Original research article

Efficacy of Pulmonary Rehabilitation Maintenance on Health-Related Quality of Life Among COPD Patients

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Abstract

Background: COPD, or Chronic Obstructive Pulmonary Disease, is a chronic lung disease that affects millions of people worldwide. It is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases, mostly tobacco smoke. Home-based pulmonary rehabilitation (PR) for chronic obstructive lung disease can improve compliance (COPD). The purpose of this study is to examine how well-home-based PR treats dyspnea, exercise tolerance, health-related quality of life, and lung function in COPD patients.

Methods: The patients were allotted randomly to two groups Group (control) Hospital-based outpatient rehabilitation group (n=20) Who are newly enrolled to participate in the Department of Physical Medicine & Rehabilitation's endurance training, lower limb, upper limb, and deep breathing exercises under supervision twice or three times per week for three months will be monitored & followed up at every visit to the PR clinic. Home-based rehabilitation Group (study) (n=20) They will get instruction in deep breathing techniques, upper body exercises, and lower body endurance training at OPD and practice at home three times a week for three months. The patient will keep a log of their endurance exercises at home, and they will have biweekly check-ups at the PR clinic.

Results: The improvement in FEV1 in the study group was far better than the control group with significant p values. Similarly, the mean 6MWD also showed improvement in the study group whereas it decreased in the control group. The change in Borg scores in both groups showed the study group showed a greater decrease in the scores than the control group and the SGRQ scores at the end of 6 weeks were significantly lesser in the study group than the control group. The CAT score was also found to be significantly lesser in the study group as compared to the control group.

Conclusion: The results of our study support the notion that a low-cost, home-based PR program is an effective COPD treatment, as seen by improvements in lung function (FEV1) and quality of life (SGRQ, Borg, and CAT scores). The research backs up the idea that people with COPD can improve their quality of life and increase their physical capability with home-based PR.

Keywords: Chronic Obstructive Pulmonary Disease, Home based PR, Hospital-based PR

Introduction

A common, preventable, and treatable condition known as a chronic obstructive pulmonary disease (COPD) is characterized by recurrent respiratory symptoms and airflow restriction that are brought on by abnormalities in the airways and/or alveoli, which are typically brought on by prolonged exposure to noxious particles and gases. [1] This term does not refer to chronic bronchitis or emphysema, in contrast to preceding definitions. The combination of small airway disease and parenchymal deterioration, the proportional contributions of which vary from person to person, results in the chronic airflow restriction that is distinctive of COPD. These changes don't usually occur at the same time; instead, they develop over time at various speeds. Chronic inflammation alters the structure of the body, constricts the tiny airways, and destroys the lung parenchyma, which reduces lung elastic recoil, restricts airflow, and impairs mucociliary function. According to the projections of the Global Burden of Disease Study, chronic obstructive pulmonary disease (COPD) will rank as the third most common cause of death and the fifth most common cause of loss of "Disability Adjusted Life Years" (DALYs) globally. The estimates for the developing nations, including India, were made on a regional basis and were significantly worse. [2] In 2016, India accounted for 32% of all DALYs caused by chronic respiratory illnesses worldwide. 75.6% and 20%, respectively, of India's DALYs from chronic respiratory illness were caused by COPD and asthma in 2016. [3]

In light of the aforementioned information, COPD has a significant economic impact. Pulmonary rehabilitation (PR) was recognized as an effective treatment for COPD in the Global Initiative for Chronic Obstructive Lung Diseases (GOLD) report from 2001. This was a significant step toward PR being the accepted standard of therapy for COPD patients. The data and recommendations for rehabilitation have grown significantly since then and up until the present. Notwithstanding the severity of the condition, these programs enhance exercise capacity, reduce breathlessness, and improve health-related quality of life, according to strong data. [4] They also decrease the number of exacerbations and hospitalizations. [5] 8% to 50% of COPD patients who are referred to PR never show up, while the rates of non-compliance range from 10% to 32%. [6, 7] Accessibility issues or patient-related variables are to blame for this. There aren't enough programs, especially in rural and regional areas, and there aren't enough skilled healthcare workers, which are the practical causes of this lack of access. Travel and transportation to programs at centers are the most prevalent patient-related barriers to attendance in this challenged population. [8, 9] Spirometry is used to detect airflow restriction since it is the most accessible and reliable lung function test. Recognizing that persistent respiratory symptoms may coexist with acute respiratory episodes and airflow obstruction development is crucial. The present study aimed to determine how pulmonary rehabilitation affects COPD patients' quality of life, ability to exercise, symptoms, exacerbations, and hospital admissions.

Material and Methods

This cross-sectional study was conducted in the Departments of Pulmonology and Physical Rehabilitation, Prathima Institute of Medical Sciences, Naganoor, Karimnagar. Institutional Ethical approval was obtained for the study. Written consent was obtained for the study after explaining the nature of the study in the local language. The samples were obtained by a convenient sampling method.

Inclusion Criteria

1. Patients with a diagnosis of COPD as per GOLD guidelines [2]
2. Males and females
3. GOLD stage II, III & IV (moderate, severe, and very severe COPD)
4. Stable COPD patients.
5. Those willing the participate in the study voluntarily.

Exclusion criteria

1. Acute exacerbation of COPD, Bronchial Asthma, and Bronchiectasis
2. Interstitial lung disease
3. Ischemic heart disease and Peripheral vascular disease
4. Neurological and orthopedic conditions
5. Decompensated liver disease or Renal failure
6. Active pulmonary tuberculosis
7. Retroviral disease.

After the selection of the cases based on the inclusion and exclusion criteria, a detailed history was obtained followed by a complete physical examination including a detailed respiratory system evaluation.

The patients were allotted randomly to two groups Group (control) Hospital-based outpatient rehabilitation group (n=20) Who are newly enrolled to participate in the Department of Physical Medicine & Rehabilitation's endurance training, lower limb, upper limb, and deep breathing exercises under supervision twice or three times per week for three months will be monitored & followed up at every visit to the PR clinic.
Home-based rehabilitation Group (study) (n=20) They have just signed up for therapy at home. They will get instruction in deep breathing techniques, upper body exercises, and lower body endurance training at OPD and practice at home three times a week for three months. The patient will keep a log of their endurance exercises at home, and they will have biweekly check-ups at the PR clinic.
The data collection tools were done with.

1. Spirometry – degree of airflow limitation
2. St George Respiratory Questionnaire (SGRQ) - Quality of life
3. Six-minute walk test (6MWT) – Exercise capacity
4. BODE Index (BMI, Obstruction, Dyspnoea, and exercise capacity) –Mortality.
5. COPD Assessment Test score (CAT) - the severity of symptoms.

All of the participants received instruction on the advantages of engaging in consistent physical exercise for the rest of their lives and how it would affect their quality of life. All patients who qualified received hospital-based PR advice. Home-based PR was made available and participants in the trial were enlisted for those who found it difficult or inconvenient to visit the hospital. Patients who were receptive to home-based PR made up the study group, whereas those who were receiving hospital-based PR made up the control group. Those in the study group performed 30-minute sessions of supervised PR, which included slow walking, upper and lower limb training, pursed lip and diaphragmatic exercises, breathing exercises, and more. It was decided to have a second session. They were then instructed to continue as before at home for six weeks. Every two weeks, phone calls were sent to check on them and see whether they were still doing the exercises at home. Any

questions about the exercises were also answered. After six weeks, both groups were evaluated. Assessment tools used before and after rehabilitation included symptom evaluation, modified Borg's dyspnea scale, SGRQ, 6MWD, CAT score, and FEV1. The student's paired t-test was used to determine the statistical significance between the groups.

Results

The mean (± SD) and baseline features of clinical importance for each of these groups are shown below [Table 1]. The two groups shared comparable values from the outset of the study. The mean age of the study group's patients was 59.25 ± 6.5 years, whereas it was 60.50 ± 5.5 years for the control group. The fact that smokers in Southern India are virtually exclusively men might account for a major portion of the participants' gender bias. N=6 cases were in GOLD group B, n=8 cases were in group C, and six were in group D. Similarly, n n=4 patients were in group B, n=7 cases were in group C, and n=9 cases were in group D among the control group. As a result, there was a comparable distribution of subjects throughout the various GOLD groups. Although the difference was not statistically significant, individuals who received PR had a 150 ml higher mean baseline FEV1 than those who did not.

Table 1: The mean values of parameters recorded in both groups before the study.

	Group (Study) N=20	*Group (control) N= 20*	*P value*
Age	59.25 ± 6.5	60.50 ± 5.5	0.258
Sex Male/Female	18/2	16/4	0.157
BMI Kg/m^2	22.55 ± 0.09	23.14 ± 0.1	0.186
FEV1	1.25 ± 0.05	1.12 ± 0.06	0.283
FEV1%	49.51 ± 10.25	48.37 ± 7.85	0.336
6MWD(m)	356.7 ± 40.25	380.25 ± 35.6	0.223
Borg Scale	6.10± 0.8	6.05 ± 0.36	0.987
SGRQ score	75.25 ± 8.33	72.67 ± 10.5	0.175
CAT score	28.71 ± 2.36	29.01 ± 4.52	0.124

The changes in dyspnea score, spirometry, six min walk test, and SGRQ are tabulated in Table 2 for the study group. Compared to the baseline FEV1, there was a mean improvement of 85 ml in the FEV1 of those who underwent PR was statistically significant (*P* = 0.01). The mean 6MWD for the intervention group at the baseline visit was 356.7 ± 40.25 (95% Confidence interval [CI] 340-415) meters. After six weeks, the intervention group that received PR had a mean improvement of 44 meters.

The mean total SGRQ was the study group compared to controls at the baseline visit. The mean total SGRQ score in the intervention group decreased from a baseline of 75.25 ± 8.33 to 67.27 ± 5.54 at the 6-week follow-up visit, which was statistically significant (P = 0.04). Comparing the Borg scale at the baseline of 6.10± 0.8 and the decrease after 6 weeks to 3.75 ± 0.7 the decrease was found to be significant. The mean CAT score of 28.71 ± 2.36 at the baseline values decreased to 26.14 ± 1.97 at the end of 6 weeks and was found to be statistically significant the details have been depicted in Table 2.

Table 2: Change in the parameters from the baseline and at the end of 6 weeks in the study group

Parameters	*Group (Study) N=20*		
	Baseline	6 weeks	P value

FEV1	1.25 ± 0.05	1.33 ± 0.04	0.010*
6MWD(m)	356.7 ± 40.25	401.15 ± 50.24	0.03*
Borg Scale	6.10± 0.8	3.75 ± 0.7	0.01*
SGRQ score	75.25 ± 8.33	67.27 ± 5.54	0.04*
CAT score	28.71 ± 2.36	26.14 ± 1.97	0.012*

* Significant

Compared to the baseline values of FEV1, there was a mean improvement of 5 ml in the FEV1 of those who underwent did not undergo PR (Control group) was not significant. The mean 6MWD for the intervention group at the baseline visit was 380.25 ± 35.6 meters (95% Confidence interval [CI] 350-411) meters. After six weeks, the intervention group that received PR had a mean increase in walking distance was 15 meters. The mean total SGRQ was the study group compared to controls at the baseline visit. The mean total SGRQ score in the intervention group decreased from a baseline of 75.25 ± 8.33 to 67.27 ± 5.54 at the 6-week follow-up visit, which was statistically significant (P = 0.04). Comparing the Borg scale at the baseline of 6.05 ± 0.36 and the decrease after 6 weeks to 5.27 ± 0.94 the decrease was found to be significant. The mean CAT score of 29.01 ± 4.52 at the baseline values increased to 30.25 ± 3.7 at the end of 6 weeks and was not found to be statistically significant the details have been depicted in Table 3.

Table 3: Change in the parameters from the baseline and at the end of 6 weeks in the control group

Parameters	*Group (Control) N=20*		
	Baseline	6 weeks	P value
FEV1	1.12 ± 0.06	1.11 ± 0.05	0.411
6MWD(m)	365.25 ± 35.6	380.12 ± 44.5	0.598
Borg Scale	6.05 ± 0.36	5.27 ± 0.94	0.04*
SGRQ score	72.67 ± 10.5	74.25 ± 2.97	0.012
CAT score	29.01 ± 4.52	30.25 ± 3.7	0.254

* Significant

Table 4 shows the comparison of parameters in both groups at the end of 6 weeks. A critical analysis of Table 4 revealed the improvement in FEV1 in the study group was far better than the control group with significant p values. Similarly, the mean 6MWD also showed improvement in the study group whereas it decreased in the control group. The change in Borg scores in both groups showed the study group showed a greater decrease in the scores than the control group and the SGRQ scores at the end of 6 weeks were significantly lesser in the study group than the control group. The CAT score was also found to be significantly lesser in the study group as compared to the control group.

Table 4: Comparison of parameters at the end of 6 weeks in both group

Parameter	*Group (Study) N=20*	*Group (control) N= 20*	P value
FEV1	1.33 ± 0.04	1.11 ± 0.05	0.011*
6MWD(m)	401.15 ± 50.24	365.12 ± 44.5	0.024*
Borg Scale	3.75 ± 0.7	5.27 ± 0.94	0.014*
SGRQ score	67.27 ± 5.54	74.25 ± 2.97	0.010*
CAT score	26.14 ± 1.97	30.25 ± 3.7	0.018*

Discussion

In the current study, we found the subjects in the study group had a mean increase in FEV1 by 85 ml. In a similar prospective study by Incorvaia C et al., [10] Comparing a sample of 190 COPD patients having PR with 67 patients getting normal medication, it was shown that the former saw a mean improvement in FEV1 from 1240 ml to 1252.4 ml whereas the latter experienced a shift from 1367 ml to 1150 ml it was statistically significant. These findings imply that one of the anticipated consequences of PR for COPD patients should be an increase in lung function, which should be routinely evaluated as a measure of therapeutic effectiveness. A minimal clinically relevant difference (MCID), which goes beyond statistical differences, serves as a guide for determining if an intervention produces a minimum amount of felt benefit. The intervention group's improvement in our study barely reaches this change in lung function following a home-based training regimen. Peripheral myopathy changes as a result of PR, but not ventilatory restriction. Most of the time, the airflow restriction is both progressive and linked to an abnormal inflammatory reaction of the lungs to toxic particles or gases. [11] In our study, after rehabilitation, the patients walked further than the controls (40 m vs. 15 m). According to earlier research, a difference of 25 to 30 m is the bare minimum for 6 MWD to be clinically significant. [12] A home-based PR program is just as successful as traditional PR in patients with moderate-to-severe COPD, according to research by Maltais et al., [13] The individuals improved their performance after 6 weeks of training, increasing their 6MWD by an average of 40.0 m following rehabilitation and experiencing less breathlessness. The study's straightforward, inexpensive, and easy-to-follow strategy appears to be sufficient for the majority of COPD patients. Via weekly phone calls, an effort was made to motivate the subjects to carry out the rehabilitation activities. Those with severe COPD had an MCID of 26 m. [14] It's possible that our sample size was insufficient to demonstrate a significant change in the walk distance. The quality of life, effort tolerance, and subjective dyspnea of the patient were all positively impacted by PR in our study, as shown by improvements in the respiratory questionnaire, CAT, and Borg scale. In COPD patients, dyspnea is a severe barrier to exercise. So, it is reasonable to assume that any intervention that lessens dyspnea would also enhance functional ability and quality of life in COPD patients. In our study, only the participants who received home-based rehabilitation showed improvement in the SGRQ's dyspnea-related symptom, activity, and impact categories. Also, we discovered a statistically significant improvement in the SGRQ's measure of life quality. According to studies, a decrease of at least 4 points on the SGRQ is the smallest clinically relevant change that may be observed in people with COPD. According to our study, post-rehabilitation SGRQ ratings increased by 10 points, which is very clinically meaningful and statistically significant. [15] The CAT is an easy-to-use quality-of-life questionnaire that patients complete. It has eight items that address how COPD symptoms affect daily living. The minimal clinically relevant difference and how the CAT score performs in clinical PR campaigns are unknown. [16]

Conclusion

The results of our study support the notion that a low-cost, home-based PR program is an effective COPD treatment, as seen by improvements in lung function (FEV1) and quality of life (SGRQ, Borg, and CAT scores). The research backs up the idea that people with COPD can improve their quality of life and increase their physical capability with home-based PR. More randomized studies are necessary to determine if a home-based PR program can take the role of a hospital-based PR program in a context with limited resources. Home-based PR may be a preferable alternative for COPD patients.

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