

The effect of home-based pulmonary rehabilitation on self-efficacy in chronic obstructive pulmonary disease patients

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Abstract

Objective: To investigate the effect of pulmonary rehabilitation on the self-efficacy of patients with chronic obstructive pulmonary disease.

Methods: The randomised case-control trial was conducted from December 2010 to February 2011 at Masih-Daneshvari Hospital, Tehran, Iran, in an outpatient clinic and comprised patients with mild to moderate chronic obstructive pulmonary disease. The patients were randomly divided into experimental and control groups. The pulmonary rehabilitation programme for the experimental group consisted of education about the disease, diet therapy, stress reduction methods, effective cough, breathing exercises, and muscle stretching exercises. The patients were encouraged to practise the programme at home three times per week for 7 weeks. They were followed up through weekly telephone contacts. The control group received only routine visits and weekly telephone follow-up. Data were gathered using the Persian version of chronic obstructive pulmonary disease self-efficacy scale, which was filled out at baseline and 7 weeks post-intervention. SPSS 16 was used for statistical analysis.

Results: Of the 66 patients in the study, 34(51.5%) were in cases and 32(48.5%) were controls. The overall mean age was 56.65±8.83 years and 47(71.2%) were males. There was a significant difference between the two groups in total score of self-efficacy ($p<0.001$) and so was the case with all subscales of self-efficacy ($p<0.001$).

Conclusion: Pulmonary rehabilitation programme can be used by nurses during discharge planning for patients in order to improve all subscales of self-efficacy of those suffering from chronic obstructive pulmonary disease.

Keywords: Chronic obstructive pulmonary disease, Pulmonary rehabilitation, Self-efficacy. (JPMA 65: 1041; 2015)

Introduction

Chronic obstructive pulmonary disease (COPD) is ranked as the fourth cause of death worldwide and, according to a recent report presented by the World Health Organisation (WHO), it will go to the third rank by 2030.¹ In 18 provinces of Iran in 2003, 105 out of every 100,000 persons aged 15-49 years suffered from COPD, while 1057 out of every 100,000 persons aged 50 and above were affected by the disease.² COPD is a chronic and progressive condition which needs long-term care.³ Nowadays, healthcare programmes are planned with a patient-centred approach.⁴ In this

regards, increasing the patients' ability to conduct and follow their own self-care activities through promoting their self-efficacy has become one of the most important parts of care plans. The nurse should assess the self-efficacy and self-care behaviours of COPD patients as one of the main parts of clinical nursing performance.⁵

Self-efficacy is a social cognitive concept derived from the Albert Bandura's theory (1994), which focuses on people's belief about their ability to perform activities successfully.⁶ It has been shown to have powerful effect on the selection of health activities and behaviours and brings a commitment to perform them.^{7,8}

Self-efficacy can be improved through mastery experience (experiencing of success in performing tasks), vicarious experiences (seeing the successful experiences of social similar models), reinterpretation of symptoms (self-judging about somatic and emotional symptoms), and social persuasion (judging others about one's capabilities to accomplish a task).⁶

Self-efficacy plays an important role in the selection of

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health behaviours and it has a positive relationship with self-care behaviours. Self-efficacy can be regarded as a basis for changing behaviours and improving self-management.⁷

Since there is no definite cure for COPD, it is very important for the patients to control their own disease and increase their independence.⁹ Pulmonary rehabilitation programme is a part of the treatment of COPD with the goal of the patients' access to optimum level of independence by making them aware about the disease, its symptoms and treatment so that they may actively participate in their own care.¹⁰ The nurse can use this programme to improve the perception of patients about their functional performance.¹¹

A study on the effects of COPD self-care management education at a nurse-led primary healthcare clinic showed that ordinary care did not have an effect on COPD patients' quality of life and smoking habits, and suggested that a structured programme with self-care education is needed to motivate patients for lifestyle changes.¹²

Another study showed that this programme can improve functional status and health perceptions after 12 weeks, but couldn't change fatigue level. It concluded that this programme had an immediate effect, but it was not sustained.¹³ A study about the effect of breathing exercises on the fatigue levels of COPD patients showed that this programme was effective in terms of fatigue level of COPD patients.¹⁴

Few studies have been conducted to evaluate the effect of pulmonary rehabilitation programme on the self-efficacy of COPD patients and ones that investigated the effect of teaching or treatment-based self-efficacy.^{15,16} But complete home-based rehabilitation has not been recommended by a study that investigated the effects of home-based pulmonary rehabilitation in COPD patients and reported that home rehabilitation is useful and have equivalent effect when compared with outpatient rehabilitation. A study about outpatient versus home-based pulmonary rehabilitation showed that self-monitored, home-based rehabilitation is an alternative to outpatient rehabilitation.^{17,18}

Since only a few studies have been conducted so far to investigate the effect of pulmonary rehabilitation programme on the self-efficacy of COPD patients, we planned the current study to examine a home-based pulmonary rehabilitation programme and assess the self-efficacy in a home-based education setting

compared to the usual care in COPD patients.

Patients and Methods

The randomised case-control trial was conducted from December 2010 to February 2011 at an outpatient clinic in Masih-Daneshvari Hospital, Tehran, Iran. With confidence interval (CI) of 95% and power of 95% the sample size was worked out using the formula,

$$N = \frac{(z_{1-\alpha} + z_{1-\beta})^2 (s_1^2 + s_2^2)}{(x_1 - x_2)^2}$$

It was calculated to be 70 cases (predicted 20% drop).¹⁴ Patients were recruited through the simple sampling method. While a few subjects left midway, data analysis for the excluded participants showed that they were the same as the average characteristics of the remaining participants in terms of demographic and disease-related specifications. As such, their omission did not have any effect on the results.

Those included were aged below 65 years; suffering from mild to moderate COPD according to Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria;¹⁹ not having participated in any sort of formal exercise training or pulmonary rehabilitation programme during the preceding year; having no cardiac, musculoskeletal and mental diseases interfering with exercise; being able to read, write and speak Persian; and willing to participate in the study. Those who experienced a recent exacerbation of the disease, or were advised by their treatment teams to restrict their mobility, or were unable to follow nutritional recommendations and exercise programmes were excluded.

The Research Ethics Committee affiliated with Tehran University of Medical Sciences approved the Study, and informed written consent was taken from the participants.

The subjects were assigned randomly to intervention and control groups.

The controls were subjected to only routine visits and followed by weekly phone contacts related to the process of the disease. The cases participated in the pulmonary rehabilitation programme, which had been designed by researchers based on the Bandura's self-efficacy theory.⁶

The rehabilitation programme included four parts in order to expand four self-efficacy sources in the patients: mastery experiences in order to create enough motivation to follow the rehabilitation programme and

successfully perform the pulmonary rehabilitation process. Telephone follow-up and answering patients' questions about the programme were compatible with the intention of gradual increase in the intensity of the rehabilitation process; verbal persuasion in order to reinforce training and to make sure that both the patients and researchers had carried out the advised activities; vicarious experiences for considering the researcher as a successful model of performing exercise and respiratory practices; and emotional arousal through providing instruction about stress reduction methods, dyspnoea management strategy, and effective coughing.

The content of the rehabilitation programme gathered in booklets were validated by three nursing experts and delivered to the patients after the introductory educational sessions.

The face-to-face educational sessions of the rehabilitation programme consisted of three parts held within 30 minutes with the consideration of rest of the intervals. It included self-care and self-management trainings, nutritional recommendations, stress reduction methods (deep breathing, exercises, visual imagery, and progressive muscle relaxation), effective cough, breathing exercises (deep breathing, pursed-lip and diaphragmatic breathing), short breath control strategies in crucial situations, and muscle stretching exercises.

In order to develop opportunities for active vicarious experience, the researcher was regarded as successful model for performing respiratory techniques and muscle stretching exercises. The patients were then asked to perform the same respiratory techniques and muscle stretching exercises in front of the trainer to ensure correct performance. Verbal incentive and social influence were taught by one of the health supervisors in order to encourage the patients to do interventions in their own homes, which could be later followed up via telephone contacts. Then, the patients were encouraged to follow the programme at home lasting 20 minutes, three times a week, and for seven continuous weeks.

Stretch muscle exercise programme consisted of three stages of warming, exercise, and cooling performed for about 1.5 hours after breakfast. Time of exercise was gradually increased from base of 5 minutes to 20 minutes by adding 3 minutes per week. Moreover, the patients were asked to perform breathing exercises for three to four times daily and during exercises. The usage of respiratory exercise, muscle stretching exercises,

effective cough, stress reduction methods, and nutritional recommendations was checked via phone and recorded separately on the programme checklists by patients and researchers. Telephone follow-up was provided according to the self-efficacy Bandura's theory and performed weekly for 7 weeks. Each telephone call lasted 15 minutes on average and was conducted for four purposes: assessing health behaviours, reinforcing education, answering the patients' questions, and encouraging patients to continue the pulmonary rehabilitation programme. In case the patients could not perform the assigned tasks correctly, the researcher helped the patients to resolve their problems.

Data gathering tools were a questionnaire that comprised 12 demographic questions and 6 disease-related questions, and the Persian version of COPD Self-efficacy Scale (CSES). The data were gathered at baseline and after 7 weeks of intervention.

The CSES is the most commonly used questionnaire to measure the self-efficacy of COPD patients^{15,20} and measuring the belief of the patient regarding his/her ability to transfer knowledge to practice how to avoid or manage breathing difficulties.²¹ The CSES was scored using 5-point Likert scale from "very confident" to "not at all confident". One approach was scored as the total degree of self-efficacy from among four of very high (135-165), high (101-134), intermediate (67-100), and low (33-66). Another approach calculated each one of five subscales of self-efficacy, including "negative effect", "intense emotional arousal", "physical", "weather or environment" and "behavioural risk factors". Both approaches were calculated for calculating total self-efficacy and domain-specific self-efficacy.

The CSES was developed for COPD in 1991 and has shown good test-retest reliability and internal consistency with a Cronbach's alpha of 0.92.²¹

After obtaining copyright permission, the original instrument was translated into Persian and then translated back to English. A panel of 10 experts in nursing, health sciences and medicine, who specialised in respiratory care and self-efficacy, validated the contents of the questionnaire. One of the items which was asked about the consumption of alcohol and was contradictory with the Iranian culture and context was removed from the Persian version. For using this scale in Iran and calculating a consistency index of the questionnaire, a pilot study was conducted in patients suffering from COPD. The consistency index of the questionnaire using Cronbach's alpha was calculated, which was acceptable ($r=0.94$).

The final version of the Persian CSES version with 33 items in five subscales was used to gather data in the study.

Data was analysed using SPSS 16. The normal distribution of the samples was checked through Kolmogorov-Smirnov test. In addition to descriptive statistics, Chi-squared or Fisher exact tests were applied to assess relation between nominal variables. To assess group self-efficacy score before intervention, independent t-test was used. Repeated measures analysis of variance (ANOVA) was used to compare significant differences between means of pre- and post-intervention scores in the two groups. $P < 0.05$ was taken as statistically significant.

Results

Initially 70 patients were enrolled and randomly

Table-1: Demographic and disease-related data.

Group characteristics		Experience	Control	P value*
Gender	Female	10(%15.2)	9(%13.9)	0.908
	Male	24(%36.4)	23(%34.8)	
Educational level	Primary	24(%36.4)	24(%36.4)	0.688
	Secondary	10(%15.2)	8(%12.1)	
History of smoking	YES	24(%36.4)	23(%34.8)	0.908
	NO	10(%15.2)	9(%13.6)	
Stage of disease	I	15(%22.7)	14(%21.2)	0.976
	II	19(%28.8)	18(%27.3)	

Data is expressed as numbers and percent.

*P-value for compare demographic data using chi- square or Fisher Exact tests

P-value ≤ 0.05 .

Table-2: Comparison of mean differences in self-efficacy scores and in subscale self-efficacy scores of the two groups, before and after study.

	Group Time	Experience (Mean \pm SD)	Control (Mean \pm SD)	Sig (group)
Self-efficacy	Pre	97.41 \pm 20.54	99.53 \pm 17.01	<0.001
	Post	137.79 \pm 10.68	92.47 \pm 16.85	
Negative affect	Pre	38 \pm 6.48	49.35 \pm 3.49	<0.001
	Post	38.75 \pm 5.80	36.44 \pm 5.51	
Intense emotional arousal	Pre	25.59 \pm 5.36	34.59 \pm 3.38	<0.001
	Post	27.31 \pm 7.04	24.62 \pm 4.45	
Physical exertion	Pre	10.91 \pm 3.74	18.03 \pm 2.72	<0.001
	Post	11.50 \pm 3.21	10.19 \pm 2.99	
Weather environmental	Pre	16.59 \pm 3.31	23.62 \pm 2.7	<0.001
	Post	17.22 \pm 2.86	16.22 \pm 3.11	
Behavioral risk factor	Pre	6.23 \pm 2.73	11.88 \pm 1.74	<0.001
	Post	6.75 \pm 3.11	5.56 \pm 2.45	

P-value for differences between groups using Repeated Measures ANOVA

P-value ≤ 0.05 .

allocated 35(50%) cases and 35(50%) controls. However, 4(5.7%) patients left during the study and the final sample comprised 66(94.3%) patients. Of them, 34(51.5%) were cases and 32(48.5%) were controls. The overall mean age was 56.65 \pm 8.83 years; 47(71.2%) were males; 48(73%) had primary school education; 25(53%) were smokers having a smoking history of at least 20-40 pack years; 37(56%) were in the second stage of COPD. There was no statistically significant difference between the two groups regarding demographic and disease specifications before the intervention ($p > 0.05$ each) (Table-1).

Mean self-efficacy of both groups before the intervention was 98.47 \pm 18.85. Post-intervention, it remained intermediate 92.47 \pm 16.85 in the control group, while in the intervention group, it improved to 137.79 \pm 10.6 ($p < 0.0001$) (Table-2).

There was no significant difference between the two groups in self-efficacy subscales before the intervention. In the control group significant reductions were reported in all subscales of self-efficacy ($p < 0.0001$ each) except weather/environmental subscale after the intervention.

Discussion

The purpose of the study was to investigate the effect of pulmonary rehabilitation programme on self-efficacy in COPD patients. It was found that the intervention group had a high self-efficacy score, while the control group had intermediate. A study on using self-efficacy theory to educate a patient with COPD showed that the patients' total CSES scores on baseline were very low, while these values changed significantly after 3 and 12 months of training.¹⁶ One study used three intervention treatments: 1) The Dyspnoea Self-Management Programme; 2) The Dyspnoea Self-Management Programme and an additional four treadmill exercise sessions for 30 minutes once every other week for 8 weeks; and 3) The Dyspnoea Self-Management Programme and an additional 24 treadmill exercise sessions for 30 minutes three times a week for 8 weeks.¹⁵ It showed that although self-efficacy increased after interventions in the three intervention groups, but there was no significant difference before and after the intervention ($p < 0.05$), while there was a significant change in self-efficacy of asthma management after the intervention in the three groups. It was believed that the CSES tests the certainty of the participants about two criteria of asthma management or asthma prevention. Thus it used secondary scale of self-efficacy for managing shortness of breath (SEMSOB) which

tests the certainty of the participants about asthma management in order to specify the difference. However, the study declared that there was significant relationship between self-efficacy scale of COPD and asthma intensity and is sensitive to intervention after pulmonary rehabilitation programme.¹⁵ In our study, only the CSES was used which measured significant improvements in the self-efficacy of the patients after the intervention. Difference of these two studies may be due to a difference in type and term of the interventions and type of measurement scales.

One study believed that the main goal of treatment in COPD patients and those of chronic heart failure (CHF) should not only be the improvement of physical performance but also an increase in their self-efficacy, because self-efficacy impacts self-care activities.²² One study showed that self-efficacy and self-care behaviours are inter-related.⁵ Therefore, the self-efficacy theory is suggested to be used for designing the interventions for improving self-care behaviours in COPD patients.

Assessment of subscales of self-efficacy can help the nurses to identify what aspects need to be improved through the pulmonary rehabilitation programme, and design proper and specific programmes for patients. In our study, all aspects of self-efficacy before the intervention were low, while after the intervention they improved. A study also reported significant improvement in self-efficacy subscales after using the pulmonary rehabilitation programme.²³ In another study, however, no statistically significant differences were found in negative affect, emotional arousal, and behavioural risk factors after the nurse-initiated telephone follow-up intervention that was held for 3 months.²⁰ The difference may be due to a difference in the type of interventions.

Our study had its limitation. First, our sample size was relatively small. Second, we evaluated only short-term effect of pulmonary rehabilitation; and it would be better to investigate long-term effects of intervention. The study was conducted using convenience sampling and, hence, future studies with a larger sample are highly recommended. Additionally, more studies are recommended that should focus on interference and measurement of self-efficacy subscales.

Conclusion

The pulmonary rehabilitation programme was effective for improving self-efficacy in patients suffering from COPD. It can also be easily acquired by patients and caregivers. Nurses have an effective role to teach, implement, encourage and follow these patients. Our

results have created a basis for future research on self-efficacy as an overall as well as domain-specific strategy in COPD patients.

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