

INFORMASI ARTIKEL

Received: February, 16 2026

Revised: February, 23, 2026

Available online: February, 28, 2026

at: <https://e-jurnal.ipphorr.com/index.php/mchc>

The effect of peppermint aromatherapy on nausea and vomiting in pediatric patients with acute lymphoblastic leukemia undergoing chemotherapy

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Abstract

Background: The incidence of ALL in children continues to rise. One therapy for ALL patients is chemotherapy. However, chemotherapy has unavoidable side effects, such as nausea and vomiting. Aromatherapy using peppermint oil can help chemotherapy patients feel less nauseous and reduce the likelihood of vomiting.

Purpose: To determine the effect of peppermint aromatherapy on nausea and vomiting in pediatric patients with acute lymphoblastic leukemia undergoing chemotherapy.

Method: Quantitative techniques were used in this study. This study employed a quasi-experimental design with pre- and post-tests for one group. There were 21 participants in this study. We used the infinite population formula for sample calculation. Peppermint aromatherapy was the independent variable in this study using the Wilcoxon test, while nausea and vomiting ratings were the dependent variables.

Results: Data analysis using the Wilcoxon Signed Rank Test yielded an Asymp. Sig. (2-tailed) value of 0.000 ($p < 0.05$). This shows that the assessment of nausea and vomiting differed significantly before and after administration of peppermint.

Conclusion: Patients in this study who suffered from nausea or vomiting reported less severe symptoms after consuming peppermint, suggesting the study's hypothesis was correct.

Keywords: Chemotherapy; Nausea and Vomiting; Pediatric Acute Lymphoblastic Leukemia Patients; Peppermint Aromatherapy.

INTRODUCTION

According to the World Health Organization (WHO), it is estimated that 400.000 children and adolescents (aged 0–19 years) develop cancer annually (World Health Organization, 2025). In 2022, there were 11.322 recorded cases of childhood cancer, with leukemia specifically blood cancer being the most prevalent malignancy in this age group (Information and Documentation Management Officer, 2022). In Central Java, the prevalence of cancer was estimated to reach approximately 68.638 cases in 2019 (Rohmah, 2019).

The incidence of Acute Lymphoblastic Leukemia (ALL) in children in Semarang, especially those treated in hospitals, has shown an increasing trend in recent years (Rohmah, 2019). In 2019, ALL

accounted for 42.5% of the total cases of childhood cancer treated, increasing to 47.1% in 2020, and reaching 51.1% in 2021. The Head of the Indonesian Children's Cancer Foundation (YKAKI) Semarang Branch, Vita Mahaswari, mentioned that prompt and appropriate treatment would prevent children from high cancer risk. Preliminary study results in the Children's Ward of Dr. Kariadi Semarang Hospital, according to RME data of Dr. Kariadi Semarang Hospital for the period June 2024 - June 2025, showed that 240 patients were children with ALL undergoing chemotherapy in the Children's Ward on the 1st Floor. The causes of leukemia in children are mostly unknown suspected to be a combination of

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genetic factors and environmental exposures (Rahmat, Tjong, Almurdi, & Wulandari, 2022).

One of the treatment options for ALL sufferers is chemotherapy. One way to treat cancer is by using chemotherapy, which involves the use of chemical compounds or cytotoxic drugs. For the purpose of preventing or killing cancer cells, a group of drugs known as cytotoxic drugs is used (Amelia, Desnita, Alisa, & Despitasi, 2023). Chemotherapy drugs work by modifying the cell cycle and mitosis. Nausea and vomiting are unpleasant but unavoidable side effects of chemotherapy (Mahdiah, Susilowati, & Rohmah, 2023).

Antiemetic drugs have become the standard of care for individuals experiencing nausea and vomiting after undergoing inpatient chemotherapy (Mahdiah et al., 2023). Although inpatients may experience less nausea and vomiting when given antiemetic drugs, these drugs still have some undesirable side effects, such as drowsiness, dry mouth, digestive problems, and constipation (Tianto & Khayati, 2023). Therefore, safe and effective alternative treatments are needed to relieve vomiting and nausea. Aromatherapy using peppermint oil can help chemotherapy patients feel less sick and reduce the likelihood of vomiting.

According to several studies, children who suffer from nausea and vomiting respond better to peppermint. This is due to a number of factors. Peppermint, when consumed in moderate amounts (e.g., as diluted essential oil or sugar-free peppermint candy), is often considered harmless for children (Shulman, Chumpitazi, Abdel-Rahman, Garg, Musaad, & Kearns, 2022). The results of this study are in line with the other research. Some patients at Telogorejo Hospital in Semarang who experienced nausea and vomiting after chemotherapy reported significant improvements after using ginger aromatherapy. Never before has a nurse taken the

additional step of administering antiemetic medication along with peppermint aromatherapy to relieve nausea and vomiting from chemotherapy in children (Astrilita & Hartoyo, 2016).

RESEARCH METHOD

In this study, an empirical quantitative methodology was used. A quasi-experimental design with a one-group pretest-posttest layout was used in this type of study. This study design is an example of a quasi-experimental study that uses one group of participants, not a control group. The dependent variable was measured both before (pre-test) and after (post-test) the intervention was carried out. This study used a complete sampling method, which included all individuals who met the requirements, because the population size was quite small. To ensure a representative sample, we used an infinite population calculation to determine that 21 people needed to complete our survey.

The inclusion criteria for this study were: Pediatric patients with ALL cancer aged 5 years - 15 years, pediatric patients with ALL cancer who experience nausea and vomiting complaints, pediatric patients with ALL cancer who have undergone chemotherapy and willing to be a research respondent. After data analysis, the data was then analyzed as follows: By using univariate analysis, we can characterize the features of each research variable. Methodologically, this study compared pre- and post-intervention assessments of participants who reported nausea and vomiting as a result of chemotherapy, as well as the frequency distribution of each variable (gender, age, and chemical regimen). To test the null hypothesis that peppermint aromatherapy has no effect on nausea and vomiting, the researchers used bivariate analysis. The Wilcoxon test was used in this study.

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RESEARCH RESULTS

Table Distribution Frequency of Respondent (N=21)

Variable	Results	P- Value	N
Age (Mean±SD) (Years)	(10.43±2.19) (7-15)		
7	2/9.5		
8	3/14.3		
9	3/14.3		
10	2/9.5		
11	5/23.8		
12	2/9.5		
13	2/9.5		
14	1/4.8		
15	1/4.8		
Gender (n/%)			
Male	13/67.0		
Female	8/38.0		
Chemotherapy Regimen (n/%)			
Induction Phase	10/47.6		
Consolidation Phase	8/38.1		
Maintenance Phase	3/14.3		
Before Peppermint Therapy (n/%)			
Mild Nausea and Vomiting	7/33.3		
Moderate Nausea and Vomiting	9/42.9		
Severe Nausea and Vomiting	3/14.3		
Very Severe Nausea and Vomiting	2/9.5		
After Peppermint Therapy (N/%)		0.000*	17 ^a
No Nausea and Vomiting	3/14.3		0 ^b
Mild Nausea and Vomiting	15/71.4		4 ^c
Moderate Nausea and Vomiting	3/14.3		

The table above shows that the mean age and standard deviation of respondents are (10.43 ± 2.19) with a range (7-15). The majority of respondents are male, with a total of 13 (67.0%) with the majority of Chemotherapy Regimen being Induction Phase, namely 10 (47.6%). Before peppermint therapy, the majority of respondents had Moderate Nausea and Vomiting 9 (42.9%) and after peppermint therapy, the majority of respondents were in Mild Nausea and Vomiting 15 (71.4%).

Wilcoxon test analysis in this study revealed an Asymp. Sig. (2-tailed) value of 0.000, which indicates $p < 0.05$. Statistical significance was achieved because the p value was less than 0.05. H_0 was rejected and H_1 was accepted based on the Hypothesis Test results in this study, because $p = 0.000 < 0.05$. This indicates that peppermint significantly improved the level of nausea and vomiting compared to placebo. Furthermore, this study

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showed that peppermint was effective in reducing the level of nausea and vomiting in pediatric patients with ALL. The results showed that the Negative Ranks value was 17, meaning that there were 17 pediatric patients who experienced a decrease in nausea and vomiting scores after peppermint, which means that their condition improved. For the Positive Ranks value, it was 0, meaning that no pediatric patients experienced an increase in nausea and vomiting scores, no one's condition worsened after being given peppermint. The Ties value in this table is 4, meaning that there were 4 pediatric patients (no change) who had the same nausea and vomiting scores before and after peppermint. According to these findings, treatment with peppermint relieved mild nausea and vomiting in 42.9 percent of patients.

DISCUSSION

This tabulation shows that age is related to the characteristics of pediatric patients undergoing chemotherapy. School-age children, especially those aged 8–11 years (13 children), appear more dominant than other age groups. This condition can be associated with the developmental phase of school-age children who experience increased immune system activity and metabolism, making them more susceptible to hematopoietic cell disorders such as acute lymphoblastic leukemia. The other research these findings are in line with other studies showing that school-age children have the highest prevalence of ALL. The peak age for ALL in children is between 10 and 12 years, and increases when they enter school (Pui, Yang, Hunger, Pieters, Schrappe, Biondi, & Mullighan, 2015). The highest frequency was seen in the 11-year-old age group, which is supported by the tabulation findings in this study.

Of the 21 pediatric patients with acute lymphoblastic leukemia (ALL) undergoing chemotherapy, 13 were male (61.9% of the total) and 8 were female (38.1%), according to gender-based analysis findings of respondent characteristics. Compared to women, there appears to be a significant gender gap in the distribution of ALL patients, according to this data. The findings of this study corroborate the results of other studies showing that ALL occurs more often in boys than in girls among children (National Cancer Institute, 2024). In short, the findings of this study corroborate the results of previous studies showing that gender is a factor in the prevalence of ALL in children, with boys being more affected than girls. These findings are an important basis for health workers, especially nurses,

to continue to provide comprehensive and equal nursing care regardless of gender, while still paying attention to the physical and psychosocial needs of each child (World Health Organization, 2025).

The results of the chemotherapy regimen tabulation in this study showed that most respondents were in the induction phase, namely 10 respondents (47.6%), followed by the consolidation phase with 8 respondents (38.1%), and the maintenance phase with 3 respondents (14.3%). These results illustrate that the induction phase is the phase most often undergone by pediatric patients during the data collection period. This condition can be explained because the induction phase is an early and crucial stage in the management of ALL which aims to achieve remission. Therefore, in this phase, pediatric patients generally require intensive care and close monitoring, so they are more often recorded as research respondents (National Cancer Institute, 2024). The findings of this study are in line with a previous study which stated that the risk and severity of CINV are higher in the early chemotherapy phase, especially in regimens with moderate to high emetogenic potential. Patients receiving combination and high-dose chemotherapy in the early phase have a higher incidence of nausea and vomiting than patients in the advanced or maintenance phase (Navari (2016). Another study in pediatric patients undergoing chemotherapy showed that the chemotherapy phase is one of the factors associated with the severity of nausea and vomiting, where the induction phase has a greater impact on symptoms than the maintenance phase (Rohmah, 2019). These results support the findings of this study that

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differences in the level of nausea and vomiting before peppermint therapy are more influenced by the chemotherapy regimen phase than other demographic factors.

When given peppermint therapy, the majority of patients who had nausea and vomiting scores before treatment had moderate levels of nausea and vomiting (42.9). This result is consistent with other studies showing that CINV remains a common side effect among pediatric cancer patients undergoing chemotherapy. Most children undergoing chemotherapy experience nausea and vomiting at a moderate to severe level, even though they have been given standard pharmacological therapy. These findings reinforce the results of previous studies that nausea and vomiting due to chemotherapy is still a significant problem and requires additional intervention. Therefore, non-pharmacological therapies such as peppermint therapy are relevant to be developed as supportive therapies to help reduce nausea and vomiting in pediatric patients undergoing chemotherapy (Hockenberry & Wilson, 2018).

The results of this study showed that the nausea and vomiting scores of patients after being given peppermint therapy mostly experienced mild nausea and vomiting, as many as 15 patients (71.4%). The results of this study indicate that there was a significant improvement in nausea and vomiting conditions after the respondents were given peppermint aromatherapy, because the majority of respondents switched from the moderate/severe category to mild or even did not experience nausea and vomiting at all. Theoretically, peppermint (*Mentha piperita*) contains active compounds menthol and menthone which have antispasmodic effects on the smooth muscles of the digestive tract. This effect can help reduce excessive gastrointestinal contractions, thereby reducing nausea stimulation. In addition, the aroma of peppermint provides a relaxing and calming effect that works through the limbic system, so it can suppress the stimulation of the vomiting center (Khan, Khan, & Ahmed, 2018). Overall, the administration of peppermint therapy has been shown to have a more positive impact in the form of reducing the degree of

nausea and vomiting to a milder level. These findings reinforce the role of peppermint therapy as a safe, easy-to-apply non-pharmacological intervention and can be recommended as a supportive therapy in the management of nausea and vomiting (Ertürk & Taşçı, 2021).

Most patients experienced nausea and vomiting before treatment. This confirms what has been shown by other studies: chemotherapy-induced nausea and vomiting (CINV) is still a common side effect among cancer patients in childhood. These findings are in line with the theory of complementary therapy which states that aromatherapy can be used as a supportive intervention to overcome physical and psychological symptoms, including nausea and vomiting (Fitrah, 2025). The findings of this study are in line with other studies that found that peppermint aromatherapy is beneficial in reducing nausea and vomiting due to chemotherapy. Pediatric patients suffering from long-term conditions may get some relief and improved quality of life through the use of complementary treatments, according to Hockenberry and Wilson. Thus, peppermint therapy can be seen as one of the interventions that supports the success of the main therapy (Jafarimanesh, Akbari, Hoseinian, Zarei, & Harorani, 2020).

Data analysis using the Wilcoxon Signed Rank Test yielded an Asymp. Sig. (2-tailed) value of 0.000 ($p < 0.05$). This shows that the assessment of nausea and vomiting differed significantly before and after administration of peppermint. Most children who participated in the peppermint intervention reported less nausea and vomiting afterwards. Seventeen patients had negative ranks, zero had positive ranks, and four had constant scores (ties), all of which indicate this. When given peppermint, the Z value of -3.827 indicates a statistically significant reduction in nausea and vomiting. In this study, we found that giving mints to children helped them feel better after experiencing nausea and vomiting. Therefore, the research null hypothesis that mints help overcome nausea and vomiting was proven true.

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