



THE ROLE OF PULMONARY REHABILITATION ON NUTRITIONAL STATUS IN STABLE COPD

Clinical Research

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ABSTRACT

Pulmonary Rehabilitation is a relatively new practice in pulmonary medicine and an integral part of management of chronic obstructive pulmonary diseases (COPD) and other chronic respiratory diseases. A prospective, randomized controlled study was carried out in 43 diagnosed patients of stable COPD having functional limitation. Patients were randomly assigned to receive 10 weeks of pulmonary rehabilitation plus standard medical treatment (SMT) and standard medical treatment (SMT) with diet modification alone. Patients enrolled were properly matched having no significant difference with respect to age, sex, height, weight, BMI, GOLD stages, various spirometric parameters when compared between both groups. The primary outcome was change in Nutritional status.

Significant improvement in the nutrition status viz mid arm circumference, BMI and serum protein was observed in patients after pulmonary rehabilitation programme.

KEYWORDS

Pulmonary Rehabilitation, Nutrition, COPD

Introduction:

COPD is an unremitting disease characterized by a decline in lung function over the time and insidiously progressive respiratory disability. Tobacco smoking is the most important risk factor for developing COPD globally. Although it primarily affects lung function, it often has extra-pulmonary manifestations and a systemic inflammatory dimension. Patients with COPD often exhibit raised levels of pro-inflammatory cytokines, e.g, interleukin (IL)-1, IL-6, tumor necrosis factor (TNF)- α , chemokines (IL-8, monocyte chemoattractant protein-1), and C-reactive protein. The expression of neutrophil adhesion molecules is increased, and there are changes in neutrophil functions, and many other perturbations. In some COPD patients, this could contribute to an increased energy expenditure, promoting muscle wasting, nutritional imbalance, and weight loss. Weight loss in patients with COPD has been correlated with serum TNF- α level and has a negative prognostic value⁽¹⁾

Principal goal of pulmonary rehabilitation is to reduce symptoms, disability and handicap, increase participation in physical and social activities (functional independence) and to improve the overall quality of life for individuals with chronic respiratory diseases⁽²⁾ Pulmonary rehabilitation is appropriate for any stable patients with disabling symptoms due to disease of respiratory system⁽³⁾. It is now an integral part of the management of all patients of COPD with persistent symptoms reaching GOLD stages II, III and IV⁽⁴⁾. The present study has been done to establish the influence and effect of pulmonary rehabilitation on nutritional status of stable patients of COPD.

Materials and Methods:

We evaluated 43 diagnosed cases of COPD of GOLD stages 2, 3 and 4 for a period of one year. A clinical diagnosis of COPD was considered, if any of, chronic cough, chronic sputum, progressive, persistent dyspnea that worsen on exercise were present along with history of exposure to risk factors, especially tobacco smoke, occupational dust and chemicals, smoke from home cooking⁽⁵⁾. In spirometry, FEV1/FVC <70% (with change in pre and post bronchodilator FEV1 \leq 200 ml and \leq 12%) confirmed diagnosis. After confirming the diagnosis, stable patients of <75 years with documented functional limitations and who had given consent to participate in the study, appropriate investigations were done like Arterial blood gas analysis (ABG), cardiac evaluation in form of electrocardiography and 2D echocardiography. Out of the 43 patients of COPD evaluated initially,

14 (32.5%) were excluded from the study due to significant comorbidities. Finally, 29 patients were included into study out of which 15 were grouped to receive pulmonary rehabilitation programme plus standard medical therapy (SMT) [i.e, Intervention group] and 14 were grouped into control group that received standard medical therapy alone by randomization. All patients in both limbs were evaluated for their nutritional status with following tools. (1) Weight, (2) Height, (3) Body Mass Index (BMI), (4) Serum Proteins, (5) Serum albumin, (5) Mid-arm Circumference etc.

After initial baseline assessment of all patients, those kept in the intervention group were trained in various aspects of pulmonary rehabilitation programmes according to standard evidence based guidelines^(4,5,6,7,8,9) and were advised to follow the Home Exercise Programme (HEP)⁽¹⁰⁾ as per "Individually tailored exercise formula" based on maximum symptom limited levels for a duration of 10 weeks. components of Pulmonary rehabilitation were Physical Reconditioning (included various sustained aerobic exercises), Breathing Retaining (included Purse-lip breathing^(11,12) and Diaphragmatic breathing), Exercise for Bronchial Hygiene (Hydration, Lung Percussion, Postural drainage⁽¹³⁾ and Control Coughing⁽¹⁴⁾), health Education^(5,15), psychosocial support and diet modification (5) as integral part of PR. Patients of control group who did not received pulmonary rehabilitation also instructed for diet modification as per their requirement viz BMI.

All 29 patients were receiving similar possible medical therapy according to their stage and GOLD Guidelines 2017 (i.e, besides inhaled Tiotropium bromide 18 μ g per day by a dry powder inhaler device (DPI), along with minimum possible oral bronchodilators (Oral etophyllin 115 mg + theophyllin 35 mg to etophyllin 231 mg + Theophyllin 69 mg/day of retard preparation twice daily according to weight) at least 2 months before and throughout the study except in acute exacerbation during which medical treatment was prescribed for desired period. None had experienced any exacerbation in previous one month and all were stable on the present medical treatment. All 29 patients had documented that they had functional limitation secondary to dyspnoea for one or more daily activity. Patients in both groups were supervised every fortnightly upto 10 weeks and no. of acute exacerbations experienced by the patients of both limbs were also recorded. At the end of 10 weeks, patients in both groups were re-evaluated by all those tools which were used during baseline assessment.

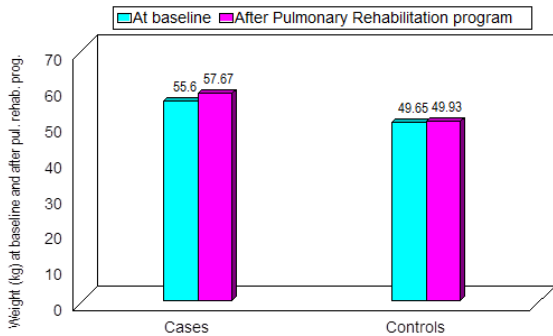
STATISTICS:

Data was analyzed by statistical software package STATA 8.0. A difference between 2 values was considered to be significant only if 'p' value was found to be <0.05. ² statistical test and **Fisher's exact p-value** tests were used to test the significance of the difference between 2 groups. **Two sample t-tests** were used to compare the means between 2 independent groups whereas **paired t-test** was used to see the difference at an interval of 10 weeks from baseline values, if data was normally distributed.

RESULTS

Out of 29 patients included, 15 were randomly enrolled Intervention group and 14 in control group. Out of Intervention group 1 patient dropped out while 2 patients from control group withdrew themselves from study. Mean age of the study group was 57.69 years while mean post-bronchodilator FEV₁ was 48.96% of predicted. Patients enrolled were properly matched having no significant difference with respect to age, sex, height, weight, BMI, GOLD stages and various spirometric parameters when compared between both groups.

Weight gain of (Mean±SD) 2.07±2.66 kg was observed in Intervention group after pulmonary rehabilitation. Weight gain (Mean±SD) 0.28±2.75 kg was also observed in control group. (Figure -1) But change in weight, when compared between case and control was not significant. (Table-1)

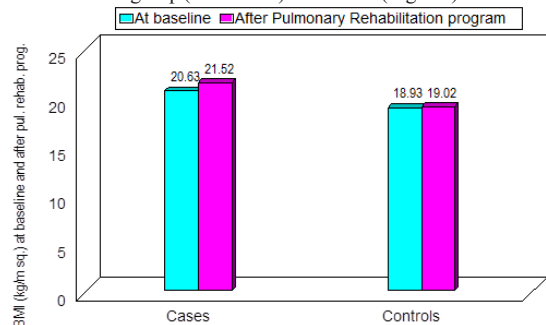


(Figure-1)

(Table-1) Comparison of differences in weight

Group	Difference in weight (Mean±SD)	p value
Cases (n=14)	2.07±2.66	0.1047
Controls (n=12)	0.28±2.75	

When BMI was evaluated after pulmonary rehabilitation programme there was a significant (p=0.0491) improvement (Table-2) in BMI (Mean±SD) of 0.88 kg/m² in Intervention group compared to increase in BMI in control group (Mean±SD) 0.09±0.95. (Figure-1)



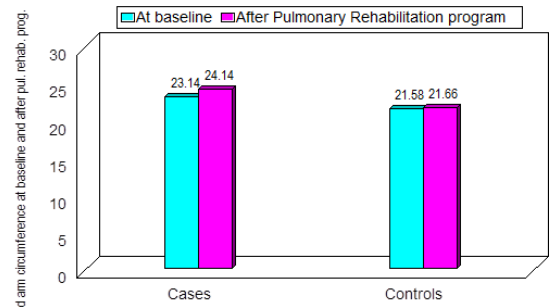
(Figure-2)

(Table-2) Comparison of differences in Body Mass Index

Group	Difference in BMI (Mean±SD)	p value
Cases (n=14)	0.88±0.28	0.0497
Controls (n=12)	0.09±0.95	

Mid arm circumference (MAC) increased (Mean±SD) 1.0±0.94 cm in patients of Intervention group while a very slight increment (mean±SD) 0.08±1.27 was observed in control group. (Figure -3) This

change in MAC was found to be statistically significant (p=0.0460) when compared between cases and control. (Table-3)

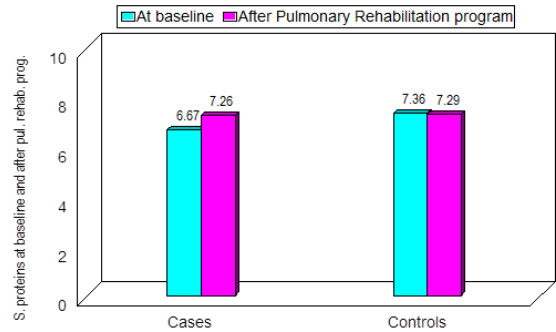


(Figure-3)

(Table-3) Comparison of differences in Mid-Arm circumference

Group	Difference in Mid-arm circumference (Mean±SD)	p value
Cases (n=14)	1.0±0.94	0.0460
Controls (n=12)	0.08±1.27	

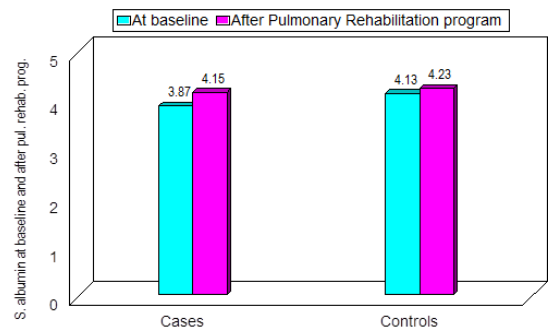
Significant improvement (Table-4) in total serum protein (p=0.0228) was also observed in intervention group while no significant (p=0.0703) improvement (Table-5) was noted in serum albumin in cases when compared with controls.



(Figure-4)

(Table-4) Comparison of differences in Serum Proteins

Group	Difference in total serum protein (Mean±SD)	p value
Cases (n=14)	0.59±0.70	0.0225
Controls (n=12)	-0.075±0.68	



(Figure-5)

(Table-5) Comparison of differences in Serum Albumin

Group	Difference in Serum albumin (Mean±SD)	p value
Cases (n=14)	0.28±0.64	0.0703
Controls (n=12)	0.10±0.10	

DISCUSSION

Pulmonary rehabilitation has become an established way to enhance standard medical therapy to control symptoms, optimize functional capacity, reduce the medical and economical burdens of patients of COPD and it also improving their nutritional status. In the present study, weight gain was observed in patients of intervention group after pulmonary rehabilitation. Weight gain was also observed in patients of control group. But the change in weight, when compared between case and control was not significant in our study. **McGavin CR et al. (1977)**⁽¹⁶⁾ also did not found any significant change in body weight after pulmonary rehabilitation programme in either group. **Lake et al. (1990)**⁽¹⁷⁾ also did not found any significant improvement in weight after exercise training in their rehabilitation programme.

In our study when BMI was evaluated after pulmonary rehabilitation programme there was a significant improvement in BMI in patients of pulmonary rehabilitation group compared to an increase in BMI in patients of control group though **Goldstein RS et al. (1994)**⁽¹⁸⁾ did not found any significant change in BMI in their study. Beside this mid arm circumference increased in patients of intervention group while a very slight increment was observed in control group in our study. This change in MAC was found to be statistically significant when compared between cases and control though **Sinclair DJM**⁽¹⁹⁾ could not found any significant change in weight and mid thigh circumference in their study in both groups.

Significant improvement in total serum protein was also observed in patients of intervention group while no significant improvement was noted in serum albumin in cases when compared with controls.

Bearing in mind the limitation of smaller sample size, it may be concluded that stable patients of COPD with functional limitation are potential candidates for pulmonary rehabilitation programme. The present study also concluded that pulmonary rehabilitation programme significantly improved nutritional status. So, comprehensive pulmonary rehabilitation programme should be considered for overall management of chronic obstructive pulmonary disease along with recommended pharmacological treatment.

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