Effect of Nurse-Led Pulmonary Rehabilitation Program on Dyspnea and Fatigue for Patients with Chronic Obstructive Pulmonary Disease

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Abstract

Background: Nurse-led pulmonary rehabilitation program is an evidence-based, comprehensive intervention designed to enhance long-term compliance to health-promotion behaviors, thus improving the physical and psychological condition and quality of life of patients with chronic obstructive pulmonary disease. **Aim:** This study aimed to evaluate the effect of the nurse-led pulmonary rehabilitation program on dyspnea and fatigue for patients with chronic obstructive pulmonary disease through 1) Assess of patients' health status 2) Develop and implement a nurse-led pulmonary rehabilitation program based on patients' needs.3) Evaluate the effect of nurse-led pulmonary rehabilitation programs on patients' outcomes regarding the severity of dyspnea and fatigue among studied patients. **Design:** A quasi-experimental research design was utilized for the conduction of this study. **Setting:** This study was conducted at the chest department and Outpatient clinics at Ain shams University Hospital. **Sample:** A purposive sample of 86 adult patients diagnosed with chronic obstructive pulmonary disease was selected and randomly divided into two equal groups (study & control groups, 43 for each one). **Tools:** four tools were used in this study; Patients structured interview questionnaire, Observational Checklist, Medical Research Council Dyspnea Scale, and Fatigue Severity Scale. **The findings** of this study revealed that majority of the study group in post and follow up had satisfactory level of knowledge, competent level of performance, grade 2 for their level of breathlessness with activity. Meanwhile, they had a decreased level of fatigue severity. **The study concluded that** there was a highly statistically significant improvement of patient knowledge, practice, as well as, decreasing dyspnea and fatigue severity for the study group in the post and follow-up program implementation. **This study recommended that** further research studies are needed to develop systemically continuous self-management programs for patients with Chronic Obstructive Pulmonary Disease as ameans for improving the health status of those patients.

Keywords: Chronic obstructive pulmonary disease, Dyspnea, Fatigue, Nurse-led pulmonary rehabilitation program.

Introduction

Chronic obstructive pulmonary disease (COPD) is defined as a disease process characterized by progressive and irreversible limitation of airflow which is associated with an abnormal inflammatory response of the lungs tissues to toxic substances or gases **(Global Initiative for Chronic Obstructive Lung Disease, 2018).** Chronic obstructive pulmonary disease prevalence is directly related to tobacco smoking and its prevalence, morbidity, and mortality vary across countries and

within different groups **(Said, et al., 2015).**

Chronic Obstructive Pulmonary Disease is a public, preventable, and treatable disease that is characterized by chronic airflow limitation and persistent distressing respiratory symptoms, including breathlessness. Globally, the treatment and management of the chronic obstructive pulmonary disease is a major challenge for health care systems as people suffering from chronic obstructive pulmonary disease requires self-management skills and knowledge to slow down the worsening symptoms that hinder their normal functional performance of daily activities, to prevent exacerbations, and improve quality of life **(Yadav, et al., 2020)**.

Dyspnea and fatigue are the most common distressing symptoms in Chronic Obstructive Pulmonary Disease. Dyspnea is responsible for more admissions of patients to hospitals than any other symptoms; patients describe their dyspnea as heaviness, air hunger, difficulty breathing, or gasping. As COPD progresses, dyspnea worsens, becomes constant even while resting and interferes with activities of daily living (**Carette et al., 2019)**. Fatigue is considered the second most important symptom of chronic obstructive pulmonary disease after dyspnea; it is a major distressing and disruptive symptom that leads to significant disability and a negative effect on the quality of life. (**Goërtz et al., 2019).**

The nurse-led pulmonary rehabilitation program is a comprehensive intervention designed to enhance long-term compliance to health-promotion behaviors, thus improving the physical and psychological condition of people with COPD, is based on the patient's assessment and includes patient measures as behavioral modification, exercise training, and education. Pulmonary rehabilitation is a vital part of the management of chronic obstructive pulmonary disease that helps in relieving fatigue and dyspnea, reducing hospital admissions and mortality rate as well as improving health-related quality of life and exercise capacity, **(Zeng et al., 2018).**

The goal of the nurse-led program of care is to assist the rehabilitation staff nurse to design and implement treatment strategies that are based on scientific nursing theory related to self-care to support chronic disease patients to promote physical, psychosocial, and spiritual health, thus attaining and maintaining optimal function. Also, the rehabilitation staff nurse assists patients in adhering to a healthy lifestyle while providing a therapeutic environment for the development of the clients and their families (**Yina, Yangb & Yeb, 2018).**

Significance of the study

Worldwide, Chronic Obstructive Pulmonary Disease is the fourth most common cause of death; moreover, it is the third leading cause of death in the USA and its global burden is predicted to increase **(Terzikhan et al., 2016**). The prevalence of chronic obstructive pulmonary disease is difficult to determine because the condition does not usually manifest until midlife, may be confused with other conditions, and normally requires lung function assessment to confirm a diagnosis **(Fishwick et al., 2015).**

In Egypt, the chronic obstructive pulmonary disease is a rising major health problem; however, there is a lack of knowledge about its prevalence, morbidity, and mortality (**Ibrahim &**

Abd El-Maksoud, 2018)). According to Global Initiative for Chronic Obstructive Lung Disease, the prevalence of COPD among high-risk individuals in Egypt is about 10% and the key predictors for COPD diagnosis are the presence of chest wheezes, smoking history, and old age (**Said et al., 2015).** World Health Organization Statistics estimated that chronic respiratory diseases are the leading cause of death in Egypt, accounting for 4% of total deaths (**World Health Organization, 2018).**

Aim of the Study

The study aimed to evaluate the effect of the nurse-led pulmonary rehabilitation program on dyspnea and fatigue in patients with chronic obstructive pulmonary disease through:

1. Assess patients' health status.

2. Develop and implement a nurse-led pulmonary rehabilitation program based on the patient's needs.

3. Evaluate the effect of the nurse-led pulmonary rehabilitation program on patients' outcomes regarding the severity of dyspnea and fatigue among studied patients.

Hypothesis

The current study hypothesized that:

The application of nurse-led pulmonary rehabilitation program will have a positive effect on reducing the severity of dyspnea and fatigue among studied patients.

Operational Definition:

The nurse-led pulmonary rehabilitation program is a program of care designed to reduce the severity of dyspnea and fatigue among patients with chronic obstructive pulmonary disease and improving their health-related quality of life.

Research design

A quasi-experimental research design was used to achieve the aim of this study. Quasi-experiment design is effective because it uses "pre-post testing" and it has independent variables. It identifies a comparison group that is as similar as possible to the treatment group in terms of baseline (pre-intervention) characteristics **(Maciejewski, 2020).**

Setting

This study was conducted at the chest department and an outpatient clinic of the chest at Ain shams University Hospitals. The department has five rooms, three rooms for male and two for female patients, each room had nine beds.

Sample

A Purposive sample of eighty-six adult patients diagnosed with COPD was selected and randomly divided into two equal groups (study & control groups), 43 patients in each group.

The sample size was calculated by Epi-Info version 7 Stat Calc, [Center for Disease Control (CDC), WHO], based on the following criteria; confidence level of 90%, margin of error of 5%.

Inclusion Criteria

- Patients age above 18 years, from both sex who were admitted to the

chest unit and agree to participate in the study.

- Patients are not exposed before to any teaching or learning experiences regarding COPD.

Exclusion Criteria

Patients with chronic diseases (e.g. Corpulmonale, respiratory failure) may hinder the implementation of the program especially exercise.

Tools for data collection:

Data were collected using the following four tools:

The Tool I: Patients structured Interview Questionnaire

It was an Arabic, semi-structured interview questionnaire constructed by the researchers after reviewing the recent related literature **(Yang et al.,2019)**, it was divided into (3) parts:

Part A: Demographic characteristics of studied patients: concerned with collecting data about demographic data such as age, gender, and marital status, level of education, occupation, place of residence, housing, and environmental condition.

Part B: Medical history of studied patients: concerned with collecting data about the patient's history of disease regarding respiratory symptoms as breathlessness, cough, phlegm, and wheezes.

Part C: Patients' level of knowledge regarding COPD:

It was used to assess the knowledge level of patients about COPD. It consists of 23 multiple choice questions and three alternative responses reflecting 10 parts: (1) Definition of the disease; (2) Causes & risk factors; (3) symptoms. (4) Diagnosis; (5) medication; (6) diet; (7) exercise; (8) smoking; (9) control of environmental irritants; and (10) stress management.

Scoring system of patients' level of knowledge regarding COPD

The patients' level of knowledge consisted of (23) closed-ended questions and formed of multiple choice, the score 2 for the correct and complete answer, score 1 for the correct and incomplete answer, and 0 for incorrect answer. The total knowledge score was (46) which was classified as satisfactory if the score ≥ 75% of the total score and unsatisfactory < 75% of total scores **(Ibrahim & Abd El-Maksoud , 2018).**

Tool II: Observational checklist

The checklist was developed by the researcher after reviewing the related literature **(Lahham, McDonald & Holland., 2016).** The checklist was designed to assess the patient's practice includes 36 items reflecting 5 parts: using an inhaler (10 items), deep breathing exercises (4 items), pursed-lip breathing (8 items), coughing technique (6 items), and using of spirometer (8 items).

Scoring system of observational checklist

The checklist scoring was (2) mark for steps done correctly and complete, (1) mark for steps done correctly and incomplete, and (0) mark for steps not done. The scoring system was divided into two levels, satisfactory ≥ 75% of total scores and unsatisfactory < 75% of

total scores (**Ibrahim & Abd El-Maksoud, 2018).**

Tool III: Medical Research Council (MRC) dyspnea scale

Medical Research Council (MRC) dyspnea scale adopted from **(O'Donnell et al., 2007).** It was used to classify the severity of dyspnea, ranking level of breathlessness with activity on a scale of 1 – 5.

Scoring system of Medical Research Council dyspnea scale

The patients were ranked their level of breathlessness with activity on a scale of 1 – 5 in which (1) indicated breathless with strenuous exercise and (5) indicated too breathless to leave the house or breathless when dressing. The higher the score, the higher level of perceived disability.

Tool IV: Fatigue Severity Scale (FSS)

This scale was adopted from **(Krupp & LaRocca 1989)**. The fatigue Severity Scale designed to assess the level of fatigue, which consists of nine questions.

Scoring system of the fatigue severity scale

The patient response for each statement was made using a 7-point Likert scale ranging from 1 to 7, the lower value (1) indicates strong disagreement with the statement, whereas a high value (7) indicates strong agreement. A total score of less than 36 suggests that the patient did not suffer from fatigue and a total score of 36 or more suggests that the patient suffered from fatigue.

Nurse-Led Pulmonary Rehabilitation program

The Nurse-Led pulmonary rehabilitation program was developed by the researchers after reviewing the following related literature **(Zeng et al., 2018; Yina, Yangb & Yeb, 2018)**. It was translated by the researchers into Arabic language and designed as a booklet for patients with COPD based on patient's level of knowledge to enrich them with information related to COPD, and measures to overcome the complications, decrease dyspnea & fatigue severity, and measures to improve patient's quality of life, as well as applying procedures related to respiratory system with proper technique.

Tools validity and reliability

a) **Content validity**

Content validity was conducted to test the tool for appropriateness, relevance, correction, comprehension, and clearance through a jury of five experts, from the medical-surgical nursing staff at the faculty of nursing, Ain Shams University. Jury members were from different academic categories (professors and assistant professors). Their opinions were elicited regarding the tool format layout, consistency, and scoring system.

B) **Testing reliability**

Testing reliability was done by alpha Cronbach test (patients' level of knowledge was 0.884), the observational checklist was 0.799, Fatigue severity scale was 0.749, Medical Research Council (MRC) dyspnea scale was 0.875.

Ethical Considerations

Oral consent was taken from patients who agree to participate in the research process. The agreement for participation of the subjects was taken after explaining the aim of the study. They were assured that anonymity and confidentiality would be guaranteed and the right to withdraw from the study at any time without giving any reason was ascertained. Values, culture, and beliefs would be respected.

Pilot Study:

A pilot study was applied on a group of 9 patients (10% of the sample) to test the applicability of tools and clarity of the designed questionnaire, as well as to estimate the time needed to fill the tools. Patients included in the pilot study were also included in the main study subject, because there were no modifications in the tools.

Field Work:

Data collection was started and completed within 9 months in the period from the beginning of April 2019 until the end of December 2019

The purpose of the study was explained by the researchers to patients who agreed to participate in the study before data collection, the study sample was randomly divided into study and control group. The study tools were filled in and completed by the researchers in three stages (pre & post and follow up the implementation of the rehabilitation program).

Data collection was done through the following four phases:

The first phase (Assessment phase):

In this phase, the researchers collected data from both groups (study & control) starting with the control group to prevent contamination of the sample. The total time needed for filling different data collection tools was 30-45minutes

Second Phase (Planning phase):

Through this phase, the content of the program was designed based on the initial assessment. The researchers prepared training places for theoretical lectures, demonstrations, and redemonstration for the practical part, teaching aids, and media (videos, illustrative pictures, and handouts). A booklet as a teaching aid was prepared and then revised by a group of experts in the medical surgical nursing at faculties of nursing for content validity.

Third Phase (Implementation phase):

In this phase, the researchers implemented the developed nurse-led rehabilitation program for the study group. The total patient's group was10 groups each group was (3-5 patients). The total number of program sessions was six for each group, three sessions for the theoretical part, and three sessions for the practical part. Each theoretical session time was (40) minutes and each practical session time was (60) minutes, each one had its objectives.

The total hours of the program implementation were (5-6) hours for each patient group (2 hrs ±30 minutes) for the theoretical part and (3 hrs ±30 minutes) for the practical part.

Description of the nurse-led pulmonary rehabilitation program

The program aimed to provide COPD patients with knowledge and practice to improve patients' outcomes as reducing the severity of dyspnea and fatigue.

The six sessions were divided into two parts, three sessions for a theoretical part and three sessions for the practical part:

First part: theoretical sessions: it consisted of the following three sessions:

1.The first session aimed to identify the purpose of the program and basic knowledge regarding the respiratory system, its function, and disease process, using a lecture and .sharing discussion

2.The second session included necessary knowledge about COPD as diagnosis, treatment &complications.

3.The third session included knowledge about preventive self-care strategies regarding COPD (diet, exercise, smoking cessation, control of environmental irritants, and stress management).

Second part: Practical sessions, consisted of the following three sessions:

1.First session: At this session, the researchers clarified the benefits of practicing physical exercises and precautions that should be followed during practicing physical exercises and methods of managing sleeping disturbance, as well, the researchers explained fatigue management technique &energy conservation and how to control anxiety and depression.

2.Second session: In this session, the researchers clarified the purpose of deep breathing exercises and their technique as well the purpose of use of the inhaler and the proper technique of using it.

3.The third session: In this session, the researchers explained the purpose of pursed-lip breathing, coughing technique, and use of spirometer and applied the procedure for each one.

At the beginning of each session, the researchers summarized knowledge of the previous session and explained the objective of the present session. At the end of these sessions, the researchers emphasized the importance of follow-up visits and informed the participants that the researchers will follow them after three months by telephone and through outpatient clinics follow up.

Evaluation phase:

This phase was performed for both study and control groups post & three months follow-up program implementation. It included reassessment using the same tools of data collection which aimed to evaluate the effect of the implemented rehabilitation program on patient`s knowledge, practice, and reducing the severity of dyspnea and fatigue. It was tested by comparing the results of the data collected post immediate & three months after program implementation from the study and control groups.

Administrative Design:

To carry out the study, the necessary approvals were obtained from the hospital director and nursing director of Ain shams University Hospitals. Official letters were issued to them from the Faculty of Nursing, Helwan University, explaining the aim of the study to obtain permission for data.

Statistical Design

Data collection was obtained; they were organized, categorized, tabulated, and analyzed. Data were presented in tables using the Statistical Package for Social Science (SPSS). Statistical significant associations were assessed using percentage (%), mean, standard deviation, chi-square, t-test, /Fisher exact test, and p-value. The observed differences were considered as follow: Not significant (NS) $p > 0.05$, Significant (S) $p < 0.05$ and highly significant (HS) $p < 0.001$

Results

Table (I): Illustrates that (44.2%) of the study group and (60.5%) of the control group were in the same age group from 50 years to less than 60 years old, with a mean age (63.3± 6.1& 62.9 ± 5.8 respectively). (60.5%) and (72.1%) of the study and control groups were males. (60.5% & 65.1% respectively) of both groups were married, **as well,** (44.2% & 53.5%) respectively of both groups weren't read and write.

Regarding occupation, (51.2% & 48.8% respectively) did not work, (55.8% & 69.8% respectively) lived in a rural area, (65.1% & 79.1% respectively) didn't have enough monthly income. There were not any statistically significant differences between the study and the control group patients regarding all aspects of socio-demographic characteristics.

As well, (44.2% &48.8% respectively) of both groups were ex-smokers, while (18.6% & 16.3% respectively) were current smokers.

Concerning the history of respiratory symptoms table (2) illustrates that (97.7%, 100% respectively) of patients had breathlessness and wheezes, (69.8% &90.7% respectively) had cough, as well, (81.4% &100.0% respectively) had sputum production.

As regard frequency of symptoms per week, (90.47% &86.0% respectively) had breathlessness all the days \ week, (56.7%) of the study group had a cough all the days and (71.8%) of control group had cough 5-6 days per week. (68.6%) of the study group had sputum production all days per week. Meanwhile (51.2%) of the control group had sputum 5-6 days\week. (57.14%&48.8% respectively) had wheezes 3-4 days\week.

Figure (1): There was a highly statistically significant improvement among study group patients regarding the total pre-post and follow up test satisfactory scores of knowledge with ($p\leq 0.001$**). While there was no statistically significant improvement in the control group regarding the total pre-post and follow up test satisfactory scores of knowledge with ($p\leq 0.125$)

Table (3): shows that (40.0% & 42.7% respectively) knew about symptoms of COPD preprogram implementation. While (91.0%,83.0%) , (88.1%), (90.9%, 84.4%) & (90.4%) respectively of study group had knowledge about definition of disease, symptoms, diet and smoking in post and follow up program implementation phases. Highly statistically significant differences were found between both groups in post and follow up program implementation regarding all items of knowledge.

Table (4) shows that, (2.9% , 6.0%) &(2.9% , 5.0%)& (3.9% , 1.3%) of study and control group patients

respectively had competent level of practice about pursed-lip breathing, deep breathing exercise, and coughing technique preprogram implementation. while (98.0%, 95.0%) , (99% ,93%), (99%, 98%), (100%, 88.4%) & (95% ,90.3%) respectively of study group had competent level of practice about using inhaler, pursed-lip breathing , deep breathing exercise, coughing technique and using a spirometer post and follow up program implementation. Highly statistically significant differences were found between both groups' post and follow up program implementation regarding all items of practice.

Figure (2): There was a highly statistically significant improvement among study group regarding the total competent level of practice throughout program implementation phases with ($p\leq 0.001$**). While there was no statistically significant improvement in the control group regarding the total pre-post and follow up competent level of practice with ($p\leq 0.187$).

Table (5) illustrates that there were highly statistically significant differences between the study and control groups post and follow up program implementation regarding severity of dyspnea.

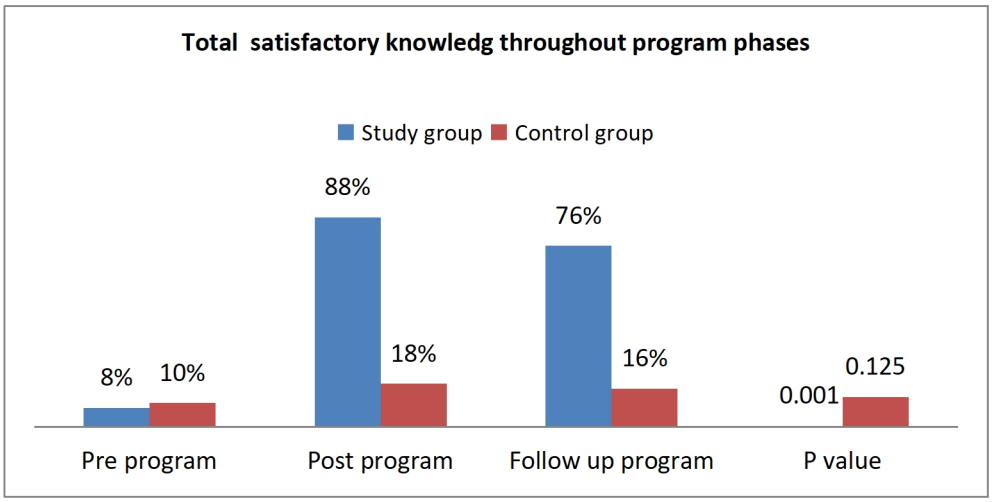
Table (6): presents that there were highly statistically significant differences between study and control groups regarding the total post and follow up fatigue severity with ($p\leq 0.001$),

Table(1): Demographic characteristics of the study and control group patients (Total N =86)

Items	Study(n=43) No	Study(n=43) %	Control(n=43) No	Control(n=43) %	Chi-square/ T test	p-value
Age Group						
>50	10	23.3	6	13.9		
50- >60	19	44.2	26	60.5	2.449	0.294
60+	14	32.5	11	25.6		
Mean ± SD	63.3± 6.1		62.9 ± 5.8			
Gender						
Male	26	60.5	31	72.1	1.301	0.254
Female	17	39.5	12	27.9		
Marital status						
Married	26	60.5	28	65.1	1.106	0.575
Divorced	1	2.3	0	0.0		
Widowed	16	37.2	15	34.9		
Educational level						
Not read and write	19	44.2	23	53.5		
Read and write	13	30.2	16	37.2	3.958	0.138
Secondary education	11	25.6	4	9.3		
	2	4.7	0	0.0		
Occupation						
Clerk						
Professional	11	25.6	11	25.6	2.497	0.476
Retired	8	18.6	11	25.6		
Does not work	22	51.2	21	48.8		
Residence place						
Rural	24	55.8	30	69.8]	1.792	0.181
Urban	19	44.2	13	30.2		
Income						
Enough	15	34.9	9	20.9	2.081	0.149
Not enough	28	65.1	34	79.1		
Smoking						
Current	8	18.6	7	16.3		
Nonsmoker	16	37.2	15	34.9		
Ex-smokers	19	44.2	21	48.8	1.213	0.545

Table (2): Frequency distribution of study and control group patients according to their history of respiratory symptoms (N=86)

Items	Study (n=43)		Control (n=43)		Chi-square\T-test	p-value
	No	%	No	%		
Breathlessness						
No	1	2.3	0	0.0	0.000	1.000
Yes	42	97.7	43	100.0		
Cough						
No	13	30.2	4	9.3	5.939	0.015
Yes	30	69.8	39	90.7		
Sputum production						
No	8	18.6	0	0.0	8.821	0.003
Yes	35	81.4	43	100.0		
Wheezes						
No	1	2.3	0	0.0	1.012	0.314
Yes	42	97.7	43	100		
Frequency of respiratory symptoms per week						
Breathlessness					1.413	0.493
All days	38	90.47	37	86.0		
5-6 days	4	9.53	6	14.0		
Cough						
All days	17	56.7	6	15.4		
5-6 days	9	30	28	71.8	6.983	0.072
3-4 days	3	10	3	7.7		
Only with resp. infection	1	3.3	2	5.1		
Sputum production						
All days	24	68.6	20	46.5		
5-6 days	10	28.6	22	51.2	2.005	0.571
3-4 days	1	2.8	1	2.3		
Wheezes						
All days	5	11.9	3	7.0	2.643	0.450
5-6 days	1	2.4	4	9.3		
3-4 days	24	57.14	21	48.8		
Only with resp. infection	11	28.57	15	34.9		



*Significant (S) p < 0.05 **Highly Significant (HS) p < 0.001 % 75 > Satisfactory level

Figure (1): Comparison between study & control group patients regarding total pre-post and follow up test satisfactory scores of knowledge.

Table (3): Comparsion between study and control groups satisfactory knowledge throughout program phases

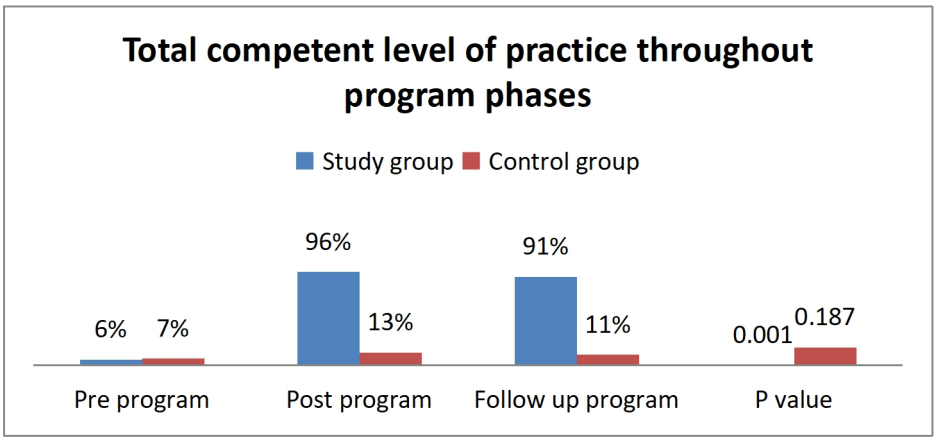
Items	Pre program				Post-program				Follow up			
	Study group %	Control group %	Chi-square	p-value	Study group %	Control group %	Chi square	p value	Study group %	Control group %	Chi-square	p value
Definition of disease	6.9	11.8	4.28	0.02	91.0	10.9	82.19	<0.001 **	83.0	10.9	72.9	<0.001 **
Risk factors	0.0	3.6	2.01	0.15	85.4	3.6	75.14	<0.001 **	78.4	3.8	75.0	<0.001 **
Symptoms	40.0	42.7	10.4	0.06	88.1	45.9	81.1	0.051*	88.1	42.7	89.0	0.051 *
Diagnosis	3.8	3.8	0	1	79.8	3.8	63.50	<0.001 **	65.8	3.8	43.5	<0.001 **
Medication	0.0	0.0	0	1	75.0	11.5	35.19	<0.001 **	36.5	0.0	23.2	<0.001 **
Diet	3.7	2.1	2.93	0.19 \	90.9	3.8	78.14	<0.001 **	84.4	3.8	68.21	<0.001 **
Exercise	0.0	0.0	0	1	84.4	3.8	68.21	<0.001 **	84.4	0.0	58.33	<0.001 **
Smoking	3.8	3.8	0	1	90.4	3.8	78.14	<0.001 **	90.4	3.8	78.14	<0.001 **
Control of environment irritatant	0.0	0.0	0	1	84.4	3.8	68.21	<0.001 **	75.8	0.0	32.02	<0.001 **
Stress management	0.0	0.0	0	1	83.9	3.5	67.95	<0.001 **	73.9	2.12	32.5	<0.001 **

*Significant (S) p < 0.05 **Highly Significant (HS) p < 0.001

Table (4): Percentage distribution of competent level of practice between study and control groups throughout program phases (N=86).

Items	Pretest				Post-test				Follow up test			
	Study group %	Control group %	Chi-square	p-value	Study group %	Control group %	Chi square	p value	Study group %	Control group %	Chi-square	p value
Using inhaler	2.7	0.0	1.012	0.314	98.0	2.3	82.09	<0.001**	95.00	2.3	79.92	<0.001**
Pursed lip breathing	2.9	6.0	3.108	0.078	99.0	6.98	88.00	<0.001**	93.0	5.098	77.78	<0.001**
Deep breathing exercise	2.9	5.0	3.04	0.40	99.0	5.0	82.00	<0.001**	98.0	5.0	82.00	<0.001**
Coughing technique	3.9	1.3	2.81	0.06	100.0	0.0	86.00	<0.001**	88.4	0.0	68.08	<0.001**
Using a spirometer	0.0	4.5	3.09	0.055	95.0	6.6	87.00	<0.001**	90.3	6.9	79.03	<0.001**

*** Statistically significant (*P* <0.05) ** Highly statistically significant (*P* <0.001)**



***Significant (S) p < 0.05 ** Highly Significant (HS) p < 0.001 % 75 >Competent level**

Figure (2): Comparison between study & control groups regarding total competent level of practice throughout program phases.

Table (5): Comparison between study and control groups regarding the severity of dyspnea throughout program phases (N=86).

MRC Dyspnea grades		Study group No	Study group %	Control group No	Control group %	Chi-square/Fisher exact test	P-value
Pre-program	Grade 3	6	14.0	4	9.3	0.453	0.797
	Grade 4	20	46.5	21	48.8		
	Grade 5	17	39.5	18	41.9		
Post-program	Grade 1	1	2.3	0	0.0	82.239	<0.001**
	Grade 2	26	60.5	0	0.0		
	Grade 3	16	37.2	6	14.0		
	Grade 4	0	0.0	20	46.5		
	Grade 5	0	0.0	17	39.5		
	Grade 3	28	65.1	6	14.0		
	Grade 4	4	9.3	20	46.5		
	Grade 5	0	0.0	17	39.5		

Table (6): Comparison between study and control groups regarding fatigue severity Scale throughout program phases (N=86).

	Study group	Control group		
fatigue severity	Mean + SD	Mean + SD	T-test	P-value
Pre- program	57.7 + 2.8	56.7 + 2.6	1.543	0.127
Post- program	24.8 + 4.8	57.7 + 2.8	38.819	<0.001**
Follow up program	33.1 + 4.1	57.7 + 2.8	32.298	<0.001**

Table (7): Relation between selected demographic characteristics and level of knowledge among studied patients post program implementation

	Total knowledge					
	Unsatisfactory		Satisfactory		Chi-square	P-value
Variables	**No**	**%**	**No**	**%**		
Gender						
Male	23	67.6	3	33.3		
Female	11	32.4	6	66.7	3.505	0.061
Age Group						
>50	8	23.5	2	22.2		
50- >60	14	41.2	5	55.6		
60+	12	35.3	2	22.2	0.712	0.701
Occupation						
Clerk	2	5.9	0	0.0		
Professional	11	32.4	0	0.0		
Retired	7	20.6	1	11.1		
Does not work	14	41.2	8	88.9	6.951	0.073

Discussion

Regarding the demographic characteristic of patients, the present study showed that more than two-fifths of the study group and about two-thirds of patients in the control group were in the same age group ranged from 50 years to less than 60 years old with a mean age (63.3± 6.1& 62.9 ± 5.8 respectively). This result is in agreement with **Li et al., (2020)** in their study about "Nonadherence in Home-Based Pulmonary Rehabilitation Program for COPD Patients **"** and mentioned that mean age in intervention and control groups were (65.3±8.8 &64.8±8.6) respectively.

However, this result is inconsistent with **Hamdi, Mostafa & Abdel Wahed, (2013)** as they studied "Smoking Cessation and Quality of life among Patients with Chronic Obstructive Pulmonary Disease after Motivational Interviewing" and found that the mean age of patients was 49 ± 12 in the intervention group and (50 ± 8) in the control group. This could be due to COPD is commonly affected older age as by aging physiological changes occur at alveoli and age may reflect the sum of cumulative exposures to COPD risk factors throughout the life span.

Regarding gender, the results of the present study revealed that two-thirds of the study group and more than two-thirds of the control group were males. This result is consistent with **Liacos et al., (2019)** who mentioned in their study about **"**The pulmonary rehabilitation adapted index of self-efficacy tool predicts the reduction in sedentary time following pulmonary rehabilitation in people with chronic obstructive pulmonary disease" that two-third of the study sample were male.

In the current study, the results showed that about two-thirds of the study and control group were married. This finding goes in line with **Kaya et al., (2018)** in a study about "Self-Efficacy Level and Patient Satisfaction with

Healthcare in Chronic Obstructive Pulmonary Diseases ". They mentioned that more than two-thirds of their study sample were married .this may be due to most of the study sample was within 60-65 years and usually, by this age, they are married according to Egyptian society customs.

Concerning **the educational level**, more than two-fifths of the study group and more than half of the control group weren't read and write. This result is consistent with **Yang et al., (2019);** who stated in their study about" Disease knowledge and self-management behavior of COPD patients in China," that more than half of the control group were illiterate. While this result is in disagreement with **Kaya et al., (2018)** who mentioned in their study that more than two-fifths of their study sample was primary education. This may be due to the nature of the setting as a governmental hospital serving low socioeconomic patients, so the majority of the patients coming to the hospital were none educated.

Regarding the patient's occupation, about half of the study and the control groups did not work. This result is consistent with **Goërtz et al., (2019**) who studied fatigue in patients with COPD and its correlation with the degree of airflow limitation and mentioned that more than half of their study sample did not work. While this result is in disagreement with **Hamdi, et al (2013)**, who mentioned that more than two-thirds of the study and control group were working. This may be due to the effect of disease on their work and the old age of studied patients.

Regarding **residente place**, more than two-thirds of the control group and more than half of the study group lived in a rural area. This result is congruent with **Steurer-Stey et al. (2018),** in their study about " Effects of the "Living well with COPD" intervention in primary care ", who found that most of their study sample lived in a rural community. While this result incongruent with **Badway, Hamed & Yousef (2016)**, in a study about "Prevalence of chronic obstructive pulmonary disease (COPD) in Qena Governorate", stated that the majority of the study sample lived in urban areas and only one fifth lived in rural areas.

Regarding **monthly income**, the present study showed that more than two-thirds of the study and the control groups didn`t have enough monthly income. This result is in agreement with **Yang et al., (2019)** who stated that nearly half of the study sample had inadequate monthly income. While this result in disagreement with **Sharma & Joshi (2015)** in their study **"**Quality of life of patients with chronic obstructive pulmonary disease in Chitwan, Nepal" who stated that more than two-thirds in their study had adequate monthly income. This finding goes in line with patients' educational level and reflects their low economic status that makes them seek medical treatment from this governmental hospital.

Concerning the **history of smoking**, less than half of the study and control group were ex-smokers, while the minority of the two groups were current smokers. This result is congruent with **Bradford et al. (2014),** who mentioned in their study about" Domain-specific self-efficacy is associated with measures of functional capacity and quality of life among patients with moderate to severe chronic obstructive pulmonary disease", that more than two-thirds of the study group were Ex-smoker and more than one fifth were current smokers.

In the current study, the results showed that there was no statistically significant difference between study and control groups regarding all aspects of demographic characteristics; this result indicates that both study and control groups were compatible. This result is in accordance with **Liu et al., (2015),** in a study about **"**Influence of COPD Assessment Test evaluation and rehabilitation education guidance on the respiratory and motor functions of COPD patients" they mentioned that the two groups had no significant difference**.**

Concerning **the history of respiratory symptoms**, nearly all study and control group patients had breathlessness and wheezes, more than two-thirds of the study group and the majority of the control group had cough, the majority of the study group, and all control group had sputum production These study findings are congruent with **Badway, Hamed & Yousef, (2016)** who mentioned in their study that breathlessness, cough, Phlegm, and wheezing were the most symptoms among the patients in their study.

The present study revealed that less than half of the study group had a family history of COPD and among them; about two-thirds of the control group had relation to those patients as father or mother. This result is in accordance with **Subba, (2014)** in a study about "Knowledge on self-care among COPD Patients attending at Chitwan medical college, teaching hospital". They mentioned that less than half of the study group had a family history and had a relation to those members as father and mother. While this result is in disagreement with **Badway, Hamed & Yousef (2016)**, who mentioned that less than one-fifth of the study group had a family history of COPD.

As regard patient's total knowledge the present study revealed that there were highly statistically significant improvement among study group patients regarding all items of patient's knowledge immediate post-program implementation than pre-program, with slightly decreased knowledge level in follow up than immediate post, while there was no statistically significant improvement in control group patients. This can be explained by the low educational level of patients that made them unaware of their health status. Therefore, the program implementation produced a high statistically significant improvement in patients' knowledge level. The slight decrease in the follow-up phase could be due to the spacing period between program implementation and the follow-up period.

This result in agreement with **Yeon et al. (2016)** who studied "Effects of educational interventions for chronic airway disease on primary care" and observed a statistically significant improvement in patients Knowledge about COPD after educational interventions. As well this result is in accordance with **Ferrone et al., (2019),** in a study about "The impact of integrated disease management in high-risk COPD patients in primary care" and mentioned that there were highly statistically significant improvement among study group subjects in all areas of patient's knowledge post-program implementation

The present study revealed that less than half of the study and control groups had satisfactory knowledge about symptoms of COPD preprogram implementation. While most of the study group had satisfactory knowledge about the definition of disease, symptoms, diet, and smoking post and follow up program

implementation. This result is in accordance with **Ibrahim & Abd El-Maksoud (2018),** in their study about " Effect of educational programs on knowledge and self-management of patients with chronic obstructive pulmonary disease ", they mentioned that majority of the study group had knowledge about the meaning of disease, risk factors, signs & symptoms, complications, nutrition, physical activity, smoking, and medication post and follow up program implementation

Regarding **patients' level of practice**, the present study finding revealed that there were no statistically significant differences between study and control group patients' pre-program implementation while there were highly statistically significant differences between study and control group regarding the competent level of total practices post and follow up program implementation. This could be due to educational material with the practical demonstration were effective and achieved a better improvement regarding patient's practice.

This result is in accordance with **Salah, Hamdi & Shehata (2013))** in their study "Improving breathlessness and fatigue in a patient with COPD", they mentioned that patients' level of practice, improved significantly in all items of practice as breathing exercises and inhaler uses during the post-program implementation phase. As well, this result is in accordance with **El-Gendy, (2015),** who assessed the effect of an educational intervention on knowledge, practices, and disease severity in patients with COPD and stated that all patients reported that they did not practice respiratory exercises or coughing technique before the educational program, showing a highly statistically significant difference after the intervention.

The present study revealed that a minority of study and control groups had a competent level of practice about pursed-lip breathing, deep breathing exercise, and coughing technique preprogram implementation. While most of the study group had a competent level of practice about using the inhaler, pursed-lip breathing, deep breathing exercise, coughing technique, and using a spirometer post and follow up program implementation. This result is in accordance with **Ibrahim & Abd El-Maksoud (2018),** who mentioned that majority of the study group had a competence level of practice about using an inhaler, pursed-lip breathing, deep breathing exercise, coughing technique, and using oxygen therapy post-program implementation

By evaluating **shortness of breath grades** pre and post-program implementation using the Medical Research Council dyspnea scale, the study results indicated that there were no statistically significant differences between study and control group patients during pre-program implementation, while during post and follow up program implementation, there were statistically significant differences between study and control group. This result is congruent with **Anastasaki et al., (2019)**, who implemented and evaluated a pulmonary rehabilitation program for patients with COPD, and found a highly statistically significant improvement post-program implementation regarding the severity of dyspnea. This reflects the patient's desire to learn and practice relieving measures to overcome this overwhelming problem that bother them.

By assessing **fatigue severity,** it was found that there were high statistically significant differences between study and control group patients regarding fatigue severity post-program implementation. While there were no statistically significant differences between both groups during pre-program implementation. This result in agreement with **Arslan & Oztunc (2015),** who found in their study about "The effects of a walking exercise program on fatigue in the person with COPD" that, no significant difference between the mean scores for pretest in both groups. While the mean fatigue score for the posttest in the intervention group was lower than the control group; and this difference was statistically significant.

On the same line **Paneroni et al., (2020),** who studied " The impact of exercise training on fatigue in patients with chronic obstructive pulmonary disease: a systematic review and meta-analysis ", and found statistically significant differences and change in fatigue symptoms after participation in the program. This could be due to fatigue is a subjective, unpleasant symptom that incorporates total body feelings ranging from tiredness to exhaustion, and interferes with the ability to function at normal capacity and may be affected by dyspnea and is frequently experienced by COPD patients.

Considering the ***Relation between*** demographic characteristics of the studied patients and total knowledge, the present study findings revealed that there was no statistically significant relation between demographic characteristics and total knowledge. This result was supported with **Kalaimathi, Vijayalakshmi, & Ragavan (2016)**, in a study about "Effectiveness of planned teaching program on knowledge about pulmonary rehabilitation among chronic obstructive pulmonary disease patients", reported that there was no significant relation between selected demographic variable such as age and sex and level of knowledge.

Conclusion

This study concluded that:

There was highly statistically significant improvement regarding the satisfactory scores of total knowledge, the competence level of total practice, as well as, decrease of dyspnea and fatigue severity for the study group in the post and follow-up program implementation. Also, there were statistically significant differences between study and control groups in relation to knowledge, practice, dyspnea, and fatigue severity in the post, and follow up phases of program implementation.

The results of the current study supported the hypothesis that nurse-led pulmonary rehabilitation program had a positive effect on reducing the severity of dyspnea and fatigue among studied patients.

Recommendations

Based on the previous results, the following recommendations are suggested:

- Nurse-led pulmonary rehabilitation program as a crucial part of the overall care of a patient with COPD have to be included in nursing plan of care.
- Future studies on a larger sample are highly recommended to achieve generalization of the results.

➢Further research studies are needed to develop systemically continuous self-management programs for patients with COPD to help in improving the health status of those patients.

➢Self-monitored home-based rehabilitation programs are recommended as an alternative to the traditional outpatient (hospital or independent facility) based programs.

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