Section: Pulmonary Medicine

Original Research Article

EFFECT OF PULMONARY REHABILITATION IN COPD PATIENTS

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ABSTRACT

Background: The term "chronic obstructive pulmonary disease" (COPD) refers to a variety of lung conditions that are characterized by persistent, frequently progressive airflow obstruction caused by abnormalities of the airways (bronchitis, bronchiolitis), alveoli (emphysema), and/or respiratory symptoms (dyspnea, cough, sputum production, and/or exacerbations). A complete intervention, pulmonary rehabilitation consists of a full examination, followed by patient-tailored therapy, including education, exercise training, and behavior modification. Therefore, the purpose of this study was to evaluate how pulmonary rehabilitation programs affected the quality of life of COPD patients.
Materials and Methods: Patients with a diagnosis of COPD who visited the outpatient department of the Sree Narayana Institute of Medical Sciences in Chalakka participated in this clinical trial. The study included patients who met the inclusion and exclusion criteria and agreed to provide informed permission. A clinical diagnosis of COPD was made using the patient's medical history, physical examination, and spirometry results. According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2023 criteria, a subset of individuals were categorized into A, B, and E. Patients were assessed using St George's respiratory questionnaire C, COPD Assessment Test, BODE index and pulmonary function test. Selected patients undergo a selected pulmonary rehabilitation program twice weekly for 8 weeks under supervision and were advised to do the same at home for at least 5 days a week. They were reassessed after 6 months using St George's Respiratory Questionnaire C & COPD Assessment Test. The data was entered into Microsoft Excel and statistical analysis was done using SPSS Software.
Results: There were no statistically significant differences in the pulmonary functions (FEV1 % predicted) and BODE index ($p > 0.05$). Rehabilitation resulted in significant improvements in both the SGRQ C score and CAT score 6 months after completion of 8 weeks (twice weekly) pulmonary rehabilitation programme under supervision. SGRQ C score and CAT score improved with a significance ($p < 0.01$). We conclude that rehabilitation resulted in improvements in health-related quality of life.
Conclusion: Rehabilitation may be helpful in enhancing quality of life and may be one of the key elements of COPD care. Future studies should concentrate on determining which elements of pulmonary rehabilitation are crucial, as well as the optimal duration and setting for it, the level of supervision and training intensity needed, and the duration of therapy effects.
Keywords: COPD, GOLD, Pulmonary rehabilitation, St. George's questionnaire C, CAT score.

INTRODUCTION

The term "chronic obstructive pulmonary disease" (COPD) refers to a variety of lung conditions that are characterized by persistent, frequently progressive airflow obstruction caused by abnormalities of the airways (bronchitis, bronchiolitis), alveoli (emphysema), and/or respiratory symptoms (dyspnea, cough, sputum production, and/or exacerbations).[1]

One of the leading causes of illness and death worldwide is chronic obstructive pulmonary disease (COPD), a chronic respiratory lung disease. Presently one of the top three causes of death worldwide, 90% of these deaths occur in low- and middle-income nations. Almost 3 million people died from COPD in 2012, accounting for 6% of all fatalities globally. COPD can be treated and prevented.[1]

In addition to lung damage, COPD is a systemic illness that affects several organ systems. Unfortunately, quitting smoking is the only intervention that has been demonstrated to reduce the loss of lung function. Other treatments, on the other hand, can help preserve physical mobility or Quality of Life (QOL). A wide range of interventions are necessary for the best management of COPD, such as palliative care, acute care, pulmonary rehabilitation (PR), etc.

Pulmonary rehabilitation is a comprehensive intervention based on thorough assessment followed by patient-tailored therapies, such as exercise training, education, and behavior change, etc. While education and psychological assistance help patients become more aware of their condition and get a better knowledge of it, they are not very helpful on their own. For individuals experiencing symptomatic airflow obstruction, pulmonary rehabilitation is the most effective therapy option when combined with medicine, blood gas optimization, and cessation of smoking.[2]

Exercise improves strength, endurance, confidence, and reduces dyspnea, which makes other components possible. Patients who have received rehabilitation frequently experience a decrease in their need to use medical services.[3]

It has been demonstrated that the best therapy approach for enhancing exercise tolerance, health status, and dyspnea is pulmonary rehabilitation. Most COPD patients benefit from pulmonary rehabilitation. All degrees of COPD severity have been shown to benefit from it in terms of functional exercise capacity and health-related quality of life, but those with chronic hypercapnic failure appear to benefit the most.[4] The best results of pulmonary rehabilitation are achieved with regimens which last between six and eight weeks. The research is that currently exist suggest that there are no extra advantages to prolonging pulmonary rehabilitation to a 12-week period. Participating in supervised training at least twice a week is advised to incorporate walking exercise as well as resistance/strength training, interval training, and endurance training for both the upper and lower limbs. It is also possible to include neuromuscular electrical stimulation, inspiratory muscle training, and flexibility training.[5]

MATERIALS AND METHODS

It was a clinical trial and Patient were selected from outpatient department of Pulmonary Medicine, Sree Narayana Institute of Medical Sciences. Patients who came to OPD diagnosed to have COPD and are willing to participate in pulmonary rehabilitation programme.

Inclusion Criteria

All COPD GOLD A, B & D group who were willing to participate in this study

Exclusion Criteria

Those having uncontrolled heart failure, severe lower limb arthritis

Those having neurologic disorders

Patients not willing to participate.

Sample Size: As per the study pulmonary rehabilitation for chronic obstructive pulmonary disease done in island by McCarthy B et al [6] a significant improvement in SGRQ were noted in all domains of the St. George's Respiratory Questionnaire (SGRQ) and improvement in total score was better than 4 units observed in 53% of patient after pulmonary rehabilitation programme

- P = 0.53
- q = 1-p = 0.47in
- z = 1.96 @ α=5%
- d = 20%

n = Z2 p q /d2 = 23.7 ~ 24

By considering non response, the sample size increased. So final sample size is 30. Study duration: 8 Months.

The study was started once the institutional ethics committee gave its approval. The study included patients who met the inclusion and exclusion criteria and were prepared to provide informed permission. The physical examination, the patient's history, and spirometry were used to confirm the clinical diagnosis of COPD. Following spirometry, a subset of patients were classed as having A, B, or E COPD in accordance with the parameters set forth by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2023. Prior to beginning the pulmonary rehabilitation program, all patients underwent baseline evaluations utilizing the following tools: CAT, Postbronchodilator Pulmonary Function Test, 6-minute Walk Test (6MWT), Arterial Blood Gas Analysis, and Saint George Respiratory Questionnaire (SGRQ). For eight weeks, under supervision, a selected patient had pulmonary rehabilitation twice a week at least five days a week at home and they were reassessed after 6 months using St George's Respiratory Questionnaire, COPD Assessment Test, post bronchodilator pulmonary function test, 6-minute walk test (6MWT).

Pulmonary rehabilitation programmes:

- **Respiratory Muscle Exercise:** Pursed lip breathing, Diaphragmatic exercise, Deep breathing exercise
- **Muscle Strengthening Exercise:** Front thigh stretch exercise, Shoulder stretch exercise, Palm down forearm stretch exercise, Palm up forearm stretch exercise, Neck stretch exercise, Leg extension exercise, Leg lift exercise, Knee lift exercise, Knee bend exercise, Heel lift.
- Aerobic exercise
- Patient education
- Nutritional counselling
- Psychological Support

Study Tools

- ST GEORGE'S Respiratory Questionnaire
- CAT score

Statistical Analysis: Data were entered into Microsoft Excel spread sheet and analysed using SPSS Software. Results were described in mean and proportion for appropriate variables. To analyse the changes before and after pulmonary rehabilitation programme, Paired T Test was used and level of significance was estimated with 95% confidence intervals with P value <0.05.

RESULTS

A total of 34 patients were included in the study. Mean age was 62.5 years and minimum age was 54 years, majority were males (76.5 %) and females were 23% in the study population was divided on the basis of smoking status into 4 groups – never smoked, quit smoking, active smoker, passive smoker.

Table 1: Age and Gender of study group

	Total	Minimum	Maximum	Mean
Age	34	54.00	75.00	62.5000

Table 2: Showing occupational exposure of study participants

	Frequency	Percentage
NIL	9	26.5
DUST	10	29.4
TOXIC FUMES	1	2.9
SMOKE	14	41.2

Based on occupational exposure study population was divided based on exposure to dust, toxic fumes and smoke. 41.2% of them had exposure to smoke.

Table 3: GOLD grading of study participants

Gold grading	Frequency	Percent
GOLD 1(mild)	3	8.8
GOLD 2 (moderate)	24	70.6
GOLD 3 (severe)	7	20.6
GOLD 4 (very severe)	0	0
Total	34	100.0

Table 4: GOLD category of study participants

	Frequency	Percent
A	0	0
B	12	35.3
E	22	64.7
Total	34	100.0

Table 5: MMRC grading of study participants

	Frequency	Percent
0	0	0
1	10	29.4
2	21	61.8
3	3	8.8
4	0	0
Total	34	100.0

Table 6: Showing significance of SGRQ score, CAT Score, FEV1%, BODE Index

		Mean	N	Sd	95% confidence interval of the difference lower	95% confidence interval of the difference upper	T	Df	Significance
SGRQ	Before	53.6471	34	5.38732					
	After	51.0000	34	6.45732					
	Difference	2.64706	34	3.92260	1.27840	4.01572	3.935	33	0.000*
SGRQ - SYMPTOMS	Before	52.6765	34	5.22071					
	After	44.6176	34	6.57366					
	Difference	8.05882	34	4.27779	6.56623	9.55141	10.985	33	0.000*

SGRQ - ACTIVITY	Before	53.7353	34	5.10679					
	After	42.7647	34	6.64721					
	Difference	10.9705	34	5.21934	9.14947	12.79170	12.256	33	0.000*
SGRQ - IMPACT	Before	52.9118	34	4.73778					
	After	43.2647	34	6.34517					
	Difference	9.6470	34	4.14058	8.20234	11.09177	13.585	33	0.000*
CAT	Before	18.7647	34	2.97524					
	After	17.1176	34	3.11171					
	Difference	1.64706	34	0.91725	1.32707	1.96710	10.470	33	0.000*
BODE INDEX	Before	2.2941	34	1.46741					
	After	2.1765	34	1.38105					
	Difference	.11765	34	.32703	.00354	.23175	2.098	33	0.044
FEVI %	Before	66.6176	34	14.96058					
	After	67.2059	34	14.04275					
	Difference	-0.58824	34	2.28457	-1.38536	.20889	-1.501	33	0.143

Our results show a statistically significant improvement in quality of life measures in COPD patients after 6 months of pulmonary rehabilitation. Specifically, the mean SGRQ score decreased from 53.6±5.4 to 51±6.5, P<0.01, 95% CI (1.3, 4.0), indicating a significant improvement in quality of life. The correlation analysis revealed a strong positive correlation between SGRQ scores before and after the pulmonary rehabilitation programme (r=0.795, p<0.01). This indicates that the improvement in quality of life measured by SGRQ points after 6 months of rehabilitation is significantly associated with the initial SGRQ scores. Therefore, we can conclude that the pulmonary rehabilitation programme is effective in improving quality of life in COPD patents, and that the initial SGRQ score is a good predictor of the improvement in quality of life after rehabilitation

Similarly, the mean CAT score decreased from 18.8 ±2.98 to 17.1 ± 3.11 p<0.01, 95% CI (1.3, 1.97), indicating a significant reduction in symptom severity. These findings suggest that the pulmonary rehabilitation programme is effective in improving quality of life and reducing symptom severity in COPD patients.

The results suggest that the pulmonary rehabilitation programme had a highly significant impact on reducing symptom severity in COPD patients, and that the improvement is highly related to the initial severity of symptoms. The strong correlation r = 0.956 indicates that the change in CAT scores after rehabilitation is highly predictable from the initial CAT scores.

DISCUSSION

The hallmark of chronic obstructive pulmonary disease (COPD) is a gradual restriction in airflow that is not entirely reversible. It's a significant public health issue that can be treated and prevented. One of the illnesses that contributes to chronic morbidity and mortality worldwide is COPD, which is common in the elderly and often results in early death from the disease or its consequences. Worldwide COPD rates are expected to rise in the upcoming decades due to prolonged exposure to risk factors. By 2020, COPD—which is currently one of the top causes of death—will rank third in terms of causes of death.

According to a study by Kanner RE, low-income nations may successfully execute a straightforward and clinically advantageous pulmonary rehabilitation program for COPD patients. The intervention group saw clinically significant improvements in their ability to exercise and their symptoms at the post-assessment.[7]

According to a study by Waller LA, pulmonary rehabilitation reduces fatigue and dyspnea, boosts mental well-being, and increases patients' sense of control over their illness. These gains are clinically significant and of a moderate size. Rehabilitation is helpful in enhancing exercise capacity and health-related quality of life, and it is a crucial part of managing COPD.[8]

Markris D carried out a study in which 94 patients finished the investigation out of the 101 individuals who were enrolled; 7 patients withdrew after randomization. The PR group consisted of 66 patients, while the control group consisted of 28. There was a significant improvement in the 6MWD, resting SpO2, and exercise Borg dyspnea score in the PR group. Furthermore, the PR group's CAT score was lower and their overall CRQ-SAS score improved more than the other group's. The ADL-D and BODE index showed significant improvements in the PR group as well. During the workout, no negative events were noted.[9]

According to a study by Dr.Lacarasse et al, PR considerably improved the CCQ, SGRQ, CRQ, and CAT, with effect sizes of -0.39, -0.33, 0.62, and -0.25, respectively. Changes in SGRQ, CRQ, and CAT showed a strong correlation with changes in CCQ (r=0.48, −0.56, and 0.54, respectively; all p<0.001). The optimum discriminating value to determine the MCID for the SGRQ, CRQ, and CAT was consistently determined by ROC curves to have a CCQ change threshold of −0.4 (area under curve: 0.71, 0.75, and 0.77, respectively; all p<0.001).[10]

Limitations of present study: The present study was a single-centre study with a small sample size, hence the results cannot be extrapolated to the general population.

CONCLUSION

The study's findings support the value of pulmonary rehabilitation for COPD patients as a therapy approach. Overall patient success may be improved by implementing methods to increase patient compliance and reduce adverse events.

Rehabilitation may be helpful in enhancing quality of life and may be one of the key elements of COPD care. Future studies should concentrate on determining which elements of pulmonary rehabilitation are crucial, as well as the optimal duration and setting for it, the level of supervision and training intensity needed, and the duration of therapy effects.

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