or *hand massage*. Patients who were given *peppermint aromatherapy* experienced an average decrease from 3 days of intervention which was 5.3 mmHg, *hand massage* was 4 mmHg and control patients were 1.6 mmHg. In addition to the assessment of systolic blood pressure, the researcher also conducted a diastolic blood pressure assessment. The following is a picture of the results of diastolic blood pressure measurements.



Graph 2. Changes in systolic blood pressure

Graph 2. above shows changes in diastolic blood pressure of patients who are given aromatherapy or *hand massage*. Patients who were given *peppermint aromatherapy* experienced an average decrease from 3 days of intervention, which was 2.6 mmHg, *hand massage*, 3.3 mmHg, and control patients, which was 1.6 mmHg. In addition to diastolic blood pressure assessment, researchers also conduct *heart rate* assessments. Here is a picture of the results of heart rate measurement.



Graph 3. Changes in systolic heart rate

Figure 3 above shows changes in heart rate in intervention and control patients. Patients who received peppermint aromatherapy had an average decrease of 2 beats per minute over three days, hand massage resulted in a 3 beats per minute decrease, and



Maya Syarivatul Azizah, Sidik Awaludin

the control patient showed a 1 beat per minute decrease.

DISCUSSION

Cholelithiasis or gallstone disease is a disease that requires surgical treatment and is the standard treatment for cholelithiasis. The three research samples showed that surgical procedures were carried out to reduce complaints. However, various complications can occur after cholelithiasis surgery. Common complications are pain after surgery, nausea and vomiting¹⁴.

The pain experienced by the three study samples was at moderate intensity. Patients given the intervention showed a more significant reduction in pain compared to the control group. In addition, the intervention group had faster treatment than the control group. Research from¹⁵ states that uncontrolled pain can cause hospital stays to be much longer, treatment costs will increase and slow down the healing process.

According to the research of¹⁶ mentioned that peppermint aromatherapy significantly reduced the severity of pain after surgery from a scale of 10 to 0. Aromatherapy can reduce pain because the inhaled fragrance can activate the limbic system which is stimulated through the olfactory nerve and cause a calming relaxation effect, aromatherapy can also change psychophysiology due to the interaction with receptors in the central nervous system. In addition, the implementation of aromatherapy if carried out repeatedly can reduce the scale of pain so that the quality of life will be much better¹⁷.

The administration of hand massage in this study showed a decrease in pain. Another study stated that there was a decrease in pain before and after the intervention for 60 minutes, there was a significant difference between the control group and the intervention⁶. Another study states that the duration of doing this hand massage is not too used as a benchmark to reduce pain. However, the presence of this hand massage can significantly reduce pain after surgery¹⁸.

This hand massage can reduce short-term as well as long-term pain. The short-term effect is that the patient will relax while the long-term is that complications are decreasing¹⁹. The results of the study supported by the research of (20) stated that this massage is an effective method to reduce

postoperative pain in a short time, therapeutic touch can increase relaxation, both physical and psychological relaxation.

Based on the results of the study, it was shown that aromatherapy and hand massage could lower the blood pressure of postoperative patients. The results of a study by²¹ stated that aromatherapy can be used as an effective treatment to reduce stress and blood pressure in hypertensive patients. This blood pressure can drop due to stimulation of smell so that the hemodynamic status is getting better.

Patients who were given hand massage showed an average decrease in systolic blood pressure of 4 mmHg and diastolic blood pressure of 3.3 mmHg. The results of the study were supported by the journal²² which examined the comparison of local cold therapy with hand and foot massage on the blood pressure of postoperative patients who stated that there was a significant difference in blood pressure before and after the intervention in the intervention group. Meanwhile, the control group showed no significant difference.

Other studies have also shown that massage of the extremities affects systolic and diastolic blood pressure. This massage triggers a relaxation response in the individual, there is a contraction in the capillary wall so that the capillary blood vessels and lymph vessels will dilate²³.

The heart rate in this study showed a decrease on the first to third day of the intervention. The results of another study showed that aromatherapy combined with conventional treatment was shown to reduce postoperative pain. In addition, aromatherapy can alter an individual's vital signs such as heart rate, blood pressure, and temperature. There have been many studies that have stated that aromatherapy oil can change muscle tension, blood pressure, heart rate and temperature in postoperative patients²⁴.

Massage can also change the physiological system of the individual's body, blood flow will increase, relaxation hormones will increase, stress hormones will decrease and the administration of this massage can significantly reduce the heart rate. This is because this massage causes relaxation, this relaxation can respond to the parasympathetic nerve so that it causes a decrease in anxiety, blood pressure and heart rate²⁵.



Maya Syarivatul Azizah, Sidik Awaludin

CONCLUSION

A comparison of peppermint aromatherapy with hand massage shows that both have the effect of reducing pain, and can objectively reduce blood pressure and heart rate. However, the results of observations and pain scale assessments using the numerical rating scale (NRS) show that peppermint aromatherapy is able to reduce pain much faster than using hand massage.

ETHICAL APPROVAL

There are no ethical approvals in this study, but it was conducted with the patient's consent before the intervention.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

No specific funding was provided for this article.

ACKNOWLEDGMENTS

This work was supported by the Faculty of Health Sciences, Jenderal Soedirman University and RSUD Prof. Dr. Margono Soekarjo Purwokerto

REFERENCES

1. Cianci P, Restini E. Management of cholelithiasis with choledocholithiasis: Endoscopic and surgical approaches. Vol. 27, World Journal of Gastroenterology. Baishideng Publishing Group Inc; 2021. p. 4536–54.
2. Guzmán HM, Sepúlveda M, Rosso N, San Martin A, Guzmán F, Guzmán HC. Incidence and Risk Factors for Cholelithiasis After Bariatric Surgery. *Obes Surg*. 2019 Jul 15;29(7):2110–4.
3. Shenoy R, Kirkland P, Hadaya JE, Tranfield MW, DeVirgilio M, Russell MM, et al. Management of symptomatic cholelithiasis: a systematic review. *Syst Rev*. 2022 Dec 1;11(1).
4. Pimpale R, Katakwar P, Akhtar M. Cholelithiasis: causative factors, clinical manifestations and management. *International Surgery Journal*. 2019 May 28;6(6):2133.
5. Talha A, Abdelbaki T, Farouk A, Hasouna E, Azzam E, Shehata G. Cholelithiasis after bariatric surgery, incidence, and prophylaxis: randomized controlled trial. *Surg Endosc*. 2020 Dec 1;34(12):5331–7.
6. Helmy Ahmed S, Mohammed Abo El-ella M. Effect of Hand Massage on alleviating Pain after Abdominal Surgery. *Tanta Scientific Nursing Journal*. 2023;30(3).
7. Parimala L, Amutha E. Effectiveness of foot massage on pain, heart rate and blood pressure among abdominal surgery patients. *Res J Pharm Technol*. 2019 Sep 1;12(9):4426–8.
8. Amini A, Bahraminejad N, Jafari S, Kamali K. The effect of aromatherapy with rosa damascena essence on postoperative pain in inguinal hernia repair: A randomized clinical trial. *Nurs Midwifery Stud*. 2020 Jul 1;9(3):117–23.
9. Lee JA, Hur MH. The Effects of Aroma Essential Oil Inhalation on Stress, Pain, and Sleep Quality in Laparoscopic Cholecystectomy Patients: A Randomized Controlled Trial. *Asian Nurs Res (Korean Soc Nurs Sci)*. 2022 Feb 1;16(1):1–8.
10. Miri A, Masoudi R, Kheiri S, Davoodvand S. Comparing the effects of cold therapy and hand and foot massage on postoperative pain among patients with major surgeries. *Journal of Multidisciplinary Care(JMDC)*. 2021;10(3):95–8.
11. Wikström L, Nilsson M, Eriksson K. The association of patients' daily summarized self-rated "real-time" pain scores with physical recovery after major surgery – A repeated measurement design. *Nurs Open*. 2020 Jan 1;7(1):307–18.
12. Ghadirian F, Karami K, Shirzadegan R, Raiesifar Z, Tahery N, Almasian M. Effects of French Lavender Aromatherapy on the Level of Pain and the Amount of Medications Prescribed to Reduce Post-Appendectomy Pain: A Single-Blind Randomized Clinical Trial. *Journal of Archives in Military Medicine*. 2020 Oct 26;8(3).
13. Silpia W, Nurhayati N, Febriawati H. The Effectiveness Of Hand Massage Therapy In Reducing Pain Intensity Among Patients With Post-Laparotomy Surgery. *Jurnal Vokasi Keperawatan [Internet]*. 2021;4(1). Available from:



- <http://ejournal.unib.ac.id/index.php/JurnalVo>
kasiKeperawatan
14. Salazar-Parra M, Guzman-Ramirez BG, Pintor-Belmontes KJ, Barbosa-Camacho FJ, Bernal-Hernández A, Cruz-Neri RU, et al. Gender Differences in Postoperative Pain, Nausea and Vomiting After Elective Laparoscopic Cholecystectomy. *World J Surg.* 2020 Dec 1;44(12):4070–6.
 15. Abd S, Ahmed E, Ibrahim IA, Mobarak AA, Atyat &, Hassan M. Effect of Aromatherapy Massage on Postoperative Pain Among School Age Children. *Assiut Scientific Nursing Journal* [Internet]. 2020;8(20):91–102. Available from: <http://asnj.journals.ekb.eghttp://www.arabim-pactfactor.com>
 16. Zhang P, Liao X, Yuan Q, Lyu F, Xie S. Effect of aromatherapy on postoperative pain relief: A systematic review and meta-analysis of randomized controlled trials. *Eur J Integr Med* [Internet]. 2023;62:102289. Available from: <https://www.sciencedirect.com/science/article/pii/S1876382023000653>
 17. Lisboa I de F, Carmo ACN, Rocha PRS, Funez MI. Aromatherapy with oil of *Lavandula angustifolia* for pain in women: scoping review. *Brazilian Journal Of Pain.* 2023;6(2).
 18. Liu C, Chen X, Wu S. The effect of massage therapy on pain after surgery: A comprehensive meta-analysis. Vol. 71, *Complementary Therapies in Medicine.* Churchill Livingstone; 2022.
 19. Duran MK, Öztürk Ş. The effect of shoulder massage on shoulder pain and sleep quality in patients after laparoscopic cholecystectomy: a randomized controlled trial. *BMC Nurs.* 2024 Dec 1;23(1).
 20. Zerkle D, Gates E. The Use of Massage Therapy as a Nonpharmacological Approach to Relieve Postlaparoscopic Shoulder Pain: a Pediatric Case Report. *Int J Ther Massage Bodywork.* 2020 Jun;13.
 21. Kholibrina CR, Aswandi A. The aromatherapy formulation of essential oils in reducing stress and blood pressure on human. In: *IOP Conference Series: Earth and Environmental Science.* IOP Publishing Ltd; 2021.
 22. Miri A, Roshanzadeh M, Masoudi R, Kheiri S, Tajabadi A, Davoodvand S. Comparison of the effects of local cold therapy and hand and foot massage on blood pressure in post-operative patients. *www.nclinmed.com Novelty in Clinical Medicine* [Internet]. 2023;2(1):24–31. Available from: <https://doi.org/10.22034/NCM.2023.380439>. 1060
 23. Sitoresmi H, Masyitha Irwan A, Sjattar EL, Usman S. The effect of foot massage in lowering intradialytic blood pressure at Hemodialysis Unit in Indonesian Hospital. *Clin Epidemiol Glob Health.* 2020 Dec 1;8(4):1272–6.
 24. Suriya M, Zuriati S. The Effect of Rose Aromatherapy on Reducing The Post-Operative Pain Scale in Aisiyiah Padang Hospital, West Sumatera, Indonesia. *International Journal of Advancement in Life Sciences Research.* 2019 Jan 1;2(1):11–5.
 25. Sifaq A, Wahyuni ES, Hariyanto A, Muhammad HN, Rahmasari D, Seputra TWA, et al. Effect of sport massage and reflexology on decreases heart rate and blood pressure after training. *Health, Sport, Rehabilitation* [Internet]. 2023;11(1). Available from: <https://doi.org/10.58962/HSR.2025.11.1>.