Original Research Report

REDUCTION OF POSTOPERATIVE NAUSEA AND VOMITING INDUCED BY SPINAL ANESTHESIA: PEPPERMINT AND LAVENDER AROMATHERAPIES AS COMPLEMENTARY THERAPIES

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ABSTRACT

Nausea and vomiting are common occurrences after surgery with spinal anesthesia, potentially leading to complications and delayed recovery. Hypotension associated with spinal, epidural, and combined spinal-epidural anesthesia is a significant factor contributing to postoperative nausea and vomiting (PONV). This study aimed to determine the difference in effectiveness between peppermint and lavender aromatherapies for reducing PONV in patients receiving spinal anesthesia. This study used a pretest-posttest design with a control group. The research sample comprised at least 12 respondents in each group, resulting in a total of 36 respondents selected by a random sampling technique utilizing a wheel spinner. The inclusion criteria were respondents who experienced moderate to severe PONV, as indicated by scores of 9–24. The Rhodes Index of Nausea, Vomiting, and Retching (RINVR) instrument was utilized to measure the level of nausea and vomiting over six hours. The statistical analysis included the Mann-Whitney test and the Wilcoxon test, with a significance level set at $p<0.05$. The Mann-Whitney test yielded values of $p=0.003$ for peppermint and $p=0.017$ for lavender, indicating the aromatherapy effect in reducing PONV compared to the control group. Furthermore, the results showed a value of $p=0.00$ for the comparison between the administration of lavender and peppermint aromatherapies, demonstrating that peppermint aromatherapy was more beneficial than lavender aromatherapy in alleviating PONV. This study suggests that peppermint aromatherapy is more effective than lavender in reducing PONV, as patients may favor the refreshing effect of peppermint, which enhances relaxation and reduces nausea and vomiting.

Keywords: Health risk; human and health; postoperative nausea and vomiting (PONV); spinal anesthesia; aromatherapy

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Highlights:
1. This study provides insight into the effectiveness of peppermint and lavender aromatherapies in reducing postoperative nausea and vomiting in patients following spinal anesthesia.
2. Aromatherapies with peppermint and lavender administered three times within six hours have demonstrated potential as an easy-to-apply intervention that reduces postoperative nausea and vomiting.
3. In terms of effectiveness, however, peppermint aromatherapy exhibits a higher effectiveness in reducing nausea and vomiting compared to lavender aromatherapy.

INTRODUCTION

Nausea and vomiting often occur during the intraoperative or postoperative period in patients receiving spinal anesthesia. These conditions are a major concern in rehabilitation efforts and a high priority for nurses and anesthetists. Spinal anesthesia suppresses sympathetic nerves, thereby prominently inducing parasympathetic effects, including an increase in intestinal contractions, intraluminal pressure, and sphincter relaxation (Arif 2022, Yuniarti et al. 2024). Conditions such as the patient's mental status, hypotension, opioid use, visceral stimulation, increased intragastric pressure, the use of uterotonic agents, excessive surgical manipulation, and the stretching of the peritoneum due to uterine exteriorization can contribute to the risk of postoperative nausea and vomiting (PONV). Hypotension associated with spinal anesthesia,

epidural anesthesia, and combined spinal-epidural anesthesia is an important factor in the occurrence of PONV (Apsari et al. 2023).

Sustained episodes of nausea and vomiting can lead to venous hypertension, esophageal rupture, bleeding, and severe dehydration as a result of electrolyte imbalance. Specifically, PONV can result in various complications, such as wound dehiscence, bleeding, the aspiration of gastric contents, delayed recovery, and increased treatment costs (Khasanah et al. 2021, Asriani et al. 2023). Nausea is a feeling of vomiting without any induction by muscle movement, whereas vomiting is the process of expelling stomach contents. The expulsion of stomach contents is a consequence of the abdominal muscles contracting during the vomiting episode (Sharma et al. 2014).

According to Rihiantoro et al. (2018), approximately 71 million patients in the United States experience PONV each year, which accounts for 70–80% of the entire surgical patient population. On the other hand, Indonesia lacks a clear record of PONV. Recent data indicate that the incidence of PONV reached 31.25% following laparotomy and gynecologic procedures and 31.4% after mastectomy Purwaningsih (2023). Clinical observations have shown that three to five patients experience PONV daily following spinal anesthesia.

Aromatherapy can serve as a complementary therapy by affecting areas of the brain and stimulating physiological responses in the nervous, endocrine, or immune systems, thereby leading to changes in heart rate, blood pressure, respiration, brain wave activity, and hormone release throughout the body. Some aromatherapies that are considered effective in addressing nausea and vomiting include lavender and peppermint aromatherapies (Purwaningsih 2023). Peppermint aromatherapy can reduce nausea and vomiting due to its relaxing and calming effects, which help control nausea (Setiawan & Susaldi 2022). Peppermint aromatherapy contains menthol and menthone, in percentage ranges of 10–30% and 35–45%, respectively. These components act as antiemetics and antispasmodics for the stomach and intestinal lining (Sumiaty et al. 2022).

On the other side, lavender aromatherapy contains various substances, such as linalool, flavonoids, geraniol, tannin, cineol, and linalyl acetate. These components can produce antibacterial, antispasmodic, antidepressant, and analgesic effects. Due to its sedative effects, lavender aromatherapy can regulate the nausea and vomiting receptors in the brain, thereby reducing the likelihood of nausea and vomiting side effects . Despite both therapies exhibiting beneficial effects, there had been no scientific evidence prior to this study to ascertain which of these complementary therapies is more effective in dealing with PONV. The aim of this study was to analyze the effectiveness of lavender and peppermint aromatherapies in reducing nausea and vomiting in postoperative patients who had spinal anesthesia.

MATERIALS AND METHODS

This research used a quasi-experimental analytical study design. Specifically, the pretest-posttest design with a control group was utilized in this study (Maciejewski 2020). Three groups were involved in this study: the peppermint aromatherapy group, the lavender aromatherapy group, and the control group. The inclusion criteria comprised patients in early and late adulthood who experienced moderate to severe PONV for two to six hours following spinal anesthesia. The exclusion criteria were patients with chronic obstructive pulmonary disease (COPD), respiratory disorders, and a history of alcoholism.

The sample size was calculated using the Federer formula as outlined by Arif (2022), which resulted in 12 respondents each for the peppermint aromatherapy group, the lavender aromatherapy group, and the control group, totaling 36 respondents according to the inclusion criteria. The sampling technique was carried out using a random sampling method with a wheel spinner. The researcher input the treatment numbers and spun the wheel, so the numbers displayed represented the treatment groups. Respondents who met the inclusion criteria were tested with the Rhodes Index of Nausea, Vomiting, and Retching (RINVR) instrument. Respondents who had undergone surgery then underwent a pretest to assess nausea and vomiting two hours postoperatively using the RINVR instrument, followed by treatment administration for three times according to their respective groups. While the intervention was given three times, the observations were conducted four times over a six-hour period. Posttest observations of the PONV levels in the treatment and control groups were conducted after the intervention, specifically at the second, third, fourth, and sixth hours. The statistical analysis was conducted using the Mann-Whitney test and the Wilcoxon test with the aid of IBM SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, N.Y., USA).

RESULTS

This study was conducted over two months, from February to March 2024, involving a total of 36 respondents. Almost all respondents who experienced nausea and vomiting belonged to the

late adult age group (36–45 years). Furthermore, the patients who became respondents had already passed 1 hour after surgery.

Table 1. Severity of nausea and vomiting before and after the administration of peppermint aromatherapy in postoperative patients receiving spinal anesthesia.

Observations	Nausea and vomiting				
	None	Mild	Moderate	Severe	Total
	n	n	n	n	n
Pretest	0	0	9	3	12
Posttest 1	0	2	8	2	12
Posttest 2	0	8	4	0	12
Posttest 3	0	11	1	0	12
Posttest 4	3	9	0	0	12

Table 1 shows the presence and severity of nausea and vomiting in the peppermint aromatherapy group. It was found that pretest, nine respondents exhibited moderate nausea and vomiting. In posttest 1 following the intervention, only eight respondents experienced moderate nausea and vomiting. In posttest 2, the severity of nausea and vomiting decreased in some respondents, resulting in eight respondents who reported mild severity. In posttest 3, resulting eleven respondents showed a decrease in nausea and vomiting to a mild severity. In posttest 4, nine respondents reported mild nausea and vomiting, while three respondents had recovered from their postoperative nausea and vomiting.

Table 2. Statistical test results of the peppermint aromatherapy group.

	p
Pretest peppermint aromatherapy Posttest peppermint aromatherapy	Wilcoxon test = 0.033
Pretest control group Postest control group	Wilcoxon test = 0.180
Pretest control group Pretest peppermint aromatherapy	Mann-Whitney test = 0.010
Posttest control group Posttest peppermint aromatherapy	Mann-Whitney test = 0.003

According to Table 2, the Wilcoxon test and the Mann-Whitney test yielded a value of $p<0.05$. The value that was smaller than alpha indicated the acceptance of H1, revealing a significant difference in the posttest results between the control group and the peppermint aromatherapy group. These results signified that peppermint aromatherapy exhibited an effect on the reduction of PONV.

As shown in Table 3, the severity of nausea and vomiting in the lavender aromatherapy group was predominantly moderate prior to the intervention. The observation on posttest 1 revealed that seven respondents continued to experience moderate nausea and vomiting. In posttest 2, the majority of the respondents indicated a reduction in the severity of nausea and vomiting, leaving ten respondents with a mild severity. By posttest 3, all respondents already exhibited mild nausea and vomiting. In posttest 4, ten respondents still experienced mild nausea and vomiting, while two respondents no longer experienced nausea or vomiting.

Table 3. Severity of nausea and vomiting before and after the administration of lavender aromatherapy in postoperative patients receiving spinal anesthesia.

Observations	Nausea and vomiting				
	None	Mild	Moderate	Severe	Total
	n	n	n	n	n
Pretest	0	0	9	3	12
Posttest 1	0	4	7	1	12
Posttest 2	0	10	2	0	12
Posttest 3	0	12	0	0	12
Posttest 4	2	10	0	0	12

Table 4. Statistical test results of the lavender aromatherapy group.

	p
Pretest lavender aromatherapy Posttest lavender aromatherapy	Wilcoxon test = 0.034
Pretest control group Posttest control group	Wilcoxon test = 0.180
Pretest control group Pretest lavender aromatherapy	Mann-Whitney test = 0.392
Posttest control group Posttest lavender aromatherapy	Mann-Whitney test = 0.017

Table 4 presents the results of the Wilcoxon test and the Mann-Whitney test, indicating a value of $p<0.05$. The value smaller than alpha indicated that H1 was accepted, suggesting that there was a significant difference in the posttest results between the control group and the lavender aromatherapy group. According to the results, there was an effect demonstrated by lavender aromatherapy in reducing PONV.

Table 5. Effectiveness of lavender and peppermint aromatherapies in reducing postoperative nausea and vomiting (PONV).

	p
Posttest control group Posttest peppermint aromatherapy	0.003
Posttest control group Posttest lavender aromatherapy	0.017
Posttest peppermint aromatherapy Posttest lavender aromatherapy	0.00

Table 5 shows that the Mann-Whitney test resulted in a value of $p=0.00$. The value smaller than alpha

(0.05) indicated the acceptance of H1, implying a significant difference in the posttest results between the peppermint aromatherapy group and the lavender aromatherapy group. These results demonstrated a difference in effectiveness between peppermint aromatherapy and lavender aromatherapy in reducing PONV.

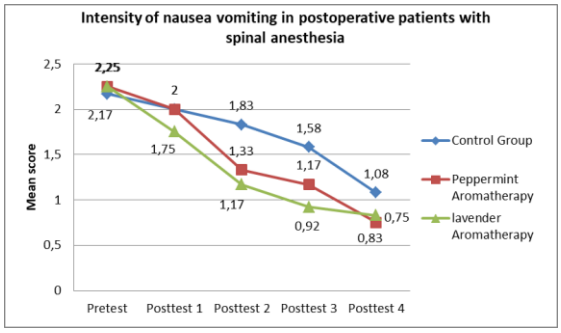

Figure 1. Reduction of postoperative nausea and vomiting (PONV) in the peppermint aromatherapy group, lavender aromatherapy group, and control group.

Figure 1 displays the pattern in the intensity of nausea and vomiting among postoperative patients receiving spinal anesthesia. The data indicated that there was a decrease in PONV after the administration of lavender aromatherapy and peppermint aromatherapy, with the average intensity score at the sixth hour being almost the same. However, the peppermint aromatherapy group exhibited the lowest average PONV score following the intervention. This demonstrated that peppermint aromatherapy provided a higher effectiveness than lavender aromatherapy in reducing nausea and vomiting.

DISCUSSION

According to Rustanti (2018), anesthesia can cause several symptoms such as nausea, vomiting, and pain, which often occur in patients following a surgery. Anesthesia reaching the brain results in a depression of the central nervous system. This depression can impair perfusion that regulates blood circulation in the central vascular system (CVC), which in turn leads to hypersecretion of mucus and saliva. This hypersecretion disrupts the digestive system and activates inflammatory mediators. The presence of inflammatory mediators stimulates the afferent vagus nerve, triggering sympathetic and parasympathetic reactions. Consequently, patients may experience nausea and vomiting after surgery (Santoso et al. 2023).

Aromatherapy involves the process of absorbing and inhaling substances to affect the limbic system of the brain, associated with emotions and memory. This process can stimulate physiological responses in the immune, endocrine, or nervous systems, subsequently affecting variables such as breathing, brainwave activity, blood pressure, heart rate, and the release of various hormones. The impact on the brain can produce a feeling of calmness or stimulate the nervous system, and in some cases, it can help normalize hormone secretion (Pratiwi & Subarnas 2020).

This study found that there was an effect of peppermint aromatherapy on reducing PONV. The results of this study are in line with those of Rihiantoro et al. (2018), who revealed a difference in the average PONV after the administration of peppermint inhalation aromatherapy. This study is also supported by a study conducted by Purwaningsih (2023), who demonstrated a decrease in PONV following the administration of peppermint aromatherapy in patients undergoing appendicectomy. The study concluded that non-pharmacological therapeutic techniques, specifically the use of peppermint oil, can help reduce PONV due to its distinctive aroma. A prior study carried out by Wilandia et al. (2024) found that peppermint aromatherapy effectively alleviates nausea and vomiting. Prior to the treatment, most of the participants experienced moderate to severe nausea and vomiting. However, after the application of peppermint aromatherapy, the majority of the participants reported only mild symptoms.

Peppermint aromatherapy is more effective than lavender aromatherapy due to the presence of menthol, which offers a refreshing effect. Postoperative patients receiving spinal anesthesia may experience reduced nausea and vomiting, as the refreshing peppermint aromatherapy can distract these symptoms (Karsten et al. 2020). The menthol content found in peppermint helps patients to be more relaxed, thereby diminishing the severity of nausea and vomiting. The respondents also preferred the refreshing effect of menthol, which induces a psychological effect beneficial for creating a state of relaxation (Sapti 2022). It has been known that peppermint aromatherapy can effectively reduce nausea and vomiting. Inhaled peppermint molecules stimulate the olfactory and central nerves, creating a relaxing sensation. The menthol in peppermint helps postoperative patients feel calmer, resulting in less nausea and vomiting. Aromatherapy increases alpha waves in the brain, facilitating a state of relaxation (Chatterjee et al. 2011).

This study additionally discovered that lavender aromatherapy produced an effect on reducing PONV. The results of this study align with research conducted by Nurrohmi et al. (2021) at Dr. Saiful Anwar Regional General Hospital, Malang, Indonesia, which showed an asymptotic significance

(2-tailed) value of p<0.000. The study determined that lavender aromatherapy has a significant effect on reducing nausea and vomiting post-chemotherapy. Another study carried out by Karaman et al. (2019) confirmed that aromatherapy may serve as a complementary therapy in the treatment of PONV. Lavender aromatherapy is superior to rose oil in alleviating PONV among patients who receive spinal anesthesia.

Lavender aromatherapy uses essential oil derived from Lavandula angustifolia, which contains various substances such as flavonoids, linalool, lavender, cineol, geraniol, tannin, and linalyl acetate. Linalool has sedative properties, whereas linalyl acetate exerts narcotic effects. These effects are able to relieve sympathetic nervous system activity, reduce stress hormones, and increase beta-endorphin secretion. With its sedative effect, lavender aromatherapy can stimulate nausea and vomiting receptors in the brain, reducing the probability of experiencing nausea and vomiting side effects (Ain et al. 2019). Furthermore, aromatherapy is highly beneficial for reducing PONV. Lavender oil has a broad therapeutic impact on the sympathetic, parasympathetic, and limbic systems, which can lead to a relaxing effect. Its pharmacological effects can induce both physical and psychological relaxation, thereby aiding in the prevention of PONV (Syahreza 2022).

Despite the beneficial effect of lavender aromatherapy, the researchers observed that peppermint aromatherapy has a significantly stronger impact on reducing nausea and vomiting levels. Aromatherapy can be a valuable intervention in nursing care, particularly in addressing basic human needs such as nutrition and fluid intake. When a patient experiences nausea and vomiting, their ability to meet nutritional and fluid requirements may be compromised, leading to serious complications such as dehydration, electrolyte imbalance, venous hypertension, bleeding, and esophageal rupture, as well as extreme dehydration in severe cases (Arfiani et al. 2017).

Aromatherapy oils have been suggested as a remedy for nausea. Their effectiveness may stem from their analgesic and antiemetic properties as seen in peppermint and ginger oils or from their antispasmodic properties as found in peppermint and fennel oils. Peppermint oil is particularly well-known for its benefits in treating digestive issues, primarily due to the presence of menthol (Hines et al. 2018). Aromatherapy works by redirecting the stimulus of nausea and vomiting into sensations of relaxation and freshness, thereby reducing or eliminating the nausea reflex. This therapeutic approach involves the interaction between the aroma produced by essential oils and the psychological response of the body, resulting in a positive effect on overall well-being (Hayati 2021).

Strength and limitations

This study determined peppermint aromatherapy to be more effective than lavender aromatherapy, suggesting its beneficial use as a complementary therapy for postoperative nausea and vomiting (PONV). However, the researchers recognized several limitations while conducting this study. The research was carried out in a ward where the respondents were unable to inhale the aromatherapy at a certain distance due to environmental factors. Furthermore, the administration of antiemetic drugs for nausea and vomiting was not carried out according to a definite schedule, resulting in a suboptimal effect of the intervention. This study also utilized inclusion criteria that were too broad, leading to non-homogeneous data due to varying levels of nausea and vomiting among the respondents. This necessitated adjustments in the analysis of the results.

CONCLUSION

Peppermint and lavender aromatherapies are effective for reducing postoperative nausea and vomiting (PONV) in patients under spinal anesthesia. Nevertheless, there is a difference in the effectiveness of lavender and peppermint aromatherapies in reducing PONV, with peppermint aromatherapy demonstrating a higher effectiveness compared to lavender aromatherapy. The administration of peppermint aromatherapy is optimal within six hours after surgery.

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Conflict of interest

None.

Ethical consideration

The Research Ethics Committee of Mardi Waluyo Regional General Hospital, Blitar, Indonesia, has declared that this research is ethically feasible by

issuing an ethical feasibility letter No. 800/5.6.8/410/302.3/KEP/I/2024 dated 1/6/2024.

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Author contribution

TA drafted the article, provided administrative support, and performed the critical revision of the article for important intellectual content. NNM drafted the article, provided technical support, and collected and assembled the data. Both MDC and FKS provided logistical support and final approval of the article.

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