ORIGINAL RESEARCH

A Prospective And Comparative Study To Evaluate 6 Minute Walk Test In Patients Of Chronic Obstructive Pulmonary Disease

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ABSTRACT

Background: 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. It is a leading cause of mortality& disability.

Aim and Objective: To study the effect of six minute walk test (6MWD) testin patients of COPD.

Material and Methods: Present prospective, observational and comparative study was conducted on patients attended OPD/admitted in Dept. of Physical Medicine & Rehabilitation and Pulmonary Medicine of IPGME & R-SSKM Hospital, Kolkata over a period of 18 monthsinclinically diagnosed 70 cases (35 patients each in group A and B).

Results: Mean age ofpatients in group A was 64.14±5.94 yearsand 65.05±5.58 inGroup B. 30 (75.72%) patients were male in Group A and 28(80%) patients in Group B. In Group A(82.85%)&Group B (77.15%) patientswere smoker. InGroup A statistically significantincrease in mean6MWDafter6 weeks & 12 weeks of PR(baseline 285.88±32.11 meter; 320.82±32.52 meter at 6 Wks; 345.48±32.10 meter at12Wks) was found. In group B, mean 6MWD increase wasnot statistically significant (baseline 296.34±28.17 meter ; 294.62±30.23 at 6 weeks & 297.02±28.89 at12 weeks).

Conclusion: COPD patients had reduced exercise capacity (low 6 MWD)at baseline. Pulmonary rehabilitationresultsin statistically significant improvementin 6 MWT 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. Results of the present study showed that 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 causeof mortality &seventh leading cause of disability-adjusted life years world-overcomorbid conditions.[1]Manypeople die prematurelyei ther due to disease itself or its complications. Considering the global trends, an increase in prevalence of COPD is projected dueto continuous exposure to COP Drisk factors & aging.[2]COPD is a multi-factorial progressive disease with air flow obstruction resulting in dyspnea & productive cough.[3]COPD is now recognized as a systemic illness with extra-pulmonary manifestations like skeletal muscle dysfunction, weight loss, cachexia, osteoporosis &cardiovascular disorders. Thus COP Dpatients have reduced functional capacity &poorquality of life whicht ends to worsen with disease progressionagin. Reduced physical activity is a high riskfactor for high morbidity & mortality.[4] Pharmacological treatment of COPD with bronchodilatorshelptoimprove pulmonary symp to mslike dyspnea, but have noeffect on extra-pulmonary manifestations. drugs. Existing drugsalso have high cost&side effects. Non-pharmacological intervention in form of pulmonary rehabilitation (PR) could be aneffective approach to improvesymp to ms, quality of life & functional status of COPD patients.[5]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. Exercise training is cornerstone of comprehensive PR program. Essential components of PR should include endurance & strength training. Six to twelve weekso fPR leads to clinically relevant improvement in daily symptoms.[6] Although PR is highly effective treatment in COPD, yetit isgrossly underutilized &frequently inaccessible to patients world over. Effective implementation of PR in clinical practice is grossly lackingin India. Hence the present study was planned to study the effect of pulmonary rehabilitation in COPD patients by change in six–minute- walk distance (6MWD) test.

MATERIAL AND METHODS

The present institution based prospective, observational and comparative studywas conducted over a period of 18months 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/admittedin Department of Physical Medicine & Rehabilitation and Pulmonary Medicine of IPGME&R-SSKM Hospital, Kolkatawere included. Patients fulfilling the criteria were categorized into two groups of 35 patients each. Patients of COPD presented with who had not receivedsteroid 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, unableto follow instructions and not willing to participate were excluded.

Both groups weregiven 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 wereevaluated thrice(at time of recruitment, after 6 weeks &12 weeks). Group A (Study group)- Thirty fivepatients of COPD were given PR along with standard treatment. Patients were giveninstitution based pulmonary rehabilitation programme. The ycame thrice a week to department. Each sessionlasted for one hour. Pulmonary rehabilitation includedcounselling 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, Bloodsugar ,Bloodurea, Liver function tests, serum creatinine, ECG & ECHO (if required) and FEV1 was done in all the patients.

Atbaseline, 6 weeks and 12 weeks in both groups, Six minute walk distance test (6 MWD) was carried out. Patient was asked to walk for 6 minutes to and fro in corridor. At the end of 6 minutes total distance walked (in meters) andfatiguewas recorded.

STATISTICAL ANALYSIS

Descriptive statistics, parametric and non-parametric inferential statistical analysis weredone. 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.

RESULTS

In the present study, majority of patients i.e. 16 (45.72%) patients in Group Abelonged to 61-70 years age group followed by 13 (37.14%) patients in <60 years. In Group B, 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 A patients was 64.14±5.94 and in Group B was 65.05±5.58 ($p >0.05$).A total of 30(75.72%) patients were male in Group A and 28(80%) patients in Group B($p >0.05$).A total of 29 (82.85%) patients were smoker in Group A and 27 (77.15%) in Group B($p >0.05$).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 A (study group) was 20.76±2.40 and 20.58±1.52 (kg/m2) in Group B (control group). Blood pressure, Pulse rate, oxygen saturation, respiratory rate and FEV1 among two groupsfound to be comparable and statistically insignificant ($p >0.05$ NS). Table: 1 depicts baseline investigations of both the groups. 6 minute walking test found to be almost similar in both the groups and thus statistically insignificant ($p >0.05$).

Table 1: Comparison of Baseline investigations among two groups

Parameters	Group A (n=35)	Group B (n=35)	Statistical analysis (p value)
6MWT (meter)	285.88±32.11	296.34±28.17	0.152*

* p >0.05 NS

Table :2 shows comparison of parameters at 6 weeks and 12 weeks between two groups at 6MWT(meter).

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

Parameters (6 weeks)	Group A (n=35)	Group B (n=35)	Statistical analysis (p value)
6MWT (meter)	320.82±32.52	294.62±30.23	0.001*
(12 weeks)			
6MWT (meter)	345.48±32.10	297.02±28.89	0.001*

* p <0.001 Highly significant

Table 3 : demonstrates 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 highly significant (p <0.001).In group B, 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 A and group B comparison shows insignificant results at baseline and highly significant at 6 weeks and 12 weeks.

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

	Time duration			Statistical analysis (p value)		
6MWT(meter)	**At baseline**	**6 weeks**	**12 weeks**	**Baseline vs. 6 weeks**	**Baseline vs. 12 weeks**	**6 weeks vs. 12 weeks**
Group A	285.88±32.11	320.82±32.52	345.48±32.10	<0.001*	<0.001*	<0.001*
Group B	296.34±28.17	294.62±30.23	297.02±28.89	0.557**	0.02**	0.412**
Statistical analysis (Gr. A vs. B)	0.152**	0.001*	0.001*			

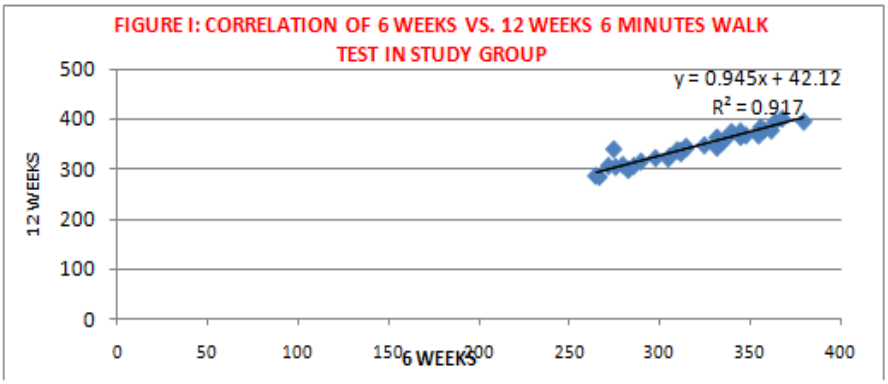
* p <0.001 Highly significant, **p >0.05 NS,

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

Table 4and Figure I 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 4: 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



DISCUSSION

Chronic obstructive pulmonary disease (COPD) is a common disease with pulmonary & extra-pulmonary symptoms. Amortalityrate of 8.7% ratehas been reported by Global Burden of Diseases, Injuries, and Risk Factors Study.[7]Worldwide there isan increasedprevalence of COP Ddueto 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 troublingsymptom. Dyspnea, exercise intolerance, extra-pulmonary symptomsand 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, butwithout anyeffects onextra-pulmonary symptomsoroverallquality of life. In additiondrugsare costly andhaveside effects. PRis being recommended as an integral part of COPD managementby number of guidelines. Meta-analysisof65 randomized-controlled trials (RCTs) on 3822 participants demonstrated statistically significantclinicalimprovement with PR inquality of life(parameter included dyspnea, fatigue, emotional function, and),and enhancedsense of controlover their condition.The PR program in all studiesranged from 8 to 12 weeksand comprisedofhospital-based or community-basedsetting.[8] In the present study, mean age was64.14±5.94 yrs in Group A and 65.05±5.58 yrs in group B($p > 0.05$). Systemic reviews & meta-analysishave reported higher prevalence of COPD in those with age above 40 yearscompared to those less than 40 years.Paneroni et al,[9]in systematic review and meta-Analysisof10 studieswith 458subjects reported mean age of 65.6 yrs. Majority of patients weremales in our study,30 (75.72%) patients were male in Group A and 28(80%) patients in Group B.Systemic reviews & meta-analysis have also reportedahigher prevalence of COPD in males compared to females. Similar results have been reported in Indian surveys.[10]In this study 80% (56/70) of themwere 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 comparablefor mean weight (kgs), height (cms) and body mass index (kg/m2)($p > 0.05$).Mean body mass index (BMI)in Group A (study group) was 20.76±2.40 and 20.58±1.52 (kg/m2)in Group B (control group).Both groups were comparablefor mean respiratory rate (Group A :19.68±2.78 / minute &Group B:19.74±1.50/minute: $p = 0.915$).Mean pulse rate was 77.31±5.15/ minute& 77.2±4.50 /minute in Group A& Group B respectively. InGroup 1the mean FEV1was 0.87±0.19 and0.81±0.20 in Group B. There was no significant difference between two groups. Outcome ofassessment of exercise capacity is essential in PR to establisheffect on exercise tolerance. Efficacy ofPR inthe present study was evaluatedbystudyingoutcomeparameterso fexercise capacity by6-min walk test. They were assessed in both groups at baseline, 6 weeks and 12 weeks. In Group A they were studied at the end of 6 weeks & 12 weeks PR. At baseline both groups were comparablefor (Group A: 285.88±32.11 meter ;Group B:296.34±28.17 meter, $p= 0.152$).

6-minute walk distance test:6MWT is a simple testused to assess functional exercise capacity before and after interventions. In present studyboth groups were comparable for meanbaseline6 MWT (285.88±32.11 meterin Group A Vs296.34±28.17 meterin Group B;$p=0.152$).In study group (Group A) with PR(6 MWT)distanceimproved from 285.88±32.11 meterto320.82±32.52 meter after6 weeks post-rehabilitation&345.48±32.10 meter at end of12weeks post-rehabilitation.In study group with PRthere wasstatistically significantincrease in6MWT indicatingimprovementinexercise capacity($p <0.001$). Whereas in group B, mean6MWD was 296.34±28.17 meter at baseline, 294.62±30.23meterat 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, wasstatistically 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[9] in a systematic review and meta-analysisassessedfunctional capacity via 6MWT ineight 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 helpto provide dyspnea relief. HoweverPR programs reportmarginalimprovementin physiologicalparameterslikereductionin lung hyperinflation, slower breathingandincrease instrength or endurance of the respiratory muscles.Singh et al[11]in their study of 40stable patients of COPDstudied the effect of 30 minutes of exercises given forfour weeksat home twice daily under supervision. With PR 6MWT distance increased to 315± 118 meters frombaseline of261 ± 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 ± 10.3which was not statistically significant). In their study themean percent increase in the distance covered in six-minute walk after the schedule was 20.7 meters in the experimental group and 2.6meters in the control group.

Duration of P: :Although ideal duration of PR for people with chronic respiratory diseases is unclear.

British guidelines recommendPRfor6–12 wks.[12]In our study we provided hospital based PR for 12 weeks andstudied parameters at end of 6 weeks & 12 weeks PR.At the end of 6 weeks PR there wasstatistically significant improvement in 6MWT which further statistically improved at 12 weeks.Studies report a minimum8 weeks ofPR (two to three sessions per week) show improvementinexercise and quality of life.Mostly benefitlastsup to 12months. Selzler et al[13]in their studyalso provided outpatient PR for 8 weeksandnotedimprovement in walk test.Oroojet al[14], in their randomized control studynoted significant improvement with 6 weeksof PR.Singh et al[11], in their study reported significant improvementin 6 minute walk distance 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).PRresultsin statistically significant improvementin 6MWT at 6 & 12 weekswhile no improvement was noted in the group not given PR.PR found to be an effective non-pharmacological intervention for COPD patients.

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