

Effects of Low Impact Aerobic Exercise in COPD

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Exercises incorporated in Pulmonary Rehabilitation for peripheral muscle training which involves exercising the lower limb muscles, that recruits a large amount of muscle mass. The training protocol adapted in COPD can stress the peripheral muscle mass and it introduces maximal stress on the cardio-vascular system thus patient stop exercising. The study aims to analyze the effects of low impact aerobic exercise on Quality Of Life, the efficiency of walking and on patient satisfaction. Total number of 30 patients with COPD were randomized into two groups and patients who were in stage II according to GOLD guidelines were recruited into Group A (n=15), Group B (n=15). Informed consent was obtained from all the subjects after a detailed explanation about the procedure of the study. Physical examination and vitals were assessed for all the subjects before the commencement of the program. For the satisfaction of the patient and to improve the walking efficacy of the patient and to provide a better quality of life, low-intensity aerobic exercises or dynamic flexibility exercises can be advised. But statistically low-intensity aerobic exercise scores better outcome than conventional therapy over the quality of life and patient satisfaction in COPD

Keywords: Aerobic Exercise; Chronic Obstructive Pulmonary Diseases;
Flexibility Exercise; Low-Intensity Exercises.

COPD has predominant extra-pulmonary consequences that may contribute to peripheral muscle dysfunction^{1,2}. Pulmonary Rehabilitation is useful Exercise training strategy employed in all pulmonary physical therapy treatment protocol^{3,4}. Training facilitating reduced muscle mass makes the Chronic Obstructive Pulmonary Disease patients to exercise further till the resultant peripheral muscle conditioning⁴. Though Treadmill

and Bicycle ergometer training are used widely in the physical therapy management for Chronic Obstructive Pulmonary Disease patients, a simpler form of training requiring Theraband forms a sole exercise component to improve health and Quality of life^{5,6}. Exercise intolerance is the key factor needs a divergent focus while delivering a prescribed exercise regimen for Chronic Obstructive Pulmonary Disease subjects. They

commonly have difficulty performing activities of daily living and this will have an impact on their workplace and another daily routine etc. The depression and other emotional disturbances are significant findings in people with COPD which is due to the disturbances in physical function. However, this reduced exercise capacity and health status also correlated with mortality. Dyspnoea is the chief symptom that makes the patient population stop exercising and that exaggerates the fear of exercising. Exercise training is of great significance for this patient population. Recently High Repetitive low-impact aerobic exercise training has been used as a peripheral muscle training approach in COPD patients without placing stress on the respiratory system⁷. In this study, low impact aerobic exercise training was applied to patients with Moderate (GOLD-STAGE II) COPD and compared with low-intensity dynamic flexibility exercises in reference to ACSM guidelines and conventional chest therapy. The actual role of low impact aerobic exercise on a peripheral muscle in moderate COPD patients and its influence on peripheral muscle conditioning are still controversial. In this study, the SF-36 is used to assess the patient-reported survey of health changes and to predict their satisfaction by using aerobic training during the follow-up period of their exercise session⁸⁻¹¹. This aerobic exercise training is applicable especially in rural and remote locations where the availability of exercise equipment is limited.¹²

With lots of advancements in Physical therapy treatment techniques in the cardio-respiratory field, Therapy management for COPD is also has been well developed. Pulmonary Rehabilitation is a commonly used technique over the past decades in the management of patients with COPD. The other method that gained its importance is Conventional therapy management which is designed to COPD population, who are not accessible to the Pulmonary Rehabilitation program.¹²⁻¹⁴ However, in conventional therapy practice, Theraband exercises and aerobic exercise for peripheral muscle conditioning is not under regular practice^{15,16}. Hence this study focuses on the effect of low impact aerobic exercise in quality of life and patient satisfaction among COPD patients

SUBJECTS AND METHODS

Subjects

Sample size

The sample size for this current study was calculated to assess of the effects of low intensity aerobic exercise in patients with COPD. The sample size was analyzed based on a confidence interval of 95%.

Study design

This experimental study included 30 adults with COPD; 15 patients (group I) who attended Low intensity aerobic exercise and 15 patients (group II) attended low intensity dynamic flexibility exercise, a conventional form of treatment. Each group was selected based on the Criteria of selection.

Inclusion Criteria

- Men and Women's with age group 40 to 60 years
- Stable Respiratory symptoms with no exacerbations in the past 4 weeks
- Patients of moderate COPD (Stage II- GOLD criteria)
- Patients with manual muscle power grading of 3+ and above for quadriceps and hamstring muscle.
- Baseline modified medical research council (MMRC) dyspnea 3 or 4 in grade

Exclusion Criteria

- Musculoskeletal, rheumatic, cardiac or neurological disorders that might influence the exercise performance.
- Previous lung surgery.
- Malignant disease.
- Patients with cognitive deficit
- Patients with lower limb surgery within the preceding 3 months
- Acute exacerbations of Chronic Obstructive Pulmonary Disease
- Long-term oxygen treatment.
- Participants with marked muscle wasting in lower extremity
- Participants with previously enrolment in the pulmonary rehabilitation program

Standard protocol approval and consents

This study was approved in the Research presentation of SRM College o Occupational therapy, SRM Institute of Science and technology with ethical number 22.6.2019. Written consent

was taken from the patients after explanation of the aim of the study and its benefits according to Ethical Committee regulations.

Procedure

COPD patients who were in stage II according to Global initiative for Obstructive Lung Disease guidelines were recruited in the study and divided conveniently into Group A (n=15), Group B (n=15). Informed consent was obtained from all the subjects after a detailed explanation about the procedure of the study. Physical examination and vitals were assessed for all the subjects before the commencement of the program.

Group A Subjects underwent Low-intensity aerobic exercise with conventional therapy exercises whereas Group B subjects received conventional therapy with low intensity dynamic flexibility exercises. Baseline assessments will be taken and explained the procedures to be followed for the duration of 6 weeks. All the training session were conducted once under supervision. In High Repetitive, low-intensity aerobic exercise, 6 weeks of exercise training has been delivered by weekly three sessions. That covers a total of 36session. 40 minutes duration of treatment includes 10 minutes warm-up, 20 minutes single limb training and 10 minutes cool-down. During warm up therapist

delivers low intensity dynamic flexibility exercises recommended by the American College of Sports Medicine (ACSM)¹². The following Warm-up exercise will be performed alternately left to the right leg. By making the patient positioned in sitting, he has been asked to perform knee extension, Heel raises, Hip flexion, Knee extension with dorsiflexion and while walking, Two heel raise, Hip flexion, Single leg swing, Leg curl were practiced as Warm-up exercise. conventional chest therapy is referred to as a combination of postural drainage, airway clearance techniques such as percussion, vibration, shaking and free exercises for lower limb to improve breathing and exercise tolerance and low intensity dynamic flexibility exercises.

Data Analysis

Mean and standard deviation were used to assess all the parameters of the data using statistical package for social science (SPSS) version 17. Paired t-test was adopted to find out the difference between the aerobic exercise training between baseline measurement and at 6th week.

This table shows that there exist no significant difference between Pre and post-test of SF-36 among Group A subjects treated with low-intensity aerobic exercise and Group B subjects treated with Conventional therapy

Table 1. Pre and Post test values of SF-36 among Group A subjects treated with aerobic exercise Group B subjects treated with Conventional therapy technique

		SF-36		T value	P value
		Mean	St.deviation		
GROUP A	Pre test	40.915	10.077	-0.675	0.760
	Post test	50.777	7.456		
GROUP B	Pre test	40.34455	10.764354	-0.11	0.222
	Post test	50.4435	5.27204		

Table 2. Pre and Post test values of Self Efficacy Walking (SEW) questionnaire among Group A subjects treated with aerobic exercise Group B subjects treated with Conventional therapy technique

		Mean	St.deviation	T value	P value
GROUP A	Pre test	10.97	3.343	11.4	0.000
	Post test	1.123	.3436		
GROUP B	Pre test	0.323	0.007	10.0	0.201
	Post test	0.234	0.062		

P < 0.005 (C.I.95%)

This table shows that there exists a significant difference between Pre and post-test of SEW questionnaire among Group A subjects treated with low-intensity aerobic exercise but there exist no significant difference between Pre and post-test of SEW questionnaire among Group B subjects treated with conventional ($P > 0.005$)

This table shows that there exists a significant difference between Pre and post-test of Likert response scale among Group A subjects treated with low-intensity aerobic exercise but there exist no significant difference between Pre and post-test among Group B subjects treated with conventional therapy.

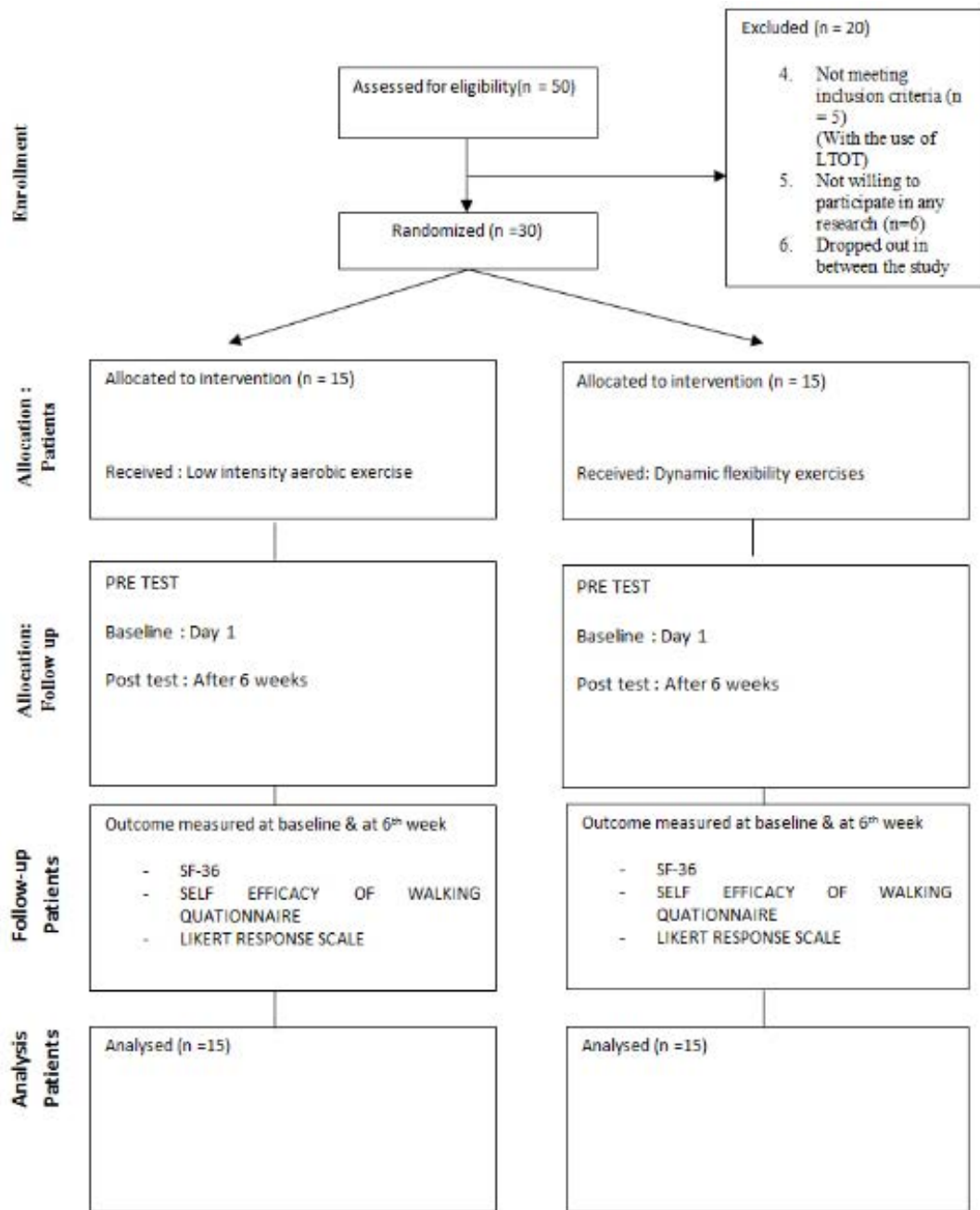


Fig. 1. Modified CONSORT flow diagram

Table 3. Pre and Post-test values of Likert Response Scale among Group A subjects treated with low-intensity aerobic exercise & Group B subjects treated with Conventional therapy technique

		Mean	St.deviation	T value	P value
GROUP A	Pre test	-.11	.680	0.12	0.000
	Post test	.76	.116		
GROUP B	Pre test	-.25	.404	0.19	0.111
	Post test	.20	.307		

P < 0.005 (C.I.95%)

DISCUSSION

Though the pulmonary rehabilitation program is used widely in physical therapy management for COPD patients, however the burden of chronic obstructive pulmonary disease (COPD) has increased and left without attention in developing countries like India. Many non-structured rehabilitation services for COPD patients are available and it is in routine practice. We call them as conventional therapy. There is a need to re-emphasize the emerging benefits of High Repetition low impact aerobic exercise in the COPD population. Aerobic exercises have emerged as a gold standard treatment option as an adjunct to other therapies in patients of COPD, even resource-poor areas of the world can have access to it. More cost-effective protocols are continuously being developed and executed by healthcare providers. Despite the availability of aerobic training, many patients in developing countries still have suffered due to the greater load imposed on their cardiovascular system by the faulty practice of the Pulmonary Rehabilitation program. Therefore, there is a need for recapitulating basic low-intensity dynamic flexibility exercises with respect to low impact aerobic training¹³. This study was done to determine the “Effectiveness of low impact aerobic exercise on Quality of life and patient satisfaction among moderate Chronic Obstructive Pulmonary Disease patients”

In India, Pulmonary rehabilitation is still under development. Because of the lack of available resources and the higher cost of rehabilitation services makes COPD population

rely on home treatment methods. Illiteracy also plays a major role in India; lack of knowledge of particular lung disease and its manifestations makes the disease progress to other severity levels. In COPD subjects a lot of treatment options exist for pulmonary manifestations and the majority of researchers focusing their attention on the cardinal symptoms of respiratory illness. Lack of research on extrapulmonary manifestations of Chronic Obstructive Pulmonary Disease patients make a greater negative impact in educating the patient and also in focusing the therapy management for skeletal muscle dysfunction. Gold standard treatment protocol in treating the extrapulmonary manifestation of COPD is lacking and its management is negligible in daily practice.

COPD is the leading cause of morbidity and mortality in the developing world. In order to improve the quality of life of this patient population, successful evaluation of their physical function and assessment of manifestation of disease should be done. SF-36 assesses the quality of life and it is a gold standard in assessing various domains of patients complaints, that need physiotherapist focus. Studies have been done on Conventional therapy management for COPD population but on the practice we found low-intensity aerobic exercise imposes less stress on major muscle groups of lower extremity, so without eliciting dyspnoea and its burden, this AEROBIC training with done with High repetitions makes the better progression in walking efficacy and patient satisfaction. So we decided to compare those these techniques to find which technique is effective in improving the quality of life in the COPD population¹⁴.

Thus this study was designed to find out the effect of low-intensity aerobic exercise on quality of life and patient satisfaction among COPD patients. In this study quality of life has been statistically increased with both conventional therapies as well as with low-intensity aerobic exercise training (Table 1). This finding was confirmed by R Crouch in his study done in 2014 shows conventional therapy management can increase the quality of life in all 8 domains of SF-36 in COPD population high repetition single limb training investigating the effect of high-repetitive exercises involving one particular muscle group of the lower limb in moderate COPD patients. Without a properly designed protocol, low-intensity aerobic exercise fails to benefit the patient's group, A proper warm-up and cool-down program is employed to attain the maximum benefit of this low-intensity aerobic exercise training. ACSM guidelines of dynamic flexibility exercises have been employed along with the aerobic program¹⁵.

Conventional therapy has statistically significant improvement in the quality of life after the treatment for 6 weeks (Table 1). Walking performance in patients with COPD improved after a 2 weeks training with aerobic training with Theraband. Statistically significant values have been achieved in both the group following 6 weeks of training with Conventional Therapy and aerobic training. (table 2 and graph 2) a study done by Amy s Davis shows that the efficacy of walking performance has a direct influence on the quality of life and they feel much satisfied when the dependency level has reduced and they feel confident to walk alone. Fear of dyspnoea during walking and the efficiency of walking has been increased following aerobic program.¹²

Patients feel satisfied following the low-impact aerobic exercise and they enjoy the visible effects of peripheral muscle conditioning and statistically significant difference obtained after 6 weeks of training in the aerobic group when compared to conventional therapy protocol. (Table 3). But when the two groups are compared, the quality of life achieved in between the groups ($P < 0.05$) is not statistically significant (Graph 4) but, when walking efficiency and satisfaction following the treatment is compared there are much difference and improvement between the groups (Table 2,3)

CONCLUSION

There exists a statistically significant difference in the self-efficacy of walking and patient satisfaction between High Repetition low-intensity aerobic exercise and Conventional therapy. There is no statistically significant difference in the quality of life found between low-intensity aerobic exercise and Conventional therapy in Chronic Obstructive Pulmonary Disease Patients. Both the treatment options can increase the quality of life in COPD populations without any statistically significant difference. So for the satisfaction of the patient and to improve the walking efficacy of the patient and to provide a better quality of life, conventional therapy can be advised. But statistically, low-intensity aerobic exercise scores better outcome than the conventional therapy over the quality of life and patient satisfaction in COPD patients

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