Transtheoretical Model-Based Nursing Interventions for Smoking Cessation in COPD Patients: A Randomized Controlled Trial

KOAH'lı Hastalarda Sigarayı Bırakmaya Yönelik Transteorik Model Temelli Hemşirelik Müdahaleleri: Randomize Kontrollü Çalışma

Figen ÇAVUŞOĞLUᵃ, Ayşe ŞAMLIᵇ, Oğuz KILINÇᶜ, Nazmiye TİBEL TUNAᵈ

ᵃOndokuz Mayıs University Faculty of Health Science, Department of Nursing, Samsun, Türkiye
ᵇKoç University Faculty of Nursing, Department of Nursing, Department of Public Health Nursing *(Retired Faculty Member)*, İstanbul, Türkiye
ᶜDokuz Eylül University Faculty of Medicine Hospital, Clinic of Chest Diseases, İzmir, Türkiye
ᵈOndokuz Mayıs University Faculty of Medicine Health Application and Research Center, Department of Chest Diseases, Samsun, Türkiye

ABSTRACT Objective: This study aimed to evaluate the effectiveness of transtheoretical model-based nursing interventions on smoking cessation in patients with Chronic Obstructive Pulmonary Disease (COPD). **Material and Methods:** An experimental design was employed in the study. The study involved 33 COPD patients in the experimental group and 35 COPD patients in the control group. Data were collected between January 2016 and November 2017. The data collection instruments included the Descriptive Characteristics Form, the Fagerstrom Nicotine Dependency Test, and the Transtheoretical Model scales for Decisional Balance, Self-Efficacy, Stages of Change, and Processes of Change. Both parametric and nonparametric tests were used for data analysis. **Results:** The subscale scores for Decisional Balance, Self-Efficacy, and Processes of Change showed significant differences in the experimental group following home nursing interventions. While there was significant improvement in the Stages of Change, 9 patients in the experimental group and 2 patients in the control group successfully quit smoking, and the difference between the groups was found to be significant. **Conclusion:** The results suggest that home care interventions based on the Transtheoretical Model are effective in supporting smoking cessation in COPD patients. It is recommended that nursing practices incorporate the Transtheoretical Model for smoking cessation interventions, utilizing a smoking cessation guide to enhance the effectiveness of these interventions.

Keywords: COPD; home care; nursing; smoking cessation;
                 transtheoretical model

ÖZET Amaç: Bu araştırmanın amacı, Kronik Obstrüktif Akciğer Hastalığı (KOAH) olan hastalarda transteorik modele dayalı hemşirelik girişimlerinin sigara bırakma üzerine etkinliğini değerlendirmektir. **Gereç ve Yöntemler:** Çalışmada deneysel bir tasarım kullanılmıştır. Çalışmaya deney grubunda 33 KOAH hastası ve kontrol grubunda 35 KOAH hastası dâhil edilmiştir. Veriler Ocak 2016 ve Kasım 2017 tarihleri arasında toplanmıştır. Veri toplama araçları arasında Tanımlayıcı Özellikler Formu, Fagerstrom Nikotin Bağımlılık Testi ve Transteorik Model için Karar Dengesi, Öz Yeterlilik, Değişim Aşamaları ve Değişim Süreçleri ölçekleri kullanılmıştır. Veri analizi için hem parametrik hem de parametrik olmayan testler kullanılmıştır. **Bulgular:** Karar Dengesi alt ölçekleri, öz yeterlilik ve değişim süreçleri alt ölçek puanları evde hemşirelik girişimleri sonrasında deney grubunda anlamlı farklılık göstermiştir. Değişim aşamalarında anlamlı iyileşme görülürken, deney grubunda 9 hasta, kontrol grubunda ise 2 hasta sigarayı bırakmış ve aralarındaki fark anlamlı bulunmuştur. **Sonuç:** Bu çalışmanın sonuçları ışığında, KOAH'lı hastaların sigarayı bırakmaları için evde bakımın desteklenmesi ve müdahalelerin Transteorik Model temelinde planlanması önerilmektedir. Sigara bırakma girişimlerinde yer alan hemşirelerin sigara bırakma rehberini kullanarak transteorik modele dayalı girişim uygulamaları önerilmektedir.

Anahtar Kelimeler: KOAH; evde bakım; hemşirelik;
                       sigara bırakma; transteorik model

The prevalence of Chronic Obstructive Pulmonary Disease (COPD) worldwide is 11.7-15.8%, while in Türkiye it is 19.1%. Globally and in Türkiye, COPD ranks 3rd among causes of death. In Türkiye, it accounts for 45.6% of deaths due to respiratory system diseases.[1]

Smoking is the leading cause of COPD, contributing to 80-90% of cases, with 15-20% of smokers developing the disease.[2] Some patients diagnosed with COPD continue to smoke, facing greater difficulties and lower success rates in quitting compared to other smokers.[3,4] Smoking cessation is crucial for the effective treatment of COPD patients. It significantly reduces the rapid decline in lung function and the risk of exacerbations associated with smoking.[5,6] High-level evidence studies and guidelines emphasize the critical role of smoking cessation in treating COPD and highlight the significant influence of physicians, nurses, and other healthcare professionals in persuading patients to quit smoking.[7,8] It is seen that the transtheoretical model, one of the behavioral approach types, is frequently used in intervention studies for smoking cessation and successful results are obtained.[9-12] Developed by Prochaska and Di-Clemente, this model emphasizes that behavioral change occurs through a process, and interventions should be tailored to the individual's current stage of change.[13] The model comprises the stages of change, processes of change, decisional balance, and self-efficacy constructs.[14] In addition, recent systematic reviews, meta-analyses and recommendations have shown that a treatment program that includes a combination of behavioral approach and pharmacotherapy is more effective in smoking cessation in COPD patients.[15,16] However, for COPD patients, home care and health education play a crucial role in preventing repeated hospital admissions and improving quality of life. The significance of this issue has been highlighted and evidenced in Cochrane studies.[17,18] Yet, the literature lacks studies on home-based nursing interventions specifically aimed at smoking cessation in COPD patients using the Transtheoretical Model. This study is expected to contribute to both the literature and the field of nursing with its unique focus.

The present study aimed to investigate the effects of nursing interventions on smoking cessation outcomes in COPD patients who smoke.

Hypotheses

After home-based nursing interventions performed according to the TTM,

1. H1: The average score on the Decision Making Scale (pros) is higher in COPD patients who smoke compared to the control group, while the average score (cons) is lower.

2. H1: The mean score on the Self-Efficacy (SE) Scale is higher in COPD patients who smoke compared to the control group.

3. H1: The mean score on the Processes of Change Scale is higher in COPD patients who smoke compared to the control group.

4. H1: The progression between stages of change is higher in COPD patients who smoke compared to the control group.

5. H1: The rate of smoking cessation is higher in COPD patients who smoke compared to the control group.

6. H1: The mean spirometer measurement values are higher in COPD patients who smoke compared to the control group.

7. H1: The mean score on the Fagerström Test for Nicotine Dependence (FTND) is higher in COPD patients who smoke compared to the control group.

MATERIAL AND METHODS

The manuscript format of the study was designed in accordance with the CONSORT guidelines.

DESIGN AND SAMPLE

The study was designed as a randomized controlled experimental study trial (Protocol ID: B.30.2.ODM.0.20.08/1184; ClinicalTrial.gov ID: NCT04313738). Data were collected between January 2016 and November 2017 at the homes of COPD patients enrolled in a public specialized hospital. Participants were selected based on the inclusion and exclusion criteria. The patients in the intervention group received TTM-based nursing interventions for smoking cessation and were followed up for 6 months through home visits. The sample size was initially determined using the Win episcope 2.0 program. The sample size was calculated as 78 with

a 5% margin of error and at a 15% prevalence rate and 95% confidence interval. It was decided to include 40 patients in the intervention group and 40 patients in the control group. However, due to the challenges encountered during data collection, the planned sample size was not achieved. After completing the pre-test measurements, the sample power was re-calculated using the G-Power Data Analysis program, confirming the adequacy of the sample size (0.56-1.21). A post-hoc power analysis (0.42-0.99) was performed upon completion of data collection. The study was completed with 68 participants, comprising 33 in the intervention group and 35 in the control group.

PARTICIPANTS

Sample selection was based on specific criteria. The inclusion criteria were as follows: volunteering to participate in the study, being diagnosed with COPD, being over 40 years old, currently smoking, not having any physical or mental problems that would prevent filling out the study questionnaires or using a

telephone, having a mobile phone available at all times, living in the city center of Samsun (a city on the north coast of Türkiye), not receiving any smoking cessation treatment at the time of the study, and not having any medical contraindications that would prevent spirometric evaluation. The exclusion criteria were as follows: patients with exacerbations in the last 2 months and those currently receiving smoking cessation treatment. Additional exclusion criteria for those already included in the study were: not completing the home visits process, agreeing to participate but then withdrawing from the study for any reason, and being diagnosed with lung cancer.

RANDOMIZATION

Of the 4,437 patients diagnosed with COPD in the automation system of a public specialized hospital, those who met the sampling criteria were identified (n=1,682). From this group, 600 patients were randomly assigned to the intervention group and 600 to the control group by using a computer program (https://www.randomizer.org/). Then, these individ-
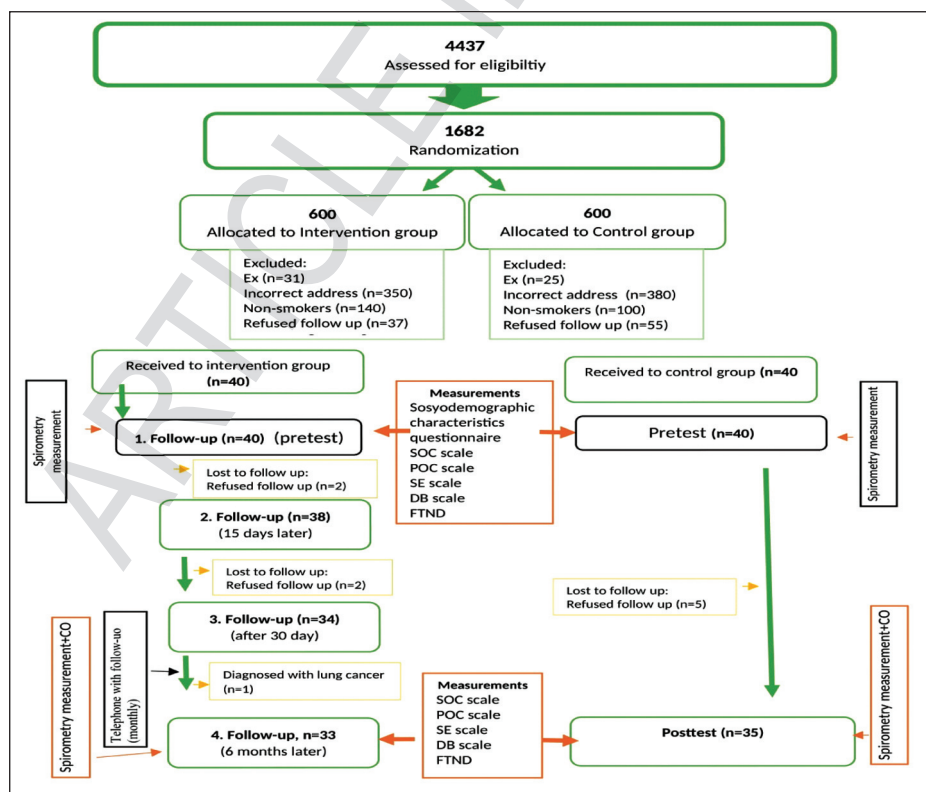

FIGURE 1: CO: carbon monoxide; SOC: Stages of Change; POC: Processes of Change; SE: Self-Efficacy; DB: Decisional Balance; FTND: the Fagerström Test for Nicotine Dependence.

uals were contacted by telephone to determine their smoking status, willingness to participate in the study, and their residency in the city center. During the randomization process, some participants were excluded due to address changes, inability to be reached by phone, death, or a cancer diagnosis. Ultimately, the study began with 40 patients in each group (Figure 1). Details of the randomization process are provided in Figure 1.

DATA COLLECTION TOOLS

The tools used to collect data included the Descriptive Characteristics Form, the FTND, and the components of the Transtheoretical model, which are Stages of Change (SOC) scale, Processes of Change (POC) scale, SE scale, and Decisional Balance (DB) scale. In addition, spirometry measurements were performed using the equipment available at the hospital where data were collected.

Fagerström Test for Nicotine Dependence: The test developed by Fagerström, Heatherton et al. includes 6 items, each rated on a different scale.[19] A total score ranging from 0 to 4 indicates low nicotine dependence, 5 to 6 indicates moderate dependence, and 7 to 10 indicates high independence. The validity and reliability study of the Turkish version of the scale was conducted by Uysal et al.[20] The Cronbach's Alpha of the original scale was 0.61, while the Cronbach's Alpha was 0.56 in Uysal et al.'s validity and reliability study and 0.79 in the present study.[20]

Stages of Change Scale: Prochaska and Diclemente developed the SOC scale to explain smoking cessation as a gradual change process, formulating questions to assess this progression.[13] Individuals select one of the following statements that best describes their current situation: Precontemplation: I do not consider quitting smoking in the next 6 months. Contemplation: I am planning to quit smoking in the next 6 months. Preparation: I am planning to quit in the next 30 days. Action: I quit smoking less than 6 months ago. Maintenance: I have not been smoking for more than 6 months. The Turkish validity and reliability of the scale were conducted by Koyun et al.[24] The scale does not yield a numerical score; instead, it determines the stage of change based on the individual's responses to the statements.

Processes of Change Scale: Developed by Prochaska et al. the POC scale includes 30 items assessing cognitive processes (15 items) and behavioral processes (15 items).[21] Each process contains five sub-dimensions. The scale is a 5-point Likert type, ranging from 1 to 5 (1=never, 2=rarely, 3=occasionally, 4=often, 5=very often), determining the methods an individual uses in behavior change. The Cronbach's Alpha values for the original scale range between 0.78 and 0.91. The Cronbach's Alpha values for the Turkish version of the scale whose validity and reliability study was conducted by Koyun et al. ranged between 0.54 and 0.86.[22] In the present study, Cronbach's Alpha values ranged between 0.61 and 0.92.

Self-Efficacy Scale: The scale developed by Velicer et al. measures the degree of confidence an individual has in maintaining non-smoking behavior in situations that trigger smoking.[23] The validity and reliability study of the Turkish version of the scale was conducted by Koyun et al.[22] While the Cronbach's Alpha of the original scale was 0.82, the Cronbach's Alpha was 0.85 in Koyun et al.'s validity and reliability study and 0.93 in the present study.[22] The scale consists of eight items rated on a 5-point Likert type scale ranging from 1 to 5 (1=not confident at all, 2=a little confident, 3=confident, 4=very confident and 5=extremely confident). The lowest and highest possible scores to be obtained from the scale are 8 and 40, respectively, with higher scores indicating greater success in maintaining non-smoking behavior.

Decisional Balance Scale: Developed by Velicer et al. the DB Scale consists of 12 items in two sub-dimensions: Pros of change (6 items) and Cons of change (6 items).[24] The Cronbach's Alpha values, used to calculate the internal validity of the original scale, were 0.87 for the Pros of change subscale and 0.90 for the Cons of change subscale.

The Cronbach's Alpha values for the Pros of Change and Cons of Change subscales was 0.88 and 0.82, respectively in the Turkish validity-reliability study of the scale conducted by Koyun et al. and 0.71 and 0.85 in the present study.[22] The scale items are rated on a 5-point Likert scale ranging from 1 to 5 (1=not important at all, 2=very little important,

3=moderately important, 4=very important and 5=extremely important). The minimum and maximum possible scores for each subscale are 6 and 30, respectively. High scores on the Pros of change subscale indicate that the individual is determined to change, while high scores on the Cons of change subscale suggest that the person is not fully aware of the harms of the problematic behavior.

IMPLEMENTATION OF THE INTERVENTIONS

During the home visits, the TTM-based Smoking Cessation Guide prepared by Koyun and Eroglu as well as the educational booklet prepared by the researcher were used.[25,26]

TTM-based Smoking Cessation Guide: The guide was prepared considering the needs of individuals at each stage according to the Transtheoretical Model. It introduces the characteristics of each stage of change of the model and provides information and strategies for initiating change in individuals. To use the guide, the individual's stage of change is 1st determined using the Stages of Change Scale, and then the appropriate procedure is followed according to the guide.

Educational Booklet: The booklet, prepared by the researcher based on the relevant literature, was finalized after incorporating feedback from five experts in public health nursing, pulmonary diseases, family medicine, and psychiatric nursing.[3,12,14,24,26] In the booklet, information on the function of the lungs, the definition of COPD, symptoms of and factors causing COPD, relationship between the disease and smoking and effects of smoking cessation on COPD is given. The evaluation of the booklet focused on content validity. Experts were provided with an assessment table, rating each section as "Appropriate" (3 points), "Appropriate but needs revision" (2 points), or "Should be removed" (1 point). Additionally, experts were asked to provide suggestions and comments for sections marked as needing revision or removal. Based on this feedback, the final version of the booklet was created. The booklet includes information on lung function, the definition and symptoms of COPD, factors causing COPD, the relationship between COPD and smoking, and the effects of smoking cessation on COPD.

The nursing intervention in this study involved home visits, 6-month periodic follow-ups, health education, smoking cessation interventions aligned with motivational interviewing principles, and telephone counseling. Patients in the intervention group were 1st invited to the hospital for spirometry measurements, followed by scheduling the first of four planned home visits.

During the first home visit, the study's aim and process were explained, the patient's stage of change was determined using relevant scales, and a TTM-based nursing intervention for smoking cessation and COPD management was applied. In the 2nd, 3rd, and 4th home visits, the patient's stage of change was reassessed, and appropriate nursing interventions were conducted according to the guidelines. Between the 3rd and 4th home visits, participants were contacted monthly via telephone.

At the end of the 6th month, the fourth home visit was conducted, during which final follow-ups and measurements were performed. The patient was then invited back to the hospital for repeat spirometry measurements. At the study's conclusion, carbon monoxide (CO) levels of participants who reported quitting smoking were measured. Those with CO levels below 5 parts per million were considered nonsmokers, with measurements taken using a handheld CO measuring device. Each home visit lasted approximately 60 minutes, and telephone calls averaged 15 minutes.

No home visits were conducted for the participants in the control group. Instead, they were invited to the hospital and interviewed face-to-face twice, once at the end of the 1st month and again at the end of the 6th month, during which measurements were performed. At the end of the 6th month, the researcher provided the control group with all the nursing interventions that had been given to the intervention group.

STATISTICS

Data were analyzed using the IBM SPSS V23. The independent samples t-test and Mann-Whitney U test were used to compare the intergroup data, while the paired samples t-test and Wilcoxon test were em-

ployed to compare intragroup pre-test and post-test values. The chi-square test and Fisher's exact test were used to analyze the categorical data. p values less than 0.05 were considered statistically significant. The Fisher's exact test was used to check the significance in categorical data. In addition, to maintain randomization and accurately evaluate the program's effect within realistic boundaries, an intention-to-treat (ITT) analysis was conducted. This analysis helps preserve the diversity and balance between the experimental and control groups. By including data from participants who left the study for various reasons, the ITT analysis allows for a realistic assessment of the intervention's effectiveness, accounting for all deviations and noncompliance.[27] This analysis was conducted for 12 participants who left the study after the pre-test data collection, with 7 from the experimental group and 5 from the control group. While the ITT analysis was not included in the thesis, it was performed in this article following the reviewers' recommendations.

ETHICAL CONSIDERATIONS

Study approval was granted by the Ondokuz Mayıs University Clinical Research Ethics Committee (date: September 3, 2014, no: 2014/773). Institutional permission was obtained from the hospital where the data were collected, and permissions were secured for the scales used in the study. All participants were informed about the study and provided informed consent. The study was conducted in accordance with the principles of the Declaration of Helsinki.

RESULTS

Data on the demographic characteristics and smoking habits of the participants are presented in Table 1. At the onset of the study, there were no statistically significant differences between the participants in the intervention and control groups in terms of their demographic characteristics and smoking habits (p>0.05).

According to the stages of change component of the Transtheoretical Model, the participants in the intervention group underwent four follow-ups, while the participants in the control group were followed twice, at the beginning and end of the 6-month pe-

riod.

The distribution of the intervention and control groups according to the stages of change is given in Table 2. A significant difference was found between the 2 groups in terms of the stages of change after the 6-month follow-up nursing intervention (p<0.001). Further analysis revealed that the difference was primarily due to the scores the patients obtained during the preparation stage. Initially, during the first home

TABLE 1: Sociodemographic characteristics of the intervention and control group.

Sociodemographic characteristics	Intervention group (n=40) $\bar{X}\pm SD$	Control group (n=40) $\bar{X}\pm SD$	t value*	p value
Age ($\bar{X}\pm SD$)	58.73±13.19	60.43±9.53	-0.660	0.511
Age of smoking	16.03±5.20	16.08±4.85	-0.044	0.965
Number of hospital admissions ($\bar{X}\pm SD$)	2.38±1.67	2.93±2.43	-1.178	0.242

| | Intervention group (n=40) | | Control group (n=40) | | | |
Sociodemographic characteristics	n	%	n	%	χ^{2**}	p value
Gender						
Female	10	25.0	10	25.0	0.000	1.00
Male	30	75.0	30	75.0		
Marital status						
Married	37	92.5	37	92.5	0.667	0.717
Single	3	7.5	3	7.5		
Educational level						
İlliterate	0	0	3	7.5		
Literate	3	7.5	1	2.5		
Primary school	22	55.0	20	50.0	4.453	0.486
Middle school	8	20.0	7	17.5		
High school and above	7	17.5	9	22.5		
Employment status						
Employed	21	52.5	22	55.0	0.50	0.823
Unemployed	19	47.5	18	45.0		
Income status						
Bad	1	2.5	5	12.5		
Middle	32	80.0	25	62.5	4.056	0.132
Good	7	17.5	10	25.0		
Number of cigarettes per day						
10 and lower	3	7.5	9	22.5		
11-20	26	65.0	20	50.0	5.668	0.129
21-30	6	5.0	9	22.5		
31 and above	5	12.5	2	5.0		
Quitting experience in past						
Yes	27	67.5	25	62.5	0.0220	0.639
No	13	32.5	15	37.5		

*Independent samples t-test statistics; **Chi-square test statistics. SD: Standard deviation.

TABLE 2: Comparison of first and last follow-up comparison of change stage by intervention and control groups.				
	First follow-up		Last follow-up	
	I*	C*	I	C
Change of stage	n (%)	n (%)	n (%)	n (%)
Precontemplation	18 (45)	26 (65)	9 (22.5)	25 (62.5)
Contemplation	17 (42.5)	14 (35)	13 (32.5)	10 (25.0)
Preparation	5 (12.5)	-	9 (22.5)	4 (10.0)
Action	-	-	4 (10.0)	-
Maintenance	-	-	5 (12.5)	1 (2.5)
Total	40 (100)	40 (100)	40 (100)	40 (100)
Statistics	χ^{2**}: 6.745		χ^{2**}: 16.510	
	p: 0.034		**p: 0.002**	

*I: Intervention group; C: Control group; **Chi-square test statistics.

TABLE 3: Comparison of smoking cessation status of patients according to intervention and control groups.				
	Intervention (n=40) (%)	Control (n=40) (%)	z value*	p value
Action and Maintenance	9 (22.0)	1 (2.5)	16.055	**0.001**

*Fisher's exact test

visit, 45% of participants in the intervention group were in the precontemplation stage, and 12.5% were in the preparation stage. By the last visit, 22.5% were in the precontemplation stage, 32.5% in the contemplation stage, 22.5% in the preparation stage, 10% in the action stage, and 12.5% in the maintenance stage.

The comparison of the smoking cessation status between the intervention and control groups demonstrated that 22.0% of the participants in the intervention group and 2.5% of the participants in the control group quit smoking. This difference was statistically significant (p<0.05; Table 3).

The mean post-test scores for the pros of change subscale of the Decisional Balance Scale increased statistically significantly in both the intervention group and the control group (p<0.05), with a signifi-

cant difference in favor of the intervention group between the 2 groups (p<0.05). The mean scores for the cons of change subscale of the Decisional Balance Scale decreased statistically significantly in the intervention group but not in the control group (p>0.05), and the difference between the 2 groups at the post-test was not significant (p>0.05). After the nursing intervention, the mean self-efficacy scores increased significantly in both groups (p<0.05), with a significant difference between the 2 groups at the posttest (p<0.05).

The results for the Processes of Change methods, another component of the TMM, and its sub-dimensions are presented in Figure 2. There was a significant increase in the mean scores obtained from all the sub-dimensions of cognitive and behavioral processes in the intervention group (p<0.05), and the difference between the 2 groups in the posttest analysis was statistically significant (p<0.05). In the control group, the mean posttest scores for the 2 sub-dimensions of the cognitive processes (Consciousness Raising, Environmental Reevaluation) and the 2 sub-dimensions of the
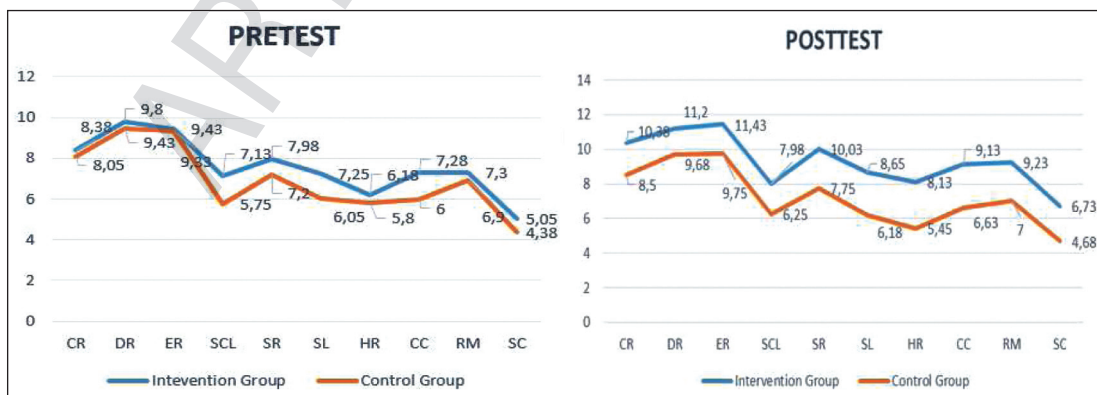

FIGURE 2: Comparison of Scores of sub-dimenson of process of change scale in the intervertion and control groups.
* CR: Consciousness Raising; DR: Dramatic Relief; ER: Environmental Reevalution; SCL: Social Liberation; SR: Self-Reevalution; SL: Self-Liberation;
HR: Helping Relationships; CC: Counter Contidioning; RM: Reinforcement Management; SC: Stimulus Control.

behavioral processes (Counter-Conditioning, Social Liberation) increased significantly compared to the pre-test scores (p<0.05).

The mean scores obtained from the Fagerström Test at the post-test differed significantly from those obtained at the pre-test in both groups (p<0.05). There was also a significant difference between the groups when comparing the post-test scores (p<0.05). Evaluation of the spirometry measurement results of the patients with COPD in the intervention and control groups was based on the Forced Expiratory Volume (FEV$_1$) scores. The mean FEV$_1$ scores of the patients in the intervention group increased significantly from the pre-test to the post-test measurements (p<0.05). However, the difference between the two groups in terms of their post-test scores was not significant (p>0.05) (Table 4).

DISCUSSION

This study demonstrated the impact of nursing interventions based on the Transtheoretical Model on patient outcomes in COPD patients who smoke.

While the mean post-test scores for the Benefits subscale of the Decisional Balance Scale increased significantly in both groups, the mean scores for the Cons of Change subscale decreased significantly. Although the difference between pre-test and post-test scores within each group was significant, no significant difference was observed between the experimental and control groups. This suggests that while the intervention had a positive effect on smoking cessation, the nursing interventions specifically based on the Transtheoretical Model did not significantly influence this difference. The act of calling the control group patients to the hospital for spirometry measurements and administering questionnaires may have had a stimulating effect, increasing their perception of the benefits of quitting smoking. The literature indicates that even brief interventions as short as three minutes can yield successful smoking cessation outcomes.[28] A systematic review examining the effects of counseling on health behavior change in patients diagnosed with COPD found that counseling by health professionals had a significantly positive impact on smoking cessation, although it did not have

Scales	Group	Pretest median $\overline{X}\pm SD$	Posttest median $\overline{X}\pm SD$	Statistics	p value
TABLE 4: Comparison of decisional balance scale, self-efficacy scale, Fagerström test for nicotine dependence and the Forced Expiratory Volume mean scores of patients in the intervention and control group.					
Pros of change	Intervention	21.95±4.6	24.4±4.9	t**:-3.991	**<0.001**
	Control	21.13±4.9	22.1±5.4	t**:-2.846	**0.007**
	t value*	0.769	2.062		
	p value	0.444	**0.043**		
Cons of change	Intervention	17.35±7.5	14.13±6.8	t**:-3.092	**0.004**
	Control	19.35±7.0	18.43±7.5	t**:1.583	0.122
	t value*	-1.232	-2.693		
	p value	0.222	**0.009**		
Self-efficacy	Intervention	22.2±8.1	26.6±9.4	t**:-3.458	**0.001**
	Control	16.9±5.8	19.1±8.1	t**:-2.095	**0.043**
	t value*	3.363	3.840		
	p value	**0.001**	**<0.001**		
Fagerström Test for Nicotine Dependence	Intervention	4 (0-10)	1 (0-7)	Z****: -4.566	**<0.001**
	Control	5 (0-9)	3 (0-9)	Z****: -2.701	**0.007**
	U***	694.0	398.5		
	p value	0.304	**<0.001**		
FEV$_1$	Intervention	64.9±6.2	66.7±6.8	t**: -2.823	**0.007**
	Control	64.2±8.1	63.6±7.5	t**: 1.092	0.281
	t value*	0.401	1.755		
	p value	0.690	0.084		

*Independent samples t-test statistic; **Dependent samples t-test statistic; ***Mann-Whitney U test; ****Wilcoxon signed rank test. SD: Standard deviation.

a significant effect on physical activity.[29] Studies investigating smokers' attitudes towards smoking according to the stages of change have demonstrated that as individuals progress through the stages towards quitting smoking, their favorable attitudes towards smoking decrease, while their unfavorable attitudes increase.[12,30-32]

In the study, after the nursing intervention for COPD patients, the self-efficacy scores of the patients in the experimental group increased significantly, and a significant difference was also found between the groups. The increase in self-efficacy scores indicates the effectiveness of the intervention, suggesting that it boosted patients' self-confidence by encouraging behavior change. Similarly, in the study by Lindberg et al. quitting smoking led to a significant increase in the self-efficacy scores of COPD patients. These findings are supported by the literature.[31-33]

The study also found that there was a significant increase in self-efficacy levels in the control group by the end of the study, similar to the significant difference observed in decisional balance. This result might suggest that even without a direct intervention aimed at smoking cessation, simply being called to the hospital for control purposes may have given patients a sense of being valued, which could have increased their belief in their ability to quit smoking. However, after the 6-month follow-up with the Transtheoretical Model-based intervention, there was no significant difference in self-efficacy, daily cigarette consumption, or nicotine dependence.[34] This discrepancy in the literature could be attributed to sample size differences.

The analysis of the mean scores from all sub-dimensions of the Processes of Change scale at the post-test revealed an increase in both the intervention and control groups, with the increase being significantly higher in the intervention group. This indicates that the nursing intervention implemented in the study contributed effectively to the use of behavior change methods. Similarly, Koyun and Eroglu's study also found a significant increase in the mean scores obtained from the Processes of Change scale.[32]

As stated in the literature, individuals in the pre-contemplation and contemplation stages tend to use cognitive methods such as environmental reevaluation. Those in the preparation stage often use self-reevaluation methods, while individuals in the action stage are more likely to employ behavioral methods.[35,36] Based on this, it can be concluded that the findings support the use of Transtheoretical Model-based smoking cessation interventions. The patients in the intervention group were more likely to take action towards change compared to the control group due to the intervention.

The analysis of the results for the stages of change demonstrated positive progress in the intervention group, with the last follow-up indicating a significant difference between the groups. The intervention implemented in the intervention group appears to be an appropriate method for encouraging COPD patients to make behavioral changes towards quitting smoking. In Cabezas et al. randomized controlled study based on the motivational interviewing principles aligned with the stages of change, the smoking cessation rate was 1.5 times higher in the intervention group than in the control group.[10] Other studies have also shown that interventions based on motivational interviewing and the Transtheoretical Model lead to improvements in the stages of change among participants.[32,34] Additionally, the study found that the smoking cessation rate in the intervention group was significantly higher than that in the control group. This suggests that smoking cessation interventions based on the Transtheoretical Model can be effective in promoting behavior change and directly influencing smoking cessation, particularly in a patient sample with high nicotine dependence, such as COPD patients. Similarly, In Koyun and Eroglu's study, after the smoking cessation intervention, none of the participants in the control group quit smoking, while 13.2% of the women in the intervention group quit smoking.[32] In another randomized controlled experimental study with COPD patients, patients were divided into 3 groups and the smoking cessation rate in the group in which motivational cognitive behavioral harm reduction program and combined therapy were applied was found to be higher than in the group in which nicotine replacement therapy was applied and this result was confirmed by a significant decrease in carbon monoxide measurements.[37] The

study results showed that the significant impact on decisional balance, self-efficacy, the process of behavior change, stages of change, and smoking cessation in the intervention group was also reflected in the patients' nicotine dependence levels. At the end of the intervention, the nicotine dependence levels in the intervention group decreased significantly compared to the control group. Additionally, as a reflection of the positive behavioral change, there was a significant improvement in spirometric evaluations, indicating better lung function in the intervention group. Although there was no significant difference between the groups, the intervention's therapeutic effect on the disease can be inferred from the improvements observed in the intervention group. As a result of the randomized controlled study conducted for smoking cessation in COPD patients, it was found that the Fargerstrom nicotine dependence level decreased compared to the group that received nicotine replacement therapy as a result of the intervention based on behavioral change by increasing motivation with a cognitive behavioral approach, and that the intervention applied increased the likelihood of smoking cessation more than the other.[38] In the current study, decreases in the number of cigarettes smoked daily, or complete cessation due to the nursing interventions led to a decrease in participants' nicotine dependence levels. According to the spirometry measurement results, lung capacity of the patients in the intervention group increased significantly.

CONCLUSIONS

The fact that patients diagnosed with COPD admitted to a single hospital constituted the sample and were followed up for only six months may constitute the limitation of this study. At least 1-year follow-up with the patient population admitted to different hospitals and follow-up of individuals in the maintenance phase after smoking cessation could have better revealed the effectiveness of the intervention. These can be considered as limitations of the study. In future nursing interventions based on the transtheoretical model, long-term follow-up may be recommended by planning a research budget. The strength of the study is that the nursing intervention was applied directly in the patient's own environment, at home and one-to-one counseling was performed.

According to the Transtheoretical Model, home-based nursing interventions increased the perception of benefits and self-efficacy regarding smoking cessation, decreased the perception of cons of change, increased smoking cessation rates, and positively affected nicotine dependence levels in patients with COPD.

It is recommended that future nursing interventions based on the Transtheoretical Model, incorporating home visits and motivational interviewing techniques, be conducted with nonsmokers with COPD as well as smokers with other chronic diseases.

Authorship Contributions

Idea/Concept: Figen Çavuşoğlu, Ayşe Şamlı, Oğuz Kılınç; Design: Figen Çavuşoğlu, Ayşe Şamlı, Oğuz Kılınç; Control/Supervision: Figen Çavuşoğlu, Oğuz Kılınç; Data Collection and/or Processing: Figen Çavuşoğlu, Nazmiye Tibel Tuna; Analysis and/or Interpretation: Figen Çavuşoğlu, Ayşe Şamlı; Literature Review: Figen Çavuşoğlu; Writing the Article: Figen Çavuşoğlu, Ayşe Şamlı, Oğuz Kılınç, Nazmiye Tibel Tuna; Critical Review: Ayşe Şamlı, Oğuz Kılınç, Nazmiye Tibel Tuna; References and Fundings: Figen Çavuşoğlu; Materials: Figen Çavuşoğlu.

REFERENCES

1. Öz MA, Özbek M, Aslan D. 15 Kasım Dünya KOAH Günü (2023). Hacettepe Üniversitesi Tıp Fakültesi Halk Sağlığı Anabilim Dalı Toplum İçin Bilgilendirme Dizisi (2023/2024-16). Available from: https://halksagligi.hacettepe.edu.tr/duyurular/halkayonelik/koah2023.pdf

2. Erdinç E. Chronic Obstructive Pulmonary Disease (COPD). [Cited: November 12, 2013]. Available from: http://168.144.121.167/TORAKSFD23NJKL4NJ4H3BG3JH/mesleki-kurslar-2-ppt-pdf/Erturk_Erdinc.pdf. (Linke erişilememektedir, kaynağa direkt erişilebilecek link eklenmelidir, erişim tarihi güncellenmelidir.)

3. Önen ZP, Şen E, Gülbay BE, Yıldız Akcakoca Ö, Acıcan T, Saryal S, et al. Long-term smoking cessation rates and differences in outpatients with Chronic Obstructive Pulmonary Disease and Asthma. Smoking and Health. 2011;12(2):67-71. doi:10.5152/ttd.2011.15.

4. Anderson JE, Jorenby DE, Scott WJ, Fiore MC. Treating tobacco use and dependence: an evidence-based clinical practice guideline for tobacco cessation. Chest. 2002;121(3):932-41. PMID: 11888979.

5. Godtfredsen NS, Prescott E. Benefits of smoking cessation with focus on cardiovascular and respiratory comorbidities. Clin Respir J. 2011;5(4):187-94. PMID: 21689381.

6. Pelkonen M, Notkola IL, Tukiainen H, Tervahauta M, Tuomilehto J, Nissinen A. Smoking cessation, decline in pulmonary function and total mortality: a 30 year follow up study among the Finnish cohorts of the Seven Countries Study. Thorax. 2001;56(9):703-7. PMID: 11514691; PMCID: PMC1746131.

7. Fiore MC, Jaén CR, Baker TB, Bailey WC, Benowitz NL, Curry SJ, et al. Treating tobacco use and dependence: 2008 update. Clinical Practice Guideline. Available from: https://www.google.com.tr/books/edition/Treating_Tobacco_Use_and_Dependence_2008/dUI4JJzIsikC?hl=tr&gbpv=1

8. Dale LC, Glover ED, Sachs DP, Schroeder DR, Offord KP, Croghan IT, et al. Bupropion for smoking cessation : predictors of successful outcome. Chest. 2001;119(5):1357-64. PMID: 11348939.

9. Moqaddas A, Reisi M, Mahmoodi M, Javadzade H. Predictive factors of stages of change in Hookah smoking cessation among Iranian adults based on the transtheoretical model. Addict Health. 2023;15(2):77-86. PMID: 37560398; PMCID: PMC10408760.

10. Tseng MF, Huang CC, Tsai SC, Tsay MD, Chang YK, Juan CL, et al. Promotion of smoking cessation using the transtheoretical model: short-term and long-term effectiveness for workers in coastal central Taiwan. Tob Use Insights. 2022;15:1179173X221104410. PMID: 35677388; PMCID: PMC9168925.

11. Sayed SH, El-Sakkar SM, Elsaka SA, El-Houfey AA. Effect of cigarette smoking cessation educational intervention based on the trans-theoretical model using motivational interviewing on Egyptian males' smoking knowledge and behavior: a randomized controlled trial. Tehran University of Medical Sciences. 2023;10(2):108-23. doi: 10.18502/npt.v10i2.12832

12. Sharifirad GR, Eslami AA, Charkazi A, Mostafavi F, Shahnazi H. The effect of individual counseling, line follow-up, and free nicotine replacement therapy on smoking cessation in the samples of Iranian smokers: examination of transtheoretical model. J Res Med Sci. 2012;17(12):1128-36. PMID: 23853630; PMCID: PMC3703164.

13. Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: toward an integrative model of change. J Consult Clin Psychol. 1983;51(3):390-5. PMID: 6863699.

14. Redding CA, Rossi JS, Rossi SR, Velicer WF, Prochaska JO. Health behavior models. The International Electronic Journal of Health Education. 2000;3(Special Issue):180-93.

15. Wei X, Guo K, Shang X, Wang S, Yang C, Li J, et al. Effects of different interventions on smoking cessation in chronic obstructive pulmonary disease patients: a systematic review and network meta-analysis. Int J Nurs Stud. 2022;136:104362. PMID: 36206617.

16. Principe R, Zagà V, Martucci P, Di Michele L, Barbetta C, Serafini A, et al. Smoking cessation in the management of Chronic Obstructive Pulmonary Disease (COPD): narrative review and recommendations. Ann Ist Super Sanita. 2024;60(1):14-28. PMID: 38920255.

17. Effing T, Monninkhof EM, van der Valk PD, van der Palen J, van Herwaarden CL, Partidge MR, et al. Self-management education for patients with chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2007;(4):CD002990. Update in: Cochrane Database Syst Rev. 2014;(3):CD002990. PMID: 17943778.

18. Jeppesen E, Brurberg KG, Vist GE, Wedzicha JA, Wright JJ, Greenstone M, et al. Hospital at home for acute exacerbations of chronic obstructive pulmonary disease. Cochrane Database Syst Rev. 2012;2012(5):CD003573. PMID: 22592692; PMCID: PMC11622732.

19. Heatherton TF, Kozlowski LT, Frecker RC, Fagerström KO. The Fagerström test for nicotine dependence: a revision of the Fagerström Tolerance Questionnaire. Br J Addict. 1991;86(9):1119-27. PMID: 1932883.

20. Uysal MA, Kadakal F, Karşidağ C, Bayram NG, Uysal O, Yilmaz V. Fagerstrom test for nicotine dependence: reliability in a Turkish sample and factor analysis. Tuberk Toraks. 2004;52(2):115-21. PMID: 15241694.

21. Prochaska JO, Velicer WF, DiClemente CC, Fava J. Measuring processes of change: applications to the cessation of smoking. J Consult Clin Psychol. 1988;56(4):520-8. PMID: 3198809.

22. Koyun A, Eroglu K, Bodur S. Sigara içen yetişkinler için Geliştirilmiş Değişim Aşamaları Modeli Ölçeklerinin Türkçeye uyarlama çalışması [Turkish adaptation study of Stage of Change Model Scales which developed for adults who smoke]. Turkiye Klinikleri J Nurs Sci. 2015;7(2):69-78. doi: 10.5336/nurses.2013-33724.

23. Velicer WF, Diclemente CC, Rossi JS, Prochaska JO. Relapse situations and self-efficacy: an integrative model. Addict Behav. 1990;15(3):271-83. PMID: 2378287.

24. Velicer WF, DiClemente CC, Prochaska JO, Brandenburg N. Decisional balance measure for assessing and predicting smoking status. J Pers Soc Psychol. 1985;48(5):1279-89. PMID: 3998990.

25. Koyun A, Eroglu K. Model of Change Stages (Prepared according to Transteoretic Model and Stages) Guideline of Smoking Cessation. 1st edition, Palme publication, Ankara, 2013. p. 51-126. (Tez kaynağımı, kitap kaynağı mı?)

26. Çavuşoğlu F. COPD and Cigarette. 1st ed. Samsun: Ondokuz Mayıs University publication. 2017

27. Partlak Günüşen, N, Üstün B. Randomize kontrollü çalışmalarda örneklemden kayıplar olduğunda gerekli bir istatistiksel analiz: Intention to treat analizi. Dokuz Eylül Üniversitesi Hemşirelik Yüksekokulu Dergisi, 2009;1(1):46-56. https://www.researchgate.net/publication/303961910_Intention_to_Treat_Analizi_Randomize_Kontrollu_Calismalarda_Orneklemden_Kayiplar_Oldugunda_Gerekli_Bir_Dstatistiksel_Analiz_Intention_to_Treat_Analizi

28. Örsel O. Tobacco and Tobacco Control. Available from: http://file.toraks.org.tr/TORAKSFD23NJKL4NJ4H3BG3JH/kisokulu5-ppt-pdf/osman_orsel_tutun.pdf Date of access: September 10, 2019 (Linke erişim sağlanamamaktadır, erişilebilecek link eklenmelidir, erişim tarihi güncellenmelidir.)

29. Williams MT, Effing TW, Paquet C, Gibbs CA, Lewthwaite H, Li LSK, et al. Counseling for health behavior change in people with COPD: systematic review. Int J Chron Obstruct Pulmon Dis. 2017;12:2165-78. PMID: 28794621; PMCID: PMC5536233.

30. Fjalldal SB, Janson C, Benediktsdóttir B, Gudmundsson G, Burney P, Buist AS, et al. Smoking, stages of change and decisional balance in Iceland and Sweden. Clin Respir J. 2011;5(2):76-83. PMID: 21410899.

31. Yalçınkaya Alkar Ö, Karanci AN. What are the differences in decisional balance and self-efficacy between Turkish smokers in different stages of change? Addictive Behaviors. 2007;32(4):836-49. doi:10.1016/j.addbeh.2006.06.023.

32. Koyun A, Eroğlu K. The effect of transtheoretical model-based individual counseling, training, and a 6-month follow-up on smoking cessation in adult women: a randomized controlled trial. Turk J Med Sci. 2016;46(1):105-11. PMID: 27511342.

33. Lindberg A, Niska B, Stridsman C, Eklund BM, Eriksson B, Hedman L. Low nicotine dependence and high self-efficacy can predict smoking cessation independent of the presence of chronic obstructive pulmonary disease: a three year follow up of a population-based study. Tob Induc Dis. 2015;13(1):27. PMID: 26321897; PMCID: PMC4551746.

34. Chang YH, Fu CH, Hsu MH, Okoli C, Guo SE. The effectiveness of a transtheoretical model-based smoking cessation intervention for rural smokers: a quasi-experimental longitudinal study. Patient Educ Couns. 2024;122:108136. PMID: 38308975.

35. Chang L. A new health education for occupational health promotion- Transtheoretical Model approach. International Congress Series. 2006;1294(11):115-8. doi:10.1016/j.ics.2006.01.014

36. Kim YH. Adolescents' smoking behavior and its relationships with psychological constructs based on transtheoretical model: a cross-sectional survey. Int J Nurs Stud. 2006;43(4):439-46. PMID: 16150450.

37. Zarghami M, Taghizadeh F, Sharifpour A, Alipour A. Efficacy of smoking cessation on stress, anxiety, and depression in smokers with Chronic Obstructive Pulmonary Disease: a randomized controlled clinical trial. Addict Health. 2018;10(3):137-47. PMID: 31105911; PMCID: PMC6511395.

38. Sharifpour A, Taghizadeh F, Zarghami M, Alipour A. The effectiveness of individual interventions on smoking cessation of chronic obstructive pulmonary disease patients. J Nurs Midwifery Sci 2020;7:13-21. doi: 10.4103/JNMS.JNMS_38_19.