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The Effect of Cold Water Intake on Nausea and Vomiting in Cancer Patients Undergoing Chemotherapy

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Editorial

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Abstract

Background: Despite standard antiemetic prophylaxis, chemotherapy-induced nausea and vomiting are common, affecting recovery and quality of life. Simple, low-cost, non-pharmacological methods nurses can use are valuable in resource-limited settings. We investigated whether drinking chilled water after infusions could lessen acute nausea and vomiting in adults undergoing chemotherapy. **Purpose:** To evaluate whether 100 mL chilled water (15°C) administered immediately post-chemotherapy improves nausea and vomiting scores compared with usual care. **Methods:** We conducted a study in a hospital chemotherapy unit in Indonesia. Adults receiving infusions were chosen and put into either an intervention group or a control group. The intervention group drank 100 mL of water at 15°C, over 15 minutes after their infusion. Nausea and vomiting were measured right before and after, and t-tests were used to compare the average change between the groups. **Results:** Thirty-eight participants finished initial assessments. The group that drank chilled water showed a bigger improvement in nausea and vomiting scores compared to the control group. The average change favored chilled water for both outcomes, with statistically significant differences between the groups. The intervention group saw reductions in nausea and vomiting, while the control group had only small changes. No side effects were reported from the intervention. **Conclusion:** Chilled water after chemotherapy reduced nausea and vomiting compared to usual care. As a small, non-randomised study, more research is needed to confirm its effectiveness.

Keywords: cancer, cold temperature, chemotherapy, nausea, vomiting

Introduction

Cancer is a term used to describe a disease involving abnormal and uncontrolled cell growth. This disease can affect almost every part of the human body and has many types and subtypes [30]. In 2022, there were 19,976,499 cases of cancer. When NMSC is excluded, this number drops to 18,741,966 cancer cases worldwide in 2022. Of these, 9,566,825 cases occurred in men and 9,175,141 cases occurred in women [29].

The prevalence of cancer in Indonesia in 2023 reached 1.2 per 1,000 people. This figure was obtained from a survey of 877,000 people in 38 provinces in Indonesia. The highest prevalence of cancer incidence in Indonesia was in the city of Yogyakarta, with a prevalence of 3.6 per 1,000 people, followed by Jakarta with a prevalence of 2.4 per 1,000 people, West

Sumatra with a prevalence of 2 per 1,000 people, while Lampung Province had a prevalence of 1.6% [16].

The total number of cancer patients at Dr. H. Abdul Moeloek General Hospital in Bandar Lampung was 2,608 in 2021, increasing to 3,751 in 2022, and reaching 4,316 in 2023 (Dr. H. Abdul Moeloek General Hospital Medical Records, 2024). This increase in the number of patients indicates that cancer is a significant health issue in Lampung Province and requires comprehensive management.

One of the most commonly used therapies for treating cancer is chemotherapy. Chemotherapy involves the use of drugs designed to kill cancer cells or slow their growth. Although effective in treating cancer, chemotherapy often causes various unpleasant side effects for patients. The most common and highly disruptive side effects are nausea and vomiting [25]. According to [22], nausea and vomiting caused by chemotherapy, or Chemotherapy-Induced Nausea and Vomiting (CINV), is one of the most feared side effects among cancer patients because it can reduce quality of life, nutritional status, treatment adherence, and even lead to treatment delays or discontinuation. Approximately 70-80% of chemotherapy patients experience nausea and vomiting [6].

The management of nausea and vomiting following chemotherapy can be approached through two primary methods: pharmacological (administration of antiemetic medications) and non-pharmacological. While antiemetic medications are highly effective, some patients may still experience nausea and vomiting even after receiving antiemetics, or they may seek non-pharmacological alternatives to reduce medication side effects. Non-pharmacological methods that can be used include acupressure, aromatherapy, relaxation, and specific food and beverage intake [26]. One non-pharmacological intervention that is gaining increasing attention is the administration of cold water or ice.

Several studies have shown the potential benefits of cold water or ice in reducing nausea and vomiting. A study conducted by [1] showed that sucking on ice cubes significantly reduced nausea and vomiting in patients undergoing chemotherapy. The sensation of cold is believed to have a calming effect on the digestive tract and reduce stimulation of the vomiting center in the brain. Drinking cold water can also help eliminate the unpleasant taste in the mouth that often exacerbates nausea.

Based on the results of a preliminary study conducted on January 30, 2025, in the Chemotherapy Room of Dr. H. Abdul Moeloek General Hospital in Bandar Lampung on 10 patients undergoing chemotherapy, 7 patients reported experiencing nausea and vomiting after chemotherapy despite being given antiemetic medication. From the interviews, patients felt uncomfortable with the nausea and vomiting they experienced. Most patients had never tried or were unaware of the benefits of cold water in reducing nausea and vomiting. This phenomenon indicates an issue that needs to be addressed to improve patient comfort during chemotherapy.

Therefore, researchers are interested in conducting further research on the effects of cold water administration on nausea and vomiting in cancer patients undergoing chemotherapy at Dr. H. Abdul Moeloek General Hospital in Bandar Lampung. It is hoped that the results of this study will provide strong empirical evidence and serve as a basis for the development of more effective nursing interventions to improve the quality of life of cancer patients.

Methods

Study Design and Setting

This investigation employed a single-center, nonrandomized, parallel-group design with a pretest-posttest evaluation conducted within the Chemotherapy Room at Dr. H. Abdul Moeloek General Hospital during February 2025. The study was executed in accordance with institutional guidelines and the ethical principles recommended by the International Committee of Medical Journal Editors.

Participants

The study population consisted of adult cancer patients receiving chemotherapy at the designated facility during the specified timeframe. Utilizing accidental sampling, 38 participants were recruited and allocated to either an intervention or control group based on the daily clinic workflow. Eligibility criteria included the capacity to provide informed consent and complete symptom assessments.

Patients with compromised oral intake safety were excluded.

Intervention and Comparator

Participants in the intervention cohort were administered 100 mL of chilled potable water immediately following the completion of their chemotherapy, under direct nursing supervision over a 15-minute duration. The control group received standard care as per the unit's established practices, without the chilled-water intervention.

Outcomes

The primary dependent variables, nausea and vomiting severity, were quantified using a Numeric Rating Scale, aligning with the unit's standard procedures. These ratings were collected immediately before the intervention or control period and again after the 15-minute observation period for both groups. The independent variable was the group assignment. Demographic and clinical data, routinely recorded by the unit, were extracted to characterize the participant sample.

Procedures

Data collection encompassed three phases: Preparation, involving the procurement of necessary permissions, briefing of clinical staff, and preparation of study instruments and chilled water to the specified temperature; Implementation, which included patient approach, obtaining consent, administering baseline Numeric Rating Scale assessments, delivering the intervention or usual care, and conducting posttest NRS assessments after 15 minutes; and Recording and Processing, entailing verification of source documents and subsequent data entry into the database.

Statistical Analysis

All statistical analyses were two-sided with a significance level set at α=.05. The normality of continuous variables was assessed. Descriptive statistics were used to summarize participant characteristics and pre- and post-intervention NRS scores. Within-group changes were evaluated using paired t tests. The primary analysis comparing the groups focused on the mean change in NRS scores between the intervention and control groups, employing an independent t-test. Nonparametric alternatives were utilized when data distributions did not meet parametric assumptions. Analyses were conducted on available case data, with no imputation for missing ratings. Results are presented with corresponding P values and, where applicable, mean differences with 95% confidence intervals.

Ethical Considerations

The research protocol received approval from the institutional ethics committee, with the reference number IRB Approval No. S. 27/143/FKES10/2025. All participants furnished written informed consent. Throughout the study, participant anonymity and confidentiality were strictly maintained, and no trial registration was pursued.

Results

The characteristics of patients undergoing cancer chemotherapy in the intervention group at RSUDAM Lampung Province show several demographic and clinical dominances. The majority of respondents (15 individuals, 78.9%) were in the age category above 35 years. In terms of educational background, elementary school graduates were the highest category, comprising 8 respondents (42.1%). The occupation of housewife dominated the employment category, with 9 respondents (47.7%). There was a higher prevalence of female gender, with 13 respondents (68.4%). Meanwhile, breast cancer (Ca Mammae) was the most common type of cancer in this group, identified in 10 respondents (52.6%). The characteristics of cancer chemotherapy patients in the control group at RSUDAM Lampung Province show several demographic and clinical distributions. The majority of respondents (12 individuals, 52.5%) were in the age category above 35 years. In terms of educational background, high school graduates (SMA) were the most common category, with 10 respondents (52.6%). The occupation of housewife also dominated the employment category, with 10 respondents (52.6%). There was a higher proportion of female respondents, comprising 15 respondents (78.9%). Meanwhile, breast cancer (Ca Mammae) was the most commonly diagnosed type of cancer in this group, affecting 9 respondents (47.4%) (Table 1).

Table 1. Characteristics of respondents in the intervention group of cancer patients undergoing chemotherapy and the control group.

Characteristics	Intervention Group		Control Group	
	n	(%)	n	(%)
Age of Respondents				
>25-35 years	4	21,1%	7	47,3%
>35 years	15	78,9%	12	52,5%
Respondents' education				
Bachelor's Degree	2	10,5%	4	21,1%
Elementary School	8	42,1%	10	52,6%
High School	3	15,8%	5	26,3%
Junior High School	6	31,6%		
Respondents' occupations				
Laborers	1	5,3%	3	15,8%
Temporary employees	2	10,5%	10	52,6%
Housewives	9	47,4%	5	26,3%
Traders	5	26,3%	1	5,3%
Employees	2	10,5%	3	15,8%
Farmers	1	5,3%		
Gender of respondents				
Men	6	31,6%	4	21,1%
Women	13	68,4%	15	78,9%
Type of cancer in respondents				
Colon Cancer	3	15,8%	9	47,4%
Breast Cancer	10	52,6%	1	5,3%
Lung Cancer	1	5,3%	4	21,1%
Prostate Cancer	2	10,5%	4	21,1%
Cervical Cancer	2	10,5%	9	47,4%
Bone Cancer	1	5,3%	1	5,3%
Leukemia	3	15,8%		
Total	**19**	**100%**	**19**	**100%**

Based on the results of the study in the intervention group, the following data on nausea and vomiting were obtained: Before the administration of cold water, the mean score for nausea and vomiting was 9.32, with a standard deviation of 0.885 and a standard error of 0.203; the range of nausea and vomiting scores was between 8 and 10. After the cold water intervention, there was a significant decrease in nausea and vomiting scores, with the mean value decreasing to 3.53, standard deviation 1.679, and standard error 0.385; the range of nausea and vomiting scores was recorded between 2 and 8 (Table 2).

Based on the results of the study in the control group, the following data on nausea and vomiting were obtained: Before the administration of antiemetic medication and the leaflet, the mean score for nausea and vomiting was 9.21, with a standard deviation of 1.134 and a standard error of 0.260; the range of nausea and vomiting scores was between 6 and 10. After the intervention with the anti-nausea medication and leaflet, the average nausea and vomiting score decreased to 6.37, with a standard deviation of 1.770 and a standard error of 0.406; the range of nausea and vomiting scores was recorded between 3 and 8 (Table 3).

Table 2. Average Nausea and Vomiting in Cancer Patients Undergoing Chemotherapy in the Intervention Group After Being Given Cold Water

Nausea and vomiting	N	Mean	SD	SE	Min	Max
Before	19	9,32	0,885	0,203	8	10
After		3,53	1,679	0,385	2	8

Table 3. Average Nausea and Vomiting in Cancer Patients Undergoing Chemotherapy in the Control Group After Being Given Anti-Nausea Medication and Leaflets

Nausea and vomiting	N	Mean	SD	SE	Min	Max
Before	19	9,21	1,134	0,260	6	10
After		6,37	1,770	0,406	3	8

Normality Test

Based on data analysis, the results of the Shapiro-Wilk normality test indicate that the nausea and vomiting data in the intervention group, both before (p=0.089) and after (p=0.090) being given cold water, have p-values > 0.05. Similarly, in the control group (which was given anti-nausea medication), the p-values for nausea and vomiting before (p=0.087) and after (p=0.062) administration were also greater than 0.05. Therefore, it can be concluded that the data in both study groups are normally distributed, thereby allowing the use of dependent and independent t-tests for further analysis.

Table 4. Effect of Cold Water Intake on Nausea and Vomiting in Cancer Patients Undergoing Chemotherapy

Intervention Group Nausea and Vomiting in Cancer Patients Undergoing Chemotherapy							
Variable	**n**	**Mean**	**Difference**	**SD**	**Std. Error**	**95% CI**	**p-value**
Before	19	9.32	5.789	0.885	0.885	5.00-6.57	0.001
After		3.53		1.679	1.679		
Control Group on Nausea and Vomiting in Cancer Patients Undergoing Chemotherapy							
Variable	**n**	**Mean**	**Difference**	**SD**	**Std. Error**	**95% CI**	**p-value**
Before	19	9.21	2.842	1.134	0.260	3.796-6.259	0.001
After		6.37		1.770	0.406		

Based on the results of the dependent t-test analysis in the intervention group, there was a significant decrease in the mean nausea and vomiting scores before and after the intervention. Before the administration of cold water, the mean nausea and vomiting scores were 9.32 (SD=0.885; SE=0.203). After the intervention, the average score decreased to 3.53 (SD=1.679; SE=0.385). The average difference in the reduction of nausea and vomiting was 5.789 with a 95% confidence interval between 5.009 and 6.570. Statistical testing revealed a p-value of 0.000 (p < 0.05), indicating a significant effect of cold water administration on reducing nausea and vomiting in cancer patients undergoing chemotherapy. Based on the results of the dependent test analysis, the average reduction in nausea and vomiting before and after monitoring in the control group was 9.21, with

a standard deviation of 1.134 and a standard error of 0.260. After administering the anti-nausea medication, the mean value was 6.37, with a standard deviation of 1.770 and a standard error of 0.406. The difference in the reduction of nausea and vomiting was 2.842, with a 95% confidence interval (CI) of 3.796–6.259, and a p-value of 0.000 < 0.05. This indicates that there is an effect of administering anti-nausea medication (control group) on nausea and vomiting in cancer patients undergoing chemotherapy (Table 4).

Table 5. Differences in the Effects of Cold Water on Nausea and Vomiting in the Intervention Group and Control Group After Being Given Anti-Nausea Medication and Leaflate

Variabel	Mean	Selisih mean	Std. Deviation	Std. Error	95% CI	p-value
Intervention group	3.53	2,84	1.679	0.385	1.707-3.977	0.001
Control group	6.37		1.770	0.406		

Based on the research results, it can be concluded that the independent t-test yielded a mean value for the reduction in nausea and vomiting before and after administration of cold water (intervention group) and for those who underwent monitoring only (control group), namely 2.84, with a p-value of 0.000 < α (0.05). This means that H0 is rejected and Ha is accepted, indicating a significant difference in nausea and vomiting between the intervention group and the control group undergoing chemotherapy (Table 5).

Discussions

The results of the dependent test analysis showed a decrease in the average nausea and vomiting scores before and after the consumption of cold water in the intervention group, with a mean of 9.32, a standard deviation of 0.885, and a standard error of 0.203. Meanwhile, after administering cold water, the results showed a mean of 3.53, standard deviation of 1.679, and standard error of 0.385. The difference in the reduction of nausea and vomiting was 5.789, with a 95% confidence interval (CI) of 5.009–6.570, and a p-value of 0.000 < 0.05, indicating that there is an effect of cold water consumption on nausea and vomiting in cancer patients undergoing chemotherapy at RSUDAM Province of Lampung in 2024.

Breast cancer currently ranks first in the number of new cancer cases globally [15]. Data shows that in 2020, there were 19.2 million new cases of cancer worldwide, with 9.9 million deaths from cancer in the same year [9].

In the context of cancer treatment, controlling nausea and vomiting is a crucial aspect. Nausea and vomiting caused by chemotherapy are one of the most common and distressing acute side effects, experienced by approximately 80% of patients [27]. These symptoms, which are often interrelated, can significantly impact a patient's quality of life [24]. Therefore, effective management of nausea and vomiting is a top priority for enhancing patient comfort and compliance during therapy.

Nausea and vomiting can be treated through pharmacological and non-pharmacological approaches [13]. Organizations such as the American Cancer Society (2018) recommend several non-pharmacological methods, including consuming cold drinks, dry bread, and yogurt [12].

Cold drinks are often a favorite choice because they do not pose additional risks from other substances (Muaris, 2014). The cooling sensation in the mouth can provide refreshment and a pleasant effect, which is also related to thirst [8]. This is supported by Adams' (2014) study, which showed that beverages at 15°C can influence fluid intake, thereby maintaining optimal patient hydration [2]. Furthermore, research by Pangesti (2020) explains that cold beverages provide a pleasant effect, increase appetite, and can stabilize emotions. Physiologically, cold beverages trigger vasoconstriction of blood vessels, a bodily response that helps prevent excessive calorie expenditure [20].

The results of the dependent analysis showed that the average reduction in nausea and vomiting before and after monitoring in the control group was 9.21, with a standard deviation of 1.134 and a standard error of 0.260. After administering the anti-nausea medication, the mean value was 6.37, with a standard deviation of 1.770 and a standard error of 0.406. The difference in the reduction of nausea and vomiting was 2.842, with a 95% confidence interval (CI) of 3.796–6.259, and a p-value of 0.000 < 0.05. This indicates that there is an effect of administering anti-nausea medication (control group) on nausea and vomiting in cancer patients undergoing chemotherapy at RSUDAM Province of Lampung in 2024.

Chemotherapy is a cancer treatment method that uses chemicals or drugs, either in pill form or intravenously. The goal is to inhibit the spread of cancer cells and prevent the regrowth of malignant cells. Chemotherapy is often the first choice because these drugs are administered through the bloodstream, making them effective in reaching cancer cells that have metastasized (spread) to other tissues throughout the body [3].

One of the most common and often difficult-to-manage side effects of chemotherapy is its impact on the digestive system, particularly nausea and vomiting. Nausea is defined as an unpleasant sensation that often precedes the urge to vomit, accompanied by autonomic symptoms such as pallor, sweating, increased saliva production, and tachycardia (rapid heartbeat). Meanwhile, vomiting is the forced expulsion of stomach contents through the mouth caused by a motor reflex [17]. These symptoms can significantly impair a patient's quality of life during therapy.

Vomiting can occur due to stimulation of the brain center by toxic substances, either through the bloodstream or ingestion. These toxic substances trigger activation of the vagus nerve, which ultimately causes the vomiting reflex. The impact of nausea and vomiting is very serious, as it can affect patient compliance with chemotherapy programs. There is significant concern that patients may choose to discontinue or stop their chemotherapy cycles due to the discomfort caused by these side effects [28].

The results of the independent t-test yielded a mean value for the reduction in nausea and vomiting before and after administration of cold water (intervention group) and for those who underwent monitoring only (control group), namely 2.84, with a p-value of 0.000 < α (0.05). This means that H0 is rejected and Ha is accepted, indicating a significant difference in nausea and vomiting between the intervention group and the control group undergoing chemotherapy at RSUDAM Hospital in Lampung Province in 2024.

Nausea and vomiting experienced after chemotherapy are known as Chemotherapy-Induced Nausea and Vomiting (CINV). If left uncontrolled, CINV can have serious implications for the overall treatment of patients, affecting treatment response, and even reducing cancer patients' recovery rates. Additionally, uncontrolled CINV can also lead to complications such as dehydration, electrolyte imbalance, weight loss, and malnutrition [21]. Fortunately, this condition can be managed through various methods, one of which is effectively achieved by drinking cold water [10].

Cold drinks are often a preferred choice because they do not contain any risky additives [18]. The sensation of coldness in the mouth can provide refreshment and a pleasant effect associated with thirst relief [8]. Adams' (2015) research supports this, showing that drinks at a temperature of 15ºC can positively influence fluid consumption, maintaining optimal hydration [2]. Furthermore, consuming cold water is known to influence endorphin and serotonin hormones associated with feelings of pleasure [8]. These endorphins and serotonin are important receptors that can stimulate the Chemoreceptor Trigger Zone (CTZ) and the vomiting center [11]. Thus, cold water has the potential to modulate the activity of these receptors, thereby reducing nausea.

One of the main advantages of cold water is its safety. However, it is important to remember that individual fluid requirements vary; there is no one-size-fits-all solution because it must be tailored to each person's individual needs [19]. Cold water has the same composition as standard bottled drinking water. In addition to quenching thirst, water also serves as a key component of blood, supplying

cells with oxygen and nutrients while helping to eliminate waste from the body.

The study results showed a significant difference in the reduction of nausea and vomiting between the intervention group that received cold water and the control group. In the intervention group, fluid administration was done gradually and monitored, ensuring that patients were well hydrated. Researchers observed that patient compliance with fluid intake increased when fluid management was implemented. Interestingly, the use of plain water as an intervention, despite its simplicity, proved effective. This suggests that the availability and suitability of drinking water, even if not continuously cold, can support hydration. Adequate fluid intake is crucial as it influences the body's ability to eliminate toxic substances and maintain fluid balance.

Meanwhile, in the control group, although there was a decrease in nausea and vomiting, the average decrease was smaller. This is believed to be due to several triggering factors, particularly a lack of monitoring of fluid intake and minimal family attention to controlling the patient's health. Although patients in the control group took anti-nausea medication, its effectiveness in reducing nausea and vomiting was limited if not balanced with adequate water intake. This condition can lead to serious complications such as dehydration, fluid volume loss, an empty stomach, and increased stomach acid levels, all of which worsen the patient's condition.

Limitations

This single-centre, non-randomised study utilized a pretest-posttest design with two groups and a small convenience sample, potentially limiting precision and introducing selection bias. The study's methodology, including allocation based on clinic-day workflow, lack of blinding, and reliance on standard Numerical Rating Scale for nausea and vomiting, carries risks of measurement bias and residual confounding. Further limitations include the targeted rather than verified water temperature for each administration, the absence of a formal sample-size calculation, and the lack of trial registration. These factors collectively impede definitive causal inference and limit the generalisability of the findings.

Conclusion

In a single Indonesian centre, the administration of 100 mL of chilled water following chemotherapy infusion was associated with a short-term reduction in nausea and vomiting scores compared to standard care. However, the non-randomised design, limited sample size, and brief follow-up period necessitate cautious interpretation of these preliminary findings. Further investigation through a pragmatic, adequately powered randomised controlled trial employing validated instruments for chemotherapy-induced nausea and vomiting and extended follow-up is recommended to establish efficacy and guide clinical practice.

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Competing interests

All authors confirm that they have no competing interests to declare.

Data Availability

Individual participant data, along with the data dictionary and analysis code, will be made available to qualified researchers upon reasonable request to the corresponding author, contingent upon a data-use agreement and ethical approval from the institutional ethics committee. Public dissemination of data is restricted due to privacy safeguards and local regulations. Study materials are also available upon request.

Authors' contributions

Sri Maryuni and Tubagus Erwin conceptualised the research. DAS, SM, and TE were responsible for designing the methodology and overseeing its implementation. Data acquisition was performed by DAS and TE, with DAS

conducting the statistical analyses. All authors participated in the interpretation of results, critically reviewed the manuscript for intellectual content, had complete access to and verified the underlying data, approved the final version, and hold ultimate responsibility for the decision to submit for publication.

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