SAĞLIK BİLİMLERİ ÜNİVERSİTESİ HEMŞİRELİK DERGİSİ
University of Health Sciences Journal of Nursing
Cilt / Volume 8 • Sayı / Number 1 • Nisan / April • 2026

Araştırma makalesi / Research article • **DOI: 10.48071/sbuhemsirelik.1750261**

The Effect of a Handheld Fan on Alleviating Chemotherapy-Associated Nausea in Children

Yüze Uygulanan El Fanının Çocuklarda Kemoterapiye Bağlı Bulantıyı Hafifletmede Etkisi

Özge Eda KARADAĞ AYTEMİZ[1], Duygu GÖZEN[1], Kübra ALKI[2], Gökçe ÇİÇEK[3]

Yazarların ORCID numaraları / ORCID IDs of the authors:
Ö.A.K.A 0000-0001-5063-4907; D.G. 0000-0001-9272-3561; K.A. 0000-0003-0307-2387; G.Ç. 0000-0002-0056-4063

[1]Koç University School of Nursing, Istanbul, Türkiye.

[2]Başakşehir Çam and Sakura City Hospital, Istanbul, Türkiye.

[3]Istanbul Kent University, Faculty of Health Science, Department of Nursing, Istanbul, Türkiye.

Sorumlu yazar / Corresponding author:
Özge Eda KARADAĞ AYTEMİZ
E-posta: oaytemiz@ku.edu.tr

Geliş tarihi / Date of receipt: 29.07.2025
Kabul tarihi / Date of acceptance: 19.10.2025

Atıf / Citation: Karadağ Aytemiz, Ö. E., Gözen, D., Alkı, K., & Çiçek, G. (2026). The effect of a handheld fan on alleviating chemotherapy-associated nausea in children. *UHS Journal of Nursing, 8*(1), 29-36. doi: 10.48071/sbuhemsirelik.1750261

ABSTRACT

Introduction: Chemotherapy-induced nausea and vomiting are significant adverse effects that greatly reduce the quality of life in children diagnosed with cancer.

Aim: To evaluate the effects of using a handheld fan on the face to alleviate nausea and improve physiological parameters in children aged 7 - 18 years receiving their first chemotherapy treatment.

Methods: This two-group randomized controlled trial with 53 children (experimental group n = 29, control group n = 24) was conducted between December 2022 and March 2023 at a pediatric oncology department. Data collection tools included an information form, observation form, and Baxter Retching Faces nausea scale. Measurements of heart rate, oxygen saturation, and nausea level were taken in both groups immediately before chemotherapy and at 5, 30, and 60 minutes after the end of treatment. In the experimental group, the fan was applied three times for 5 minutes each at 15 cm from the child's face, immediately before each posttreatment measurement. Statistical analyses included the Kolmogorov-Smirnov, chi-square, Mann-Whitney U, and Wilcoxon tests.

Results: The experimental group demonstrated significantly lower Baxter Retching Faces scores ($p = 0.005$) and heart rate ($p = 0.022$) at 60 minutes posttreatment compared to controls, with no significant differences at 5 or 30 minutes. The experimental group also showed decreased heart rate from pretreatment to 60 minutes ($p = 0.004$). Oxygen saturation levels remained unchanged between groups ($p > 0.05$).

Conclusion: These preliminary findings suggest that the fan intervention may serve as a supportive strategy for managing nausea and improving the quality of life in pediatric cancer patients undergoing chemotherapy.

Keywords: Chemotherapy; child; complementary therapies; nausea.

ÖZ

Giriş: Kemoterapiye bağlı bulantı ve kusma, kanser tanısı almış çocuklarda yaşam kalitesini önemli ölçüde azaltan ciddi yan etkilerdir.

Amaç: Bu araştırma ilk kez kemoterapi alan 7 - 18 yaş arası çocuklarda, yüze uygulanan elde taşınabilir fanın bulantıyı azaltma ve fizyolojik parametreleri iyileştirme üzerindeki etkilerini değerlendirmek amacıyla gerçekleştirilmiştir.

Yöntem: İki gruplu bu randomize kontrollü çalışma, 53 çocuk (deney grubu n = 29, kontrol grubu n = 24) ile Aralık 2022 ile Mart 2023 tarihleri arasında pediatrik onkoloji servisinde yürütülmüştür. Veri toplama araçları arasında bilgi formu, gözlem formu ve Baxter Retching Faces bulantı ölçeği yer almıştır. Her iki grupta da kalp hızı, oksijen satürasyonu ve bulantı düzeyine ilişkin ölçümler, kemoterapiden hemen önce ve tedavi sonrasında 5., 30. ve 60. dakikalarda yapılmıştır. Deney grubuna, her bir tedavi sonrası ölçümden hemen önce çocuğun yüzünden 15 cm uzaklıkta olacak şekilde 5 dakikalık üç fan uygulaması yapılmıştır. İstatistiksel analizlerde Kolmogorov-Smirnov, ki-kare, Mann-Whitney U ve Wilcoxon testleri kullanılmıştır.

Bulgular: Tedavi sonrası 60. dakikada deney grubunda Baxter Retching Faces skorları ($p = 0,005$) ve kalp hızı ($p = 0,022$) kontrol grubuna göre anlamlı düzeyde daha düşük bulunmuş olup, 5. ve 30. dakikalarda anlamlı fark gözlenmemiştir. Deney grubunda tedavi öncesine göre 60. dakikada kalp hızında anlamlı düşüş görülmüştür ($p = 0,004$). Oksijen satürasyonu düzeyleri gruplar arasında değişmeden kalmıştır ($p > 0,05$).

Sonuç: Bu ön bulgular, fan uygulamasının kemoterapi alan pediatrik kanser hastalarında bulantının yönetilmesinde ve yaşam kalitesinin iyileştirilmesinde destekleyici bir strateji olarak hizmet edebileceğini göstermektedir

Anahtar Kelimeler: Bulantı; çocuk; kemoterapi; tamamlayıcı tedaviler.

Introduction

Nausea is typically described as an unpleasant sensation associated with the urge to vomit (Balaban & Yates, 2017). Chemotherapy is a widely used and effective method in cancer treatment. Despite the use of pharmacological antiemetics, chemotherapy-induced nausea and vomiting (CINV) are significant adverse effects that greatly reduce the quality of life in children diagnosed with cancer (Rodgers et al., 2012; Ruggiero et al., 2018). Acute CINV can occur during or within hours after treatment (Duggin et al., 2014; Ay et al., 2023; National Cancer Institute, 2024). The condition can lead to physical and psychosocial problems, including fluid-electrolyte imbalance, oral mucositis, increased intracranial pressure, infection, prolonged hospitalization, and impaired quality of life (Ruggiero et al., 2018; Evans et al., 2020). Nausea may also be accompanied by symptoms such as drowsiness, rapid pulse, and dyspnea (Zhang et al., 2014). Mitigating these unpleasant posttreatment symptoms and providing support with alternative nonpharmacological approaches alongside antiemetics is crucial for children receiving chemotherapy. Common nonpharmacological interventions used to control nausea and vomiting in cancer patients include music, herbal products, aromatherapy, massage, acupuncture, and acupressure (Kiernan, 2018; Li et al., 2022; Ho et al., 2025)

Using a handheld fan directed toward the face is another nonpharmacological method reported in the literature to reduce perceived dyspnea (Galbraith, Fagan, Perkins, Lynch and Booth, 2010; Qian et al., 2019; Kocatepe, Can & Oruç, 2021) but no study has directly investigated its effect on nausea and vomiting. A handheld fan is a simple, inexpensive, portable, and easy-to-use device (Kako et al., 2018). Moreover, there is a widespread lay belief that fresh air alleviates nausea, although this is not well documented in the literature.

Study Aim

We conducted this randomized controlled study to address both scientific and clinical gaps by evaluating the effects of a fan intervention on chemotherapy-related nausea and its potential contribution to symptom management in pediatric cancer patients.

Study Hypotheses

H1: Nausea scores after chemotherapy will be lower in children who receive a fan intervention than in children who do not receive the fan intervention.

H2: Oxygen saturation values (SpO_2) after chemotherapy will be higher in children who receive a fan intervention than in children who do not receive the fan intervention.

H3: Heart rate (HR) after chemotherapy will be lower in children who receive a fan intervention than in children who do not receive the fan intervention.

Method

Study Design and Setting

This randomized controlled trial was designed to evaluate the effects of using a handheld fan directed at the face on nausea and vital signs in children aged 7 - 18 years who were newly diagnosed with cancer and receiving their first chemotherapy session. The study was conducted between December 2022 and March 2023 at the Pediatric Oncology Department of a hospital.

Participants

The inclusion criteria for children were being 7 - 18 years of age, having no chronic diseases other than cancer, receiving their first chemotherapy treatment and antiemetic premedication as ordered by the responsible physician, and having obtained parental verbal and written informed consent to participate in the study.

The G*Power program (version 3.1.9.2, Heinrich-Heine University) was used to determine the sample size. A power analysis using SpO_2 data from a similar study (Kocatepe et al., 2021) indicated that with a 5% error rate, effect size of 0.78, and 80% power, a total sample size of 44 participants was required. Considering potential sample losses, a total of 53 children were included in the study. We acknowledge a methodological limitation: power analysis was based on SpO_2 data rather than BARF scores (our primary outcome), as no prior pediatric studies had examined fan effects on nausea. The urn method was used for randomization, with 29 children randomized to the experimental group and 24 to the control group (Figure 1).

Data Collection Tools

Information Form: Prepared by the researchers, this form consisted of five questions about the demographic information of the parents and child (age, sex, anthropometric measurements, and diagnosis).

Baxter Retching Faces (BARF) Nausea Scale: Developed by Baxter et al. in 2011 to evaluate nausea and vomiting in children, this scale includes six illustrated faces scored from 0 to 10 (Baxter, Watcha, Baxter, Leong & Wyatt, 2011). The internal consistency coefficient was found to be high (Cronbach's alpha=0.86). The Turkish validity and reliability study was conducted by Şişman in 2015. A score of 0 indicates no nausea/vomiting, and a score of 10 indicates severe nausea/vomiting (Şişman, 2015).

Pulse Oximeter: The PlusMED plus-50DL Fingertip Pulse Oximeter (Plus Medical Co, Ltd; serial no: 12.06.2012-70235) was used consistently in both groups for SpO_2 and HR measurements.

Observation Form: Created by the researchers, this form was used to record the SpO_2 (%) and HR (beats per minute [bpm]) of all children in the study immediately before the first chemotherapy session and 5, 30, and 60 minutes after the end of the treatment.

Handheld Fan: The experimental group received a Vkusra brand rechargeable portable handheld fan (Shenzhen Anny Tech Co, Ltd). The CE-certified device operates silently and does not produce heat.

Data Collection

All children received standard antiemetic premedication according to institutional protocol, administered 30 minutes before chemotherapy initiation. The purpose of the study was explained to the families in both groups, and their verbal and written consent was obtained. Families in the experimental group were briefly trained on the use of the fan. Anthropometric measurements (height, weight) were taken at the time of admission to the ward and recorded in the information form. Both groups of children were then monitored with the pulse oximeter. All children received chemotherapy in a quiet room, positioned in a semi-Fowler position.

For the fan intervention, the parent continuously directed the fan at the child's upper lip from a distance of 15 cm for 5 minutes (Galbraith et al., 2010). During the intervention, the child rested in a semi-

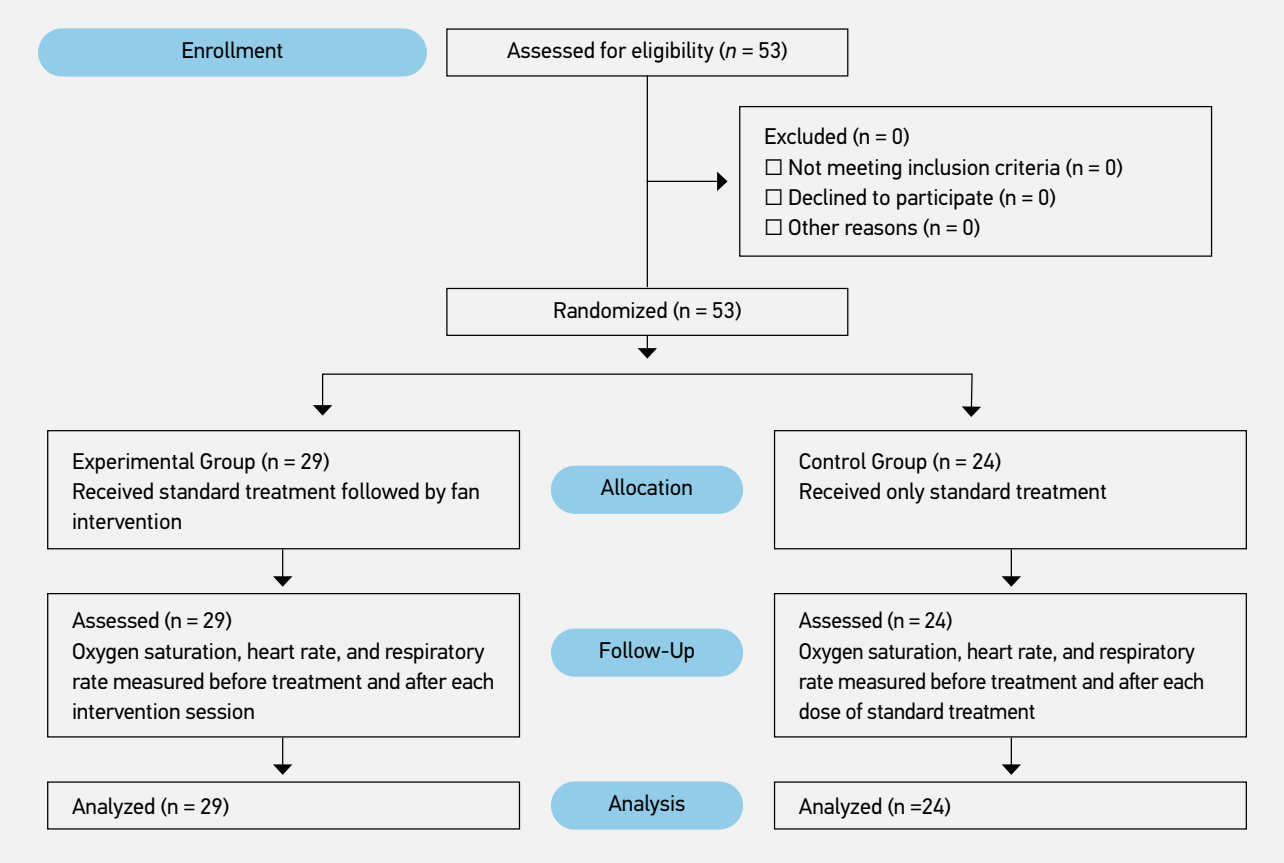

Figure 1: CONSORT Flow Diagram

RANDOMIZATION	
EXPERIMENTAL	**CONTROL**
Pre-Treatment Measurement	Pre-Treatment Measurement
Chemotherapy	**Chemotherapy**
5 min fan application	5 min rest
TS Measurement 1 (5 min after treatment)	**TS Measurement 1** (5 min after treatment)
20 min rest	25 min rest
5 min fan application	**TS Measurement 2** (30 min after treatment)
TS Measurement 2 (30 min after treatment)	
25 min rest	30 min rest
5 min fan application	**TS Measurement 3** (60 min after treatment)
TS Measurement 3 (60 min after treatment)	

Figure 2: Intervention Flow

Fowler position with the parent positioned within the child's line of sight. The fan was applied before each of the three posttreatment measurements in the experimental group.

Pretreatment Measurement: In both groups, HR and SpO_2 were measured, and the BARF scale was administered immediately before the chemotherapy treatment.

Posttreatment Measurement 1 (5 minutes): In the experimental group, the first fan application was performed for 5 minutes immediately after chemotherapy, followed by HR and SpO_2 recording and BARF assessment. In the control group, children rested for 5 minutes before measurement.

Posttreatment Measurement 2 (30 minutes): In the experimental group, there was a 20-minute rest period after the first measurement, followed by the second fan application and repeated assessments. Children in the control group rested for 25 minutes after the first measurement, then the assessments were repeated.

Posttreatment Measurement 3 (60 minutes): In the experimental group, the children rested for approximately 25 more minutes after the second measurement, then the third fan application and assessments were performed. Children in the control group rested for 30 minutes after the second measurement, then assessments were repeated (Figure 2).

Data Analysis

For statistical analysis, percentages, means, standard deviations, and range were used. The Kolmogorov-Smirnov test was employed to check the normality of data distributions, and the chi-square test was used to test the relationships between categorical variables. Due to the non-normal distribution of the data, the Mann-Whitney U test was used to compare two independent samples, and the Wilcoxon test was used for paired sample comparisons. A power analysis was recalculated for the 53 patients in the sample, resulting in a study power of 83% with a 0.05 error margin. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from Health Sciences Research and Publication Ethics Committee (Date: 06.04.2021 and No: 58797640-050), and institutional permission was secured from the center where the study was conducted. Written consent was obtained from the parents of the children after informing them about the study. Additionally, verbal assent was obtained from all children after explaining the study procedures in age-appropriate language.

Results

There was no statistically significant difference in age, height, weight, or sex between the experimental and control groups ($p > 0.05$) (Table 1).

A significant difference in BARF scores was found between the experimental and control groups 60 minutes after treatment ($p = 0.005$, Cohen's $d = 0.73$, medium-to-large effect size). BARF scores decreased significantly more in the experimental group than the control group between posttreatment 5 and 60 minutes ($p = 0.035$). In the control group, there was a statistically significant increase in BARF score at posttreatment 30 minutes compared to the pretreatment value ($p = 0.011$) (Table 2).

Table 1: Distribution and Comparison of Demographic Characteristics of Groups (n = 53)

Demographic		Experimental Group		Control Group		Test†	p
		Mean ± SD (Range)		Mean ± SD (Range)			
Age (years)		11.62 ± 3.58 (7 - 18)		13.16 ± 3.69 (7 - 18)		-1.528†	0.126
Height (cm)		145.79 ± 19.10 (105 - 181)		155.20 ± 20.09 (112 - 182)		-1.780†	0.075
Weight (kg)		44.41 ± 16.87 (23 - 103)		50.75 ± 17.88 (23 - 93)		-1.449†	0.147
		n	%	n	%	χ^2	
Sex	Female	9	31.0	9	37.5	.245‡	0.621
	Male	20	69.0	15	62.5		

SD: Standard Deviation; †: Mann-Whitney U test; ‡: Chi-square test; * $p < 0.05$

Table 2: Comparison of BARF Score Averages and Changes Over Time Between Groups (n = 53)

	Experimental Group	Control Group	Test† / p
	Mean ± SD	Mean ± SD	
BARF Score			
Pre	3.03 ± 2.42	2.91 ± 2.56	-0.512† / 0.608
Post - 5 min	3.93 ± 4.49	5.16 ± 3.00	-1.357† / 0.175
Post - 30 min	3.86 ± 2.66	4.75 ± 2.93	-1.109† / 0.268
Post - 60 min	2.13 ± 2.13	3.75 ± 2.30	-2.800† / **0.005***
Difference			
Pre / Post - 5 min	0.89 ± 2.80	2.25 ± 2.65	-1.652 / 0.098
Z‡ / p	-1.498 / 0.134	-1.192 / 0.233	
Pre / Post - 30 min	0.82 ± 2.95	1.83 ± 3.33	-0.904 / 0.366
Z‡/ p	-1.337 / 0.181	-2.547 / **0.011***	
Pre / Post - 60 min	-0.89 ± 2.90	0.83 ± 3.27	-2.113 / **0.035***
Z‡ / p	-2.272 / **0.023***	-1.239 / 0.215	

BARF: Baxter Retching Faces scale; SD: Standard Deviation; Pre: Pretreatment; Post: Posttreatment; †Wilcoxon test; ‡Z: Mann-Whitney U test; ***p < 0.05**

No statistically significant difference in SpO_2 levels was observed between the experimental and control groups before treatment or at posttreatment 5, 30, and 60 minutes ($p > 0.05$) (Table 3).

The children in the experimental group exhibited a significant decrease in HR at 60 minutes posttreatment compared to pretreatment ($p = 0.004$). Moreover, this decrease was significantly greater than that in the control group ($p = 0.022$, Cohen's $d = 0.51$, medium effect size) (Table 4).

Discussion

The study aimed to evaluate the effect of facial fan application on nausea and physiological parameters in children aged 7 to 18 years receiving their first chemotherapy session. Nausea, a common adverse effect after chemotherapy, remains a significant issue despite pharmacological interventions, affecting patients' quality of life and adherence to treatment (Ruggiero et al., 2018; Kiernan, 2018). Although antiemetic drugs have reduced the incidence of vomiting, approximately 30-60% of patients still experience acute or delayed CINV, making it one of the most severe adverse effects. Thus, effective and safe methods for managing post-chemotherapy nausea are sought (Rao & Faso, 2012).

Distractions such as listening to music (Kiernan, 2018), watching television, playing games (National Cancer Institute, 2024), and exercising (American College of Cardiology, 2019) are often used in addition to antiemetic regimens (Conk, Başbakkal, Yılmaz & Bolışık, 2013; Hockenberry & Rodgers, 2015). Integrative health approaches favored by children and parents for managing nausea and vomiting include acupuncture (National Cancer Institute, 2024), acupressure

Table 3: Comparison of Mean of SpO2 and Changes Over Time Between Groups (n = 53)

	Experimental Group	Control Group	Test† / p
	Mean ± SD	Mean ± SD	
SpO_2 (%)			
Pre	98.65 ± 1.39	99.03 ± 0.92	-1.040† / 0.298
Post - 5 min	98.31 ± 1.62	98.83 ± 1.00	-1.077† **/** 0.282
Post - 30 min	98.24 ± 1.55	98.95 ± 1.16	-1.838† **/** 0.066
Post - 60 min	99.06 ± 0.99	99.16 ± 0.96	-0.372† **/**0.710
Difference			
Pre / Post - 5 min	-0.34 ± 1.56	-0.25 ± 1.07	-0.218 / 0.827
Z‡ / p	1.156 / 0.248	-1.192 / 0.233	
Pre / Post - 30 min	-0.41 ± 1.54	-0.12 ± 1.45	-0.576 / 0.564
Z‡ / p	-1.361 / 0.173	-0.324 / 0.746	
Pre / Post - 60 min	0.41 ± 1.37	0.08 ± 1.05	-0.912 / 0.362
Z‡ / p	-1.530 / 0.126	-0.460 / 0.646	

SpO_2: Oxygen saturation; SD: Standard deviation; Pre: Pretreatment; Post: Posttreatment; †Wilcoxon test; ‡Z: Mann-Whitney U test; ***p < 0.05**

Table 4: Comparison of Mean of Heart Rate and Changes Over Time Between Groups (n = 53)

	Experimental Group	Control Group	Test† / p
	Mean ± SD	Mean ± SD	
Heart Rate (min)			
Pre	91.69 ± 17.67	95.50 ± 16.15	-1.020† / 0.308
Post - 5 min	90.86 ± 15.09	96.87 ± 17.69	-1.279† / 0.201
Post - 30 min	90.62 ± 13.02	96.79 ± 16.57	-1.306† **/** 0.192
Post - 60 min	87.24 ± 12.02	95.33 ± 15.95	-1.770† **/** 0.077
Difference			
Pre / Post - 5 min	-0.82 ± 9.31	1.37 ± 9.05	-0.734 / 0.463
Z‡ / p	-0.048 / 0.962	-1.035 / 0.300	
Pre / Post - 30 min	-1.06 ± 10.69	1.29 ± 10.40	-1.101 / 0.271
Z‡ / p	-0.331 / 0.741	-1.302 / 0.193	
Pre / Post - 60 min	-4.44 ± 7.80	-0.16 ± 9.08	-2.291 / **0.022***
Z‡ / p	-2.875 / **0.004***	-0.640 / 0.522	

HR: Heart Rate (beats per minute); SD: Standard Deviation; Pre: Pretreatment; Post: Posttreatment; †Wilcoxon test; ‡Z: Mann-Whitney U test; *** p < 0.05**

(Cheung et al., 2020), aromatherapy (National Cancer Institute, 2024), and hypnosis (Ho et al., 2025). This study investigates an easy, parent-administered new method to reduce nausea in children receiving chemotherapy. The facial fan application provides gentle airflow to the face to stimulate nerve endings and provide comfort. It has been proposed as a promising noninvasive and nonpharmacological strategy for managing nausea that can potentially enhance children's treatment experience and thereby improve their overall quality of life.

Studies on fan interventions have primarily focused on its effects on respiration in terminal-stage cancer, chronic COPD, and heart disease in adults, while no research has examined its use in children to alleviate nausea. Therefore, the discussion of this study is based on the findings obtained. Previous studies have reported that fan application is safe during rest and exercise (Bausewein, Booth, Gysels, Kühnbach & Higginson, 2010; Booth, Galbraith, Ryan, Parker & Johnson, 2016; Wong, Leong, Chan, Kan & Cheng, 2017; Luckett et al., 2022). Given the lack of sufficient data in pediatric samples, the results of this study are a significant contribution to the literature. Our findings indicate that applying a fan plays a positive role in alleviating nausea and providing comfort to children receiving chemotherapy.

The experimental and control groups in our study were well-matched in terms of their age, height, weight, and sex distribution. Before the chemotherapy session, there was also no significant difference between the groups in levels of nausea assessed using the BARF scale. However, post-chemotherapy assessments revealed that the mean BARF score in the experimental group was lower than that in the control group, though the difference between groups did not reach statistical significance until 60 minutes. When nausea scores were examined within the groups, the control group showed a significant increase in mean BARF score at 30 minutes after treatment compared to pretreatment, and the mean BARF scores at 60 minutes after chemotherapy remained higher than the pretreatment level. These findings support the effectiveness of the fan intervention in reducing nausea at the 60-minute time point.

While the BARF score reduction of approximately 1.6 points at 60 minutes was statistically significant, the clinical meaningfulness should be considered. A 1 - 2 point reduction on a 10-point scale may represent mild improvement in symptom burden. Further research is needed to establish minimal clinically important differences for the BARF scale in this population.

Mean oxygen saturation levels remained within the normal range after treatment in both groups, with no significant differences within or between the groups. Unlike previous studies in adult populations with respiratory symptoms where fan application improved SpO_2 (Kako et al., 2018), our pediatric sample did not show SpO_2 changes, likely because the children did not have baseline respiratory compromise. In our study, the lower HR in the children who received the fan intervention supports the effectiveness of the fan against nausea. At 60 minutes after chemotherapy, the experimental group showed a significant decrease in mean HR compared to pretreatment and a significant difference compared to the control group, corroborating the changes observed in BARF scores.

Studies like this are crucial to expand existing treatment options for controlling nausea and vomiting in children. The noninvasive nature of the handheld fan application can positively impact children's treatment experiences. Future studies should evaluate the use of this method to enhance children's quality of life and make the treatment process more tolerable.

The results suggest that a fan directed at the face may be effective in reducing nausea and has positive effects on HR in children undergoing chemotherapy at 60 minutes post-treatment. However, given the single-center design, limited sample size, and short follow-up period, these findings should be interpreted cautiously. Further research with larger, multi-center studies is needed before broad clinical recommendations can be made. These findings indicate that the facial fan intervention may be considered an alternative supportive treatment option for managing post-chemotherapy nausea in pediatric oncology settings.

Limitations of the Study

This study has several limitations. The lack of blinding in outcome assessment may have introduced observer bias**.** The study was single-centered with a relatively small sample size (n = 53), which may limit generalizability across different pediatric oncology settings and chemotherapy protocols. Observations were limited to the first chemotherapy cycle and short-term follow-up only. While researchers supervised all fan applications to ensure proper technique, parent administration may have introduced minor variability. The power analysis was based on SpO_2 data rather than our primary outcome (BARF scores), as no prior effect size data were available for fan interventions on pediatric nausea. The study was not prospectively registered in a clinical trial registry. Further multi-center randomized controlled trials with larger samples, longer follow-up, blinded assessment, and standardized protocols are needed to validate these preliminary findings.

Conclusions

These preliminary findings suggest that a handheld fan intervention may serve as a promising approach in managing CINV in children and can contribute to developing supportive strategies for managing nausea and quality of life in pediatric cancer treatment. Future research on the effects of a handheld fan on the face on reducing nausea and vomiting in children can provide significant contributions to the literature.

The handheld fan intervention may be considered a simple and cost-effective nonpharmacological approach for managing CINV in children. Healthcare professionals, including nurses, may consider integrating this intervention into pediatric oncology care protocols as a complementary supportive measure.

However, given the study's limitations, including single-center design, small sample size, and short follow-up duration, these results should be interpreted cautiously. Further multi-center randomized controlled trials with larger sample sizes and longer follow-up periods are strongly recommended to validate these findings, address methodological limitations, and explore factors affecting the clinical applicability of a handheld fan intervention. Research on the optimal timing and duration of handheld fan use is also suggested.

Ethical Considerations: Ethical approval was obtained from Istanbul Kent University Health Sciences Research and Publication Ethics Committee (Date: 06.04.2021 and No: 58797640-050).

Author Contribution: Study design- ÖEKA, DG, Data collection- ÖEKA, DG, Data analysis- ÖEKA, KA, GÇ, Manuscript writing- EÖ, YYA, Study supervision- ÖEKA, KA, GÇ, Manuscript writing- ÖEKA, KA, GÇ, Critical revisions for important intellectual content- ÖEKA, KA, GÇ.

Peer Review: External independent

Conflict of interest: Authors declare no conflict of interest.

Sources of Funding: This research did not receive any specific grant from funding agencies in the public, commercial, or not for profit sectors.

Acknowledgements: The authors would like to thank the participants for their co-operation

References

American College of Cardiology. (2019). Exercise before, during, and after cancer therapy. Retrieved from (24.06.2024): https://www.acc.org/Latest-in-Cardiology/Articles/2019/12/04/08/22/Exercise-Before-During-and-After-Cancer-Therapy

Ay, A., Boztepe, H., Özbay, Ş. Ç., Yılmaz, P., Karadavut, B., Burhanoğulları, D., & Akyüz, C. (2023). Determining the factors affecting chemotherapy-induced nausea and vomiting in children with cancer. *Journal of Pediatric Nursing, 73,* 426-434. doi: 10.1016/j.pedn.2023.10.011

Balaban, C. D., & Yates, B. J. (2017). What is nausea? A historical analysis of changing views. *Autonomic neuroscience: basic & clinical*, *202*, 5–17. https://doi.org/10.1016/j.autneu.2016.07.003

Bausewein, C., Booth, S., Gysels, M., Kühnbach, R., & Higginson, I. J. (2010). Effectiveness of a hand-held fan for breathlessness: A randomised, phase II trial. *BMC Palliative Care, 9*(1), 22. doi: 10.1186/1472-684X-9-22

Baxter, A. L., Watcha, M. F., Baxter, W. V., Leong, T., & Wyatt, M. M. (2011). Development and validation of a pictorial nausea rating scale for children. *Pediatrics*, *127*(6), e1542–e1549. doi: 10.1542/peds.2010-1410

Booth, S., Galbraith, S., Ryan, R., Parker, R. A., & Johnson, M. (2016). The importance of the feasibility study: Lessons from a study of the hand-held fan used to relieve dyspnea in people who are breathless at rest. *Palliative Medicine, 30*(5), 504–509. doi: 10.1177/0269216315607180

Cheung, D. S. T., Yeung, W. F., Chau, P. H., Lam, T. C., Yang, M... Lai, K. (2020). Patient-centred, self-administered acupressure for Chinese advanced cancer patients experiencing fatigue and co-occurring symptoms: A pilot randomised controlled trial. *European Journal of Cancer Care, 29*(6), 1331-4. doi: 10.1111/ecc.13314

Conk, Z., Başbakkal, Z., Yılmaz, H. B., & Bolışık, B. (2013). *Pediatri hemşireliği.* Ankara: Akademisyen Tıp Kitabevi.

Duggin, K., Tickle, K., Norman, G., Yang, J., Wang, C... Cross, S. J. (2014). Aprepitant reduces chemotherapy-induced vomiting in children and young adults with brain tumors. *Journal of Pediatric Oncology Nursing, 31*(5), 277–283. doi: 10.1177/1043454214531090

Evans, A., Vingelen, M. B., Yu, C., Baird, J., Murray, P... Bryant, P. (2020). Nausea in numbers: Electronic medical record nausea and vomiting assessment for children with cancer. *Journal of Pediatric Oncology Nursing, 37*(3), 195–203. doi: 10.1177/1043454219900467

Galbraith, S., Fagan, P., Perkins, P., Lynch, A., & Booth, S. (2010). Does the use of a handheld fan improve chronic dyspnea? A randomized, controlled, crossover trial. *Journal of Pain and Symptom Management*, *39*(5), 831–838. doi: 10.1016/j.jpainsymman.2009.09.024

Ho, K. Y., Lam, K. K. W., Xia, W., Liu, Q., Chiu, S. Y., Chan, G. C. F., & Li, W. H. C. (2025). Systematic review of the effectiveness of complementary and alternative medicine on nausea and vomiting in children with cancer. *Cancer nursing*, *48*(2), 89–98. https://doi.org/10.1097/NCC.0000000000001239

Hockenberry, M. J., & Rodgers, C. C. (2015). *Nausea, vomiting, anorexia, and fatigue.* In Pediatric Psycho-Oncology: A Quick Reference on the Psychosocial Dimensions of Cancer Symptom Management (2nd ed.) (pp. 79–95). Oxford University Press

Kako, J., Morita, T., Yamaguchi, T., Sekimoto, A., Kobayashi, M... Kinoshita, H. (2018). Evaluation of the appropriate washout period following fan therapy for dyspnea in patients with advanced cancer: A pilot study. *American Journal of Hospice and Palliative Medicine, 35*(2), 293–296. doi: 10.1177/1049909117707905

Kiernan, J. M. (2018). Chemotherapy-induced nausea and vomiting mitigation with music interventions. *Oncology Nursing Forum, 45*(1), 88–95. doi: 10.1188/18.ONF.88-95

Kocatepe, V., Can, G., & Oruç, Ö. (2021). Lung cancer-related dyspnea: The effects of a handheld fan on management of symptoms. *Clinical Journal of Oncology Nursing, 25*(6), 655–661. doi: 10.1188/21.CJON.655-661

Li, K., Cai, Y., Xie, S., Zhou, Y., Dong, J., & Zhu, Q. (2022). Evidence summary for nonpharmacological management of chemotherapy-induced nausea and vomiting. *BioMed Research International, 2022*(1), 1-10. doi: 10.1155/2022/4741193

Luckett, T., Roberts, M., Smith, T., Garcia, M., Dunn, S, Swan, F. (2022). Implementing the battery-operated hand-held fan as an evidence-based, non-pharmacological intervention for chronic breathlessness in patients with chronic obstructive pulmonary disease (COPD): A qualitative study of the views of specialist respiratory clinicians. *BMC Pulmonary Medicine*, *22*(1), 234. doi: 10.1186/s12890-022-02038-2

National Cancer Institute. (2024). Acupuncture (PDQ®). Retrieved from (11.03.2024): https://www.cancer.gov/about-cancer/treatment/cam/hp/acupuncture-pdq

Qian, Y., Wu, Y., de Moraes, A. R., Yi, X., Geng, Y... Dibaj, S. (2019). Fan therapy for the treatment of dyspnea in adults: A systematic review. *Journal of Pain and Symptom Management*, *58*(3), 481–486. doi: 10.1016/j.jpainsymman.2019.04.011

Rao, K. V., & Faso, A. (2012). Chemotherapy-induced nausea and vomiting: Optimizing prevention and management. *American Health & Drug Benefits*, *5*(4), 232–239. doi: 10.1111/ahdb.2012.5.4.232

Rodgers, C., Norville, R., Taylor, O., Poon, C., Hesselgrave, J., Gregurich, M. A., & Hockenberry, M. (2012). Children's coping strategies for chemotherapy-induced nausea and vomiting. *Oncology Nursing Forum, 39*(2), 202–209. doi: 10.1188/12.ONF.202-209

Ruggiero, A., Rizzo, D., Catalano, M., Coccia, P., Triarico, S., & Attinà, G. (2018). Acute chemotherapy-induced nausea and vomiting in children with cancer: Still waiting for a common consensus on treatment. *Journal of International Medical Research, 46*(6), 2149–2156. doi: 10.1177/0300060518765324

Şişman, H. (2015). Validity and reliability study of the BARF nausea scale (Master's thesis). Acıbadem University, Istanbul, Türkiye.

Wong, S. L., Leong, S. M., Chan, C. M., Kan, S. P., & Cheng, H. W. (2017). The effect of using an electric fan on dyspnea in Chinese patients with terminal cancer. *American Journal of Hospice and Palliative Medicine, 34*(1), 42–46. doi: 10.1177/1049909115615127

Zhang, X., Jin, H. F., Fan, Y. H., Lu, B., Meng, L. N., & Chen, J. D. (2014). Effects and mechanisms of transcutaneous electroacupuncture on chemotherapy-induced nausea and vomiting. *Evidence-Based Complementary and Alternative Medicine*, *2014*(1), 1-6. doi: 10.1155/2014/860631