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EFFECT OF TRAINING AND REMINDER SHORT MESSAGES ON THE FATIGUE LEVEL OF INDIVIDUALS WITH COPD: A RANDOMIZED CONTROLLED STUDY

KOAH'LI BİREYLERE VERİLEN EĞİTİMİN VE HATIRLATICI KISA MESAJLARIN YORGUNLUK DÜZEYİNE ETKİSİ: RANDOMİZE KONTROLLÜ ÇALIŞMA

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ABSTRACT

Objective: The study aimed to determine the effect of education and reminder short messages on fatigue levels in individuals with Chronic Obstructive Pulmonary Disease (COPD).

Method: Randomized controlled experimental study (ClinicalTrials.gov: NCT06286072). The study was conducted with 105 patients hospitalized with the diagnosis of COPD between December 15, 2023, and May 15, 2024. The patients were randomized into three groups, 35 in each group. The first group was assigned as the education+message group, the second group as the education group, and the third group as the control group (routine treatment and care). The education content consisted of COPD and fatigue management. The education was completed in three days. Messages included reminders of the education content and motivational sentences. Questionnaires were applied to all patients at baseline and the end of 8 weeks to determine their personal information, degree of dyspnea, general COPD status, and fatigue level.

Results: In intragroup comparisons, dyspnea and fatigue levels decreased significantly and the general COPD status improved in the education+message group ($p<0.001$). In the education group, dyspnea severity decreased ($p=0.014$) and the general COPD status improved ($p=0.013$). There was no significant difference in the control group. There were significant differences ($p<0.05$) in intergroup comparisons and the strongest effect was in the education +message, education, and control groups ($d_1>d_2>d_3$).

Conclusion: Education and 8-week short message intervention in patients with COPD effectively reduced dyspnea severity and fatigue and improved the general COPD status. Education alone was not successful in alleviating fatigue in the long term. Therefore, post-discharge patient follow-up should be taken into consideration.

Key Words: Fatigue, COPD, Education, Short Message Service

ÖZ

Amaç: Çalışma, Kronik Obstrüktif Akciğer Hastalığı (KOAH) olan bireylere verilen eğitimin ve hatırlatıcı kısa mesajların yorgunluk düzeyine etkisini belirlemek amacıyla yürütüldü.

Yöntem: Randomize kontrollü deneysel çalışma (ClinicalTrials.gov: NCT06286072). Çalışma, 15 Aralık 2023-15 Mayıs 2024 tarihleri arasında KOAH tanısı nedeniyle hastanede yatan 105 hasta ile yürütüldü. Hastalar her grupta 35 olmak üzere üç grupta randomize edildi. İlk grup eğitim+mesaj, ikinci grup eğitim, üçüncü grup ise kontrol (rutin tedavi ve bakım) olarak atandı. Eğitim içeriğini; KOAH ve yorgunluk yönetimi oluşturdu. Eğitimler üç günde tamamlandı. Mesajlar, eğitim içeriğini hatırlatıcı ve motive edici cümlelerden oluşturuldu. Tüm hastalara başlangıçta ve 8 hafta sonunda kişisel bilgilerini, dispne derecesini, KOAH genel durumunu ve yorgunluk seviyesini belirleyen anketler uygulandı.

Bulgular: Grup içi karşılaştırmalarda eğitim+mesaj grubunda dispne ve yorgunluk düzeyi anlamlı olarak azaldı, KOAH genel durumu iyileşti ($p<0.001$). Eğitim grubunda dispne şiddeti azaldı ($p=0.014$) ve KOAH genel durumu iyileşti ($p=0.013$). Kontrol grubunda anlamlı fark oluşmadı. Gruplar arası karşılaştırmalarda anlamlı fark elde edildi ($p<0.05$), en güçlü etki eğitim+mesaj, eğitim ve kontrol grubunda oldu ($d_1>d_2>d_3$).

Sonuç: KOAH'lı hastalara verilen eğitim ve 8 haftalık kısa mesaj uygulaması dispne şiddetinin ve yorgunluğun azaltılmasında, KOAH'ta genel durumunun iyileşmesinde etkilidir. Tek başına eğitim, uzun vadede yorgunluğu hafifletmede başarılı olmamıştır. Bu nedenle taburculuk sonrası hasta takipleri önemsenmelidir.

Anahtar Kelimeler: Yorgunluk, KOAH, Eğitim, Kısa Mesaj Servisi

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is an important chronic disease characterized by damage in the respiratory tract. Increased mucus secretion in the airways, its thickening, and inflammatory processes lead to airway obstruction. The symptoms resulting from this pathogenesis cause significant problems in the patient's ability to perform daily activities. Various symptoms, including dyspnea in particular, cough, sputum, wheezing, and fatigue, occur [1]. The most important problem that physio pathological processes in the patient will cause is inadequate oxygenation. Fatigue is the leading problem caused by impaired tissue oxygenation [2].

Fatigue indicates tissue hypoxia and is a subjective finding that affects the patient's activities of daily living and reduces the quality of life. It causes the patient to feel exhausted, weak, and sluggish [3]. All these may lead the individual to postpone, not perform, or reduce the activities that he/she can or should perform. These effects may cause difficulties in treatment compliance [4,5] and even COPD exacerbations [4,6]. Fatigue can have not only physiological effects, but also psycho-social effects such as lack of motivation, distraction, and disruption of individual and family processes [7]. Nursing practices are of great importance in the elimination of fatigue, which can cause quite extensive consequences in the patient's life. Therefore, nursing care should include useful practices to improve patients' ability to cope with fatigue and alleviate fatigue.

In most of the non-pharmacological studies on the management of fatigue in patients, energy control, activity planning, acupuncture, acupressure, and massage have been highlighted. In the literature, it has been observed that patients with COPD experience intense fatigue and that the severity of fatigue decreases with the interventions made [8-11]. In the light of all these interventions, nursing care should include education on the causes of fatigue and what the patient can do to reduce fatigue. The aim should be to ensure that effective nursing interventions are practical and provide positive outcomes in a short time. In this context, it was thought that it would be useful to repeat the education provided routinely to each patient at certain intervals with motivating and reminding content [5].

It has been reported that education should be repeated at certain intervals to ensure and increase motivation [5,12]. Additionally, it was thought that reminding the patient of what he/she can do, and his/her power and importance would be beneficial. The workload of the nurse should not be increased while reaching out to the patient practically, especially by using today's communication networks [13]. Although it is impossible for nurses to repeat the education face-to-face at certain intervals for each patient, online interviews, phone calls, e-mail, or short message services can provide positive outcomes in reminding the focus points of the education. A study showed that not only disease, medication control, or nursing care, but also appointment reminders of patients significantly contribute to health costs [14]. In some studies, conducted with patients other than COPD patients, mobile phone calls, online tracking systems, and reminder short messages have been reported to be effective in nursing care [15-18]. Therefore, it is necessary to extend such practical and useful applications to all patient groups under current conditions.

In the literature, it has been reported that the use of short messaging in the management of chronic diseases, including COPD, has yielded effective results [5,19,20]. In the study of Ojeda (2018), it was found that 47.1% of COPD patients preferred short message service the most among communication technologies [21]. Short message service has been shown to provide asthma control [22], and to be effective in active monitoring and early detection of exacerbations in patients with COPD [23]. It has also been reported that patients define telehealth applications as the best service and are eager to use them [24].

Nurse-led education contributes positively to patient outcomes. In 2023, Qomi et al. applied nurse-led fatigue management for Multiple Sclerosis patients and achieved effective results [25]. In this context, it is thought that nurse-led education is needed to reduce fatigue and dyspnea which are also important symptoms of COPD patients, and to improve the general COPD status. In particular, it is predicted that supporting the education content with motivating and reminding short messages will be beneficial and will shed light on future studies to be carried out with remote communication content.

The study primarily aimed to determine the effect of education and reminder short messages on the fatigue level of individuals with COPD. The secondary aim of the study was to reveal the effect of the interventions on dyspnea severity and general COPD status.

METHOD

Study Design and Hypotheses

The study has a randomized controlled experimental design, which is one of the quantitative research methods.

Hypotheses of the study:

$H_{0\text{-}1}$: The level of fatigue does not decrease in patients who receive COPD education and reminder short messages.

$H_{1\text{-}1}$: The level of fatigue decreases in patients who receive COPD education and reminder short messages.

$H_{0\text{-}2}$: The level of fatigue does not decrease in patients who receive COPD education.

$H_{1\text{-}2}$: The level of fatigue decreases in patients who receive COPD education.

Participants

The study was carried out with patients diagnosed with COPD in the pulmonology clinic of a Training and Research Hospital. The patients were divided into three groups by randomization. The number of patients in each group was determined using G. Power Version 3.1.9.2 (Franz Faul, Universitat Kiel, Germany). Accordingly, based on the sample group of a similar study [5], it was decided to include 34 patients in each group of the study with type 1 error=0.5, a confidence of 95% (1-α), a test power of 95% (1-β), an effect size of d=0.59 in the one tailed analysis performed with the Wilcoxon signed-rank test (matched pairs). The Consolidated Standards of Reporting Trials (CONSORT) were adhered to throughout the study (Figure 1). Considering possible data loss, a total of 183 patients were included in the study. Thirty-five patients were excluded due to reasons such as declining to participate (n=22), having no mobile phone (n=9), and not meeting inclusion criteria (n=4). A total of 148 patients were randomly assigned to 3 groups. The study was completed with a total of 105 patients, 35 in each group, due to data loss during the study and follow-up phases.

Inclusion Criteria:

•Having been diagnosed with COPD for at least one year

•Being planned to be hospitalized for at least three days

•Having a mobile phone and being able to read the messages.

Exclusion Criteria:

•Having conditions other than COPD such as chronic fatigue syndrome or advanced heart failure which may cause excessive fatigue

•Inability to read messages from a mobile phone or being illiterate,

•Not agreeing to participate in the study.

Randomization

The primary aim of sample selection was to avoid bias and interaction between patients. Therefore, a number was assigned to each patient and these numbers were randomized in www.random.org in computerised simple randomisation. The patients were assigned three

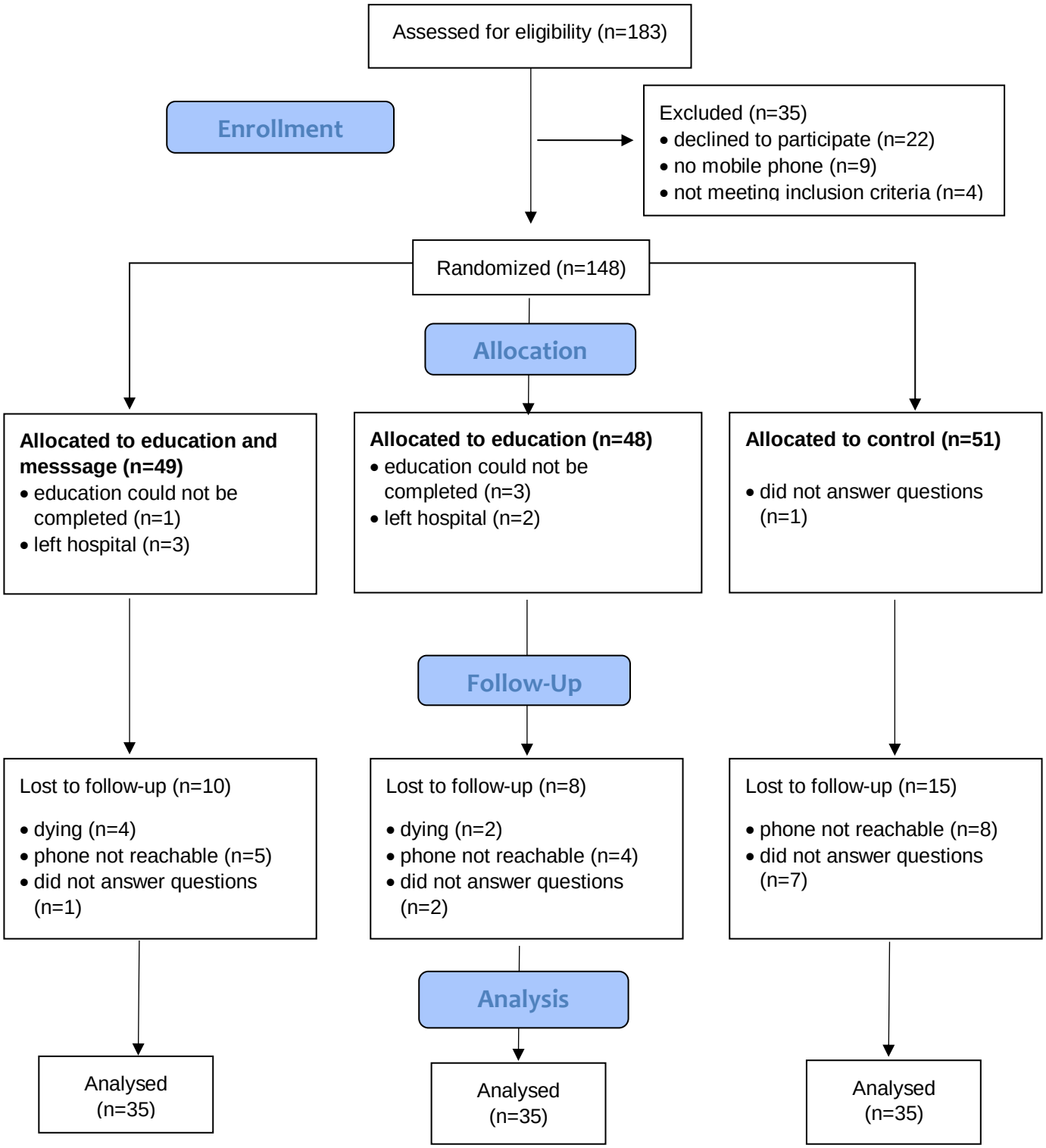

Figure 1. CONSORT Flow Diagram

groups. The first group was determined as education+message, the second group as education, and the third group as the control group which received routine treatment and care.

Outcome Measures

The data were collected using a personal information form, the Modified Medical Research Council (mMRC) dyspnea scale, the COPD assessment test (CAT), and the COPD-asthma fatigue scale (CAFS).

Personal Information Form: This form was prepared by the researcher in line with the literature [5,8-11] and includes questions regarding age, sex, educational status, duration of COPD diagnosis, and length of hospitalization.

Modified Medical Research Council Dyspnea Scale: The scale was developed by the British Medical Research Council and provides information about the degree of dyspnea during activity. The score ranges between 0-4; a score of 0 indicates the best condition (no dyspnea) while 4 indicates the worst condition (very severe dyspnea). A high score indicates an increased dyspnea severity [26]. The Cronbach alpha coefficient was not calculated because it is a unidimensional scale.

COPD Assessment Test: The Turkish validity and reliability of the scale were established by Yorgancıoğlu et al. (2012) and the scale aims to measure the general health status of individuals with COPD [27]. It consists of 8 questions and is a 5-point Likert-type scale. The score obtainable from the scale varies between 0-40 and a higher score indicates a worsening of the general COPD status. In our study, the Cronbach alpha coefficient for the pre-test was 0.95.

COPD and Asthma Fatigue Scale: The Turkish validity and reliability of the scale were established by Arslan & Öztunç (2013) and the scale aims to measure the fatigue level of patients with COPD [28]. It consists of 12 questions and is a 5-point Likert-type scale. The first 10 questions are scored in increasing order and the last two questions are scored in decreasing order. The resulting total score constitutes the raw score. The total score of the scale is calculated using the formula (total raw score-12/48) x 100 and varies between 12-100. A higher score indicates a higher fatigue level. In our study, the Cronbach alpha coefficient for the pre-test was 0.96.

Data Collection

The study was carried out between December 15, 2023, and May 15, 2024, after taking necessary permissions. The patients included in the study were interviewed in the patient room. First, the purpose of the study and how the patients would be followed up were explained. For the patients who would receive education, it was explained that the education would be given three days in a row, and preliminary information was given about the education planning according to the days. For the patients who would receive short messages, their ability to use their mobile phones and whether they could read the messages were evaluated. The baseline forms were filled out and recorded for the patients who met all the criteria and volunteered.

Interventions for Patient Groups

Education+message group: First, the patients were introduced, and routine treatment and care and the planned education process were explained. Phone numbers of the patients were recorded, and they were informed that they would be texted later. It was stated that they did not need to return the messages. Questionnaire forms were administered before the education sessions. The education was conducted face-to-face in the patient room. Education sessions were completed in 30 minutes on the first two days and 60 minutes on the third day. On the first day, the education content consisted of the definition of COPD, symptoms, correct use of drugs, recognition of conditions in which symptoms worsen and measures to be taken. On the second day, the physiology of fatigue, the factors causing fatigue, and the relationship between COPD and fatigue were explained. On the third day, breathing exercises and strategies for coping with fatigue were explained. These strategies were determined as appropriate time planning by knowing the tiring actions during the day, getting help for actions that they cannot do, avoiding inappropriate movements, avoiding allergens and bad air, eating a balanced and energizing diet, energy refreshment, relaxation recommendations, pre-activity rest periods, pre-activity inhaler use, positive perspective on life, improving quality of life, and accepting what they cannot do [1,5,7,8,12,17,20,25,29,30]. Following the discharge of the patients, motivational and reminder short messages were sent twice a week for 8 weeks in line with the content of the education. The table including the short messages was presented in the supplementary file. After 8 weeks, the questionnaire form was administered again.

Education group: Patients in this group were introduced in the first interview and questionnaire forms were administered. In addition to routine treatment and care, the planned education process was explained. This patient group received the same education as mentioned above for three days under the same schedule. No short messages were sent to the patients in this group. The questionnaire forms were repeated 8 weeks after discharge.

Routine treatment and care (Control) group: Patients in this group did not receive any planned education other than the routine treatment and care provided during hospitalization. In addition, no text messages were sent. Questionnaire forms were administered on the day they were included in the study and 8 weeks after discharge. After the study was completed, the education given to other patients was given in the same way on a suitable day determined by the patients to prevent bias.

Ethical Approval

Permissions were received from the Kırşehir Ahi Evran University Ethics Committee (date: 10/19/2023, approval number: 2023/09/05) and the Kırşehir Training and Research Hospital (date: 12/06/2023, approval number: E-42884709-020-231013765) prior to the start of the study. Ethical principles and the Declaration of Helsinki were followed throughout all stages of the study. Patients were included in the study voluntarily and an informed consent form was taken from them after explaining the purpose and content of the study. This study was registered at ClinicalTrials.gov (Registration Number:NCT06286072).

Statistical Analysis

The data were analyzed in SPSS V25 (IBM Corp., Armonk, New York, USA). The normality of the data was tested with the Shapiro-Wilk test. Descriptive statistics were presented as number (n), percentage (%), and mean ± standard deviation. In intergroup comparisons, Pearson Chi-Square (χ^2) was used for categorical data and ANOVA analysis was used for continuous data. Scale correlations were presented with Spearman's rho coefficient. The Wilcoxon test was used for intragroup comparisons and the Kruskal Wallis H Test for intergroup comparisons. Multiple comparisons were performed with Dunn's test. Analysis findings were presented as median (min-max). The level of significance was taken as $p<0.05$.

RESULTS

The demographic characteristics of the patients in the study were compared. There was no statistically significant difference between the groups, and they were similar to each other ($p>0.05$). The mean age of the patients was 57.29±17.32 years and 50.5% of them were male. The mean duration of COPD diagnosis was 9.876±9.163 years. The mean length of total hospitalization in the last year was 22.05±38.30 days (Table 1).

The mean total scale scores of the patients decreased from 1.66±0.9 at the first follow-up to 1.33±1.0 at the last follow-up for mMRC, from 18.14±10.15 to 13.52±9.9 for CAT and from 48.13±23.63 to 37.91±24.81 for CAFS. The decrease in the total scale scores indicated that the severity of dyspnea was alleviated, that the general COPD status improved, and that fatigue decreased. In addition, the relationship between the scales was examined and all of them were found to be significantly correlated ($p<0.001$) (Table 2).

Table 3 shows the intragroup pre-test and post-test comparisons and inter-group comparisons. Accordingly, there was a significant difference between the pre-test and post-test mean total mMRC scores of the patients in the education+message group (Z: -4.817; $p<0.001$) and in the education group (Z: -2.449; $p=0.014$). There was no significant effect in the control group ($p>0.05$). When the dyspnea severity of the groups was analyzed, it was seen that the post-test means had a significant difference (KW=41.308; $p<0.001$). According to the effect sizes, the effect size was highest in the education+message group and lowest in the control group ($d_1>d_2>d_3$).

Table 1. Demographic and clinical characteristics of the sample (N = 105).

Variables	Education+Message (n=35) n(%)	Education (n=35) n(%)	Control (n=35) n(%)	Total (N=105)	Test	*p*
Age (Mean±SD)	59.828±13.445	57.714±19.495	54.342±18.469	57.295±17.321	0.891**	0.413
Gender						
Female	19 (54.3)	17 (48.6)	16 (45.7)	52 (49.5)	0.533*	0.766
Male	16 (45.7)	18 (51.4)	19 (54.3)	53 (50.5)		
Education level						
Elementary school	13 (37.2)	11 (31.4)	12 (34.3)	36 (34.2)		
Middle School	7 (20)	8 (22.9)	11 (31.4)	26 (24.8)	2.438*	0.875
High school	9 (25.7)	10 (28.6)	9 (25.7)	28 (26.7)		
Bachelor	6 (17.1)	6 (17.1)	3 (8.6)	15 (14.3)		
Marital status						
Married	30 (85.7)	27 (77.1)	29 (82.9)	86 (81.9)	0.9*	0.638
Single	5 (14.3)	8 (22.9)	6 (17.1)	19 (18.1)		
Profession						
Housewife	8 (22.9)	7 (20)	9 (25.7)	24 (22.9)		
Worker	2 (5.7)	4 (11.5)	10 (28.6)	16 (15.2)		
Officer	8 (22.9)	9 (25.7)	7 (20)	24 (22.9)	11.045*	0.199
Retried	12 (34.2)	9 (25.7)	4 (11.4)	25 (23.8)		
Self-employment	5 (14.3)	6 (17.1)	5 (14.3)	16 (15.2)		
Time of diagnosis	9.571±7.978	11.857±10.784	8.2±8.358	9.876±9.163	1.435**	0.243
Number of Hospitalisation days in the last year due to COPD	28.714±54.192	26.114±31.284	11.342±19.787	22.057±38.303	2.140**	0.123
Regular use medicaitons						
Yes	30 (85.7)	27 (77.1)	26 (74.3)	83 (79)	1.495*	0.474
No	5 (14.3)	8 (22.9)	9 (25.7)	22 (21)		

**: Pearson Chi-Square; **: ANOVA; COPD: Chronic obstructive pulmonary disease.*

Table 2. Cronbach's alpha coefficients and correlation values of the scales, descriptive findings of the patients

SCALES	Time	Cronbach's alpha	Mean±SD	M (Min-Mak)	CAT	CAFS	MMRC
1. mMRC	**Pre**	-	1.666 ± 0.905	1 (0-4)	r=0.570		
	Post	-	1.333 ± 1.006	1 (0-5)	**p<0.001**		
2. CAT	**Pre**	0.954	18.142 ± 10.155	16 (4-40)		r=0.806	
	Post	0.960	13.523 ± 9.949	10 (0-39)		**p<0.001**	
3. CAFS	**Pre**	0.960	48.134 ± 23.633	43.75 (8.33-37.92)			r=0.624
	Post	0.899	37.916 ± 24.811	29.166 (4.17-100)			**p<0.001**

mMRC: Modified Medical Research Council; r: Spearman's rho; CAT: COPD assessment test; CAFS: COPD-asthma fatigue scale;.

There was a significant difference between the pre-test and post-test total CAT scores of the education+message group (Z= -5.17; p<0.001) and the education group (Z= -2.496; p=0.013). There was no significant effect in the control group (p>0.05). When the general COPD status of the groups was analyzed, it was observed that the post-test means showed a significant difference (KW=69.866; p<0.001). The effect size was highest in the education+message group and lowest in the control group (d_1>d_2>d_3).

When the fatigue level in the study was evaluated with CAFS, the pre-test and post-test results showed a significant difference in the inter-group comparisons of the education+message group (Z= -5.164; p<0.001).

Table 3. Comparison of mMRC, CAT, and CAFS results of the groups

	Groups	Pre Total		Post Total		Test	Cohen's Z test	Ranking
		(M±SD)	M(Min-Mak)	(M±SD)	M(Min-Mak)			
MMRC	Education+Message [a]	2.085 ± 0.742	2 (1 - 3)	1.228 ± 0.910	1 (0 - 3)	KW= 41.308 **p<0.001**	d_1: 2.79	$d_1>d_2>d_3$
		Z= -4.817 **p<0.001**						
	Education [a]	1.457 ± 0.885	1 (0 - 4)	1.285 ± 0.925	1 (0 - 3)		d_2: 0.90	
		Z= -2.449 **p=0.014**						
	Control [b]	1.457 ± 0.950	1 (0 - 4)	1.457 ± 1.093	1 (0 - 5)		d_3: 0.128	
		Z= -0.378 p=0.705						
CAT	Education+Message [a]	23.057 ± 8.390	23 (11 - 40)	10.885 ± 8.767	10 (0 - 31)	KW= 69.866 **p<0.001**	d_1: 3.59	$d_1>d_2>d_3$
		Z= -5.17 **p<0.001**						
	Education [a]	18.028 ± 10.376	16 (5 - 39)	16.428 ± 11.520	14 (0 - 39)		d_2: 0.928	
		Z= -2.496 **p=0.013**						
	Control [b]	13.342 ± 9.424	9 (4 - 39)	13.257 ± 8.792	10 (4 - 38)		d_3: 0.164	
		Z=-0.483 p=0.629						
CAFS	Education+Message [a]	58.511 ± 18.164	54.2 (33.3 - 97.9)	27.678 ± 19.677	25 (4.2 - 93.8)	KW= 65.821 **p<0.001**	d_1: 3.578	$d_1>d_2>d_3$
		Z= -5.164 **p<0.001**						
	Education [a]	47.202 ± 25.040	43.8 (10.4 - 97.9)	46.726 ± 28.170	39.6 (8.3 - 100)		d_2: 0.456	
		Z= -1.316 p=0.188						
	Control [b]	38.690 ± 23.408	33.3 (8.3 - 95.8)	39.345 ± 22.635	31.3 (10.4 - 95.8)		d_3: 0.016	
		Z= -0.047 p=0.963						

mMRC: Modified Medical Research Council; r: Spearman's rho; CAT: COPD assessment test; CAFS: COPD-asthma fatigue scale;. Z: Wilcoxon Test; KW: Kruskal Wallis H Tests; a-b: There is no difference between groups with the same letter.

There was no significant effect in the education and control groups ($p>0.05$). When the fatigue levels of the groups were analyzed, it was observed that the post-test means showed a significant difference (KW= 65.821; $p<0.001$). The effect size was found to be the highest in the education+message group ($d_1>d_2>d_3$). In line with this result, hypothesis H1-2 was accepted.

DISCUSSION

In the study which was conducted to determine the effect of education and reminder short messages on fatigue levels of patients with chronic obstructive pulmonary disease, it was determined that most of the patients were male and in the middle age group. Diseases occur at earlier ages due to climatic and global changes in the world in recent decades [31]. According to reports published, factors such as the increase in air pollution, the diverse use of tobacco products such as electronic cigarettes and hookahs due to the use of tobacco products at younger ages, exposure to chemical gases accelerate the destruction of the airways [1]. Therefore, chronic diseases such as COPD occur more frequently. The equalization in the sex distribution of COPD, which had been seen mostly in men in previous years, is remarkable. Women's exposure to harmful particles, significantly increased rates of smoking, and differences in lung volumes are risk factors for COPD [32]. These global changes were similarly observed in our study sample.

Modified Medical Research Council dyspnea scale, which is one of the most frequently used scales in COPD, was used to determine dyspnea severity and CAT was used to assess general condition. In our study, the reliability coefficients of the scales were within the appropriate limits [33]. On the dyspnea scale, according to the GOLD guideline, 0-1 is interpreted as mild dyspnea, while higher values can be interpreted as moderate-severe. The dyspnea levels of our patients at the first measurement were moderate-severe. The total CAT score, which is used to determine the severity of COPD disease, indicates low severity between 0-10, moderate severity between 11-20, high severity between 21-30, and very high severity between 31-40 [1]. Accordingly, the COPD disease severity of our patients in the study was moderate. These results were attributed to the fact that our sample group was not elderly and that the mean duration of diagnosis was 9.87 years. In the literature, it has been found that in COPD, advanced age and longer duration of the disease are associated with an increase in dyspnea severity and worsening of the general disease status [34]. These results are expected due to the nature of chronic diseases. Because chronic diseases affecting systems lead to disruption of the functioning of other systems over time and diseases bring along additional diseases. This situation becomes more serious with chronic illness in the respiratory system, which is a vital system. Inadequate oxygenation and problems in gas exchange can lead to damage and dysfunction of many tissues and organs. Therefore, diseases of the respiratory system bring many symptoms and serious problems along [1]. Among all these, fatigue is an important problem that negatively affects the care and work of the individual.

Fatigue is very common in COPD patients [8-11,35]. The main reason for this is insufficient tissue oxygenation. In addition, other diseases and the inability of the individual to maintain appropriate treatment also trigger fatigue. Actually, fatigue and care are in a cyclical relationship. As the fatigue level of the individual increases, he/she cannot accomplish the disease care he/she needs to do and does not have enough energy. The disruption in care leads to the occurrence of systemic pathologies in the later stages of the disease and ultimately to higher fatigue levels. This vicious cycle leads to problems that the

patient cannot overcome. Therefore, in COPD nursing care, it is extremely important to address and monitor fatigue in-depth and develop coping strategies [2]. Various approaches are available to relieve or alleviate fatigue. Very positive results have been reported in studies on this subject. In their study, Polat & Ergüney (2017) showed that the level of dyspnea and fatigue decreased in patients with COPD thanks to reflexology [10]. In their systematic review and meta-analysis, Paixão et al. (2024) reported that fatigue was reduced by physical activity interventions used in many studies [9].

One of the striking findings of our study was that the mean CAFS scores showed a significant difference in the education+message group, but not in the education and control groups. This result showed that education alone does not provide sufficient effect. It is understood that reminders and motivation are necessary in certain periods in strategies to cope with fatigue. This result was also supported by the effect size in intergroup comparisons ($d_1>d_2>d_3$). It is thought that the result obtained is associated with the physiology of fatigue. Fatigue causes the patient to feel mentally inadequate as well as negatively affects their daily work. In many studies, it has been shown that fatigue is associated with depression and anxiety [7,36,37]. This may lead to a loss of motivation in patients. For this reason, the results of our study suggest that it would be beneficial to remind the education content and support the patient at certain intervals in coping with fatigue. Akrom & Nurwijayanti (2015) showed that reminding and motivational short messages were effective in strengthening patient compliance in patients with COPD, supporting our study findings [5].

There is an important association between fatigue and symptoms in COPD. In their study, Goertz et al. (2019) showed that dyspnea was the best predictor in a multiple regression model on fatigue [4]. This is associated with muscle fatigue and weakness caused by dyspnea in the patient [38]. Strategies to cope with fatigue are expected to have a positive effect not only on fatigue but also on other important problems of COPD. In studies, this has been demonstrated in the relationship between fatigue and the general COPD status [3,4,8,11,34]. Likewise, in the study of Stridsman et al. (2018), it was reported that the CAT scale, which is used to evaluate the general COPD status, was also associated with fatigue [39]. In line with the results obtained from these studies, it can be suggested that being able to cope with fatigue will also contribute positively to the patient's general COPD status. According to the effect size of the comparisons between the groups in our study, strengthening the education with the right strategies led to a superiority of the groups over each other ($d_1>d_2>d_3$). Therefore, it can be suggested that correct nursing interventions are extremely valuable in achieving the maximum treatment effect. The result of this study design revealed that the follow-up of patients in certain periods is also very important. In the literature, studies involving patient follow-up have contributed positively in many ways [9-11,17,19,22]. These results show that our findings are supported by the literature.

Limitations

There are some limitations in the study. Firstly, the study results only reflect the findings of the group in which it was conducted and cannot be generalized to all patients. Due to the study design, it took time to reach a sufficient sample. In addition, patients who did not use phones could not be included in the sample. Some of those who used phones could not be reached during the follow-up period.

CONCLUSION

According to our study results, dyspnea, general COPD status and fatigue were moderate in patients with COPD. With the education given to the patients, improvements were achieved in these findings. However, the strongest effect was observed in the education+message group. This result showed the importance of follow-up in patient education. It can be suggested that it would be beneficial to integrate supportive non-pharmacologic methods in addition to pharmacologic treatments into nursing care.

New studies are needed due to the lack of sufficient studies on the subject. Basic issues such as the causes of fatigue in COPD patients, minimizing-increasing factors, actions to be taken to prevent disruption of care, and organization of daily work should be included in patient education. All education sessions should be repeated and reminded after discharge with the physical or technological means available. Accessible and uncomplicated practical approaches, especially for patients, and sustainable practices for nurses are the first choice. This way, patient outcomes can be maximally improved even in units where there is an insufficient number of nurses or excessive patient care. After reaching a sufficient level of evidence, necessary guidance to patients can be planned with smart tracking systems. It is evident that it will be extremely useful to process patient data in accordance with systems such as decision support systems during patient hospitalization and provide artificial intelligence-supported messages, calls, or online calls after the patient's discharge and in the follow-up of patients at certain intervals with nursing management. These issues will be discussed in the nursing of the future. For this reason, it is thought that the results and observations obtained in the study conducted with the classical method will provide resources for future studies involving patient follow-up systems.

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