RESEARCH ARTICLE

Effect of Inhaled Peppermint Aromatherapy on Chemotherapy-Induced Acute Nausea and Vomiting among Women with Breast Cancer in Gresik Regency

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ABSTRACT

Background: Chemotherapy-induced acute nausea and vomiting are commonly experienced by breast cancer patients. Therefore, this study aimed to determine the effect of inhaled peppermint aromatherapy on chemotherapy-induced acute nausea and vomiting among women with breast cancer.

Methods: This pre-experimental study was conducted using a one-group pre-post-test design approach. The sample included 28 women with breast cancer undergoing chemotherapy at the Chemotherapy Unit of Semen Gresik Hospital, Gresik, Indonesia. Respondents were administered 0.25 cc of peppermint essential oil on a cotton ball and then inhaled for 10 minutes. Data were collected using Rhodes Index Nausea Vomiting & Retching (RINVR) and analyzed with a paired sample t-test.

Results: The pre-test showed that the majority of respondents experienced a moderate level of nausea and vomiting. After the intervention, the post-test results indicated mild nausea and vomiting. The statistical analysis showed that peppermint aromatherapy significantly affected chemotherapy-induced acute nausea and vomiting with a p-value of 0.001 (α<0.05).

Conclusions: There was a significant improvement in chemotherapy-induced acute nausea and vomiting after the administration of peppermint aromatherapy. Therefore, this intervention could be used as a non-pharmacological complementary therapy to reduce chemotherapy-related nausea among breast cancer patients.

INTRODUCTION

Breast cancer is the most prevalent cancer in Indonesia and also the leading cause of death among women aged 40-50 years [1,2]. Chemotherapy is the primary method used for cancer treatment and often the most effective therapeutic option [3,4]. However, the drugs administered cause side effects including myelosuppression (such as anemia, leucopenia, and thrombocytopenia), nausea, vomiting, mucous membrane ulceration, and alopecia [5]. Treatment for chemotherapy-induced acute nausea and vomiting (CINV) commonly involves pharmacological interventions such as antiemetic prescriptions (anti-nausea drugs). Based on the observations carried out at the Chemotherapy Unit of Semen Gresik Hospital, 8 out of 10 patients still experienced nausea and vomiting even after taking antiemetic drugs.

According to the basic health research data in 2018, the incidence of breast cancer in Indonesia was 42.1 per 100,000 population with an average death rate of 17 per 100,000 population, and the prevalence in East Java reached 12,186 cases in 2019 [1,6]. Among the 10 patients examined at the Chemotherapy Unit of Semen Gresik Hospital, 10% and 80% experienced nausea and vomiting, respectively, while the remaining 10% did not encounter any symptoms. Chemotherapeutic regimens used in breast cancer patients led to nausea and vomiting in 60%–90% of cases, particularly the doxorubicin-cyclophosphamide (AC)
combination regimen, noted for its relatively higher emetogenicity [7]. Bourdeanue, et al. [8] also stated that 80% of patients receiving chemotherapy based on Cyclophosphamide, an Anthracycline derivative, experienced certain degrees of these side effects.

Chemotherapy agents cause vomiting through a receptor that activates the Chemoreceptor Trigger Zone (CTZ) in the vomiting center of the medulla. In another mechanism, chemotherapy acts through a peripheral pathway mediated by the vagus nerve. It irritates gastrointestinal mucosa and causes neurotransmitters to release 5-HT$_3$ (5 hydroxytryptamines). Furthermore, this symptom is caused by neurohormonal influences through the disruption of arginine vasopressin and prostaglandin [9].

Peppermint essential oil (EO) has been shown to contain menthol and menthone. Meanwhile, neuron cells interpret odors through the respiratory process, transmitting signals to the limbic system, and the hypothalamus. A smell that induces a sense of calm stimulates the raphe nucleus in the brain, leading to the production of serotonin. This neurotransmitter functions to cause a sense of comfort and calm, thereby reducing the intensity of nausea and vomiting. Peppermint EO also exhibits mild anesthetic effects, as well as possesses carminative and antispasmodic properties that work in the small intestine of the gastrointestinal tract, aiding in alleviating nausea and vomiting [2]. Furthermore, peppermint aromatherapy is readily accessible, easy to use, and affordable [10]. This study aimed to determine the effect of inhaled peppermint aromatherapy on chemotherapy-induced acute nausea and vomiting in women with breast cancer.

**METHODS**

This pre-experimental study was conducted using the one-group pretest-posttest design. A total of 30 breast cancer patients undergoing chemotherapy treatment at the Chemotherapy Unit of Semen Gresik Hospital were screened using the purposive sampling method, resulting in the selection of 28 samples. The inclusion criteria were patients who experienced acute nausea and vomiting, did not use anti-emetic drugs except prescribed by the doctor and administered on time, as well as used no other aromatherapies. Meanwhile, patients who did not like peppermint aromatherapy, as well as those having anxiety, depression, or other weak conditions were excluded.

Before giving the intervention, the objectives of this study and the procedures involved were explained to the respondents. The tools and materials used were peppermint essential oil, cotton balls, and a time measuring device (clock/stopwatch), while the instrument employed to measure the level of nausea and vomiting was Rhodes Index Nausea Vomiting & Retching (RINVR) with content validity index of 0.88 [11]. This questionnaire contains the severity, the frequency, and the feelings after vomiting, as well as the number, the amount, the feelings after nausea, the number of retching, and the feelings after each. Respondents filled the questionnaire with 5 Likert Scale responses, from 0–4. The intensity of nausea and vomiting was based on a score range of 0–32. The score was categorized into 5 levels (1) score 0 “none”; (2) 1–8 “mild”; 3) 9–16 “moderate”; (4) 17–24 “severe”; and (5) score 25–32 “great”. RINVR was modified from a study conducted by Apriany [12], which translated the instrument into Indonesian with a validity score between 0.636 and 0.882 and a reliability score of 0.898.

Before the pre-test, details on how to complete the questionnaire were explained to the respondents at the hospital. The questions included severity, frequency, and feelings after vomiting, as well as the number, amount, feelings after nausea, the number of retching, and feelings after each. Furthermore, the respondents inhaled 5 drops of peppermint essential oil on cotton balls for 10 minutes [12-14]. A direct post-test was then conducted to measure the level of nausea and vomiting.

Data from the pre-test and post-test measurements were represented in frequency and percentage, while those from statistical tests were presented as mean and standard deviation. A paired t-test was conducted to determine the difference between the pre-test and post-test with a confidence level (CI) of 95% and a significance level of p < 0.05.

**RESULTS**

A total of 28 patients participated in this study, and the percentage of nausea and vomiting history is presented in Table 1. The results showed the majority of respondents (78.6%) had a history of nausea and vomiting. Additionally, 57.1% had undergone chemotherapy more than 3 times. The predominant effects of nausea and vomiting were loss of appetite and weight loss (57.1%), while the most common chemotherapy regimen administered was cyclophosphamide, doxorubicin, and fluorouracil (53.6%).

RINVR score was analyzed using the paired sample t-test to determine the difference between the conditions before and after the administration of peppermint aromatherapy. The degree of nausea and vomiting pre-test and post-test as well as the results of the paired sample t-test result are presented in Table 2.

Table 2 shows that before the intervention, the majority of respondents experienced moderate nausea and vomiting (60.7%) but after the intervention, there was a reduction to a mild degree (53.6%). This indicated that there was a decrease in RINVR score before and after inhaling peppermint aromatherapy. The paired sample t-test showed a p-value of 0.001, indicating a significant difference.
DISCUSSION

The results showed that inhaled peppermint aromatherapy significantly affected chemotherapy-induced acute nausea and vomiting in women with breast cancer. In the acute condition, most of the respondents experienced moderate nausea and vomiting but after inhaling peppermint aromatherapy, there was a reduction to a mild degree. Peppermint EO contains menthol (35–45%) and menthone (10–30%) which can improve the potential imbalance in the body. A smell that induces a sense of calm will stimulate the nucleus raphe to produce serotonin. This neurotransmitter functions to cause a sense of comfort and calm, resulting in a reduction in the intensity of nausea and vomiting [3,15]. Peppermint aromatherapy in this study also caused a decrease in the level of nausea and vomiting.

Eghbali et al. [16] in a study provided 2 drops of peppermint aromatherapy on a piece of tissue, which were attached to the shirt collar of the respondents and then inhaled for 20 minutes 3 times a day. The results showed breast cancer patients receiving chemotherapy experienced decreased levels of nausea and vomiting in the acute phase with a significant statistical value of p<0.05. A decrease in the frequency and duration of the symptoms also occurred in the delayed phase but the statistical value was not significant (p>0.05). Another study by Jafarimanesh et al. [17] examined 42 breast cancer patients given 40 drops of peppermint extract mixed in 20 cc of tap water every 8 hours, starting from 12 hours before chemotherapy to 48 hours. The results showed that the level of nausea

Table 1. Nausea and vomiting history of respondents

<table>
<thead>
<tr>
<th>History</th>
<th>Parameters</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of nausea and vomiting</td>
<td>None</td>
<td>2</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td>In past chemotherapy</td>
<td>22</td>
<td>78.6</td>
</tr>
<tr>
<td></td>
<td>On traveling</td>
<td>4</td>
<td>14.3</td>
</tr>
<tr>
<td>Alcohol use</td>
<td>Never</td>
<td>28</td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>In the past</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Chemotherapy cycle</td>
<td>1st</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>2nd</td>
<td>5</td>
<td>17.9</td>
</tr>
<tr>
<td></td>
<td>3rd</td>
<td>7</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td>More</td>
<td>16</td>
<td>57.1</td>
</tr>
<tr>
<td>Impact of CINV on dietary intake</td>
<td>No appetite and weight loss</td>
<td>17</td>
<td>60.7</td>
</tr>
<tr>
<td></td>
<td>No appetite and fixed weight</td>
<td>11</td>
<td>39.3</td>
</tr>
<tr>
<td></td>
<td>Appetite increases and weight rises</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Chemotherapy Regiment</td>
<td>Cyclophosphamide, doxorubicin, and fluorouracil</td>
<td>19</td>
<td>71.5</td>
</tr>
<tr>
<td></td>
<td>Cisplatin, paclitaxel</td>
<td>6</td>
<td>21.4</td>
</tr>
<tr>
<td></td>
<td>Cisplatin, docetaxel</td>
<td>3</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Table 2. Effect of inhaled peppermint aromatherapy on chemotherapy-induced acute nausea and vomiting

<table>
<thead>
<tr>
<th>No.</th>
<th>Degree of Nausea and Vomiting</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>1.</td>
<td>None</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2.</td>
<td>Mild</td>
<td>6</td>
<td>21.4</td>
</tr>
<tr>
<td>3.</td>
<td>Moderate</td>
<td>17</td>
<td>60.7</td>
</tr>
<tr>
<td>4.</td>
<td>Severe</td>
<td>5</td>
<td>17.9</td>
</tr>
<tr>
<td>5.</td>
<td>Great</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
<td>100</td>
<td>28</td>
</tr>
<tr>
<td>Mean</td>
<td>2.9643</td>
<td>2.0714</td>
<td></td>
</tr>
<tr>
<td>Std deviation</td>
<td>6.3725</td>
<td>7.6636</td>
<td></td>
</tr>
<tr>
<td>Paired t-test result</td>
<td>p = 0.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
and vomiting decreased 24 and 48 hours after chemotherapy with a significance value of ANOVA test \( p=0.001 \). However, the measurement method for nausea and vomiting scores was different compared to this study, which used Visual Analog Scale (VAS) for appetite and nausea.

Supatmi & Agustiningsih [18] found differences in nausea and vomiting levels among the control and intervention groups of chemotherapy patients in Bantul, Central Java, Indonesia. After the treatment with peppermint inhalation aromatherapy for the first 10 minutes, the symptom levels decreased significantly in the intervention group compared to the control with \( p=0.027 \). Furthermore, Sari et al. [15], showed that 15 patients undergoing adjuvant chemotherapy experienced a decrease in the intensity of nausea and vomiting after receiving the intervention with a \( p=0.001 \). The intensity measured using the Numeric Rating Scale (NRS) before and after the intervention was 3.40 and 2.40, respectively.

Based on the general observations, respondents experienced no side effects after being given peppermint aromatherapy. However, 3 respondents did not experience changes after the intervention, with 1 and 2 reporting severe and moderate levels of nausea and vomiting, respectively. Among respondents who did not experience any change, 1 received cisplatin and paclitaxel regimens, while the other 2 were given a doxorubicin-cyclophosphamide combination. These regimens belong to the high and moderate emetogenic category, capable of causing nausea and vomiting [19,20]. Cisplatin damages the GI tract and causes calcium-dependent exocytic detachment release of 5-hydroxytryptamine (HT)3, leading to the activation of the chemoreceptor trigger zone (CTZ) and vomiting center [21]. Additionally, these patients also reported CINV to an extent that might also affect the level of nausea and vomiting. The first limitation of this study was the failure to generalize to other cancer patients. Respondents received different types of chemotherapy regimens, which could have impacted the results.

CONCLUSIONS

Inhaled peppermint aromatherapy significantly reduced chemotherapy-induced acute nausea and vomiting in women with breast cancer. This intervention could be given by caregivers as a supplementary therapy alongside pharmacological treatment to provide better quality services for patients with chemotherapy-induced acute nausea and vomiting.

DECLARATIONS

Competing interest
The authors declare no competing interest in this study.

Ethics approval and consent to participate
This study has been approved by the Research Ethics Committee of Ibnu Sina General Hospital with Number 071/010/437.76.46/2018. All patients included in this study had given informed consent before the study.

Acknowledgment
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REFERENCES


