Pravara Med Rev; December 2023, 15 (04), 50 -57
DOI: 10.36848/PMR/2023/00000.51111

Original article

Outcome of pulmonary rehabilitation in stable Chronic Obstructive Pulmonary Disease (COPD) patients

[1]Dr. Rishabh Sharma, [2]Dr. Amalesh Basak, [3]Dr. Somenath Kundu, [4]Dr. Rajesh Pramanik

[1]Junior Resident, [2]Associate Professor, [3]Professor and Head*,[4] Professor and Head
Department of Physical Medicine and Rehabilitation & Chest Medicine*
IPGME & R-SSKM Hospital, Kolkata, 244 A.J.C. Bose Road, Kolkata-700020
Correspondence: Dr. Rishabh Sharma

Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a common disease with pulmonary & extra-pulmonary symptoms. It is a leading cause of mortality & disability. In India, the crude estimate of COPD burden is over 30 million.

Methods: Study was conducted over a period of 18 months in clinically diagnosed 70 cases (35 patients each in group I and II) of COPD of all ages and both gender.

Results: Mean age of patients was 64.14±5.94 years in Group I and 65.05±5.58 in Group II. Majority of patients were males in our study, 30 (75.72%) patients were male in Group I and 28(80%) patients in Group II. In Group I (82.85%) & Group II (77.15%) patients were smoker. In Group I statistically significant decrease in mean mMRC after 6 weeks & 12 weeks of PR (baseline 2.57±0.50; 6 Wks 1.68±0.47; 12Wks 1.02±0.16) was observed. In group II, mean mMRC decrease was not statistically significant (baseline 2.54±0.50; at 6 weeks 2.51±0.50 & 2.48±0.50 at 12 weeks). In Group I statistically significant increase in mean 6MWD after 6 weeks & 12 weeks of PR (baseline 285.88±32.11 meter; 320.82±32.52 meter at 6 Wks; 345.48±32.10 meter at 12Wks) was found. In group II, mean 6MWD increase was not statistically significant (baseline 296.34±28.17 meter ; 294.62±30.23 at 6 weeks & 297.02±28.89 at 12 weeks). In Group I statistically significant decrease in mean SGRQ after 6 weeks & 12 weeks of PR (baseline 68.05±5.54; at 6 Wks 53.74±5.79; at 12Wks 38.22±8.66). Decrease in SGRQ indicated improvement in quality of life whereas in group II, there was no significant decrease in mean SGRQ (baseline 66.28±3.97; at 6 weeks 65.2±3.88 & at 12 weeks 65.11±4.70).

Conclusion: COPD patients had reduced exercise capacity (low 6 MWD), high dyspnea score and impaired quality of life as indicated by high SGRQ at baseline. Pulmonary rehabilitation results in statistically significant improvement in 6MWT, decrease in dyspnea score & improvement in quality of life at 6 & 12 weeks while no improvement was noted in the group not given pulmonary rehabilitation. Pulmonary rehabilitation found to be an effective non-pharmacological intervention for COPD patients.

Keywords: Pulmonary, Rehabilitation, COPD

Introduction

Chronic obstructive pulmonary disease (COPD) is one of the most prevalent respiratory condition associated with high disability, morbidity and mortality. Currently recognized as third leading cause of mortality & seventh leading cause of disability-adjusted life years world-over comorbid conditions.[1,2] Many people die prematurely either due to disease itself or its complications. Considering the global trends, an increase in prevalence of COPD is projected due to continuous exposure to COPD risk factors & aging.[3] COPD is a multi-factorial progressive disease with air flow obstruction resulting in dyspnea & productive cough.[4,5] COPD is now recognized as a systemic illness with extra-pulmonary manifestations like skeletal muscle dysfunction, weight loss, cachexia, osteoporosis & cardiovascular disorders. Thus COPD patients have reduced functional capacity & poor quality of life which tends to worsen with disease progressionagin.[6] Reduced physical activity is a high risk factor for high morbidity & mortality.[7]

Pharmacological treatment of COPD with bronchodilators help to improve pulmonary symptoms like dyspnea, but have no effect on extra- pulmonary manifestations. drugs. Existing drugs also have high cost & side effects. Non-pharmacological intervention in form of pulmonary rehabilitation (PR) could be an effective approach to improve symptoms, quality of life & functional status of COPD patients.[8] Pulmonary rehabilitation (PR) is evidence based comprehensive intervention based on thorough patient assessment followed by patient tailored therapies to improve physical, psychological condition of patients with chronic respiratory disease & to promote long term adherence to health enhancing behaviors. PR helps by breaking vicious cycle of dyspnea, decreased activity, deconditioning & isolation.

PMR P ISSN: 0975-0533, E ISSN: 0976-0164

Exercise training is cornerstone of comprehensive PR program.[9] Essential components of PR should include endurance & strength training. Six to twelve weeks of PR leads to clinically relevant improvement in daily symptoms.[10] There are several assessment scales like St. George's Respiratory Questionnaire (SGRQ) for quality of life assessment[11],6-minute walk test (6 MWT)[12,13] & dyspnea assessment by modified Medical Research Council Scale (mMRC)[14].

Although PR is highly effective treatment in COPD, yet it is grossly underutilized & frequently inaccessible to patients world over. Effective implementation of PR in clinical practice is grossly lacking in India. Hence the present study was planned to study the effect of pulmonary rehabilitation in COPD patients by change in mMRC scale, six–minute- walk distance (6MWD) test & quality of life by SGRQ score.

Material and Methods

The present institution based prospective, comparative study was conducted over a period of 18 months in Department of Physical Medicine and Rehabilitation & Department of Pulmonary Medicine IPGME & R-SSKM Hospital, Kolkata. Ethical clearance was taken from The Institutional Ethics Committee before starting study. Patient information sheet was explained to each patient in their own language and signed informed consent was taken. A total of 70 clinically diagnosed cases of COPD of all ages and both gender attending OPD/admitted in Department of Physical Medicine & Rehabilitation and Pulmonary Medicine of IPGME&R-SSKM Hospital, Kolkata were included. Patients fulfilling the criteria were categorized into two groups of 35 patients each. Patients of COPD presented with modified medical research council (mMRC) breathlessness (mMRC) 2-3 score and who had not received steroid in last 6 months were included in the study. Patients who got/received steroids in last 6 months, unstable cardiovascular disease, severe arthritis, severe peripheral vascular disease, uncontrolled hypertension, neuromuscular conditions, psychiatric and cognitive impairment, unable to follow instructions and not willing to participate were excluded.

Both groups were given regular standard treatment as per Global Initiative for Chronic Lung Diseases (GOLD) guidelines. They were given same medications throughout the study period. Both group patients were evaluated thrice (at time of recruitment, after 6 weeks &12 weeks).

Group I (Study group)-Thirty five patients of COPD were given PR along with standard treatment. Patients were given institution based pulmonary rehabilitation programme. They came thrice a week to department. Each session lasted for one hour. Pulmonary rehabilitation included counselling for smoking cessation, nutritional therapy for early satiety, bloating, dyspnea, anorexia, fatigue, constipation, dental problems. It involved patient education, secretion mobilization techniques, airway clear techniques, controlled breathing techniques, abdominal muscle exercise and general reconditioning exercises, relaxation techniques, energy conservation techniques and necessary vocational measures.

Group 2 (Control group) - Thirty five patients of COPD given standard treatment without PR.

X -ray Chest (PA View), Blood tests which included complete blood count, Blood sugar, Blood urea, Liver function tests, serum creatinine, ECG & ECHO (if required) and FEV1 was done in all the patients.

Assessments

At baseline, 6 weeks and 12 weeks in both groups, the following parameters were carried out:

i. Six minute walk distance test (6 MWD):Patient was asked to walk for 6 minutes to and fro in corridor. At the end of 6 minutes total distance walked (in meters) and fatigue was recorded.
ii. Dyspnea assessment by mMRC scale
iii) Quality of life by St. George Respiratory Questionnaire (SGRQ)

Statistical Analysis:

Descriptive statistics, parametric and non-parametric inferential statistical analysis were done. Data analyzed as percentages and mean±SD. The comparison of the baseline characteristics between the groups was determined by using Student t-test for independent samples. The significance of changes before and after treatment for each group was analyzed using a Student *t*-test (Paired) for dependent variables. Pearson correlations of Coefficient (r value) were used to describe associations between independent variables. A p value of <0.05 was considered as significant.

PMR P ISSN: 0975-0533, E ISSN: 0976-0164

Data availability statement

The data associated with the paper are not publicly available but are available from the corresponding author on reasonable request.

OBSERVATIONS AND RESULTS

In the present study, majority of patients i.e. 16 (45.72%) patients in Group I belonged to 61-70 years age group followed by 13 (37.14%) patients in <60 years. In Group II, majority of patients i.e. 20 (57.15%) belonged to 61-70 years age group followed by 8 (22.85%) patients in <60 years. Mean age in Group I patients was 64.14±5.94 and in Group II was 65.05±5.58 (p >0.05). A total of 30(75.72%) patients were male in Group I and 28(80%) patients in Group II (p >0.05). A total of 29 (82.85%) patients were smoker in Group I and 27 (77.15%) in Group II (p >0.05). Mean weight (kgs), height (cms) and body mass index in both the groups found to be almost similar (p >0.05). Mean body mass index (BMI) in Group I (study group) was 20.76±2.40 and 20.58±1.52 (kg/m2) in Group II (control group). Blood pressure, Pulse rate, oxygen saturation, respiratory rate and FEV1 among two groups found to be comparable and statistically insignificant (p >0.05 NS).

Table 1 depicts baseline investigations of both the groups. MMRC, 6 minute walking test and SGRQ found to be almost similar in both the groups and thus statistically insignificant (p >0.05).

Table 2 shows comparison of parameters at 6 weeks and 12 weeks between two groups i.e. MMRC, 6MWT(meter) and SGRQ (p <0.001). highly significant (p <0.001).In group II, mean 6MWT(meter) at baseline was 296.34±28.17 which decreased to 294.62±30.23 after 6 weeks and further increased to 297.02±28.89, after 12 weeks. When compared statistically, the difference between baseline vs. 6 weeks, baseline vs. 12 weeks and 6 weeks vs. 12 weeks, found to be insignificant (p >0.05). Group I and group II comparison shows insignificant results at baseline and highly significant at 6 weeks and 12 weeks.

Comparison of SGRQ from baseline to 12 weeks in both the groups. In group I, mean SGRQ at baseline was 68.05±5.54 which decreased to 53.74±5.79 after 6 weeks and further decreased to 38.22±8.66, after 12 weeks. When compared statistically, the difference between baseline vs. 6 weeks, baseline vs. 12 weeks and 6 weeks vs. 12 weeks, found to be highly significant (p <0.001). In group II, mean SGRQ at baseline was 66.28±3.97 which decreased to 65.2±3.88 after 6 weeks of and further decreased to 65.11±4.70, after 12 weeks. When compared statistically, the difference between baseline vs. 6 weeks, baseline vs. 12 weeks and 6 weeks vs. 12 weeksfound to be insignificant (p >0.05). Group I and group II comparison shows insignificant results at baseline and highly significant at 6 weeks and 12 weeks.

Table 3 demonstrates comparison of MMRC, 6MWT (meter) from baseline to 12 weeks in both the groups. In the present study, mean MMRC in group I patients at baseline was 2.57±0.50 which decreased to 1.68±0.47 after 6 weeks and further decreased to 1.02±0.16, after 12 weeks. When compared statistically, the difference between baseline vs. 6 weeks, baseline vs. 12 weeks and 6 weeks vs. 12 weeks, found to be highly significant (p <0.001). Similarly, in group II, mean MMRC at baseline was 2.54±0.50 which decreased to 2.51±0.50 after 6 weeks and further decreased to 2.48±0.50, after 12 weeks. When compared statistically, the difference between baseline vs. 6 weeks, baseline vs. 12 weeks and 6 weeks vs. 12 weeks, found to be insignificant (p >0.05 NS). Group I and group II comparison shows insignificant results at baseline and highly significant at 6 weeks and 12 weeks.

Comparison of 6MWT (meter) from baseline to 12 weeks in both the groups. In the present study, mean 6MWT(meter) in study group patients at baseline was 285.88±32.11 which increased to 320.82±32.52 after 6 weeks and further increased to 345.48±32.10, after 12 weeks. When compared statistically, the difference between baseline vs. 6 weeks, baseline vs. 12 weeks and 6 weeks vs. 12 weeks, found to be

PEARSON'S CORRELATION OF 6 WEEKS VS. 12 WEEKS IN GROUP I

Table 4 and Figure I shows Pearson's correlation coefficient of MMRC at 6 weeks vs. 12 weeks. The value of R found to be 0.116. Although technically a positive correlation, the relationship between variables is weak.

Table 5 and Figure II shows Pearson's correlation coefficient of 6MWT at 6 weeks vs. 12 weeks. The value of R found to be 0.957. This is a strong positive correlation, which means that high X variable scores go with high Y variable scores (and vice versa).

Table 6 and Figure III shows Pearson's correlation coefficient of SGRQ at 6 weeks vs. 12 weeks. The value of R found to be 0.831.This is a strong positive correlation, which means that high X variable scores go with high Y variable scores (and vice versa).

PMR P ISSN: 0975-0533, E ISSN: 0976-0164

Table 1: Comparison of Baseline investigations among two groups

Parameters	Group I (n=35)	Group II (n=35)	Statistical analysis (p value)
MMRC	2.57±0.50	2.54±0.50	0.813*
6MWT (meter)	285.88±32.11	296.34±28.17	0.152*
SGRQ	68.05±5.54	66.28±3.97	0.128*

* p >0.05 NS

Table 2: Comparison of parameters at various time intervals between two groups

Parameters **(6 weeks)**	Group I (n=35)	Group II (n=35)	Statistical analysis (p value)
MMRC	1.68±0.47	2.51±0.50	0.001*
6MWT (meter)	320.82±32.52	294.62±30.23	0.001*
SGRQ	53.74±5.79	65.2±3.88	0.001*
(12 weeks)			
MMRC	1.02±0.16	2.48±0.50	0.001*
6MWT (meter)	345.48±32.10	297.02±28.89	0.001*
SGRQ	38.22±8.66	65.11±4.70	0.001*

* p <0.001 Highly significant

Table 3: Comparison of MMRC, 6MWT(meter) and SGRQ at various time intervals in among both the groups

	Time duration			Statistical analysis (p value)		
MMRC	At baseline	6 weeks	12 weeks	Baseline vs. 6 weeks	Baseline vs. 12 weeks	6 weeks vs. 12 weeks
Group I	2.57±0.50	1.68±0.47	1.02±0.16	<0.001*	<0.001*	<0.001*
Group II	2.54±0.50	2.51±0.50	2.48±0.50	0.767**	0.571**	0.822**
Statistical analysis (Gr. I vs. II)	0.813**	0.001*	0.001*			
6MWT(meter)						
Group I	285.88±32.11	320.82±32.52	345.48±32.10	<0.001*	<0.001*	<0.001*
Group II	296.34±28.17	294.62±30.23	297.02±28.89	0.557**	0.02**	0.412**
Statistical analysis (Gr. I vs. II)	0.152**	0.001*	0.001*			
SGRQ						
Group I	68.05±5.54	53.74±5.79	38.22±8.66	<0.001*	<0.001*	<0.001*
Group II	66.28±3.97	65.2±3.88	65.11±4.70	0.08**	0.06**	0.905**
Statistical analysis (Gr. I vs. II)	0.128**	0.001*	0.001*			

* p <0.001 Highly significant, **p >0.05 NS,

Table 4: Correlation of 6 weeks vs 12 weeks – MMRC

MMRC	6 weeks	12 weeks	Pearson's Correlation of Coefficient (r value)	Statistical significance
Mean±SD	1.68±0.43	1.02±0.16	0.116	>0.05 NS

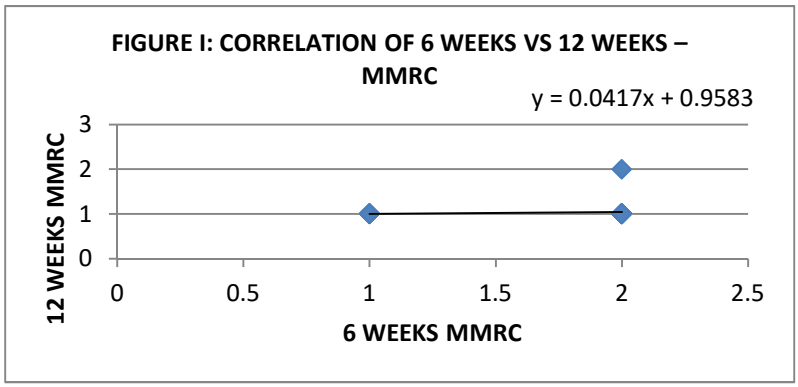
Table 5: Correlation of 6 weeks vs 12 weeks – 6MWT(meter)

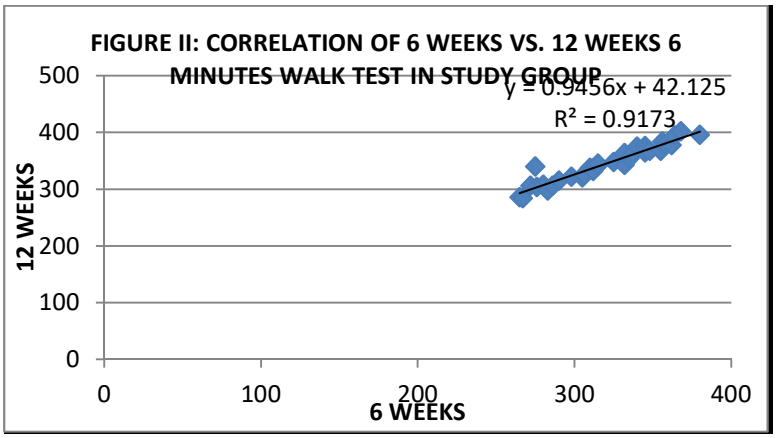
6MWT	6 weeks	12 weeks	Pearson's Correlation of Coefficient (r value)	Statistical significance
Mean±SD	320.85±32.52	345.48±32.10	0.957	<0.01 Significant

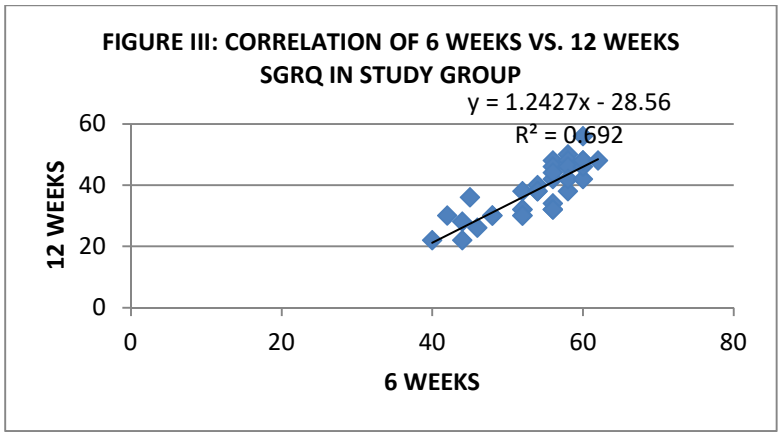
PMR P ISSN: 0975-0533, E ISSN: 0976-0164

Table 6: Correlation of 6 weeks vs 12 weeks – SGRQ

SGRQ	6 weeks	12 weeks	Pearson's Correlation of Coefficient (r value)	Statistical significance
Mean±SD	53.74±5.79	38.22±8.66	0.831	<0.01 Significant







PMR P ISSN: 0975-0533, E ISSN: 0976-0164

Discussion

Chronic obstructive pulmonary disease (COPD) is a common disease with pulmonary & extra-pulmonary symptoms. A mortality rate of 8.7% rate has been reported by Global Burden of Diseases, Injuries, and Risk Factors Study.[15,16] Worldwide there is an increased prevalence of COPD due to continuous exposure to COPD risk factors & aging. The progression of airflow obstruction and the impairment in alveolar ventilation and gas exchange in COPD results in abnormal gas exchange, reduced respiratory reserve, increasing symptoms of dyspnea and reduced exercise tolerance..Exercise intolerance is most troubling symptom. Dyspnea, exercise intolerance, extra-pulmonary symptoms and adverse psychological effects of COPD reduce health related quality of life. Thus, it is important to prevent respiratory decompensation and improve health status in COPD patients. Medicines have a limited role in improving airway obstruction, but without any effects on extra-pulmonary symptoms or overall quality of life. In addition drugs are costly and have side effects.

PR is being recommended as an integral part of COPD management by number of guidelines. Meta-analysis of 65 randomized-controlled trials (RCTs) on 3822 participants demonstrated statistically significant clinical improvement with PR in quality of life (parameter included dyspnea, fatigue, emotional function, and), and enhanced sense of control over their condition. The PR program in all studies ranged from 8 to 12 weeks and comprised of hospital-based or community-based setting.[17]

In the present study, mean age was 64.14±5.94 yrs in Group I and 65.05±5.58 yrs in group II (p >0.05). Systemic reviews & meta-analysis have reported higher prevalence of COPD in those with age above 40 years compared to those less than 40 years. Paneroni et al,[18] in systematic review and meta-Analysis of 10 studies with 458 subjects reported mean age of 65.6 yrs.

Majority of patients were males in our study, 30 (75.72%) patients were male in Group I and 28(80%) patients in Group II. Systemic reviews & meta-analysis have also reported a higher prevalence of COPD in males compared to females. Similar results have been reported in Indian surveys.[19] In this study 80% (56/70) of them were smokers. Tobacco smoking has been reported to be the strongest risk factor followed by environmental tobacco smoke, occupational exposure, age, and biomass fuel. Both groups were statistically comparable for mean weight (kgs), height (cms) and body mass index (kg/m2) (p >0.05). Mean body mass index (BMI) in Group I (study group) was 20.76±2.40 and 20.58±1.52 (kg/m2) in Group II (control group). Both groups were comparable for mean respiratory rate (Group I :19.68±2.78 / minute &Group II:19.74±1.50/minute: p = 0.915). Mean pulse rate was 77.31±5.15/ minute & 77.2±4.50 /minute in Group 1 &Group II respectively. In Group 1 the mean FEV1 was 0.87±0.19 and 0.81±0.20 in Group II. There was no significant difference between two groups.

Outcome of assessment of exercise capacity is essential in PR to establish effect on exercise tolerance. Efficacy of PR in the present study was evaluated by studying outcome parameters of exercise capacity (by 6-min walk test), health related quality of life (by SGRQ) & dyspnea (by mMRC). They were assessed in both groups at baseline, 6 weeks and 12 weeks. In Group I they were studied at the end of 6 weeks & 12 weeks PR. At baseline both groups were comparable for mean mMRC (Group I 2.57±0.50 ; Group II 2.54±0.50;p= 0.813), six minute walk test (Group I : 285.88±32.11 meter ; Group II: 296.34±28.17 meter, p= 0.152) and SGRQ(Group I : 68.05±5.54 ; Group II 66.28±3.97 ; p= 0.128).

mMRC scale :Dyspnea or subjective respiratory discomfort is common & most troublesome symptom for COPD patient. Initially patients limit their exercise to avoid dyspnea. Severity of the underlying COPD is reflected by degree of exercise intolerance.[20] In present study baseline mean MMRC scale was 2.57±0.50 in group I patients & 2.54±0.50 in group II (p >0.05 NS). In study group after 6 weeks of PR the MMRC scale decreased to 1.68±0.47 which further decreased to 1.02±0.16 at end of 12 weeks PR. In study group with PR there was statistically significant difference (p <0.001) between baseline Vs 6 weeks, baseline Vs 12 weeks and 6 weeks Vs 12 weeks. There was a positive but weak correlation (r=0.116;p >0.05 NS) of mMRC at 6 weeks Vs 12 weeks. Whereas in group II, mean MMRC scale at baseline was 2.54±0.50, at 6 weeks was 2.51±0.50 & 2.48±0.50 after 12 weeks follow up. When compared statistically, the difference between baseline Vs 6 weeks, baseline vs. 12 weeks and 6 weeks vs. 12 weeks, were statistically insignificant. In study group with PR there was significant decrease in MMRC scale at end of 6 weeks & 12 weeks. But there no change was in control group MMRC scale. Paz-Dı´et al,[21] in their study on 24 patients of severe COPD reported significant improvement in MMRC scale with 8-wk PR. In their study MRC dyspnea score improved only in the PR group (P< 0.01), without changes in the controls. Wadell et al,[22] in randomized, controlled study of 48 subjects with COPD reported clinically meaningful improvement in dyspnea with PR in the absence of consistent physiological training effects.

6-minute walk distance test: 6MWT is a simple test used to assess functional exercise capacity before and after interventions. In present study both groups were comparable for mean baseline 6 MWT (285.88±32.11 meter in Group I

Vs 296.34±28.17 meter in Group II; p=0.152). In study group (Group I) with PR (6 MWT) distance improved from 285.88±32.11 meter to 320.82±32.52 meter after 6 weeks post-rehabilitation & 345.48±32.10 meter at end of 12 weeks post-rehabilitation. In study group with PR there was statistically significant increase in 6MWT indicating improvement in exercise capacity (p <0.001). Whereas in group II, mean 6MWD was 296.34±28.17 meter at baseline, 294.62±30.23 meter at 6 weeks follow up & 297.02±28.89 after 12 weeks. When compared statistically, the difference between baseline vs. 6 weeks, baseline vs. 12 weeks and 6 weeks vs. 12 weeks, was statistically insignificant. There was a positive correlation (r=0.957; p <0.01) of 6 MWD at 6 weeks Vs 12 weeks indicating improvement in 6MWD with time. Paneroni et al[18] in a systematic review and meta-analysis assessed functional capacity via 6MWT in eight studies (396 patients: 207 treatments and 189 controls). They reported statistically significant improvement in intervention group [mean difference of 67.1] compared to control group. Desensitization to dyspnea-related fear & anxiety, increased self-efficacy, improved emotional functioning and coping skills help to provide dyspnea relief. However PR programs report marginal improvement in physiological parameters like reduction in lung hyperinflation, slower breathing and increase in strength or endurance of the respiratory muscles. Singh et al[12] in their study of 40 stable patients of COPD studied the effect of 30 minutes of exercises given for four weeks at home twice daily under supervision. With PR 6MWT distance increased to 315± 118 meters from baseline of 261 ± 113 meters (mean increase of 54.2 ± 26.7). This increase was statistically significant (p <0.001) whereas in non-PR group 6MW distance increased to 264.2 ± 157 meters from 257.7 ± 158 meters (mean increase of 6.7 ± 10.3 which was not statistically significant). In their study the mean percent increase in the distance covered in six-minute walk after the schedule was 20.7 meters in the experimental group and 2.6 meters in the control group. In addition there was improvement in dyspnea, mastery, fatigue and emotion scores but there was no significant change in FEVl.

St. George Respiratory Questionnaire (SGRQ): In present study both groups were comparable for SGRQ at baseline. In study group (Group I) with PR (SGRQ) score decreased from 68.05±5.54 to 53.74±5.79 after 6 weeks post-rehabilitation & 38.22±8.66 at end of 12 weeks post-rehabilitation. In study group with PR there was statistically significant decrease in total SGRQ indicating improvement in health related quality of life (p <0.001). Whereas in group II, mean SGRQ scale at baseline was 66.28±3.97, at 6 weeks follow up was 64.8±3.53 & 64.11±3.87 after 12 weeks. When compared statistically, the difference between baseline vs. 6 weeks, baseline vs. 12 weeks and 6 weeks vs. 12 weeks, was statistically insignificant. There was a positive correlation (r=0.831; p< 0.01) of SQRQ at 6 weeks Vs 12 weeks indicating improvement in quality of life with time. Paz-Dıaz et al[21] in their study, reported significant decrease in the total score of the SGRQ (P < 0.01) only in the PR group (P< 0.01), without changes in the controls. With PR, there was a significant improvement in the severity of depression (p <0.01), a decrease in symptoms (P <0.05), an increase in daily living activities. Paneroni et al[18] in a systematic review and meta-analysis of 182 patients (98 treatments and 84 controls) showed that the intervention group showed significant improvement more than the control group.

Duration of PR: Although ideal duration of PR for people with chronic respiratory diseases is unclear. British guidelines recommend PR for 6–12 wks.[23] In our study we provided hospital based PR for 12 weeks and studied parameters at end of 6 weeks & 12 weeks PR. At the end of 6 weeks PR there was statistically significant improvement in mMRC, 6MWT & SGRQ which further statistically improved at 12 weeks. Studies report a minimum 8 weeks of PR (two to three sessions per week) show improvement in exercise and quality of life. Mostly benefit lasts up to 12 months. Selzler et al[24] in their study also provided outpatient PR for 8 weeks and noted improvement in SGRQ and walk test. Orooj et al[25], in their randomized control study noted significant improvement with 6 weeks of PR. Singh et al[12], in their study reported significant improvement in 6 minute walk distance, dyspnoea & emotional score with domicillary PR given for half an hour twice a week for four weeks. However they did not notice any change in FEV1.They concluded that PR results in significant improvement in quality of life, even without improvement in FEV1.

Conclusion

COPD patients had reduced exercise capacity (low 6 MWD), high dyspnea score (as measured by mMRC) and impaired quality of life as indicated by high SGRQ at baseline. PR results in statistically significant improvement in 6MWT, decrease in dyspnea score & improvement in quality of life (reflected by decrease in SGRQ score**)** at 6 & 12 weeks while no improvement was noted in the group not given PR. PR found to be an effective non-pharmacological intervention for COPD patients.

REFERENCES

1. DALYs GBD, Collaborators H. Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 2018;392:1859–1922
2. Halpin DMG, Celli BR, Criner G, Frith P, López Varela MV, Salvi S. The GOLD Summit on chronic obstructive pulmonary disease in low- and middle-income countries.Int J Tuberc Lung Dis 2019;23:1131-41.
3. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. PLoS Med 2006;3:e442
4. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management and prevention of chronic pulmonary disease, 2022. Available at: http://www.goldcopd.org/Guidelines/guidelines-resources.html
5. Reardon JZ, Lareau SC, Zuwallack R. Functional status and quality of life in chronic obstructive pulmonary disease. Am J Med 2006;119:32–7.
6. American Thoracic Society and European Respiratory Society. Skeletal muscle dysfunction in chronic obstructive pulmonary disease. A statement of the American Thoracic Society and European Respiratory Society. Am J Respir Crit Care Med 1999;159:S1-40.
7. American Thoracic Society College of Chest Physicians ATS/ACCP statement on cardiopulmonary exercise testing. Am J Respir Crit Care Med 2003;167:211-77.
8. Rochester CL, Vogiatzis I, Holland AE, Lareau SC, Marciniuk DD, Puhan MA, et al. An Official American Thoracic Society/ European Respiratory Society policy statement: enhancing implementation, use, and delivery of pulmonary rehabilitation. Am J Respir Crit Care Med 2015;192:1373-86
9. Spruit MA, Singh SJ, Garvey C, ZuWallack R, Nici L, Rochester C, et al. Task Force on Pulmonary Rehabilitation. An official American Thoracic Society/ European Respiratory Society statement: key concepts and advances in pulmonary rehabilitation. Am J Respir Crit Care Med 2013;188:e13–64
10. Arnold MT, Dolezal BA, Cooper CB. Pulmonary Rehabilitation for Chronic Obstructive Pulmonary Disease: Highly Effective but Often Overlooked. Tuberc Respir Dis 2020;83:257-67.
11. Jones P, Quirk F, Baveystock C, Littlejohns P. A self-complete measure of health status for chronic airflow limitation. The St. George's respiratory questionnaire. Am Rev Respir Dis 1992;145:1321-27.
12. Singh S, Puhan M, Andrianopoulos V, Hernandes N, Mitchell K, Hill C, et al. An official systematic review of the European Respiratory Society/American Thoracic Society: Measurement properties of field walking tests in chronic respiratory disease. Eur Respir J 2014;44:1447-78.
13. Spruit MA, Polkey MI, Celli B, Edwards LD, Watkins ML, Pinto-Plata V, et al. Evaluation of COPD Longitudinally to Identify Predictive Surrogate Endpoints (ECLIPSE) study investigators. Predicting outcomes from 6-minute walk distance in chronic obstructive pulmonary disease. J Am Med Dir Assoc 2012;13:291–7.
14. Mahler DA, Wells CK. Evaluation of clinical methods for rating dyspnea. Chest 1988;93:580-89.
15. She J,Yang P,Wang Y, Qin X, Fan J, Wang Y et al. Chinese water- pipe tobacco smoking & the risk of COPD. Chest 2014;146;924-31.
16. Tan WC, Lo C, Jong A, Xing L, Fitzgerald MJ, Vollmer WM, et al. Marijuana & chronic obstructive lung disease: a population based study. CMAJ 2009;180:814-20.
17. McCarthy B, Casey D, Devane D, Murphy K, Murphy E, Lacasse Y. Pulmonary rehabilitation for chronic obstructive pulmonary disease. Cochrane Database Syst Rev 2015:CD003793
18. Paneroni M, Simonelli C, Vitacca M, Ambrosino N. Aerobic Exercise Training in Very Severe Chronic Obstructive Pulmonary Disease A Systematic Review and Meta-Analysis. Am J Phys Med Rehabil 2017:96(8):541-48.
19. Jindal SK, Aggarwal AN, Chaudhry K, Chhabra SK, D'Souza GA, Gupta D et al. A multicentric study on epidemiology of chronic obstructive pulmonary disease and its relationship with tobacco smoking and environmental tobacco smoke exposure. Indian J Chest Dis Allied Sci 2006;48:23-30.
20. Pineda H, Haas F, Axen K, Haas A. Accuracy of pulmonary function tests in predicting exercise tolerance in chronic obstructive pulmonary disease. Chest 1984;86:564-7,
21. Paz-D´ıaz H, Montes de Oca M, L´opez JM, Celli BR. Pulmonary rehabilitation improves depression, anxiety, dyspnea and health status in patients with COPD. Am J Phys Med Rehabil 2007;86:30–36.
22. Wadell K, Webb KA, Preston ME, Amornputtisathaporn N, Samis L, Jennifer PJ, et al. Impact of Pulmonary Rehabilitation on the Major Dimensions of Dyspnea in COPD, COPD: J Chronic Obstr Pulm Dis 2013;10(4):425-35.
23. Bolton CE, Bevan-Smith EF, Blakey JD, Crowe P, Elkin SL, Garrod R, et al. British Thoracic Society guideline on pulmonary rehabilitation in adults. Thorax 2013;68:1-30.
24. Selzler AM, Simmonds L, Rodgers WM, Wong EWL, Stickland MK. Pulmonary Rehabilitation in Chronic Obstructive Pulmonary Disease: Predictors pof program completion and success. COPD: J Chronic Obstr Pulm Dis 2012;9:538-45.
25. Orooj M, Moiz JA, Mujaddadi A, Ali MS, Talwar D. Effect of pulmonary rehabilitation in patients with asthma COPD overlap syndrome: a randomized control trial. Oman Med J 2020;35:136.