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COMPARING THE EFFECTS OF LAVENDER AND LEMON AROMATHERAPY ON PAIN LEVELS IN WOMEN WITH CAESAREAN SECTION PATIENTS

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ABSTRACT

Background: Postoperative pain is a common complication among women undergoing caesarean section and may negatively affect recovery and quality of life. Non-pharmacological interventions such as aromatherapy have been increasingly explored to complement analgesic management. **Objective**: This study aimed to compare the effects of lavender and lemon aromatherapy on pain levels among post-caesarean section patients during the first and second postoperative days **Method:** A quasi-experimental study with a non-equivalent control group design was conducted involving 36 post-caesarean section patients. Participants were divided into two groups: lavender aromatherapy (n = 18) and lemon aromatherapy (n = 18). Aromatherapy was administered once daily for two consecutive days using a diffuser (4–5 drops of essential oil mixed with 10 ml water). Pain intensity was measured using the Numeric Rating Scale (0–10). Data were analyzed using paired sample t-tests and independent sample t-tests. **Results:** Both lavender and lemon aromatherapy significantly reduced pain levels within groups (lavender: $p < 0.001$; lemon: $p < 0.001$). However, no statistically significant difference was observed between the two interventions in post-test pain scores ($p = 0.584$). **Conclusion:** Lavender and lemon aromatherapy are both effective as non-pharmacological interventions for reducing post-caesarean section pain. Either intervention may be considered as a complementary nursing intervention in postoperative pain management.

Keywords: Aromatherapy, Caesarean Section, Lavender, Lemon, Pain Level

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INTRODUCTION

Pain is a common postoperative experience for women following Caesarean Section (Niazi et al., 2021). It is occurring around the surgical site and lasting from the first 48 hours and persisted until 3-6 weeks or more to almost 10% of women globally (Ciechanowicz et al., 2024). Caesarean section postoperative discomfort is a serious issue, which has led to a rise in interest in complementary therapies like aromatherapy. Unmanaged pain can lead to increased morbidity, reduced functionality and quality of life, and delayed recovery (Angriani et al., 2024). Although pharmacological analgesics are the norm for postoperative treatment, interest in complementary therapies like aromatherapy has grown as a result of worries about adverse effects, drug combinations, and the desire for natural alternatives.

Lavender (*Lavandula angustifiola*) and Lemon (*Citrus limonem*) Aromatherapy, may offer non-pharmacological and safe approach to alleviate Post Caesarean Section pain (Anna C. Bertone & Rebecca L. Dekker, 2021). Essential oils like lemon and

lavender are used in aromatherapy to enhance mental and physical health. The relaxing and pain-relieving qualities of lavender are well known, especially in postoperative contexts such as after a cesarean delivery. Research indicates that when compared to placebo treatments, lavender aromatherapy lowers anxiety and pain (Nouira et al., 2024). Known for its invigorating and energizing qualities, lemon essential oil has been demonstrated to lessen nausea, ease pain, encourage relaxation, and elevate mood in a variety of clinical settings, including post-operative care (Rambod et al., 2023; Zaen, 2021). The purpose of the study was to evaluate the degree of pain experienced by 18 post- caesarean section patients who were treated with aromatherapy using lavender, lemon, or both.

METHODS

This quasi-experiment, non-equivalent control group study design had applied to assess the impact of a treatment or intervention from Lavender and Lemon aromatherapy on Pain Levels among post-caesarean section women.

Study design

The experimental group in this study will be given treatment by using diffuser machine in the form of lavender aromatherapy, while the control group will be given treatment in the form of lemon aromatherapy. The two group will have their pain levels seen before and after being given treatment. The research subjects were taken from post-cesarean patients at a private hospital without randomization. Both aromatherapy dose were 4-5 drops of essential oil mixed with 10 cc of water by diffuser.

Population and sample

Based on preliminary data from early January 2023, which shows a monthly increase in moms who underwent *Caesarean Section* (CS) at the private hospital in Malang City, East Java, Indonesia. This study focuses on 36 post-section cesarean patients. The number of samples in this study had recruited 36 people by using convenience sampling method. The number of samples will be divided into two groups, namely the case group (the group that received lavender aromatherapy) of 18 people and the control group (the group that received lemon aromatherapy) of 18 people. This is in accordance with the Quasi Experiment (Non-Equivalent Control Group Design) research design used in this study.

The research sample was also determined based on inclusion and exclusion criteria:

Inclusion criteria:

a. Post-CS patients who experience pain on days 1-2.
b. Post-CS patients who are in a compos mentis condition.
c. Post-CS patients aged 20-40 years; and
d. Post-CS patients who are not under the influence of analgesics.

Exclusion criteria:

a. Post-CS patients who have comorbidities such as hypertension, heart disease, and asthma.
b. Post-CS patients who have impaired vision, smell and hearing.
c. Post-CS patients who are allergic to aromatherapy; and
d. Post-CS patients who do not experience severe preeclampsia.

The process of dividing the research groups, namely the experimental group and the control group, was carried out by making the first 18 patients to come to

hospital as the experimental group and the next SC patients as the control group. This was done after the patients who came to hospital met the inclusion criteria. This research had conducted for approximately 1 month and 26 days (from March 21 – May 16, 2023) at a private hospital of Malang City, East Java, Indonesia.

Data collection

To quantify independent variables and adult patients' pain levels, the researcher created observation sheets for this study. The dependent variable was pain levels, while the independent variables were aromatherapy with lavender and lemon. The purpose of the observation sheets was to show the degree of pain; a lower number denoted less discomfort. Using 0–10 as pain level, the researchers completed the sheets based on the responses from the respondents.

Preparation and implementation were the two phases of data gathering for this study. In the maternity room, they collected data from post-section cesarean patients, gained respondents' informed consent, prepared pain level observation sheets for post-CS patients, and sent and submitted the research permit to Hospital.

On days 1 and 2, 4-5 drops of lavender essential oil were combined with 10cc of water and given for 30 minutes. Six hours after the analgesic was administered, the treatment started. On days 1 and 2, 4-5 drops of lemon essential oil were combined with 10cc of water and given for 30 minutes. To prevent disruption and to allow for hospital stays, the treatment was changed to once daily for two days.

Data analysis

Processing post-caesarean section patients' pain level data before and after lavender and lemon aromatherapy is part of the study. The editing procedure verifies that data has been collected; if not, re-measurement is carried out. Using Microsoft Excel to facilitate simple input into SPSS v.25 for Windows, the tabulation procedure arranges data into a single table that is coded and scored. The effects of lavender and lemon aromatherapy on post-caesarean section pain levels had investigated by the researcher using both univariate and bivariate data analysis techniques. Bivariate analysis will ascertain the impact of the two treatments on post-caesarean section pain levels, whereas univariate analysis will display the mean pain level prior to and following treatment. With an alpha of 0.05, the study will employ the Paired Sample T-Test and the Independent Sample T-Test. The difference in average values between the experimental and control groups will be the dependent variable.

Ethical statement

This study had conducted from March 21st to May 16th, 2023, in a private hospital of Malang City, East Java Province of Indonesia, with the registered IRB No.1771/ UN25.8/ KEPK/DL/2022. When gathering data, researchers followed several research ethics. These include getting prospective respondents' informed consent, keeping them anonymous by not revealing their true names, protecting confidentiality to stop careless people from abusing it, and abiding by the moral precepts of beneficence and non-maleficence. This guarantees that the information gathered is handled sensibly and doesn't hurt the people who answered it. When gathering data, researchers need to be courteous and open-minded.

RESULTS

This study used post-C-section patients who were admitted to a private hospital

in Malang to examine the pain levels of post-SC patients. Eighteen initial SC patients and eighteen control patients provided data. The data was gathered on their own with help from medical staff, and the researcher wasn't there every day at the hospital. The information, which included demographic and location profile data, pretest and posttest identification, and treatment differences, was separated into general and specific groups.

Demographic Data

Table 1 Demographic Characteristic of Experimental Group

Characteristics	Indicators	Frequency	Percentage
Age (year)	17-25	5	27.8
	26-35	11	61.1
	36-45	2	11.1
	Total	18	100.0
Sub-district Region	Klojen	4	22.2
	Lowokwaru	3	16.7
	Tlogomas	2	11.1
	Blimbing	1	5.6
	Sukun	3	16.7
	Tajinan	1	5.6
	Singosari	3	16.7
	Pakis	1	5.6
	Total	18	100
Education	Junior High School	1	5.6
	Senior High School	1	5.6
	Diploma III/IV	7	38.9
	Bachelor	9	50
	Total	18	100
Occupation	Private Worker	5	27.8
	Seller	1	5.6
	Housewives	11	61.11
	Nursing	1	5.6
	Total	18	100
	Caesarean Section	14	78
Labor History	Normal	4	22
	Total	18	100

As shown in the following table, most responders' ages are The experimental group comprises eleven early adults, ranging in age from 26 to 35. (61.1%); four, or 22.2%, make up nearly a quarter of the respondents; nine, or 50%, have a bachelor's degree; eleven, or 61.1%, are mothers in households; and fourteen, or 78%, have had a history of cesarean deliveries.

Table 2 Demographic Characteristic of Control Group

Characteristics	Indicators	Frequency	Percentage
Age (year)	17-25	3	16.7
	26-35	10	55.6
	36-45	5	27.8
	Total	18	100.0
Sub-district Region	Klojen	4	22.2
	Lowokwaru	3	16.7
	Tlogomas	1	5.6
	Blimbing	3	16.7

Characteristics	Indicators	Frequency	Percentage
	Sukun	6	33.3
	Dampit	1	5.6
	Total	18	100
Education	Senior High School	6	33.3
	Diploma III/IV	5	27.8
	Bachelor	7	38.9
	Total	18	100
Occupation	Private Worker	3	16.7
	Police/Army/Government staff	2	11.1
	Seller	3	16.7
	Housewives	8	44.4
	Nursing	1	5.6
	Teacher	1	5.6
	Total	18	100
Labor History	Caesarean Section	12	67
	Normal	6	33
	Total	18	100

The data above demonstrates that the majority of respondents have a history of caesarean deliveries, nearly a quarter of the respondents are from the sub-district of Klojen, with four respondents (22.2%), nearly half of the respondents have a bachelor's degree (S1-S3), with seven respondents (38.9%), nearly half of the respondents work as housewives, with eight respondents (44.4%), and more than half of the respondents in the early adult control group (26–35 years old) totaled 10 respondents (55.6, 1%) 12 persons, or 67%.

Pain Level of Patients Post-Caesarean Section (CS) Day first before being given Lavender Aromatherapy

Table 3. Pretest Pain Level of Experimental Group (Lavender)

Pain Level	F	%	Mean	Min	Max
No Pain	0	0	4.94	3.00	7.00
Low Pain	1	5.6			
Moderate Pain	15	83.3			
Severe Pain	2	11.1			
Very Severe Pain	0	0			
Total	18	100			

Most respondents experienced post-SC in the moderate category, comprising 15 individuals (83.3%), with an average score (mean) 4.94 or rounded to 5 (moderate pain category), a minimum value of 3, and a maximum of 7, according to the pretest results of the patients' pain levels in the experimental group prior to receiving lavender aromatherapy on day 1.

Pain Level of Patients Post-Caesarean Section (CS) second day after being given Lavender Aromatherapy

Table 4. Posttest Pain Level of Experimental Group (Lavender)

Pain Level	F	%	Mean	Min	Max
No Pain	0	0	3.78	2.00	6.00
Low Pain	8	44.4			
Moderate Pain	10	55.6			

Pain Level	F	%	Mean	Min	Max
Severe Pain	0	0			
Very Severe Pain	0	0			
Total	18	100			

After receiving lavender aromatherapy on the second day, the experimental group's posttest results for post-SC pain levels indicate that over half of the respondents reported experiencing discomfort (see table 5.4 above). in the moderate group, which consists of 10 individuals (55.6%) with a mean score of 3.78, rounded to the nearest four (moderate pain category), with a minimum score of 2 and a maximum score of 6.

Pain Level of Patients Post-Caesarean Section (CS) Day first before being given Lemon Aromatherapy

Table 5. Pretest Pain Level of Control Group (Lemon)

Pain Level	F	%	Mean	Min	Max
No Pain	0	0	6.33	4.00	8.00
Low Pain	0	0			
Moderate Pain	10	55.6			
Severe Pain	8	44.4			
Very Severe Pain	0	0			
Total	18	100			

After receiving lavender aromatherapy on the second day, the experimental group's posttest results for post-SC pain levels indicate that over half of the respondents reported experiencing discomfort (see table 5.4 above). in the moderate group, which consists of 10 individuals (55.6%) with a mean score of 3.78, rounded to the nearest four (moderate pain category), with a minimum score of 2 and a maximum score of 6.

Pain Level of Patients Post-Caesarean Section (CS) Second Day after being given Lemon Aromatherapy

Table 6. Posttest Pain Level of Control Group (Lemon)

Pain Level	F	%	Mean	Min	Max
No Pain	0	0	3.56	1.00	6.00
Low Pain	7	38.9			
Moderate Pain	11	61.1			
Severe Pain	0	0			
Very Severe Pain	0	0			
Total	18	100			

The posttest results of the pain levels of post-SC in the control group following lemon aromatherapy on the second day are displayed in Table 5.6 above. Most respondents, or 11 individuals (61.1%), have moderate pain, with an average score (mean) of 3.56 and rounded to 4 (medium category), a minimum score of 1 and a maximum score of 6.

Results of the Analysis of the Effects of Different Lavender Aromatherapy Treatments and Lemon on Pain Levels in Post-Caesarean Section Patients

(SC) Day 1 and 2

The research conducted a Paired Sample T-Test using SPSS v.25 to compare the effects of lavender and lemon aromatherapy on post-SC pain levels in 18 patients. The normality test was used to ensure data distribution normality, as it is prerequisite for conducting parametric and paired tests. The results of the normality test are presented in a table, indicating the effectiveness of the treatments.

Table 7. Normality Test of Post-SC Pain Data with Shapiro-Wilk test

Group	P Value	Alpha Value
Pretest (Experiment)	0.088	0.05
Posttest (Experiment)	0.135	
Pretest (Control)	0.100	
Posttest (Control)	0.057	

As can be observed in the SPSS output on the Test of Normality table in the Sig. column, the findings of the distribution normality test on the research data (post-SC pain) are shown in Table 5.7 above with a larger P-value. All test findings (group pretest experiment = 0.088; posttest experimental group = 0.135; pretest group control = 0.100; and posttest control group = 0.057) were derived from the (>) alpha value (0.05). This suggests that the research data's distribution is deemed normal. As a result, the Paired Sample T-Test approach can be used to analyze data.

Results of the Paired Sample T-Test

Table 8. Results of the Paired Sample T-Test

Group	P Value	P-Value	Alpha Value
Pretest-Posttest (Experiment)	1.167	0.000	0.05
Pretest-Posttest (Control)	2.778	0.000	

Table above shows that the results of the SPSS v.25 test with the Paired Sample T-Test technique on the experimental group shows a P-value of 0.000 < 0.05. This means that there is a significant average difference between the pain levels of post-SC patients in the experimental group (18 people) before and after being given lavender aromatherapy. Next, if the average between pretest and posttest pain levels of post-SC patients in the group the experiment was compared, resulting in a decrease with a difference an average of 1.167. In simpler terms, it can be said that lavender therapy has significantly affected pain levels post-SC respondent patients, namely reducing the pain levels of post-SC patients. Next, the table also shows that the test results Paired Sample T-Test on the control group also showed a P-value of 0.000 < 0.05. It means that there is a significant difference between the averages pain levels of post-SC patients in the control group (18 people) before and after being given lemon aromatherapy. Next, if the average pretest score and posttest pain levels of post-SC patients in the control group compared, there was a decrease with an average difference of 2.778. In simpler terms, it can be said that lemon therapy has significantly affects the pain levels of post-SC patients, namely reducing post-SC pain levels.

Based on the test results above, it can be said that both treatment both significantly affect the pain levels post-SC patients. Therefore, the next test is

Independent Sample T-Test to show the difference in the effect of both treatments (lavender aromatherapy and lemon aromatherapy) on the pain levels of post-SC patients. However, before this study conducts a difference test with the Independent Sample T-Test, this study first conducting a homogeneity test to ensure data similarity.

Results of the Homogeneity Test

This homogeneity test is conducted because each quantity respondents in both groups are less than (<) 30 people. Homogeneity test this is only done on the post-SC pain level measurement data in the post-test only (and not in the pretest). Because theoretically, in the homogeneity test only conducted on post-test results. Here are the results of the data homogeneity test.

Table 9. Homogeneity Test

Group	P-Value	Alpha Value
Post-test of the experimental and control groups	0.532	0.05

Table above shows that the results of the data homogeneity test posttest pain levels of post-SC patients in both treatment groups shows the P-value in the Levene's Test for Equal Variances Assumed column of 0.532 > alpha value (0.05). This means that the research data is declared homogeneous or the same. Because the research data is stated to be homogeneous or same, then the data analysis with the Independent Sample T-Test can continue without having to retest, because the results can already be seen in previous homogeneity test table. If the homogeneity test looks at the column Levene's Test for Equal Variances Assumed, then in the Independent Sample T-test Test looks at the T-Test for Equality of Mean column.

Results of the Test on the Difference in the Effects of Lavender and Lemon Therapy on Pain Levels of Post-Caesarean Section (CS) Patients on Days 1-2

Difference testing using the Independent T-Test technique is conducted by examining significance value (Sig. 2 tailed) or P-value in the T-Test for Equality of column Mean. The results can be seen in the table below:

Table 10. Independent Sample T-Test

Group	P-Value	Alpha Value
Posttest of the experimental and control groups	0.584	0.05
Difference in posttest mean of the experimental group and control	0.222	

The table above is the result of the Independent Sample T-Test which shows that the resulting P-value is 0.584 > 0.05. This also proven by the mean difference or average of the two groups of 0.222 (rounded to 0). Therefore, it can be said that there is a significant difference in the effects between lavender therapy and lemon on the pain levels of post-SC patients. As a result, it can be said that both

treatments are equally influential, significantly affect the pain levels of post-SC patients. However, the influence of both is not significantly different.

DISCUSSION

This study reveals that over half of post-surgical cesarean (SC) patients experience moderate pain before receiving lemon aromatherapy. This pain is influenced by the surgical scar or tear in the abdomen during the surgery and the loss of pharmacological effects of the anesthetic drug (Angriani et al., 2024). Post-SC pain is a common complication experienced by patients who undergo cesarean surgery. Factors such as age, education, depression, anxiety, and childbirth history also contribute to the intensity of pain in the moderate category. Age is a significant factor in influencing pain, as adults experience a change in neurophysiology and sensory perception, leading to an increase in pain threshold. Education level is also likely to affect moderate pain in the control group, as people with higher education tend to control pain more effectively.

The results of this research identification related to the pain levels of post-SC patients the experimental group after being given lavender aromatherapy reported more than Half of the respondents were in the moderate pain category with an average of 4. (medium category). This means that, when compared to the previous average value, the average pain level has decreased (the previous average was 5 or category being). The administration of aromatherapy treatment in general, including aromatherapy lavender, usually done for 2 days with a frequency of 2 times a day in the morning and afternoon. However, due to the hospital's request that patients do not interrupted, finally the treatment in this study was modified to once one day for two days. Additionally, post-SC patients are in the hospital for only two days only with a frequency of once a day for two days with a duration of each treatment was done for 30 minutes with a dosage of 4-5 drops of essential oil lavender mixed with 10 cc of water. Then the treatment starts after 6 hours. after being given pharmacological therapy (analgesics). This study shows a decrease in post-SC pain after administration. that aromatherapy.

The decrease in pain levels is certainly due to the treatment lavender aromatherapy given twice over two days has worked well. Lavender aromatherapy can reduce post-SC pain because of the oil. That essential oil, when inhaled, indeed functions to enhance alpha waves that are in the brain and waves that will function to provide peace and comfort for who inhaled it. Next, the pain the post-SC will decrease because of the molecules from the essential oil will be received by several receptor cells present in the nasal lining and will a process of sending signals to the brain that will ultimately affecting the limbic system within the brain. As a result, when it happens thus, it will affect mood, emotions, and memory for producing neurohormones in endorphins and enkephalins where those two things function to reduce and eliminate pain. This is proven research which shows that essential oil lavender has significantly influenced post-SC pain as evidenced with a P-value of $0.001 < 0.05$.

The effect of lemon aromatherapy administration over two days shows the occurrence of a decrease in post-SC pain in the study respondents. The occurrence of a decrease this pain is certainly influenced by the lemon aromatherapy treatment given to respondents twice over 2 days. This means the treatment has

worked. well and have an effective influence. Theoretically, the substance (endorphins and serotonin) contained in lemon essential oil can causes a decrease in blood pressure, pulse rate, and pain scale.

The lemon aroma that is processed and transformed by the body of someone who inhales it will be giving rise to an action that releases neurochemical substances in the form of endorphins and serotonin. The aroma captured by the nose will be perceived by the brain to giving rise to reactions that cause physiological changes in the mind, soul, and body, so that it can calm the body itself. In addition, lemon essential oil contains essential oils that has anti-stress functions. Because of that, when the oil is inhaled, it will provide a calming effect, alleviates dizziness, restlessness, mental fatigue, nervousness, nerve tension, and pain (Anna C. Bertone & Rebecca L. Dekker, 2021).

CONCLUSION

By Inhaled essential oil molecules cause the nose's receptor cells activation, sending messages to the brain. Neurochemicals are released and transported throughout the body by electrochemical stimulation. Endorphins, which relax and reduce pain, are released when the scent activates the neurological system (Vora et al., 2024). Lavender, has antispasmodic, relaxant, and analgesic effects due to its linalyl acetate and linalool content (Nouira et al., 2024). Lemon, containing Limonene and Linalyl Acetate, can treat pain by inhibiting prostaglandins and controlling Cyclooxygenases I and II (Li et al., 2022). Nurses play a crucial role in observing the body's response to post-surgical pain, so identifying the most effective aromatherapy is essential. By provided some options of non-pharmacological therapy can alleviate the pain and promote comfort for Post Section-Caesarean Women (Angriani et al., 2024).

CONFLICT OF INTEREST

The study's authors affirm that they have no conflicts of interest.

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