Assiut Scientific Nursing Journal
http://asnj.journals.ekb.eg http://www.arabimpactfactor.com
DOI:10.21608/asnj.2025.361552.2016 http://olddrji.lbp.world/indexedJournals.aspx
https://vlibrary.emro.who.int/journals/assiut-scientific-nursing-journal

Effect of Pulmonary Rehabilitation Protocol after Chronic Obstructive Pulmonary Disease (COPD) Exacerbation

Nehmedo Mohamed Ibrahim[1], Ali Abdel-Azeem Hasan Zayed[2], Ebtesam Aly Abd el-Fatah Aly[3] & Marwa Ali Almasry[4]
[1.] Fellow of Medical Surgical Nursing, Assuit University, Egypt.
[2.] Professors of Chest Diseases and Tuberculosis, Faculty of Medicine, Assuit University, Egypt.
[3.] Lecture of Medical-Surgical Nursing, Faculty of Nursing, Minia University, Egypt.
[4.] Assistant Professors of Medical-Surgical Nursing, Faculty of Nursing, Assuit University, Egypt.

Abstract:
Pulmonary rehabilitation is the cornerstone of non-pharmacological treatment for patients experiencing a COPD exacerbation. **Aim:** to find out the effect of pulmonary rehabilitation (PR) on exacerbations in chronic obstructive pulmonary disease patients. **Research design:** Quasi-experimental with one group (pre-post) research design. **Subjects and methods:** A purposive sample of 60 adult patients diagnosed with COPD exacerbation. A study was conducted in the chest department and outpatient clinic at Assiut University Hospital. **Tools**: Three tools were utilized; a Patient assessment sheet, a Modified Medical Research Council Dyspnea Scale (mMRC), and St. George's Respiratory Questionnaire (SGRQ) **Results:** The mean age of the studied patients was 57.28±6.88, 67.5% of patients were males, and more than half of the patient's participants were overweight 56.7%. Post implementing the pulmonary rehabilitation protocol a significant decrease in Modified Medical Research Council Dyspnea Scale (mMRC) was found post-intervention compared with that pre-intervention (P = ≤ 0.001). There was a statistically significant difference between pre\post pulmonary rehabilitation protocol reflected a positive influence on patients' levels of dyspnea which in turn improved their health related quality of life in all dimensions of the St, GORG scale (symptoms, activity and impact of the disease) (P = ≤ 0.001). **Conclusion:** This study showed that pulmonary rehabilitation could reduce dyspnea of patients with COPD and improve the health related quality of life**.** **Recommendation**: A simple chart about pulmonary rehabilitation should be provided for each patient to control episodes of COPD exacerbation.

Keywords: COPD, Exacerbation, Pulmonary & Rehabilitation.

Introduction:
Chronic obstructive pulmonary disease COPD is a persistent illness marked by increasing tissue damage and airflow restriction. Structural lung alterations due to chronic inflammation from repeated exposure to harmful particles or gases most commonly cigarette smoke. The disease often presents with symptoms the most significant is dyspnea **(Shakeel et al., 2023).** Despite improvements of pharmacological treatments of COPD, a huge number of patients remain symptomatic and suffer from frequent exacerbations and hospitalizations.

Exacerbations of chronic obstructive pulmonary disease (COPD) are defined as events characterized by dyspnea and/or cough and sputum that worsens over less than 14 days. Such exacerbations worsen symptoms, obstruct airflow, impact quality of life and increase the mortality risk, particularly among patients requiring hospitalization, hence called as severe exacerbation **(GOLD, 2023).**

Patients with COPD acute exacerbations may experience symptoms that is characterized by acute worsening of dyspnea, cough, sputum production and purulence. These episodes are known as acute exacerbation of COPD (AECOPD). AECOPD can last for days or even weeks, it requires pharmacological treatment, early pulmonary rehabilitation and occasionally hospitalization **(MacLeod et al., 2021)**.

Chronic obstructive pulmonary disease (COPDE) exacerbation or flare up is a known by much more sever COPD respiratory symptoms, this symptoms differ from one person to another. The most important symptoms of the disease is worsening of dyspnea, increased coughing, wheezing, or shortness of breath than usual, changes in mucus color, thickness, or quantity, fatigue that lasts for more than a day, legs or ankles swelling, difficult sleeping and feeling the need to increase patient need for oxygen. If measured, patient's oxygen levels will be lower than normal. While the dangerous warning occur if the patient suffer from severe shortness of breath or chest pain, bluish lips or fingers and confusion, disorientation, or trouble speaking in complete sentences **(Celli et al., 2021**).

Exacerbations trigger are usually caused by viral and bacterial lung infection, smoking or being exposed to smoke, indoor and outdoor air pollution, household

dust, spreading germs, cold air or being in cold environment and fumes from household cooking or cleaning products. Exacerbations have a direct impact on patients' quality of life and cause significant additional morbidity and mortality. However, exacerbations remain the primary cause of hospitalizations related to COPD, despite tremendous progress in understanding and treatment of this condition. **(Barker et al., 2021).**

To reduce the occurrence of COPD exacerbation should be stay on the treatment regimen, avoid common triggers, if the patient experiencing exacerbation or not getting enough relief ask the doctor about other treatment options, follow healthy life style, practice breathing exercise, relaxation and body positioning techniques **(Yohannes et al., 2021).**

The term "pulmonary rehabilitation" (PR) refers to non-pharmacological interventions such as diaphragmatic exercises and breathing, and coughing exercises. There are many benefits of pulmonary rehabilitation, such as decreased perceived dyspnea, length of hospital stays, and number of hospital referral, while also improving functional capacity and health-related quality of life. To effectively manage COPD, pulmonary rehabilitation for patients experiencing an exacerbation must be combined with lifestyle modifications, quitting smoking, and engaging in physical activity. (**Candemir et al., 2021).**

Significance of the study:

It has been observed by the researcher at the chest department of Assiut University Hospital that the number of patients with COPD exacerbations who were admitted to the hospital has increased, and those patients have inadequate knowledge and skills about pulmonary rehabilitation exercises that relieve episodic breathlessness. In 2022, 400 COPD exacerbation patients were admitted to the chest department at Assiut University Hospital (**Assiut University Hospital Statistical Records, 2023**). It is expected that this study could help to improve disease symptoms and health-related quality of life for COPD patients through providing pulmonary rehabilitation exercises.

Aim: This study aimed to find out the effect of pulmonary rehabilitation (PR) protocol on exacerbations in chronic obstructive pulmonary disease patients.

This through:

- Assess the level of dyspnea and health related to quality of life for patients with COPD exacerbation (pretest)
- Developing pulmonary rehabilitation exercises for patient with COPD exacerbation
- Evaluate the pulmonary rehabilitation exercises on the level of dyspnea and health related to quality of life (post-test)

Hypothesis:

The following research hypothesis was created in order to fulfill the purpose of the study:

H0: No difference in the level of excepted dyspnea and health related quality of life between the pre and post implementing the pulmonary rehabilitation protocol among the studied patients.

H1: All symptoms of COPD exacerbation, level of dyspnea, and health-related quality of life will be improved after the studied patients practice the pulmonary rehabilitation exercises.

H2: A positive correlation between the ST,GORG and pulmonary function test obtained by COPD patients post implementing the pulmonary rehabilitation protocol.

Patients and Method:

Research design: Quasi-experimental research design with one group pre and post test approach was utilized.

Setting: The Chest department it contains two sections, one for men and one for women. Each section contains about 17 beds, including its out-patients clinics at Assiut University Hospital.

Study participants: A purposive sample of sixty male and female adult patients, their aged was ranged from 20-65 years.

In this study sample size of the studied patients was calculated by using the G-power with a confidence level at 95% and the flow rate of patients 240 cases in 6 months so the sample was calculated to be 60 patients agreed to participate and completed the study period.

An interventional study was performed during the period from January 2023 to March 2024.

Inclusion criteria:

Patients with history of COPD exacerbation in the last 4weeks, having post bronchodilator FEV/FVC<0.7 or FEV1 score lower than 50% to be high risk factors for exacerbations.

Exclusion criteria:

We excluded patients with any of the following conditions: uncontrolled hypertension, cardiac diseases, severe desaturation during exercise that was not corrected with oxygen therapy , and any orthopedic or neurological condition that might interfere with exercise, severe cognitive disorders, and lack of motivation.

Tools of the study:

Three tools will be used to achieve the aim of the study

Tool I:Patient assessment sheet:
It will include 2 parts as follows:
Part 1: Demographic data: such as code, phone number, age, gender, educational level, occupation, income, and marital status.
Part 2: Patients' Medical Assessment data: This part was utilized to assess:

1. Risk factors that can lead COPD exacerbation (BMI and smoking risk factors) and comorbidities.
2. Pre /Post PR protocol the patients' main complain that indicated COPD exacerbation: (cough, wheezing, fatigue associated with overwork, sputum color and its amount, and easiness of sputum expectoration).
3. Pre /Post PR protocol pulmonary function test and oxygen saturation level.

Tool II: Modified Medical Research Council (mMRC) Scale:
British Medical Research Council created this scale (**Williams, 2017),**
It used to evaluate impairment caused by shortness of breath during daily activities pre implementing the PR protocol, after 3 months and 6 months from PR protocol implementation. It used Pre /Post PR protocol .It consists of the following items:
0= no breathlessness except on strenuous exercise
1= shortness of breath when hurrying on the level or walking up a slight hill
2= walks slower than people of the same age on the level because of breathlessness or has stop to catch their breath when walking at their own pace on the level
3=stops for breath after walking ~100 m or after a few minutes on the level.
4= too breathless to leave the house, or breathless when dressing or undressing.
Scoring system: it was ranged from 0-4, with 0 means less breathlessness and 4 means marked breathlessness
Tool III- St. George's Respiratory Questionnaire (SGRQ):
It is a standardized disease-specific questionnaire developed by **Jones & forde (2018)** The St George's Respiratory Questionnaire (SGRQ) is a 50-item disease-specific questionnaire. It measures health related quality of life (HRQL) in three domains: symptoms (distress due to respiratory symptoms), activities (the effects due to impairment of mobility or physical activity), and impacts (the psychosocial impact of the disease), plus a summary total score. It used Pre /Post PR protocol
The symptomatology, impact, frequency, and severity of respiratory symptoms are assessed in the first section (Symptoms). It includes the frequency of coughing, sputum production, wheezing, and dyspnea, as well as the length of time and frequency of episodes of dyspnea or wheezing (8/items). "Activity" and "Impacts" are the two parts of the second section. Breathlessness-causing or breathlessness-limiting activities are covered in the "Activity" section (16 items). The impact section includes social and psychological alterations related to airway disease. These include the impact on employment, control over one's health, panic, stigmatization, the need for medication, side effects of prescribed therapies, expectations for one's health, and disruptions of day-to-day living (26 items)
The number of possible answers for each question ranges from two to five. After the responses are weighted, the scores are determined by dividing the total weights by the maximum weight for each item on the questionnaire. The result is then expressed as a percentage, with 0% representing the best possible score and 100% representing the worst. The sum of the weights is divided by the modified maximum weight for that component to determine the total score, which is then expressed as a percentage:

$$\text{Score} = 100 \times \frac{\text{Summed weight from positive items in that component}}{\text{Sum of weight for all items in that component}}$$

The total score is determined similarly:

$$\text{Score} = 100 \times \frac{\text{Summed weight from positive items the questionnaire}}{\text{Sum of weight for all items in the questionnaire}}$$

Validity & Reliability:

- It established by a panel of five experts (include 3 specialists in medical surgical nursing and 2 specialists in the field of chest medicine)
- The Cronbach test was used to examine the tools' internal consistency, which indicated their reliability (0.85).

Pulmonary rehabilitation (PR) protocol:

- Pulmonary rehabilitation was designed according to individual needs.
- The PR consists of theoretical part and practical training (breathing exercises).
- The first part under the title of "introduction about breathing exercises" include(definition of PR information, types of breathing exercises, benefits of breathing exercises, implementing a pulmonary rehabilitation exercises training, suitable duration to practice this exercises and exercise limitation).
- The second part under the title of "The best practice statement for chest physical therapy and exercise techniques" involve (secretion clearance exercises include; huff cough, percussion, and vibration, diaphragmatic breathing, purse-lip breathing, and postural technique including; standing leaning forward, standing with back support, sitting leaning forward, sitting leaning forward at a table, and high side-lying all of these exercises completed and applied by the researcher.

- All exercises was chosen for each patient according to his tolerance for it and actual health status.
- The patient who practice the pulmonary exercise monitor his SpO2 by pulse oximetry if decreased below 90%, administered oxygen therapy as the doctor prescription and stopped to practice this exercise.
- After the pulmonary rehabilitation program was completed all patients came for a scheduled visit after 3 months and 6 months post PR implementation to find out the effect of pulmonary rehabilitation (PR) protocol on exacerbations in chronic obstructive pulmonary disease patients.

Methods:

Administrative approval: The chairman of the Assiut University Hospital's chest department and outpatient clinics officially gave their consent for the study to be carried out.

Ethical considerations: The study protocol was approved by the ethical committee of the Faculty of Nursing, Assuit University with approval code (2023, No. 575), and oral consent was obtained from all patients after detailed clarification of the benefits and risks of the study.

Pilot study: Ten percent of the sample (6 patients) participated in a pilot trial to assess the applicability and clarity of tool was done. According to this pilot study, the required modifications were made. Those patients selected for the pilot study were not included in the main study.

Data collection: The following phases were included in the data-gathering process:

Assessment phase:

- The researcher conducted interviews with patients in the chest department and outpatient clinic to obtain oral approval for their participation.
- A patient assessment sheet (Tool I) was used which was concerned with the patient's demographic data and patients' medical assessment.
- Tool (II) Modified Medical Research Council Dyspnea Scale (mMRC) was used to evaluate impairment caused by shortness of breath during daily activities pre implementing the PR protocol.
- Tool (III) St. George's Respiratory Questionnaire was used to measures health related quality of life (HRQL) For patients with COPD before pre implementing the PR protocol.

Implementation phase:

- The researcher introduced herself to establish good communication.
- Every patient meets individually with the researcher in three sessions, the patients' number in each session varies according to the patients' availability in each meeting (2-3).
- PR starting in the last week before discharge from the hospital.
- The theoretical part takes one session and two other sessions include practical PR application.
- Each session last from 30-50 minutes. There were fifteen to twenty minutes for discussion and comments following each session.
- All patients received a hard copy of the booklet. To make sure the patient following the PR protocol, the researcher visualized the educational materials for the patients using laptops, diagrams, and illustrations.
- The researcher monitors all patients through the outpatient clinic, phone, and WhatsApp to ensure compliance with PR protocol after 3 months and 6 months from PR protocol implementation.

Evaluation phase:

After three months of PR protocol, and six months post PR implementation every patient was evaluated for the clinical manifestations of COPD exacerbation, pulmonary function test, Spo2, impairment caused by shortness of breath during daily activities, and health related quality of life (HRQL)using (Tool I part two except risk factors, II, III).

Statistical design:

The SPSS version 23 statistical software applications were used to evaluate, code, analyze, and tabulate data. Frequencies and percentages were used as descriptive data. Using the Chi-square ($\chi 2$) test, the relationship between two or more qualitative variables was examined. The qualitative data were presented as percentages (n, %) and numbers. The quantitative data's mean and standard deviation (SD) were applied. The direction and strength of the linear correlations between two sets of data are evaluated using coefficients. P-value < 0.05 was determined to be the significance.

Results:

Table (1): Demographic data of Exacerbation COPD patients (n=60)

Demographic data	N	%
Age (years) Mean±SD 57.28±6.88		
Sex:		
Male	40	66.7
Female	20	33.3
Level of education:		
Illiterate	23	38.3
Read and write	29	48.3
Secondary education	2	3.3
High education	6	10.0
Occupation:		
Employee	9	15.0
Craftsman	6	10.0
Freelancers	3	5.0
Housewife	14	23.3
Retierd	9	15.0
Not Working	19	31.7
Residence:		
Rural	44	73.3
Urban	16	26.7
Marital status		
Single	1	1.7
Married	49	81.7
Widowed	10	16.7

Data represented as frequency (percentage)

Table (2): Distribution of COPD exacerbation risk factors and comorbidities among the studied sample (n=60)

Variables	N	%
BMI:		
Under weight	1	1.7
Normal weight	9	15.0
Overweight	34	56.7
Obese	11	18.3
Morbidity Obsess	5	8.3
Smoking:		
Smoker	4	6.7
Non-Smoker	29	48.3
Ex – smoker	27	45.0
Comorbidities:		
HTN	24	40.0
DM	27	45.0
Pneumonia	19	31.7
Asthma	3	5.0

Data expressed as frequency (percentage).

Table (3): Clinical manifestations of COPD exacerbation among the studied patients pre, post and Follow up pulmonary rehabilitation protocol (n=60)

Clinical manifestations	Pre		Post		Follow up		P. value
	N	%	N	%	N	%	
Cough:							
Mild	3	5.0	15	25.0	46	76.7	<0.001**
Moderate	12	20.0	34	56.7	13	21.7	
Sever	45	75.0	11	18.3	1	1.7	
Chest wheezing:							
Mild	1	1.7	9	15.0	47	78.3	<0.001**
Moderate	8	13.3	42	70.0	12	20.0	
Sever	51	85.0	9	15.0	1	1.7	
Overwork and fatigue:							
Mild	2	3.3	13	21.7	43	71.7	<0.001**
Moderate	5	8.3	41	68.3	16	26.7	
Sever	53	88.3	6	10.0	1	1.7	
Sputum:							
Mild	2	3.3	15	25.0	49	81.7	<0.001**
Moderate	6	10.0	35	58.3	11	18.3	
Sever	52	86.7	10	16.7	0	0.0	
Sputum color:							
Green	45	75.0	4	6.7	2	3.3	<0.001**
Yellow	14	23.3	24	40.0	2	3.3	
White	1	1.7	32	53.3	56	93.3	
amount of sputum:							
Less than 100 ml/ day	34	56.7	55	91.7	59	98.3	<0.001**
About 200 ml/ day	11	18.3	4	6.7	0	0.0	
More than 200 ml/ day	15	25.0	1	1.7	1	1.7	
Expectoration:							
Yes	4	6.7	57	95.0	59	98.3	<0.001**
No	56	93.3	3	5.0	1	1.7	

Chi square test for qualitative data between the two groups
**Significant level at P value < 0.05, **Significant level at P value < 0.01*

Table (4): Mean value of pulmonary functions test (PFT) and oxygen saturation for studied patients pre, post and Follow up pulmonary rehabilitation protocol (n=60)

PFT	Pre	Post	Follow up	P. value
	Mean±SD	Mean±SD	Mean±SD	
FEV	52.72±26.97	59.26±22.2	67.5±18.48	0.007**
FVC	56.7±23.92	62.49±20.47	71.59±20.06	0.003**
FEV/FVC	70.07±17.77	75.64±14.56	83.74±17.56	<0.001**
PEF	38.17±15.94	49.13±17.41	46.95±16.86	0.003**
MIF	42.13±20.62	60.03±22.47	55.59±21.08	0.001**
MEF	26.56±22.3	29.54±20.91	40.38±25.22	0.011*
Oxygen saturation	80.28±13.04	93.72±3.41	89.35±8.72	0.003**

One-way Anova test quantitative data between the Three groups or more(with Lcd Method)
FEV1/FVC (>= 80% Normal; 50-< 80 Mild; 30-< 50 Moderate; < 30 Severe)

Table (5): Distribution of dyspnea severity (mMRC) for studied patients pre, post and in follow up period after applying pulmonary rehabilitation protocol (n =60).

Variables (mMRC)	Pre		Post		Follow up		P. value
	N	%	N	%	N	%	
Grade 0	0	0.0	0	0.0	18	30.0	<0.001**
Grade I	0	0.0	11	18.3	35	58.3	
Grade II	4	6.7	33	55.0	4	6.7	
Grade III	27	45.0	15	25.0	3	5.0	
Grade IV	29	48.3	1	1.7	0	0.0	

Chi square test for qualitative data between the two groups
**Significant level at P value < 0.05, **Significant level at P value < 0.01*

Table (6): Mean of health related quality of life according to (SGRQ) for COPD patients pre, post and in follow up period after applying pulmonary rehabilitation protocol (n =60)

Variables (SGRQ)	Pre	Post	Follow up	P. value
Symptoms:				
Mean ± SD	82.31±8.05	61.7±14.95	44.31±11.26	<0.001**
Activity:				
Mean ± SD	82.74±13.93	50.13±22.07	26.52±20.26	<0.001**
Impact:				
Mean ± SD	85.11±10.09	42.98±29.03	16.18±18.11	<0.001**
Total:				
Mean ± SD	83.93±9.32	48.25±23.5	23.98±16.36	<0.001**

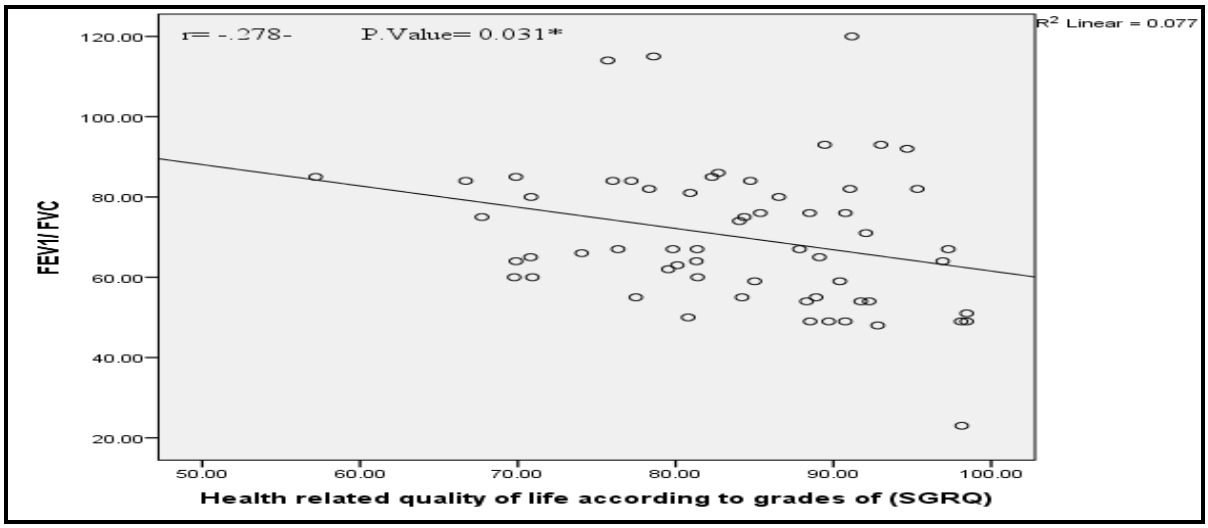

Figure (1):One-way Anova test quantitative data between the Three groups or more (with Lcd Method)

Table (1): The study shows that the group of 40 men and 20 females with COPD exacerbation had a mean age of 57.28±6.88 years. The majority of them were married and read and wrote. More than one-fifth of patients were housewives, and more than one-third were not working (23.3% and 31.7%, respectively), with nearly three-quarters having low living standards.

Table (2): Reveals that more risk factors that lead to COPD exacerbation were overweight; more than half of the patient's participants were overweight (56.7%), and more than two-fifths of them were ex-smokers (45.0%). According to comorbidities; more than one quarter of patients complained from DM.

Table (3): Represents that, three-quarters of COPD patients were admitted to the hospital with severe cough. In contrast, after implementing pulmonary rehabilitation and in the follow-up period the cough severity subsided into the moderate level (56.7, 21.7 respectively). Also, the majority of COPD patients

complained of chest wheezing (85.0%) and (70.0%) complained of moderate wheezing after the procedure, and (78.3%) in the follow-up period reduced to mild chest wheezing. Regarding expectoration, most patients could not easily expectorate the sputum Verses versa after pulmonary rehabilitation protocol and in the follow-up period.

Table (4): Illustrates that, the mean value of air limitation severity was determined by FEV1/FVC ratio, which was improved gradually from (70.07±17.77, 75.64±14.56, and 83.74±17.56 respectively) pre-, post, and follow-up pulmonary rehabilitation protocol with statistical significant improvement with (p value <0.001**). Also the same improvement in oxygen saturation occurred among the studied patients with (80.28±13.04, 93.72±3.41, and 89.35±8.72 respectively) pre-, post, and follow-up pulmonary rehabilitation protocol with statistical significant improvement with (p value 0.003**).

Table (5): reflect that ; there was statistically significant improvement in the dyspnea severity among COPD patients post and in the follow up period after applying pulmonary rehabilitation protocol than pre applying the PR protocol with(p value <0.001**).

Table (6): Illustrates that, the level of health related quality of life was determined by the mean of SGRO which was graded from (83.93±9.32, 48.25±23.5, and 23.98±16.36respectively) pre-, post, and follow-up pulmonary rehabilitation protocol. The same improvement in mean three domains of SGRO scale occurred among the studied patients with (44.31±11.26, 26.52±20.26, and 16.18±18.11 respectively) than pre implementing the pulmonary rehabilitation protocol (82.31±8.05, 82.74±13.93, and 85.11±10.09 respectively),

Figure (1): This figure illustrates that; there was a positive correlation between Health-related quality of life for COPD patients, as assessed by (SGRQ) and pulmonary function test (PFT) with (r=-.278*). This means all health-related quality-of-life items are reflected in COPD patients' clinical improvement (PFT) by the positive effect of pulmonary rehabilitation protocol.

Discussion:

The COPD exacerbation defined by Global Initiative for COPD guidelines2023 as a significant air trapping that increased throughout the course of the disease and subsequently caused dynamic hyperinflation. The common clinical presentations from that group of patients were dyspnea, sputum production and exercise intolerance.

As regarding the demographic data of COPD patients;

Among sixty of COPD patients who included in this study, their ages mean was 57.28±6.88 (36-56), fifty percent of study sample their age ranged between 50-60 years. From the researcher opinion, several structural and physiological changes occur in the lung as a part of the normal aging process and the structure change of the lung tissue that occurs with aging, as an increase in the size of the alveolar space without any inflammation or alveolar wall damage, is referred to as “senile emphysema. These explore the effect of aging on the COPD exacerbation occurrence due; ciliary dysfunction, diminish in the lung expansion, decrease in respiratory muscles strength and immune function.

These findings are not compatible with the study conducted by **Diego et al., (2023)** which found that the vast majority of COPD patients' age in his study was 73 years, while **Helmy et al., (2022,** supported the study results which found that more than half of their patients with chronic obstructive lung disease were in the fifty to sixty-year age range.

As for gender more than half of the study sample was male. According to the researcher, males are more exposed to the risk of COPD exacerbation because they are more frequently exposed to the dangers of fumes and smoke that they are exposed to due to work, Moreover, smoking is a significant contributor to COPD in both sexes, but it is comparatively uncommon among women. These results are supported by **Diego et al., (2023)**, who found that more than half of the sample was males. While the study **by Yamamoto et al. (2024)** contradicts our findings, which found that more than half of the study sample were female.

Regarding the level of education; more than two-fifths of COPD patients in this study read and write, this happened due to nearly three-quarters of the studied sample living in rural areas and the society culture there do not care about educating their children and are satisfied with teaching them reading and writing, which results in most patients not having sufficient health awareness and knowledge about the chronic obstructive pulmonary disease and how to apply breathing exercises correctly to confront the complications resulting from the disease. These findings are inconsistent with research conducted at COPD patients by **Mohammed et al., (2020)** which found that about two fifth of the patients had only completed secondary school. Also research conducted by **Suerdem et al., (2020)** disagrees with the research findings which mentioned that more than three quarters of the patients had only completed high school.

Concerning occupation, Near to one third of COPD patients gave up their jobs, this indicates the impact of the disease on patients' health status leads to activity impairment and productivity loss and makes

them unable to work**. (Abdelwahab et al., 2023)** confirms the same research result, as it was found that three-quarters of the study sample did not work.

As regarding to the COPD exacerbation risk factors; the most common risk factor of COPD among the studied sample is overweight which represent about more than half of sample size followed by ex-smokers were represent about one quarter. The study findings disagree with **Venkatesan (2024),** who founded that one major risk factor for COPD is cigarette smoking compared to non-smokers. Also **Gomaa et al. (2020),** most of the patients in the study were smokers.

As regarding to comorbidities; COPD frequently coexists with other chronic diseases, namely comorbidities. They negatively impact prognosis, exacerbations and quality of life in COPD patients, more than one quarter of COPD patients who participated in this study had DM. This result matched with **Hansen et al., (2020)** they mentioned that the most prevalent chronic diseases among his cohort study are metabolic disorders such as diabetes near to one quarter.

Regarding chief complain; the current study finding denoted that three-quarters of COPD patients have severe cough on admission. In contrast, after implementing pulmonary rehabilitation and in the follow-up period about more than half of the studies sample; the cough severity level subsided into the moderate level. Also, the majority of COPD patients complained from severe chest wheezing before procedure and more than two third complain from moderate wheezing after the procedure, and more than three quarter of patients in the follow-up period reduced to mild chest wheezing. Regarding expectoration, most patients could not easily expectorate the sputum Verses versa after pulmonary rehabilitation protocol and in the follow-up period.

All pre mentioned improvement in the cough, wheezing and sputum expectoration after pulmonary rehabilitation implementation this similar to **Global Initiative for Chronic Obstructive Lung Disease (GOLD)., 2023** mentioned the beneficial effect of pulmonary rehabilitation program on symptom burden and risk of exacerbations especially if applied on structured manner with considering the individual's COPD characteristics and comorbidities.

According to the value of pulmonary functions test (PFT) and oxygen saturation for studied patients there was marked improvement in an FEV1/FVC ratio and SaO2% among the study group patients at post 3 months, and 6th months follow-up. This could be due to the effect of pulmonary rehabilitation protocol. This study finding was in a line with a study conducted by **Ahmed et al (2014)** studied the effects of PR program on 116 COPD patients, observed that significant improvement in SaO2% in patients who completed the PR programme. However, **Saad et al. (2023)** presented study results that contradict the current research results. They illustrated a slight increase in PaO and SaO2%and a minimal decrease in PaCO without significant changes after the PR program compared with before the program.

The grade of dyspnea was assessed by a mMRC scale before and after pulmonary rehabilitation protocol. The study's results mentioned that, there was a significant drop in mMRC after implementing the pulmonary rehabilitation protocol compared to pre-protocol. According to the researcher's point of view, there is evidence of improvement in dyspnea related to the benefits of using pulmonary rehabilitation exercises

The study is boosted by the same findings of **Saad et al. (2023),** who founded that' mMRCS had significant improvement at the end of the programme in the three studied groups. The same results was reported in **Ceyhan et al. (2022)** study, which demonstrated patients' dyspnea severity decreased as shown by statistically significant mMRC scores.

According to ST George's Respiratory Questionnaire (SGRQ) for COPD patients, this questioner was designed to measure health related quality of life in patients with COPD; the current study finding showed that the patients after completed pulmonary rehabilitation protocol had a significant improvement in the quality of life according to the change in SGRQ total mean. This finding is supported by **Dong et al. (2020),** who found that the vast majority of the studied sample had a fall in the SGRQ total score. This indicates an improvement in HROL in those who completed the pulmonary rehabilitation program.

Additionally, there was a positive correlation between pulmonary function test (PFT) and Health-related quality of life for COPD patients, as measured by the (SGRQ). This means all health-related quality-of-life items are reflected in COPD patients' clinical improvement (PFT) by the positive effect of pulmonary rehabilitation protocol. These findings were supported by **Westwood et al .,2011** who done a recent systematic review of 22 studies found that increase in FEV1 was associated with a statistically significant reduction in SGRQ.

Conclusions:

The pulmonary rehabilitation program for COPD patients led to better outcomes that were apparent in relieving cough, wheezing, and breathlessness and improved the health-related quality of life, which was apparent in decreasing the level of St SGRQ among COPD patients.

Observed significant correlation in level of quality of life and PF test after applying the PR protocol compared with pre-implementing the PR protocol.

Recommendations:

- A pulmonary rehabilitation program for COPD should be provided to every patient considering actual health status and his tolerance to these exercises to prevent further breathlessness and achieve better health-related quality of life.
- Simple charts, including pictures and guidance about the pulmonary rehabilitation program for COPD patients, should be available in the outpatient clinic of chest disease.
- Replicate this study on a large sample and in a different hospital setting.

References:

Abdelwahab H, Sehsah R ., El-gilany A., & Shehta M., (2023): Factors affecting work productivity and activity impairment among chronic obstructive pulmonary disease patients, Ind Healt 2023 Apr 21;62(1):20–31. doi: 10.2486/indhealth.2022-0174.

Ahmed MNU, Begum S, & Ali T. (2014): Effects of pulmonary rehabilitation on exercise tolerance in patients with COPD. J Bangladesh Soc Physiol 2014;9:65–71. 10.3329/jbsp.v9i2.22799

Assiut University Hospital Statistical Records, 2022.

Barker RE, Kon SS, Clarke SF, Wenneberg J, Nolan CM, & Patel S, (2021): COPD discharge bundle and pulmonary rehabilitation referral and uptake following hospitalisation for acute exacerbation of COPD. Thorax. 2021;76(8):829-1.

Candemir, I., Ergün, P., & S¸ahin, M.E. (2021): Maintenance of pulmonary rehabilitation benefits in patients with COPD: Is a structured 5-year follow-up program helpful? Turk. J. Med. Sci. 2021, 51, 2915–2923. [CrossRef]

Celli BR, Fabbri LM, Aaron SD, Agusti A, Brook R, & Criner GJ, (2021): An updated definition and severity classification of chronic obstructive pulmonary disease exacerbations: the Rome proposal. Am J Respir Crit Care Med . 2021;204:1251–1258. doi: 10.1164/rccm.202108-1819PP DOI] [PubMed] [Google Scholar

Ceyhan, Y., & Tekinsoy Kartin, P. (2022): The effects of breathing exercises and inhaler training in patients with COPD on the severity of dyspnea and life quality: a randomized controlled trial. Trials, 23(1), 707. https://doi.org/10.1186/s13063-022- 06603-3

Diego M., José L., Juan R., Jesús C., María B., Alejandro P., José Miguel R., (2023): The Clinical Profile of Patients with COPD Is Conditioned by Age

Dong J., Li Z., Luo L., Luo L., & Xie Honzihi (2020): Efficacy of pulmonary rehabilitation in improving the quality of life for patients with chronic obstructive pulmonary disease: evidence based on nineteen randomized controlled trials. Int J Surg. 2020;73:78–86. [DOI] [PubMed] [Google Scholar

Global Initiative for Chronic Obstructive Lung Disease (GOLD), (2023): Global Strategy for Prevention, Diagnosis and Management of COPD: 2023 Report. https://goldcopd.org/2023-gold-report-2/

GOLD Report. Global Initiative for Chronic Obstructive Lung Disease – GOLD (2023): [cité 7 janv 2023]. Disponible sur: https:// goldc opd. org/ 2023- gold- report- 2/

Gomaa, W., Mohamed, H., & Morad, A. (2020): Assessment lifestyle for patients with chronic obstructive pulmonary disease. Egyptian Journal of Health Care, 11(2), 273-285.

Gomaa, W., Mohamed, H., & Morad, A. (2020): Assessment lifestyle for patients with chronic obstructive pulmonary disease. Egyptian Journal of Health Care, 11(2), 273-285.

Hansen NS, Ängquist L, Lange P, Jacobsen R. (2020): Comorbidity clusters and healthcare use in individuals with COPD. Respir Care. 2020;65(8):1120–7. https://doi.org/10.4187/RESPCARE.07136.

Helmy, M., Sobieh, H., & Nabil, S. (2022): Health Needs for Patients with Chronic Obstructive Pulmonary Disease: Suggested Self-Management Guidelines. Egyptian Journal of Health Care, 13(4), 40-51. https://doi.org/10.1093/occmed/kqx086

Jones P., & Forde Y. (2018): The St George's Respiratory Questionnaire (SGRQ). Version No.1.3, updated23March2018

MacLeod M, Papi A, Contoli M, Beghé B, Celli BR, & Wedzicha JA, (2021): Chronic obstructive pulmonary disease exacerbation fundamentals: diagnosis, treatment, prevention and disease impact. Respirology . 2021;26:532–551. doi: 10.1111/resp.14041. [DOI] [PubMed] [Google Scholar

Mohammed M, Almeziaen M, Eid R, Sobeh D, & Ibrahem A, (2020): Impact of Educational Program on Knowledge and Practice of Patients with Chronic Obstructive Pulmonary Disease,Port Said Scientific Journal of NursingVol7,No2,June2020.

Saad B, Amer M, Elsaadany H, Mansour Y, Sharshar R, & Bahr H, (2023): Effect of pulmonary rehabilitation programme including either O2 inhalation or noninvasive ventilation in patients with chronic obstructive pulmonary disease. Can J Respir Ther. 2023 Jan 20;59:45–51. doi: 10.29390/cjrt-2022-051

Shakeel, I., Ashraf, A., Afzal, M., Sohal, S., Islam, A., Kazim, S., & Hassan, M. (2023): The Molecular Blueprint for Chronic Obstructive Pulmonary Disease (COPD): A New Paradigm for Diagnosis and Therapeutics. Oxidative medicine and cellular longevity, 2023, 2297559. https://doi.org/10.1155/2023/2297559

Suerdem, M., Gunen, H., Akyildiz, L., Cilli, A., Ozlu, T., Uzaslan, E., & Abadoglu, O., (2020): Demographic, Clinical and Management Characteristics of Newly Diagnosed COPD Patients in Turkey: A Real-Life Study. International journal of chronic obstructive pulmonary disease, 15, 261– 267. https://doi.org/10.2147/COPD.S211838.

Venkatesan P. (2024): GOLD COPD report: 2024 update. The Lancet. Respiratory medicine, 12(1), 15–16. https://doi.org/10.1016/S2213-2600(23)00461-7.

Venkatesan P. (2024): GOLD COPD report: 2024 update. The Lancet. Respiratory medicine, 12(1), 15–16. https://doi.org/10.1016/S2213-2600(23)00461-7

Westwood M, Bourbeau J, Jones PW, Cerulli A, Capkun-Niggli G, & Worthy G (2011); Relationship between FEV1 change and patient-reported outcomes in randomised trials of inhaled bronchodilators for stable COPD: a systematic review. Respir Res. 2011, 12: 40-10.1186/1465-9921-12-40.

Williams N. (2017): The MRC breathlessness scale. Occupational medicine (Oxford, England), 67(6), 496–497.

Yamamoto T, Oishi K, Ohata S, Murata Y, Yamaji Y, & **Asami-Noyama M, (2024):** Management Reality of Female Patients with COPD: Dovepress journal. 23 May 2024 Volume 2024:19 Pages 1123—1130

Yohannes A.M., Dryden S, Casaburi, R, & Hanania, N.A. (2021): Long-Term Benefits of Pulmonary Rehabilitation in Patients with COPD: A 2-Year Follow-Up Study. Chest 2021, 159, 967–974. [CrossRef]