The Impact of Fan Application on the Comfort Levels of Patients with Lung Cancer in Managing Dyspnea: A Randomized Controlled Trial

Ayşegül ÇELİK,[1] Derya ÇINAR,[1] Seçil GÜNDOĞAN,[2] Berna KÖMÜRCÜOĞLU[2]

[1] Department of Nursing, İzmir Bakırçay University Faculty of Health Sciences, İzmir-*Türkiye*
[2] Department of Chest Diseases, University of Health Sciences, Dr. Suat Seren Chest Diseases and Chest Surgery Training and Research Hospital, İzmir-*Türkiye*

OBJECTIVE
The aim of this study was to investigate the effect of the application of a hand fan to the face on comfort level, dyspnea severity, and changes in physiological parameters in the management of dyspnea in patients with lung cancer.

METHODS
This study was conducted in a randomized controlled experimental design. 56 lung cancer patients were randomly assigned to the intervention group (n:27) receiving fan therapy and the control group (n:29) receiving routine therapy. The intervention group had a hand fan applied to the face for five minutes twice a day for five days. The Cancer Dyspnea Scale, General Comfort Scale-Short Form, and Vital Signs Monitoring Form were completed before and after the intervention.

RESULTS
There was no significant difference between the Cancer Dyspnea Scale and the General Comfort Scale-Short Form scores of patients in the intervention and control groups before and after the application (p>0.05). The intervention group had a significantly lower mean heart rate compared to the control group (p<0.05).

CONCLUSION
The study found that using a handheld fan for five minutes twice a day for five days did not affect the patients' dyspnea or comfort level. However, it did result in a reduction in heart rate from physiological parameters.

Keywords: Evidence-based practices; dyspnea; fan application; lung cancer; nursing; symptom management.
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INTRODUCTION

Dyspnea is a common symptom that causes a feeling of suffocation and fear of death in cancer patients. It may lead to physical and psychological problems in patients and may negatively affect activities of daily living and quality of life.[1–5]

Especially in advanced cancer patients, the prognosis of dyspnea may worsen, and its prevalence may gradually increase. Although the prevalence of dyspnea varies between 50% and 70% in cancer patients, this rate increases to 90% in patients with lung cancer.[3,4] Pathologic changes that develop due to lung cancer contribute to impairment in respiratory functions and

Dr. Ayşegül ÇELİK
İzmir Bakırçay Üniversitesi Sağlık Bilimleri Fakültesi,
Hemşirelik Bölümü,
İzmir-Türkiye
E-mail: aysegul.celik@bakircay.edu.tr

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increase the severity of dyspnea. Psychological distress caused by dyspnea may lead to anxiety. Anxiety may lead to an increase in respiratory and heart rate and worsening of dyspnea prognosis.[4,5] However, due to the physical and psychosocial multidimensional nature of dyspnea, the relationship with these physiologic measurements alone may be weak. It has been reported to be strongly associated with psychological conditions such as increased anxiety and depression in cancer patients who experience dyspnea.[1,2,4–6]

It is recommended that non-pharmacologic approaches such as hand fan application, respiratory exercises, education, and pulmonary rehabilitation should be used primarily in the management of dyspnea.[5] Among these approaches, the application of air to the face with a hand fan may decrease the severity of dyspnea in patients by providing cooling and airflow in the nasal receptors. At the same time, as a method of distraction, it may contribute to the distraction of patients and decrease their perception of dyspnea. Evidence on the use of hand fan application in dyspnea management is insufficient due to insufficient power and sampling.[3,5–14] However, despite limited evidence from systematic reviews and meta-analysis studies, clinical guidelines support the use of hand fan application in dyspnea management, given that it has no potential harm.[5,9] It has been suggested that a hand fan can be used in the individual management of dyspnea as low-cost, simple, lightweight, portable, and non-stigmatizing equipment. However, clinical guidelines state that the duration of benefit should be further analyzed.[3,5,7]

There are a limited number of studies in the literature on dyspnea management in patients with lung cancer. In these studies, the effects of hand fan application on dyspnea severity, pulmonary functions, vital parameters, and quality of life are generally shown.[3] According to the study findings, it is reported that hand fan application provides relief by alleviating the severity of dyspnea in patients. However, literature findings reveal that the effect of hand fan application on the comfort level, defined as comfort in dyspnea management of patients with lung cancer, has not been objectively evaluated.[5–9] Dyspnea management in patients with lung cancer is extremely important in terms of increasing activity tolerance and fulfillment of activities of daily living. In this context, it is thought to be important to evaluate the effectiveness of hand fan application on the comfort level of patients in these patients.

In this study, we aimed to investigate the effect of the application of a hand fan to the face on comfort level, dyspnea severity, and changes in physiological parameters in the management of dyspnea in patients with lung cancer.

MATERIALS AND METHODS

Design
This study was conducted in a randomized controlled experimental design to determine the effect of air application to the face with a hand fan on the comfort level in the dyspnea management of lung cancer patients. The study was registered in the clinical trials database (Clinical Trial Number: NCT05887986).

Study Setting and Sampling
The study was conducted with lung cancer patients who received inpatient treatment at a university thoracic diseases and surgery training and research hospital in Türkiye between December 2022 and February 2024. According to the power analysis for the sample size of the study, it was determined as a total of 54 patients, 27 for each group, with a 95% confidence interval and 5% error. Based on the studies conducted on dyspnea management in patients with lung cancer, the average effect size was estimated to be 1.01. To account for potential data loss, the sample size in both groups was increased by 10%. However, four patients were excluded from the study sample (one participant withdrew from the study, two were ex, and one participant was admitted to the intensive care unit due to deterioration). According to the randomization list (randomizer.org) prepared by the researcher, patients who used hand fans constituted the intervention group (n=27) and those who received only routine care constituted the control group (n=29) (Fig. 1).

Individuals who were 18 years of age or older, diagnosed with lung cancer, had an mMRC dyspnea scale score ≥2, ECOG Performance Score ≥3, and volunteered to participate were included in the study. Patients who had a fever of 38.0°C or higher in the last 24 hours, were cognitively and verbally unable to communicate, had a diagnosis of psychiatric illness, underwent thoracentesis before the study, and had muscle disease were excluded.

Measurements
Individual Descriptive Information Form: This form, which was prepared by the researchers by reviewing the relevant literature, consists of 15 questions related to socio-demographic characteristics (age, gender, education level, etc.) and clinical characteristics (lung cancer type, disease year, cancer stage, etc.) of cancer patients.[3,13,14]

Fig. 1. Consort flow diagram for participants.
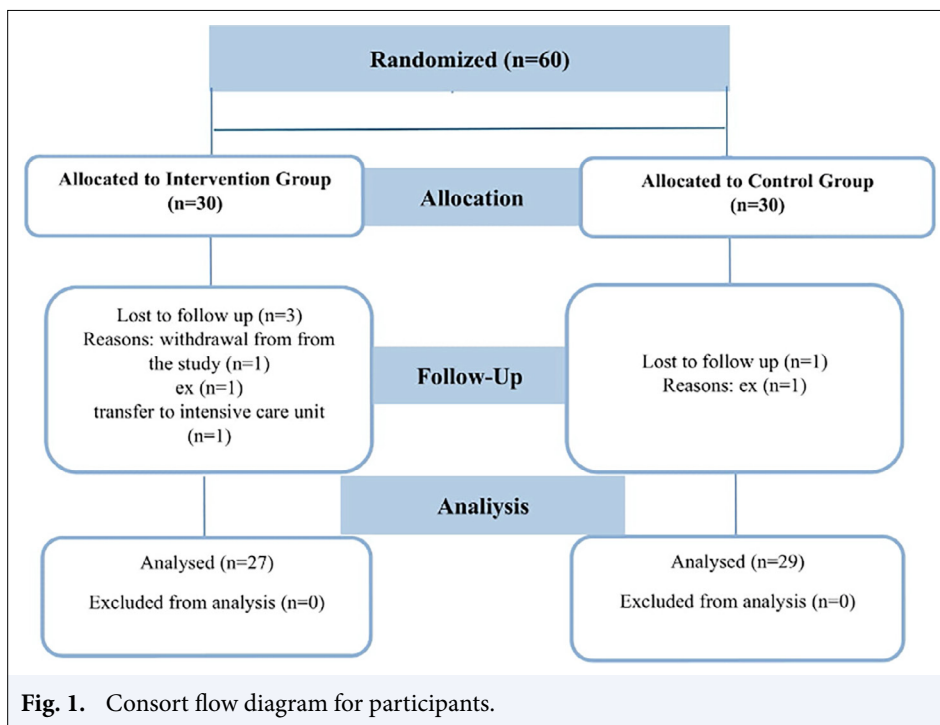
Medical Research Council Scale (mMRC): This scale, which was used to determine the severity of dyspnea in patients, was developed by Bestall et al.[15] in 1999. In Türkiye, it was recommended to be used by Güneş et al.[16] by comparing it with other dyspnea scales. The scale consists of five items based on various physical activities that cause dyspnea. In this scale, patients are asked to mark the level of activity that causes dyspnea in them. The rating is between 0–5, and an increase in the scale score indicates an increase in the severity of dyspnea.

Cancer Dyspnea Scale: It was developed by Tanaka et al.[17] to evaluate dyspnea. Turkish validation was performed by Bitek et al.[18] The scale contains 12 items and is evaluated on a five-point Likert scale. The scale has three dimensions: effort, anxiety, and discomfort. The total score obtained from the scale is 48. An increase in the total score obtained from the scale indicates an increase in dyspnea severity.[17,18]

Vital Signs Monitoring Form: With this form, data on respiratory rate, oxygen saturation value, and pulse rate were measured and recorded.

ECOG (Eastern Cooperative Oncology Group) Performance Scale: This scale, published in 1982, is used for performance evaluation in patients with cancer.[19] The score values that can be obtained vary between 0–4, with 0 indicating "good health status" and 4 indicating "death."

General Comfort Scale-Short Form: This scale was developed in 2006 by Kolcaba et al.[20,21] and a Turkish validity and reliability study was conducted by Çıtlık Sarıtaş et al.[22] The scale consists of 28 items and is evaluated on a 6-point Likert scale. The scale has three sub-dimensions: relief, ease, and transcendence. In the evaluation of the scale consisting of positive and negative items, negative items are reverse coded and summed. The total score obtained is divided by the number of scale items, and the average value is found. The lowest possible value of 1 indicates a low comfort level, and the highest value of 6 indicates a high comfort level.

Procedures

In the study, face-to-face interviews were conducted with the patients in the experimental and control groups before the application. The purpose and rationale of the study were explained, and informed consent was obtained from the participants. The Individual Identifying Information Form, Medical Research Council Scale (mMRC), Cancer Dyspnea Scale, ECOG (Eastern Cooperative Oncology Group) Performance Scale, General Comfort Scale Short Form, and Vital Signs Monitoring Form were completed for the patients in both groups. Patients in the control group received routine care throughout the study period, and no intervention was performed. In addition to routine care, the intervention group received hand fan application for

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dyspnea management for five days. Vital signs of the patients in the intervention group were measured and recorded before and after hand fan application. The Cancer Dyspnea Scale, General Comfort Scale Short Form, and Vital Signs Follow-up Form were administered to both groups after the study was completed.

Intervention

Patients in the intervention group were first given individual training by the researcher on the use of the hand fan. Then, for five days, a hand fan was regularly applied to the face twice a day (before breakfast and dinner) for five minutes from a distance of 15 cm, especially in the 2nd and 3rd trigeminal nerve areas.[10,23,24] A charged hand fan with high current speed and four propellers was used in the application. Patients were instructed to apply the hand fan if they had an episode of dyspnea and to apply oxygen on the physician's order if dyspnea persisted.

Data Analysis

Analysis of data obtained from the research was performed using the Statistical Package for Social Sciences 26.0 (SPSS Statistics for Windows, Version 26.0, IBM Corp. Armonk, NY). In the study, kurtosis and skewness coefficients were analyzed to determine whether the scale scores were normally distributed or not. The kurtosis and skewness values between +1.5 and -1.5 are considered sufficient for normal distribution.[25] Data were analyzed using descriptive statistics (means, standard deviations, frequencies, minimums, and maximums), Paired Sample t-test, Independent Samples t-test, Wilcoxon signed rank test, and Mann-Whitney U test. In instances where the normality assumption was satisfied, the Independent Sample t-test was employed to assess the discrepancy between the mean values of two independent groups, whereas the Paired Sample t-test was utilized in the dependent group. In cases where the assumption was not met, the Mann-Whitney U and Wilcoxon Signed Ranks tests were applied. p<0.05 was considered to be significant.

Ethical Consideration

The study was approved by the Non-Interventional Clinical Research Ethics Committee at a university in Türkiye (decision no: 2022/797). Before the research began, potential participants received both verbal and written descriptions of the procedures and were informed of their right to withdraw from the study. The study procedures were conducted in accordance with the Declaration of Helsinki.

RESULTS

The socio-demographic characteristics of the patients in the intervention and control groups were found to be homogeneously distributed (Table 1).

Table 2 shows the pretest-posttest Cancer Dyspnea Scale and General Comfort Scale-Short Form score comparisons of the patients in the intervention and control groups. The statistical analysis revealed no significant difference between the Cancer Dyspnea Scale and General Comfort Scale-Short Form scores of patients in the intervention and control groups before and after the application of the hand fan and face fan (p>0.05) (Table 2).

Table 3 shows the intragroup and intergroup comparisons of vital sign mean values for patients in the intervention and control groups before and after the intervention. There was no significant difference between the pretest and posttest mean values of vital signs in the intervention and control groups (p>0.05). Upon analyzing the mean values of respiratory rate and oxygen saturation among the vital signs evaluated at the end of the intervention, no significant difference was found between the groups (p>0.05). In addition, the mean heart rate was significantly lower in the intervention group than in the control group (p<0.05).

DISCUSSION

Dyspnea is a common and distressing symptom experienced by patients with advanced cancer. Lung cancer is a frequent cause of dyspnea, observed in a significant proportion of affected patients.[10,26] The incidence of dyspnea increases as patients near death, and its relief is therefore crucial to enhance the quality of life in these patients. The management of dyspnea involves treating the underlying causes using a combination of pharmacological and non-pharmacological therapies. Fan therapy is often used to relieve dyspnea by blowing air toward the patient's face.[5,9,26] While many clinical guidelines recommend fan therapy, there is limited evidence to support its effectiveness.[7,8,27]

Comfort is a desirable state of fulfillment, where an individual copes positively and effectively with difficulties. Increased patient comfort with therapeutic interventions can enhance hope and confidence, contributing to treatment, rehabilitation, and end-stage care processes.[28–31] Therefore, the universal goal of healthcare services should be to achieve the optimal level of patient comfort and maximize it to the highest possi-

Table 1 Socio-demographic and clinical characteristics of the patients (n=56)

Variables	Intervention group (n=27)		Control group (n=29)		p*
	Mean	**SD**	**Mean**	**SD**	
Age (years)	64.48	5.85	63.79	10.94	0.089
Lung cancer diagnosis time (months)	29.55	24.36	34.20	15.27	0.341
Smoking duration (years)	31.29	19.58	38.68	14.42	0.482
Variables	**n**	**%**	**n**	**%**	
Sex					
Female	4	14.8	3	10.3	0.700
Male	23	85.2	26	89.7	
Education					
Primary school	21	77.8	21	72.4	0.092
Secondary school	5	18.5	3	10.3	
High school or more	1	3.7	5	17.2	
Marital Status					
Single	3	11.1	9	31.0	0.069
Married	24	88.9	20	69.0	
Employment status					
Employed	1	3.7	5	17.2	0.195
Unemployed	26	96.3	24	82.8	
Smoking status					
Current smoker	6	22.2	4	13.8	0.100
Never smoker	5	18.5	1	3.4	
Former smoker	16	59.3	24	82.8	
Lung Cancer Type					
NSCLC	27	100.0	2	6.9	0.492
SCLC	0	0	27	93.1	
Cancer Stage					
Stage II	3	11.1	1	3.4	**0.000**
Stage III	20	74.1	8	27.6	
Stage IV	4	14.8	20	69.0	
mMRC dypnea score					
Grade 2	5	18.5	6	20.7	**0.001**
Grade 3	13	48.1	1	3.4	
Grade 4	4	14.8	6	20.7	
Grade 5	5	18.5	16	55.2	
ECOG performance score					
Grade 1	3	11.1	3	10.3	**0.017**
Grade 2	18	66.7	9	31.0	
Grade 3	6	22.2	17	58.6	

*: p<0.05. Chi-square analysis. SD: Standard deviation; NSCLC: Non-Small Cell Lung Cancer; SCLC: Small Cell Lung Cancer; mMRC: Modified Medical Research Council; ECOG: Eastern Cooperative Oncology Group

ble levels. Studies have shown that nurses may struggle to identify and address patients' comfort needs, as well as determine effective interventions to improve comfort levels and report results.[29] Furthermore, there is a dearth of literature that documents the identification of effective and efficient interventions to improve patient comfort, their specific outcomes, and results.[32] A review of the literature revealed no research studies that have investigated the effect of fan application on the comfort level of lung cancer patients experiencing

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Table 2 Comparison of pretest-posttest Cancer Dyspnea Scale and General Comfort Scale-Short Form mean scores of the study groups

Variables	Groups (n=56)	Pre-test		Post-test		test	p
		Mean±SD	Min-max	Mean±SD	Min-max		
Cancer Dyspnea Scale	Intervention	26.7±10.8	15.0–47.0	27.4±10.8	13.0–47.0	-1.440*	0.162
	Control	27.6±11.6	6.0–46.0	27.1±11.5	6.0–47.0	0.844*	0.406
	test	1.861**		0.918**			
	p	0.068		0.103			
General Comfort Scale-Short Form	Intervention	4.11±0.2	3.54–4.43	4.08±0.0	3.39–4.46	0.644*	0.525
	Control	3.95±0.3	2.61–4.54	3.98±0.6	2.50–4.50	-0.526***	0.599
	test	-2.036****		-1.133****			
	p	0.052		0.257			

*: Paired Sample t-Test; **: Independent Samples t-Test; ***: Wilcoxon signed rank test; ****: Mann Whitney U test. SD: Standard deviation

Table 3 Comparison of pretest-posttest vital signs mean scores of the study groups

Variables	Groups (n=56)	Pre-test		Post-test		test	p
		Mean±SD	Min-max	Mean±SD	Min-max		
Respiration rate (breaths per minute)	Intervention	21.0±2.6	18.0–28.0	21.0±2.6	18.0–28.0	-0.736*	0.462
	Control	21.4±1.7	18.0–24.0	21.4±1.7	18.0–24.0	0.103**	0.596
	test	-1.355***		-1.446***			
	p	0.175		0.148			
Oxygen saturation (%)	Intervention	93.9±4.4	82.0–102.0	94.2±2.8	88.0–99.0	-0.056*	0.955
	Control	94.9±1.3	92.0–98.0	94.7±0.8	94.0–96.0	0.493**	0.634
	test	-0.720		-0.930****			
	p	0.471		0.360			
Heart rate (beats per minute)	Intervention	89.1±15.0	68.0–116.0	87.3±11.1	68.0–112.0	-0.888*	0.375
	Control	92.4±2.4	86.0–95.0	92.4±2.4	86.0–95.0	0.00**	1.00
	test	-0.720***		-2.330****			
	p	0.471		0.027			

*: Wilcoxon signed rank test; **: Paired Sample t-Test; ***: Mann Whitney U test; ****: Independent Samples t-Test. SD: Standard deviation

dyspnea. To the best of our knowledge, our study is the first of its kind in this regard and is therefore distinctive. This study evaluated the comfort level of patients before and after fan application. No significant difference was observed between the application group and the control group. Previous studies evaluating the effectiveness of fan application have frequently focused on terminal period patients or chronic cancer, pulmonary, and cardiac patients. These studies investigated the effects of the application on dyspnea level, physiological parameters, and exercise capacity during rest and exercise. [27,33,34] The absence of a comparable study in the literature limited the comparison of research findings.

The literature contains studies that evaluate the effectiveness of fan therapy in managing dyspnea in cancer patients. However, there are limited well-designed randomized controlled trials that assess the efficacy of fan therapy and increase the level of evidence on this subject.[7,8,27,33–36] In this study, it was found that hand-held fan therapy did not change dyspnea scores. Similar to the findings of this study, several studies in the literature have reported no significant alleviation of dyspnea with fan therapy.[7,12,33] However, limited direct evidence from some randomized controlled trials has shown effectiveness in improving dyspnea. A randomized controlled trial conducted in China found that fan therapy may be effective in alleviating dyspnea in patients with advanced cancer.[35] Similarly, Kako et al.[26] reported a decrease in dyspnea scores in terminally ill patients who underwent facial fan application in a parallel-arm, randomized controlled trial. Kocatepe et al.[3] investigated the long-term ef-

fects of fan therapy applied to the face for 5 minutes in patients with lung cancer. At the end of the application, they found a significant decrease in dyspnea scores compared to other days.[3] Similarly, in their study, Puspawati et al.[36] found that hand-held fans reduced dyspnea and respiratory frequency in non-hypoxaemic lung cancer patients. A meta-analysis evaluating the effect of fan therapy on dyspnea management in adults reported that fan therapy effectively alleviated dyspnea despite limited direct evidence.[7] This study evaluates the long-term results of fan use in managing dyspnea in lung cancer patients. Previous studies have focused on the severity of dyspnea, using unidimensional measurement tools. However, to reveal the effect of dyspnea on activities of daily living, multidimensional dyspnea scales are necessary. In this study, a multidimensional dyspnea measurement tool was used to objectively evaluate dyspnea, as unidimensional scales were found to be inadequate.

Fan therapy has been suggested as a method to reduce dyspnea by activating dyspnea-related brain areas, such as the insular cortex, anterior cingulate cortex, and amygdala through trigeminal stimulation. However, it does not improve breathing patterns or other physiological outcomes.[37] The study found no significant difference in oxygen saturation and respiratory rate values between the intervention and control groups after hand-held fan application, consistent with previous literature.[26,35,37] Previous studies have reported conflicting results regarding the impact of fan application on physiological parameters. Kako et al.[26] and Wong et al.[35] reported no significant difference in oxygen saturation and respiratory rate values with fan application, while Kocatepe et al.,[3] Ting et al.,[38] and Puspawati et al.[36] reported improved respiratory parameters. This study observed a notable alteration in physiological parameters, specifically in heart rate. A substantial decline in heart rate was evident in the intervention group following the intervention, compared to the control group. It was postulated that this reduction could be attributed to the placebo effect of fan therapy. A study with comparable findings reported a significant decrease in heart rate in the intervention group following the intervention compared to the control group.[3]

Limitations

This study has some limitations. Firstly, it was conducted with lung cancer patients in a single center. Secondly, in contrast to previous studies, our investigation of the long-term impact of fan application may have influenced the outcome of our findings.

CONCLUSION

It was determined that fan application did not improve dyspnea and had no effect on the comfort level in dyspnea management of patients with lung cancer. However, it has been found that the application of a fan can decrease heart rate among physiological parameters. Further evidence-based, well-designed, randomized controlled trials are needed to evaluate the long-term effects of fan application in dyspnea management for lung cancer patients.

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