

Content available at: <https://www.ipinnovative.com/open-access-journals>

IP Indian Journal of Immunology and Respiratory Medicine

Journal homepage: <https://www.ijirm.org/>

Original Research Article

Exercise in chronic obstructive pulmonary disease

Midhun M¹, Anuja R^{1,*}¹Dept. of Respiratory Medicine, Pushpagiri Medical College, Thiruvalla, Kerala, India

ARTICLE INFO

Article history:

Received 25-04-2023

Accepted 05-07-2023

Available online 09-08-2023

Keywords:

COPD

Chronic Obstructive Pulmonary

Disease

6MWT

Exercise

Pulmonary Rehabilitation

ABSTRACT

Background: Chronic Obstructive pulmonary disease is continuing as a major public health problem across the globe, causing significant morbidity and affecting the quality of life more commonly among the elderly. This aim of the study was to assess whether a regular, routine 20 minute walk will help improve the quality of life and symptoms in patients with COPD.

Materials and Methods: Patients selected according to the inclusion and exclusion criteria and using a pretested questionnaire, were included in the study and data were collected. The questionnaire included information on basic demographic details, symptomatology, and smoking and alcohol habits. History, clinical examination, and selected investigations were done before and after a month of this exercise program. Qualitative data was analyzed using Chi-Square Test and Quantitative data using Paired T test

Results: The study population was mostly elderly males. Most of them gave history of smoking in the past and a few had biomass exposure. The most predominant symptom was dyspnea. After 2 months of regular exercise there was statistically significant change in CAT Score, mMRC score and six minute walk distance. The desaturation while doing Six minute walk test also improved after the exercise program.

Conclusion: This study concluded that a regular physical activity can be considered as a possible alternative to pulmonary rehabilitation program for those who cannot afford the cost of consultations, transport for attending the program.

This is an Open Access (OA) journal, and articles are distributed under the terms of the [Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License](https://creativecommons.org/licenses/by-nc-sa/4.0/), which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprint@ipinnovative.com

1. Introduction

Chronic Obstructive pulmonary disease is continuing as a major public health problem across the globe causing significant morbidity, affecting the quality of life more commonly among the elderly. There is huge economic and social burden among the society associated with this disease, which is increasing with time.¹

Denison (1893), in the book titled “Exercise and food for pulmonary invalids”, highlighted the importance of healthy food and physical exercise for the health of “pulmonary invalids”.²

It is known that, the exercise tolerance in these patients with COPD, takes a spiral downward turn. The breathlessness these patients are suffering from and the fear of getting a more breathless during activity, prevents them from any further exertions. Hence these patients usually choose to be sedentary. Various factors including deconditioning, leads to further decrease in exercise tolerance and increase in dyspnea.³ Thus the cycle of COPD → Dyspnea → Activity Limitation → Deconditioning → Increased Ventilatory Requirement → Further increase in Air trapping → increased hyperinflation → further worsening of dyspnoea.⁴

Apart from regular medications, exercise programs are now known to be one of the cornerstones in improving exercise tolerance and quality of life in patients with COPD.

* Corresponding author.

E-mail address: anujaraju86@gmail.com (Anuja R).

However this is not put into regular practice. Pulmonary Rehabilitation, which is a comprehensive structured program including education, physical activity, exercise training, nutrition counseling and self- management skills has proven benefits in COPD patients. Pulmonary rehabilitation is defined as “ a comprehensive intervention based on thorough patient assessment followed by patient tailored therapies that include but are not limited to exercise training, education, self-management, intervention aiming at behavioral change, designed to improve the physical and physiological condition of people with chronic respiratory disease and to promote the long term adherence to health enhancing behaviours.”⁵

The American college of sports medicine recommends that each week older adults should do at least 30 minutes of moderate physical activity for 5 days or 20 minutes of vigorous physical activity for 3 days; 8-10 strength exercises for 2 days; and flexibility exercises for at least 10 minutes for 2 days. Many older adults do not meet these recommendations.⁶

As reported by Sharma & Singh, 2011, the widespread implementation of a structured.

rehabilitation programme in developing countries has a lot of practical difficulties.⁷ Due to the expenditure and inaccessibility of Pulmonary Rehabilitation programmes in our part of this world, for most patients in our country, this is yet to be a routinely included in out treatment plan. So an alternative strategy for this behavioral change in physical activity, and its inclusion in rehabilitation, along with the regular medications and nutritional and self- management advices should be made available to these patients to shed the light of this knowledge into their sufferings. Objectives of this study were to study the effectiveness of a 2 month exercise programme in patients with Chronic Obstructive Pulmonary Disease.

2. Materials and Methods

This study was done from March 2020 to August 2020 among COPD patients attending OPD at a tertiary care centre in Central Kerala. The study was done in an interventional with pre and post-test design. Patients who were willing to participate in the study and satisfied the inclusion and exclusion Criteria were evaluated using a semi-structured questionnaire. The questionnaire included globally recommended and validated scales like mMRC and COPD assessment test.

2.1. Sample size

From a previous study by Nasser et al., sample size was calculated to be 16.⁸

$$n \geq \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 (\sigma_1^2 + \sigma_2^2 / r)}{(\mu_1 - \mu_2)^2}$$

Alpha (α) 0.05	Mean in group 1 (μ ₁) 336.73
Beta (β) 0.2	Standard deviation in group 1 (σ ₁) 65.92
	Mean in group 2 (μ ₂) 403.13
	Standard deviation in group 2 (σ ₂) 64.34
	Ratio (Group 2 / Group 1) 1

The study population was instructed to go through a 2 month exercise programme of daily walking at least 5 days a week for a total of 20 minutes with 5 minutes rest after 10 minutes. Their mMRC scores, COPD assessment test scores, Six minute walk distance and SpO₂ were measured at 0 and 2 months. Data was analysed using SPSS version 16.

2.2. Inclusion criteria

All consecutive COPD patients attending OPD of Department of Pulmonary Medicine, Pushpagiri Medical College, Kerala satisfying the following criteria.

1. All patients with COPD (except Group A) according to GOLD Guidelines 2020 interested and willing for home based pulmonary rehabilitation.
2. On regular medications as advised.
3. Consented to participate in the study.

2.3. Exclusion criteria

1. Patients not willing for exercise for the specified time period.
2. Patients already on heavier exercise programme regularly.
3. Patients unable to perform the specified exercise due to lung or joint conditions or stroke.
4. Recent Myocardial Infarction.
5. Psychiatric Illness

3. Results

The mean age of the study population was found to be 69.6. 90 % of the study population were males.

Most of the study participants had history of smoking and the mean pack years was calculated as 20.2.

In 93.3% the age of onset of symptoms of COPD symptoms was after 40 years.

Among the study group 53 % were Group B COPD, 30 % group D and 16.7 % group C according to refined ABCD Tool-Gold guidelines 2020.¹

The mean mMRC score at initial visit was 2.1 while after the exercise programme the mean mMRC score improved to 1.467. This improvement was found to be statistically significant. Table 1

The mean CAT score at initial visit was 18.7 while after the exercise programme the mean CAT score improved to

Table 1: Effect of exercise on MMRC dyspnoea score

	Time	Mean	Standard deviation (SD)	Mean difference	Paired t test P-value
mMRC	Before	2.100	.7589	0.6333	< 0.001
	After	1.467	.5074		

Table 2: Effect of exercise on cat score

	Time	Mean	SD	Mean difference	Paired t test P-value
CAT	Before	18.700	5.9140	6.4667	<0.001
	After	12.233	4.4075		

12.23 the difference being statistically significant. Table 2

Table 3: Effect of exercise on 6 minute walk distance

	Time	Mean	SD	Mean difference	Paired t test P-value
6MWD	Before	289.333	52.2549	-	<0.001
	After	338.333	67.1634		

The mean six minute walk distance at initial visit was 289.33 meters while after the exercise programme the mean six minute walk distance improved to 338.33. In this study the change 6MWD - 49 meters, was found to be statistically significant. Table 3

Table 4: Effect of exercise on exertional desaturation

	Time	Mean	SD	Mean difference	Paired t-test P-value
Desaturation	Before	1.7667	1.30472	0.5667	0.630
	After	1.02000	1.20217		

The mean drop in Spo2 while doing six minute walk test at initial visit was 1.76 while after the exercise program, 1.02. This improvement though a favorable sign, was not statistically significant. Table 4

4. Discussion

The mean age of the study population was found to be 69.6. 90% of the study participants were males. 63.3% of the study population were from rural areas. In most of the patients (93.3%) the age of onset of symptoms of COPD was after 40 years. In a systematic review and meta-analysis between 1990 and 2004 in 28 countries it was found that COPD is more common above the age of 40 and was more common in males.⁹

The PLATINO study done in 5 Latin American countries revealed that the prevalence of COPD increased with age and reached a maximum above the age of 60 years.¹⁰

Among the study group 53% were Group B COPD, 30% group D and 16.7% group C according to Refined ABCD

Tool from Gold Guidelines 2020.

Only just above half of the patients knew the how to use the inhaler technique. 24–91% patients use inhaler incorrectly according to several studies in the past.

The mean mMRC score at initial visit was 2.1 while after the exercise program 1.467. This improvement in mMRC score was statistically significant.

The mean CAT score at initial visit was 18.7 and after the exercise program 12.23. It was inferred that the drop in CAT score was statistically significant.

According to Dodd et al. (2012) there was a significant improvement in CAT, CRQ-SR and ISW immediately following PR. However there was no significant difference in the short and medium term changes in the CAT and CRQ-SR following Pulmonary Rehabilitation. In a multi-center, prospective study by Dodd et al. (2011), mean change in CAT score after PR was 2.9 (5.6) points.¹¹

The mean six minute walk distance at initial visit was 289.33 meters while after the exercise program 338.33. This change in the six minute walk distance of 49 meters was statistically significant. In a study done by Redelmeier, Bayoumi, Goldstein & Guyatt, (1997), data supported an improvement of 54 meters to be a clinically important difference in chronic lung disease.¹² Puhan et al., (2008), suggested MCID of 35m for COPD patients.¹³ In the study Effectiveness of exercise training in patients with COPD: the role of muscle fatigue 46 patients followed a 3-month high-intensity exercise training program patients with fatigue had a higher increase in 6-min walk distance.¹³

The mean drop in Spo2 while doing six minute walk test at initial visit was 1.76 while after the exercise program, 1.02. Though a favourable sign this change did not have statistical significance. In a study published by Piszko, Lewczuk, Kowalska-Superlak, & Wrabec (2002) the SaO2 did not change in both the control and the pulmonary rehabilitation group however the maximal drop in SaO2 during exercise testing decreased in the pulmonary rehabilitation group.¹⁴

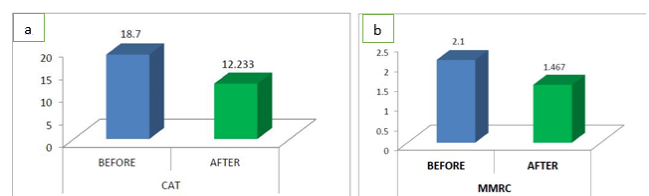


Fig. 1: a and b - Mean mMRC and CAT scores before and after exercise programme

5. Conclusions

The aim of this study was to know whether a daily 20 minute walk would bring about an improvement in symptoms and exercise tolerance among COPD patients. The conclusions



Fig. 2: Mean 6 minute walk distance before and after exercise programme

drawn from this study were as follows:

COPD is more common in the elderly and is more prevalent among males.

There is statistically significant difference improvement in mMRC, CAT score and six minute walk distance following a 2 month daily 20 minute walking exercise program. After the exercise program an improvement in SpO₂ desaturation was also noted which was not statistically significant.

This study could reveal that a regular 20 minute walk daily can be considered as alternative to pulmonary rehabilitation programs for those patients who are not able to attend the rehabilitation program due to financial or logistical reasons.

6. Conflict of Interest

None.

7. Source of Funding

None.

References

1. Goldcopd.org ; 2023. [Last accessed 2023 July 1]. Available from: <https://goldcopd.org/wp-content/uploads/2019/11/GOLD-2020REPORT-ver1.1wms.pdf>. Last accessed.
2. Denison C. Exercise and Food for Pulmonary Invalids. India: Hansebooks; 2017.
3. Pitta F, Troosters T, Probst VS, Spruit MA, Decramer M, Gosselink R, et al. Physical activity and hospitalization for exacerbation of COPD.

Chest. 2006;129(3):536–44.

4. Troosters T, Van Der Molen T, Polkey M, Rabinovich RA, Vogiatzis I, Weisman I, et al. Improving physical activity in COPD: towards a new paradigm. *Respir Res*. 2013;14(1):115. doi:10.1186/1465-9921-14-11.
5. Spruit MA, Singh SJ, Garvey C, Zuwallack R, Nici L, Rochester C, et al. An official American thoracic society/European respiratory society statement: Key concepts and advances in pulmonary rehabilitation. *Am J Respir Crit Care Med*. 2013;188(8):13–64.
6. Nelson ME, Rejeski WJ, Blair SN, Duncan PW, Judge JO, King AC, et al. Physical activity and public health in older adults: recommendation from the American College of Sports Medicine and the American Heart Association: Recommendation from the American college of sports medicine and the American heart association. *Med Sci Sports Exerc*. 2007;39(8):1435–45.
7. Sharma BB, Singh V. Pulmonary rehabilitation: An overview. *Lung India*. 2011;28(4):276–84. doi:10.4103/0970-2113.85690.
8. Naseer BA, Al-Shenqiti AM, Ali AH, Al-Jeraisi T, Gunjan GG, Awaidallah MF, et al. Effect of a short term pulmonary rehabilitation programme on exercise capacity, pulmonary function and health related quality of life in patients with COPD. *J Taibah Univ Med Sci*. 2017;12(6):471–6. doi:10.1016/j.jtumed.2017.07.005.
9. Halbert RJ, Natoli JL, Gano A, Badamgarav E, Buist AS, Mannino DM, et al. Global burden of COPD: systematic review and meta-analysis. *Eur Respir J*. 2006;28(3):523–32.
10. Menezes AM, Perez-Padilla R, Jardim JR, Muiño A, Lopez MV, Valdivia G, et al. Chronic obstructive pulmonary disease in five Latin American cities (the PLATINO study): a prevalence study. *Lancet*. 2005;366(9500):1875–81.
11. Dodd JW, Marns PL, Clark AL, Ingram KA, Fowler RP, Canavan JL, et al. Interpreting small differences in functional status: the Six Minute Walk test in chronic lung disease patients. *Am J Respir Crit Care Med*. 1997;9(4):1278–82.
12. Puhan MA, Mador MJ, Held U, Goldstein R, Guyatt GH, Schünemann HJ, et al. Effectiveness of exercise training in patients with COPD: the role of muscle fatigue. *Eur Respir J*. 2008;32(3):637–43.
13. Lewczuk J, Piszko P, Kowalska-Superlak M, Wrabc K, Knap J, Palka P, et al. Rehabilitacja oddechowa u chorych z przewlekłą obturacyjną chorobą płuc w ocenie subiektywnej i obiektywnej [Respiratory rehabilitation of patients with chronic obstructive lung diseases in the subjective and objective evaluation. *Pneumonol Alergol Pol*. 1991;59(3-4):132–6.
14. Burtin C, Saey D, Saglam M, Langer D, Gosselink R, Janssens W, et al. Effectiveness of exercise training in patients with COPD: the role of muscle fatigue. *Eur Respir J*. 2012;40(2):338–44.

Author biography

Midhun M, Assistant Professor

Anuja R, Senior Resident

Cite this article: Midhun M, Anuja R. Exercise in chronic obstructive pulmonary disease. *IP Indian J Immunol Respir Med* 2023;8(2):69-72.