Original Article

TANAFFOS

Effects of a Comprehensive Care Program on the Readmission Rate and Adherence to Treatment in Elderly Patients with Chronic Obstructive Pulmonary Disease

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Background: The low treatment adherence of patients with chronic obstructive pulmonary disease (COPD) leads to the exacerbation of their symptoms and readmission. Comprehensive care programs are among interventions that can improve the patients' adherence to treatment and prevent readmission. The present study aimed to evaluate the effects of a comprehensive care program on the adherence to treatment and readmission of COPD patients.

Materials and Methods: This randomized clinical trial was performed in a hospital in Rafsanjan, Iran, in 2017. Sixty elderly patients with COPD were randomly enrolled in this study by pair-matching. The intervention group participated in a comprehensive care program, whereas the control group received routine care. The readmission rate and adherence to treatment were measured at one-, three-, and six-month intervals. To evaluate the patients' adherence to treatment, an adherence-to-treatment questionnaire for chronic diseases was used. Data were analyzed using Chi-square test, independent t-test, and repeated measures ANOVA at a significance level of 0.05.

Results: A significant difference was observed between the two groups in terms of readmission at the end of the study (P=0.03). In the intervention group, the mean level of adherence to treatment and its subscales improved as compared to the control group, and there was a significant difference between the two groups.

Conclusion: Although most of the patients in this study were old, with a rather low educational level and socioeconomic status, the care program could improve their treatment adherence and reduce the readmission rate.

Key words: Chronic obstructive pulmonary disease; Re-hospitalization; Readmission; Adherence to treatment; Elderly; Comprehensive care

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is one of the most common chronic and debilitating diseases among the elderly (1, 2). COPD is known as the fourth cause of mortality around the world. It is estimated that 210 million people suffer from this disease worldwide (3). Annually, more than 1.5 million people are referred to emergency rooms due to COPD, and 700,000 people are

hospitalized because of this disease (4). In Iran, about 10% of the population suffer from COPD (5). One of the most important problems of COPD patients is the recurrence of symptoms that results in their hospital readmission (6). The recurrence of symptoms is remarkable in these patients, as 18% of them are readmitted within one year after discharge (7). Evidence shows that readmission in COPD patients can lead to severe pulmonary dysfunction

(8), decreased quality of life (9), reduced survival (10), increased mortality and disability rates (8), and increased health and medical costs (10, 11).

Some of the factors contributing to the relapse of symptoms and readmission in COPD patients include the way of providing medical care services to patients, influenza and pneumococcal vaccination, oxygen therapy, respiratory rehabilitation, prescriptions, lifestyle, quality of life, socioeconomic support, physical activity, nutritional status, concurrent chronic diseases, and treatment adherence of the patients (10). One of the effective factors in hospital readmission is the patient's adherence to treatment (12-14). Low adherence leads to the exacerbation of the disease and results in hospital readmission (15). In this regard, a review study by Bryant revealed that at least 40% of COPD patients do not adhere to the medical treatment (16).

Comprehensive care programs, including self-care training programs, pulmonary rehabilitation programs, motivational and educational discussions and interviews for increasing treatment adherence, improvement of self-care behaviors and lifestyle (18), phone follow-ups (19), and home visits (20), are among interventions to enhance the treatment adherence of COPD patients and reduce their readmission (17). Previous studies have shown that different training programs have positive effects on self-care, quality of life, readmission, and mortality of patients (5, 21-24). Nevertheless, the type of training methods and their efficacy in patients' readmission vary in different studies. In this regard, Vanhaecht found that the self-care method had no significant effects on the readmission of patients after six months. However, it significantly reduced readmission after 30 days, improved treatment adherence, reduced the mortality rate, and shortened the length of hospitalization (25).

To the best of our knowledge, despite the high prevalence of COPD in Iran, only a limited number of studies have evaluated the patients' adherence to treatment and have proposed approaches to reduce the readmission rate. Overall, due to differences in factors affecting the patients' adherence to treatment, it does not seem logical to generalize the results of studies conducted on Iranian patients to other populations. Also, the measurement tools of adherence to treatment vary in different studies, and the reported rates vary. Therefore, it is necessary to evaluate the effects of comprehensive care programs on the adherence to treatment and recurrence of COPD in Iranian patients to suggest effective approaches.

MATERIALS AND METHODS

This randomized clinical trial (IRCT code: IRCT2017061822320N5) was carried out to determine the effects of a comprehensive care program on the readmission rate and adherence to treatment of elderly patients with COPD, who were referred to Ali-Ibn Abitaleb Hospital in Rafsanjan, Iran, in 2017. The inclusion criteria were as follows: 1) hospitalization with a definitive diagnosis of COPD exacerbation; 2) consciousness; 3) age above 60 years; 4) speaking Farsi; 5) lack of other debilitating physical or psychiatric diseases; and 6) access of the patient or his/her companion to a phone. The exclusion criteria were unwillingness to cooperate with the study and patient's death.

The instruments used in the present study included a demographic information form, disease-related variables, and an adherence-to-treatment questionnaire. The adherence-to-treatment questionnaire was rated on a six-point Likert scale (0=never and 5=always). The design and psychometric properties of this scale were evaluated by Seyed Fatemi et al. for the first time (26). This questionnaire contains seven subscales and 40 items, with items 33, 34, 35, 37, 38, 39, and 40 scored in reverse. The maximum and minimum scores can be calculated for each subscale. The items are scored in a positive direction; in other words, the higher the desirability of a feature is, the higher its score will be. Therefore, a high total score or a high score of a given subscale represents the respondent's high treatment adherence (Table 1).

Moreover, to evaluate the intensity of symptoms in the two groups, the COPD Assessment Test (CAT) was

employed before the study. This tool, which was designed by Jones et al. in 2009 (27), consists of eight items, including cough, phlegm, chest pain, dyspnea during physical activities, activity limitations, sleeplessness, energy level, and confidence leaving home. Each item is scored from zero to five, and the total score ranges from zero to 40. Based on the scores, the patients can be classified into three groups. Sigari and Ghafouri confirmed the reliability and validity of the Persian version of this test in their study. Also, based on their results, the Persian version of this test for the assessment of COPD has a direct relationship with the severity of airway obstruction, based on the GOLD criteria (28).

Table 1. Scores of subscales Treatment Adherence Questionnaire.

Dimension	The minimum and maximum score
1) Treatment effort	0 to 45
2) Willingness to participate in treatment	0 to 35
3) Adjustment capability	0 to 35
4) Integration of life and treatment	0 to 25
5) Treatment adherence	0 to 20
6) Treatment commitment	0 to 25
7) Hesitation in treatment implementation	0 to 15
Total score	0 to 200

After obtaining an ethical approval, a total of 60 elderly patients with COPD were randomly enrolled in this study by pair-matching. For randomization, the first patient to enter the study was randomly assigned to a group (intervention or control), while the next patient was assigned to the opposite group, based on age, sex, and duration of COPD; this process continued until sampling was completed. The subjects were assured about the confidentiality of their information and were divided into the control (usual care) and intervention (usual care and comprehensive care program) groups.

The comprehensive care program included self-care training, respiratory rehabilitation, phone follow-ups, home visits, specialist visits, and psychosocial support. The research team designed a training booklet, based on previous studies. The booklet included a brief explanation about the anatomy of the respiratory tract; an introduction to the disease and its treatment; drugs for respiratory disorders and the correct way of using inhalers; suitable diets for COPD patients; suitable physical activities; training respiratory rehabilitation; training for the management of acute symptoms; and familiarity with emergency drugs for severe attacks.

After stabilizing the patients, the self-care training program was presented to the intervention group, based on the content of the booklet. The booklet content was taught individually to each patient face-to-face, using a simple and comprehensible method. Five training sessions were held, and the duration of each session varied from 20 to 30 minutes, depending on the patient's tolerance. In the first session, the researcher introduced herself, as well as the study objectives and methods. Besides, the researcher explained the anatomy and physiology of the lungs and described the disease and its causes, symptoms, and treatments. In the second session, the patients were instructed on their diet, type of foods, daily activities, exercise and physical activities, walking, respiratory rehabilitation, pursed-lip breathing, and coughing for effective mucus discharge.

In the third session, the negative effects of cigarette smoking on the respiratory system were explained, and the patients were encouraged to reduce smoking and avoid exposure to harmful smoke. In the fourth session, the acute symptoms of COPD, management of acute symptoms, and familiarity with emergency drugs during acute attacks were explained. In the final session, the importance of adherence to medical and treatment regimens, the positive effects of oxygen therapy on the heart and respiratory system, and the way of using inhalers were discussed. Overall, training was fully compatible with the subjects' needs and knowledge. At the end of each session, the researcher's booklet and phone number were given to the patients.

To perform respiratory rehabilitation during hospitalization, the researcher educated the patients about

physiotherapy, breathing exercises, postural or bronchial drainage, pursed-lip breathing, and diaphragm breathing for 20 minutes per day. After discharge, a medical team conducted respiratory rehabilitation at home for the patients. After the first part of the intervention was implemented at the hospital, a specialist evaluated the quality of training. To ensure the implementation of the program based on the booklet content and to assess the patients' respiratory status, follow-up calls were made twice a week from the first month until six months after discharge. Also, the researcher's phone number was given to the patients and their companions. During phone calls, the symptoms of COPD exacerbation, including dyspnea, coughing, and changes in the consistency, color, and volume of mucus, were evaluated. The physicians visited the patients with unstable breathing, and measurements were done to improve their respiratory status.

To follow-up and evaluate the patients' respiratory status and review the training program, home visits were made in the first, third, and fifth months after consulting a specialist. In each visit, the respiratory status of the patient was evaluated using a pulse oximeter, lung auscultation, and assessment of respiratory symptoms. It should be noted that patients with financial problems were introduced to charity organizations for support. A specialist evaluated the respiratory status of patients in the clinic within three-month intervals until the end of the study. Before the intervention and one, three, and six months after discharge, the adherence-to-treatment questionnaire was completed. Also, the readmission rate was measured at one-, three-, and six-month intervals, based on the patient's medical file with an electronic file number in the health information system (HIS) (Figure 1).
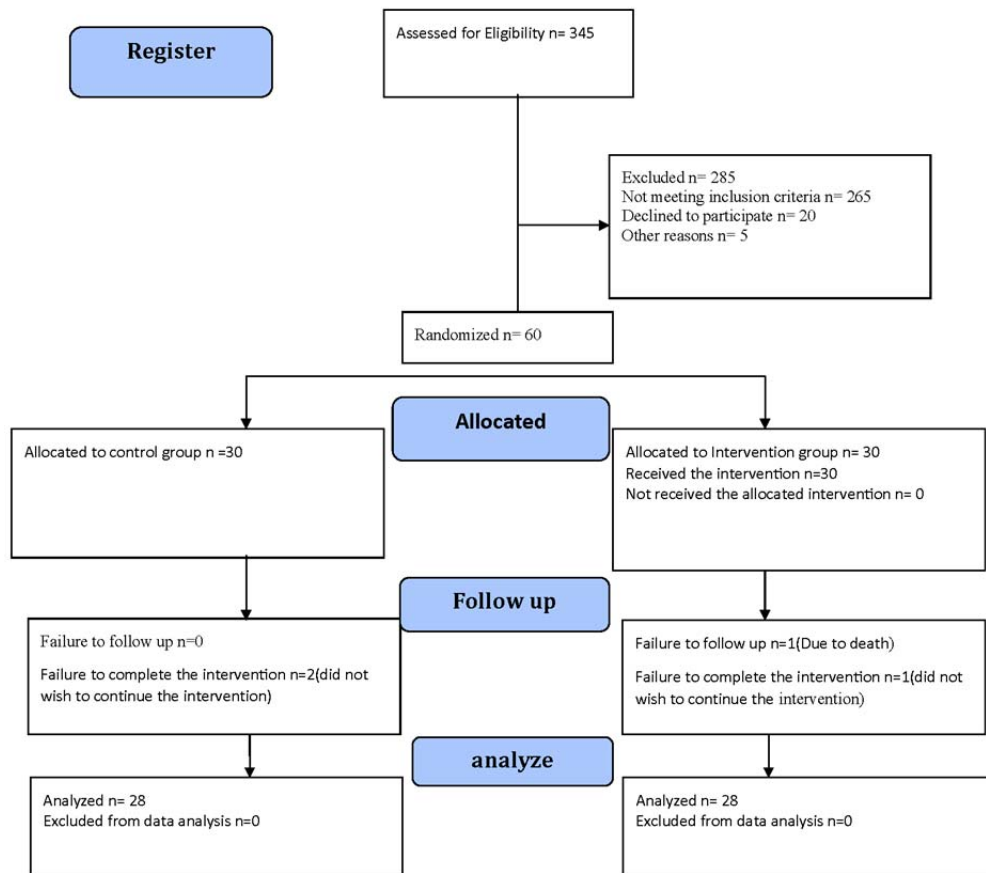

Figure 1. CONSORT flow chart of research implementation stages.

Data were analyzed using SPSS version 18. Quantitative variables are reported as mean±SD, and qualitative variables are reported as percentage and number. The parametric tests included independent and paired t-tests, Chi-square, McNemar's test, and ANOVA test. For non-parametric variables, the equivalent non-parametric tests were applied. The significance level was set at P≤0.05 for all tests. For demographic information, the frequency distribution indices and Chi-square test were used. Besides, a paired t-test was performed to evaluate the pre- and post-intervention status of each group. Also, an independent t-test was used to compare the groups. Kolmogorov-Smirnov test was carried out to determine the normality of data.

RESULTS

In both intervention and control groups, the mean age of the patients was above 70 years. The mean body mass index (BMI) of both groups before the intervention was almost similar (>21 kg/m^2). The results of independent t-test showed no significant differences between the two groups in terms of age and BMI (P=0.243). Most of the participants were male and literate (writing and reading), and only a limited number of patients had primary and high school education. In terms of occupation, the majority of patients were farmers, housewives, and retired, respectively. Based on the self-reports, 75% of the patients had a good socioeconomic status. The results of Chi-square test showed no significant difference between the two groups in terms of education (P=0.752), occupation (P=0.703), and socioeconomic status (P=0.313).

Analysis of disease background showed that the duration of having COPD was similar between the groups (5.64 and 6.18 years in the intervention and control groups, respectively) (P=0.649). Most of the patients had a history of smoking. The majority of patients with a smoking history were in the intervention group; the average duration of smoking was above 31 years in the two groups (P=0.989). Moreover, the average frequency of hospital admission in the two groups was almost similar (more

than 3.5 times) (P=0.686). Also, in the two groups, the average length of hospitalization was more than five days (P=0.400). The results of independent t-test showed no significant difference between the two groups in terms of disease-related variables. In both groups, the mean oxygen saturation (SpO$_2$) exceeded 82% (P=0.971), and the respiratory rate was more than 25 breaths per minute; the results of independent t-test showed no significant difference between the two groups (P=0.965) (Table 2).

Regarding the severity of symptoms before the intervention, the CAT scores of patients in the intervention and control groups were 35.32±2.93 and 33.86±3.35, respectively; however, the difference was not statistically significant (P=0.088). The mean total score of adherence to treatment and the scores of its subscales were almost the same in the two groups before the intervention, and independent t-test showed no significant difference (P=0.959). In the first month after the intervention, the total score of treatment adherence and the scores of its subscales, as well as adaptation ability, adherence to treatment, and treatment commitment, improved in the intervention group as compared to the control group, and independent t-test showed a significant difference between the groups. In the third month, the mean total score of treatment adherence and the scores of its subscales, expect hesitation in the implementation of treatment, increased as compared to the control group, and independent t-test showed a significant difference between the groups.

Moreover, after six months, the total score of adherence to treatment and the scores of its subscales showed greater improvements in the intervention group compared to the controls, and independent t-test showed a significant difference between the groups in terms of adherence to treatment. In figure 2, changes in the total score of adherence to treatment were compared between the control and intervention groups, which indicated an increasing trend in the mean total score of the intervention group within the first, third, and sixth months, compared to the pre-intervention stage (P=0.0001). However, in the

control group, there was no significant difference compared to the pre-intervention stage (Table 3).

Regarding readmission, 7 (25%) and 2 (7.1%) patients, who were readmitted in the first month, belonged to the control and intervention groups, respectively. In the third month, 4 (14.3%) and 2 (7.1%) patients, who were readmitted to the hospital, belonged to the control and intervention groups, respectively. Besides, in the sixth month, 1 (3.6%) and 5 (17.9%) patients from the intervention and control groups were readmitted. The results of Chi-square tests showed no significant difference between the two groups in terms of readmission in the first (P=0.143), third (P=0.388), and sixth (P=0.193) months.

At the end of the study, the highest readmission rate was reported in the control group. Four patients in the intervention group were readmitted to the hospital five times, whereas in the control group, 11 patients were readmitted during the study (20 readmissions in total). Overall, the frequency of readmission in the intervention and control groups was five and 20 times, respectively. Despite the lower rate of readmission in the intervention group compared to the controls, the results of Chi-square test showed no significant difference between the two groups in terms of the frequency of admissions (P=0.215). However, at the end of the study, four patients from the intervention group (14.3%) and 11 patients from the control group (39.3%) were readmitted. The results of Chi-square test showed a significant difference between the two groups regarding the number of readmitted patients (P=0.035) (Table 4).

Table 2. Comparison between intervention and control groups in terms of demographic characteristics and disease-related characteristics

Group		Intervention	Control	2χ		
				$2T,\chi$	Df	p-Value
Sex	Female (N, %)	6 (21.4)	11 (39.3)	X^2=2.11	1	0.146
	Male (N, %)	22 (78.6)	17 (60.7)			
Education	Reading and writing (N, %)	21 (75)	22 (78.6)	X^2=0.100	1	0.752
	primary of high school (N, %)	7 (25)	6 (21.4)			
Job	Farmer (N, %)	10 (35.7)	8 (28.6)	X^2=1.41	3	0.703
	Free job (N, %)	7 (25)	6 (21.4)			
	Retired (N, %)	5 ()17.9	4 (14.3)			
	Housewife (N, %)	6 (21.4)	10 (35.7)			
Economic situation	Meet the minimum requirements (N, %)	4 (14.3)	7 (25)	X^2=1.01	1	0.313
	Meet the essential needs (N, %)	24 (85.7)	21 (75)			
History of risk factors	Smoking (N, %)	18 (64.3)	13 (46.4)	X^2=1.15	2	0.563
	Job (N, %)	8 (28.6)	11 (39.3)			
	Environmental (N, %)	3 (10.7)	4 (14.3)			
Age (mean ± SD)		70.25±7.501	71.79±10.246	T=-0.640	54	0.525
BMI(Body mass Index) (mean ± SD)		22.902±4.193	21.122±6.779	T=1.181	54	0.243
duration of COPD (mean ± SD)		4.56±5.64	4.19±6.18	T=-0.457	54	0.649
Duration of smoking (year) (mean ± SD)		11.99±31.22	15.43±31.15	T=0.014	29	0.989
Previous admissions (mean ± SD)		4.18 ± 4.00	2.94 ±3.61	T=0.406	54	0.686
The length of hospitalization (mean ± SD)		1.11±5.71	1.66±5.39	T=0.849	54	0.400
SPO2(Saturation of Peripheral Oxygen)(mean ± SD)		6.60 ±82.46	8.16 ±82.39	T=0.036	54	0.971
RR(Respiratory Rate) (mean ± SD)		1.90 ±25.29	3.826 ±25.25	T=0.044	54	0.965

Table 3. Comparison of mean total score of Adherence to treatment and subscales before, first, third and sixth months in intervention and control groups

Group		Before Mean	First Month Mean	third Month Mean	Sixth month Mean	Within group
Treatment effort	Intervention	24.39+6.69	31.32+4.15	33.35+4.38	37.60+4.39	f=52.046 df=1.940 p=0.0001
	Control	26.60+7.88	25.64+6.71	25.10+6.49	24.78+6.35	f=2.325 df=1.505 p=0.123
Between group (p value)		0.262	0.0001	0.0001	0.0001	
Willingness to participate	Intervention	25.60+4.13	26.82+3.20	26.60+2.92	28.64+2.46	f=5.640 df=2.564 p=0.003
	Control	24.82+5.92	24.32+5.96	23.60+5.61	23.78+6.20	f=1.609 df=2.014 p=0.209
Between group (p value)		0.568	0.056	0.015	0.0001	
Adjustment capability	Intervention	20.03+4.93	25.64+4.00	28.14+3.30	30.17+3.54	f=50.218 df=1.809 p=0.0001
	Control	19.64+6.64	20.46+5.90	20.46+5.71	19.60+6.17	f=1.297 df=2.451 p=0.282
Between group (p value)		0.803	0.0001	0.0001	0.0001	
Integration of life and treatment	Intervention	19.07+2.46	20.21+2.71	21.32+1.88	22.00+2.03	f=8.783 df=2.805 p=0.0001
	Control	19.92+2.77	19.07+3.54	18.35+4.01	19.00+3.38	f=3.289 df=2.661 p=0.030
Between group (p value)		0.227	0.181	0.01	0.0001	
Treatment adherence	Intervention	10.35+4.50	14.25+3.02	15.14+2.63	16.32+2.19	f=19.733 df=1.924 p=0.0001
	Control	10.78+5.05	10.46+4.06	10.39+4.12	10.14+4.68	f=0.454 df=1.936 p=0.631
Between group (p value)		0.739	0.0001	0.0001	0.0001	
Treatment commitment	Intervention	13.03+3.44	17.35+4.09	13.03+3.43	19.89+2.88	f=24.390 df=2.382 p=0.0001
	Control	12.21+4.96	11.35+3.54	11.85+3.61	11.42+3.51	f= 1.383 df= 1.976 p= .259
Between group (p value)		0.475	0.0001	0.0001	0.0001	
Hesitation in treatment implementation	Intervention	5.25+4.02	5.07+2.49	5.96+1.29	5.78+1.77	f=0.792 df=1.806 p=0.447
	Control	4.07+4.64	4.50+3.65	4.07+3.44	3.39+3.41	f= 1.962 df= 1.716 p= 0.158
Between group (p value)		0.315	0.497	0.09	0.02	
Total score	Intervention	117.75+18.9	140.67+11.5	149.85+12.3	160.42+11.51	f=66.243 df=1.447 p=0.0001
	Control	118.07+27.28	115.82+21.99	113.85+20.71	112.1422.27	f= 2.627 df= 1.529 p= 0.097
Between group (p value)		0.959	0.0001	0.0001	0.0001	

Table 4. Comparison of intervention and control groups in terms of re-admission in the first, third and sixth months after intervention and the end of the study

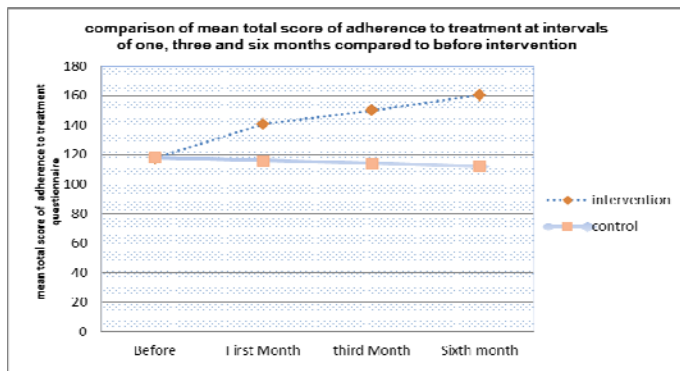| Re-admission		Intervention		Control		Chi-square test		
		Number	Percentage	Number	Percentage	2χ	Df	P
first month	Yes	2	7.10%	7	25.00%	2.33	1	0.143
third month	Yes	2	7.10%	4	14.30%	0.74	1	0.388
Sixth month	Yes	1	3.60%	5	17.90%	2.98	1	0.193
	Once	3	10.70%	7	25.00%			
Number of re-admissions	Twice	1	3.60%	1	3.60%	5.79	4	0.215
	Three and more	0	0.00%	3	10.70%			
Number of patients with re-admission	Yes	4	14.30%	11	30.30%	4.46	1	0.035

Figure 2. Comparison of the mean of total score changes of Adherence to treatment at intervals of before, one, three and six months after intervention in two groups of intervention and control

DISCUSSION

The findings of the present study indicated the positive effects of the comprehensive care program on the treatment adherence and readmission of elderly patients with COPD. In this study, the effective factors in treatment adherence and readmission of elderly patients with COPD, including age, history of smoking, previous hospital admissions, length of hospitalization, and SpO2 during admission, were matched between the control and intervention groups. Similarly, Sridhar matched the influential factors, such as age, gender, severity of disease, severity of dyspnea, previous hospital admissions, and use of oxygen at home before the study, between the two groups (20). In the present study, most of the patients were male, which is similar to previous studies (5, 11, 29). Also, the majority of our patients were smokers. In other similar studies, smoking has been also introduced as the main risk factor for COPD (30).

Regarding the readmission rate, despite reductions in the number of readmitted patients and the frequency of readmission within the first, third, and sixth months, no significant difference was observed between the two groups. However, at the end of the study, there was a significant difference between the two groups in terms of the number of readmitted patients within six months. Generally, the effects of training programs on readmission vary in previous studies. Some studies have reported the short-term effectiveness of training and management programs. In this regard, Benzo et al. (11) reported low readmission rates at one-, three-, and six-month intervals in the intervention group, and a significant difference was found between the intervention and control groups; nevertheless, after 12 months, the difference was not significant. Moreover, Ko et al. (31), in a clinical trial, reported the positive effects of a comprehensive care program on preventing the readmission of patients with COPD. After 12 months, the intervention group had a lower readmission rate, and a significant difference was observed between the groups.

Ospina et al. in a study evaluating the effects of care programs on the discharge of COPD patients found that these programs reduced the readmission rate, but did not have any considerable effects on the quality of life or mortality of the patients (32). Another review study by Moore et al. on the effects of respiratory rehabilitation as a care program on reducing the readmission rate of COPD patients showed that such programs reduced the readmission rate (33). However, other studies have

reported the ineffectiveness of comprehensive care programs in the readmission rate. Sridhar (2007), in a clinical trial, found that the nursing care program had no significant effects on the readmission rate of patients with COPD at the end of the study; the difference between the two groups was not significant (20). Moreover, Fan et al. reported that a comprehensive care program had no significant effects on the readmission rate of COPD patients at the end of the intervention (29).

Moreover, Prieto-Centurion et al. conducted a review study in the United States, based on the inclusion criteria of five studies, which measured the readmission rates in intervals of six to 12 months. The results showed that there was no specialized program for reducing the readmission rate of COPD patients. Also, one of the five clinical trials did not report any significant difference between the case and control groups in terms of the readmission rate. However, none of the reviewed studies measured the readmission rate at 30 days after discharge (34). Differences in the type and duration of interventions and disease progression may be a cause of discrepancy between the results of different studies. In most studies with long-term follow-ups, the number of training programs, follow-ups, and visits reduced over time during the study. However, in the present research, all patients were able to call the researcher when needed and receive the required care.

The present findings showed that before the intervention, the mean total score of adherence to treatment and the scores of its subscales were not significantly different between the groups. The mean total score of adherence to treatment increased in the intervention group at one and three months after the intervention. Also, after six months, the mean total score of adherence to treatment and the scores of its subscales increased, which indicates the positive effect of comprehensive training on treatment. However, only a limited number of interventional studies have been conducted on the treatment of COPD patients.

In this regard, Abdulsalim et al. conducted a randomized clinical trial and evaluated the effects of a care program and medical training on the treatment adherence of patients with COPD (35). To measure treatment adherence, the medication adherence questionnaire (MAQ) and the self-report Morisky medication adherence scale were used. Their results showed that treatment adherence improved within the mentioned intervals, and maximum change was observed at six months after the intervention; however, the treatment adherence subscales were not compared between the two groups.

Moreover, Wei et al. in a randomized clinical trial, evaluated the effects of a medication care program on the treatment adherence of patients with COPD (36). Their results indicated no significant difference between the groups regarding treatment adherence in the first month after the intervention. However, treatment adherence improved at six and 12 months after the intervention, and a significant difference was observed between the two groups. Generally, in all studies on treatment adherence, only the variable of adherence was reported. In most of these studies, the patient's status or social factors affecting treatment were not considered, or only a particular dimension of treatment adherence, such as medication adherence, was examined (37).

The findings of the present study revealed that interventional training programs, such as remote training and short-term interactions between the patient and the medical team, could not improve treatment adherence in the elderly patients with a chronic disease (38). Since treatment adherence is not dependent on a single variable and is influenced by several factors, such as the patient's educational level, social and economic support, knowledge, beliefs, attitudes, self-efficacy, awareness of disease and treatment, advanced age, and drug costs, (15, 35, 39), comprehensive interventions for patients with chronic diseases can positively affect their treatment adherence.

The main limitation of this study was the use of CAT questionnaire to assess the severity of symptoms in both groups.

CONCLUSION

Based on the findings of long-term studies, the effectiveness of interventions is at the highest level in the first six months after the intervention; therefore, in the present study, the duration of intervention was six months. The present results indicated that comprehensive training reduced the readmission rate of patients with COPD and increased their treatment adherence. Although the patients' educational level and socioeconomic status were low, and they were old, the positive effects of the intervention were evident, and a significant difference was observed between the two groups. Therefore, it is suggested to establish continuous interventions with full monitoring of patients to reduce the recurrence and exacerbation of symptoms, decrease the readmission rate, and increase treatment adherence in patients.

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Conflicts of interest

Nothing to declare.

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