

Impact of modified pulmonary rehabilitation on morbidity due to chronic obstructive pulmonary disease in rural area

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ABSTRACT


Background: Chronic obstructive pulmonary disease (COPD) is a chronic respiratory disease which leads to a significant reduction in the quality of life of patients. Pulmonary rehabilitation (PR) is a multidisciplinary intervention to improve the quality of life of COPD patients. In our study, we have tried to see the effect of modified PR program to improve the quality of life in COPD patients of rural area with limited resources. **Objective:** The aim of this study was to study the effect of modified PR on the lung functions and quality of life of COPD patients. **Materials and Methods:** It was an analytical and interventional study where 30 patients of COPD were included. The total duration of study was of 12 weeks which was divided in two phases. The first phase (pharmacotherapy-[PT] Phase) comprises 6 weeks when patients were given only PT as per the Global Initiative for chronic obstructive lung disease guidelines, and subsequent phase (PT plus PR phase) comprises the next 6 weeks when patients were provided PT plus modified PR which included once a week supervised chest physiotherapy at hospital, dietary advice, and psychiatric evaluation followed by the same advice at home and were checked through the telephone weekly. Between the two phases, the severity of dyspnea (COPD assessment test [CAT] score and Modified Medical Research Council [MMRC] grade), quality of life (Saint George questionnaires [SGRQs]), psychological aspects (Patient Health Questionnaire 9 [PHQ9]), and lung functions (spirometry – forced expiratory volume in 1 s [FEV1], forced vital capacity [FVC], and FEV1/FVC) and exercise capacity (6-min walk test [6MWT]) were compared and analyzed. **Results:** We found a significant improvement after PR in SGRQ ($P \leq 0.001$), CAT score ($P \leq 0.001$), MMRC grade ($P \leq 0.001$), PHQ9 score ($P \leq 0.001$), and 6MWT ($P \leq 0.001$) but no statistical significant improvement in spirometry parameters. **Conclusion:** Modified home-based PR program can be an effective therapy to improve quality of life of COPD patients in rural areas with limited resources.

KEY WORDS: Chronic Obstructive Pulmonary Disease; Quality of Life; Pulmonary Rehabilitation

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) causes significant morbidity and mortality affecting 10–15% of

adults all over the world.^[1] Cigarette smoking, passive smoking, air pollution, and biomass fuel consumption in rural communities are important causative factors for COPD. The prevalence of COPD is rapidly increasing^[2] and its incidence is also growing in old age.^[3] COPD also leads to a reduction in physical activity and psychological problems such as depression, all of which contribute to the patient's disability and poor health-related quality of life.^[4] Various questionnaires were designed to assess quality of life, health status, patients performance status inclusive of exercise capacity, and prognosis in COPD.^[5] Pulmonary rehabilitation (PR) program consists of patient assessment,

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exercise training including chest physiotherapy, health education, nutritional assessment with dietary guidance, and psychosocial support. The role of PR in patients with COPD in improving exercise capacity, in reducing breathlessness, in reducing health-care utilization, and improving quality of life has been widely studied and established.^[6-8] PR is now recommended by many guidelines as a part of holistic management of COPD to improve the quality of life in COPD patients.^[9]

It is difficult to implement PR program in rural areas due to patients' poor compliance and limited resources. We have modified PR program to suit the rural population in limited resources. The present study was performed to study the effect of modified home-based PR on the quality of life of COPD patients. In this study, rehabilitation was continued at home also, and compliance was monitored through the phone every weekly.

Objective

This study aimed to study the effect of modified home-based PR on lung function and the quality of life of COPD patients.

MATERIALS AND METHODS

Study Design

It was an interventional analytical study. We included 30 male COPD patients meeting the inclusion criteria as mentioned below. The study was conducted at the Department of Respiratory Medicine, Pramukhswami Medical College, Karamasd, Anand, Gujarat. Synopsis of the study was submitted to the Institutional Ethics Committee, and the approval was obtained to perform the study. Informed consent was obtained in the local language (Gujarati) from all the patients, and patient information sheet regarding the study also provided to each patient.

Inclusion criteria

- An Modified Medical Research Council (MMRC) score of 3, 4 or 5
- An MMRC score of 1 or 2, with a related hospital admission in the past 12 months or an exacerbation requiring treatment with steroids
- Sufficient functional mobility to participate in the exercise regime (particularly walking)
- Optimal medical management ensured for COPD as per the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guideline
- Willingness to participate in the program and ability to commit for entire length of the program
- Not having unstable angina, severe aortic stenosis, and history of myocardial infarction in the past 4 weeks

- Any other medical condition or cognitive impairment which restricts the patient's ability to participate in exercise has been excluded.

At starting of the study, demographic data, history, physical examination, and psychological assessment of all patients were conducted. The total duration of the study was 12 weeks. During the first 6 weeks, the study patients were given only pharmacotherapy (PT) as per the GOLD guidelines without PR, and during the second phase for the next 6 weeks, patients were provided PT with modified PR in addition. Various parameters of every patient at the initiation of PT (before 1st half/1st week), at the initiation of PR with PT (at the end of the 1st half/completion of 6 weeks), and at the end of the study (at 12 weeks) were recorded in structured individualized sheet and compared. We have measured every patient's symptoms with MMRC dyspnea scale, COPD assessment test (CAT) score, the BORG scale, body mass index (BMI), lung function assessment through spirometry (Post bronchodilator Forced Expiratory volume in 1 second [Post-FEV₁%], Post bronchodilator Forced Vital Capacity [Post - FVC], Post Bronchodilator-FEV₁/FVC), Bode index BMI, airflow obstruction, dyspnea, and exercise capacity), 6-min walk distance (6MWD) test, various parameters of quality of life such as Saint George questionnaire (SGRQ), and psychological parameters such as psychological scoring system (Patient Health Questionnaire 9 [PHQ9]) at the initiation of the study, after the first phase, and at the end of the study and compared between the two phases of the study.

During the second half in addition to pharmacological measures, as a part of modified PR, there was one hospital visit at every week for consecutive 6 weeks. At hospital visit on the 1st day, patients were provided chest physician consultation, physiotherapy consultation for supervised physiotherapy in clinic and training for home-based physiotherapy, psychiatric assessment, and dietary counseling. For the rest of the days in the week, patients were given home-based chart to perform and record compliance of PT and physiotherapy which was advised during hospital visit. At home stay, patients have been asked through the phone by an investigator regarding the performance of exercise as per the prescribed schedule and prescription. The detail of all patients were recorded in an individual patient card and were maintained.

Again at the end of the study, difference in the patients' level of symptoms (MMRC, CAT, and BORG scale), lung function parameters, psychological assessment (PHQ9), quality of life (SGRQs), and objective parameters (6-min walk test, spirometry, BMI, and Bode index) between the two phases of the study were measured and compared as mentioned above.

RESULTS

There were 30 male patients. The mean age was 62 years. We have found that there was a significant improvement in

patients' symptoms in all the three measured scales [Table 1]. Thus, with the addition of PR, we could see the improvement in patient baseline symptoms.

We did not find significant improvement in BMI of patient after addition of PR (the mean BMI before the first phase was 20.7580, with standard deviation (SD) 5.36491, after the first phase was 20.8780 with SD 5.0461, and at the end of the second phase was 20.8353 with SD 4.69788) ($P = 0.18$).

We did not found significant improvement in lung function parameters such as post-FEV₁%, post-FVC%, and post-FEV₁/FVC [Table 2]. We have found an increase in 6MWD after rehabilitation program along with overall improvement in Bode index [Table 2].

Regarding the quality of life, there was a significant improvement after the addition of rehabilitation measure through SGRQ along with psychological condition (PHQ9 score) of the patients [Table 3].

DISCUSSION

In our study, it was found that modified PR could improve quality of life along with exercise capacity with improvement in symptoms of COPD patients. As there is a

constant and significant rise in the burden of COPD patients worldwide, and there are limited options to cure and improve quality of life of COPD patients, there is an urgent need for a more widespread implementation and utilization of PR programs in the world.^[10] Feasibility, utilization, and patient compliance for successful PR program are extremely important in rural areas with limited resources. Various similar studies suggested that modified and tailored rehabilitation programs should be considered for COPD patients of all stages, who have respiratory symptoms and/or who have an intolerance to physical effort despite optimal pharmacological treatment.

One study conducted by Rossi *et al.* titled: Length and Clinical Effectiveness of PR in outpatients, showed less improvement in walking distance in 6 min and quality of life in 10 consecutive sessions as compared to 20 sessions.^[11] In our study, we found improvement in the quality of life and 6MWD test after 6 weeks which included once the weekly session and followed by telephonic monitored home bases session.

Goldstein *et al.* conducted a prospective randomized controlled trial of respiratory rehabilitation of 89 patients with severe but stable COPD who received rehabilitation or conventional community care.^[12] The treatment groups were provided supervised rehabilitation for 8 weeks in hospital and were supervised as outpatients for 16 weeks. The primary outcome measures of exercise tolerance and quality of life were made at the baseline and were repeated at 12, 18, and 24 weeks. There was a statistically significant difference found between the baseline and last follow in the above parameters.^[12] Thus, in our study also, we found improvement in the quality of life and increase in walking distance after 6 min at the end of the study.

One of the largest studies conducted by Ries *et al.* included 119 patients of COPD. Eight week PR consisted of twelve 4-h sessions of education, physical and respiratory care

Table 1: Parameters of assessment of symptoms (breathlessness) in all phases

Parameters	Before Phase 1	After Phase 1	After Phase 2	P value
	Mean±SD	Mean±SD	Mean±SD	
MMRC	2.33±0.479	1.97±0.55	1.77±0.568	<0.001
CAT score	10.93±6.247	9.17±5.814	7.43±5.569	<0.001
BORG scale	5.23±1.278	4.40±1.102	3.33±1.028	<0.001

MMRC: Modified Medical Research Council, CAT: Chronic obstructive pulmonary disease assessment test

Table 2: Parameters of lung function measurement and performance status

Parameters	Before Phase 1	After Phase 1	After Phase 2	P value
Mean post-FEV ₁ %	41.33	42.83	43.23	0.673
Mean post-FVC%	68.96	69.83	71.16	0.754
Mean post-FEV ₁ /FVC	0.59	0.61	0.60	0.561
6WDT (m)	349.93 (92.274)	372.50 (98.846)	395.87 (112.156)	<0.001
Bode index	3.87 (1.978)	3.53 (1.995)	3.10 (2.040)	<0.001

6WDT: Six minute walk distance test, FEV₁: Forced expiratory volume in 1 s, FVC: Forced vital capacity

Table 3: Parameters of quality of life along with psychological condition

Parameters	Before Phase 1	After Phase 1	After Phase 2	P value
SGRQ	44.77 (16.675)	39.93 (17.096)	34.73 (14.776)	<0.001
PHQ9	3.20 (2.917)	2.27 (2.766)	1.73 (2.716)	<0.001

SGRQ: Saint George questionnaires, PHQ9: Patient Health Questionnaire 9

instruction, psychological support, and supervised exercise training was provided to the patients of one group. Monthly reinforcement sessions were also added for 1 year. The other group attended four 2-h sessions that included videotapes, lectures, and discussions but not individual instruction or exercise training. There was significant improvement in the first group in lung function, maximum exercise tolerance and endurance, shortness of breath, self-efficacy for walking, depression, general quality of well-being, and hospitalizations as compared to patients who received education alone.^[13] Thus, PR was extremely useful to improve the quality of life. In this study, it was an 8 week program with 12-h sessions, whereas in our study, it was a 6-week program with six personal contact sessions and the rest were telephonically interviewed sessions performed at home.

Bendstrup *et al.* also concluded that cost-effective and comprehensive outpatient rehabilitation program of 12 weeks can produce long-term improvement in activities of daily living, quality of life, and exercise tolerance in patients with moderate-to-severe COPD.^[14] In our study of 6 weeks, we found a significant improvement in quality of life.

Another cost-effective study was done by Shetty *et al.* in Kolkata on 32 patients with 6-month follow-up of PR in the form of health education, psychosocial intervention, and exercise training. In this study, dyspnea indices showed a significant reduction of more than 64%, and the average increase of 78.41 m was found in 6MWD in the study group, which is also correlated with our study.^[15]

Although home-based rehabilitation is more cost-effective than traditional hospital treatment^[16,17] and enables patients to stay in their own comfortable environments, where exercise training specific to their daily activities can be applied,^[18] it is more focused on chest physiotherapy and muscle strengthening, whereas PR conducted in the health-care settings addresses additional aspects, such as quality of life, breathlessness cessation, psychological profile, and effectiveness of therapeutic interventions.^[18]

In our study of modified PR, we have tried to combine home as well as hospital-based program so we can make it most suitable, comfortable, and affordable to the patients. We could enroll very limited number of patients which can be the limitation of this study.

CONCLUSION

We could conclude that home-based modified PR program can be added as a part of holistic approach of management of COPD patients. It can be used in resource-limited setting as it is being more feasible, convenient, and cost-effective and can improve the quality of life of COPD patients.

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