

ORIGINAL ARTICLE

Effects of Inspiratory Muscles Trainer in Pulmonary Rehabilitation Program among COPD Patients

RABIYA NOOR¹, WAJEEHA ZIA¹, MASHAR HAYYAT², IQRA ISHRIAQ³, ALVEENA SHAKOOR⁴, MEHWISH KHALID⁵

¹Department of Rehabilitation Sciences, Riphah International University, Lahore-Pakistan.

²Department of Physical-Therapy, Kamiyab institute of medical science, Kot Addu-Pakistan

³Department of Physical-Therapy, PSRD, Lahore-Pakistan

⁴Department of Allied Health Sciences, Mashal Physiotherapy Clinic, Islamabad-Pakistan

⁵Department of Physical-Therapy, Institute Lahore medical and dental college, Lahore-Pakistan

Correspondence to Dr. Rabiya Noor, Email: rabiya.noor@riphah.edu.pk Tel:+92-3344355660.

ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is associated with prolonged respiratory problems and compromised airflow. Eventually, routine activities become troublesome. Pulmonary rehabilitation program and specific training of inspiratory muscles can do management of such patients.

Aim: To find out the effects of Inspiratory Muscle Trainer on dyspnea in moderate COPD patients during Pulmonary Rehabilitation in terms of improvement of pulmonary lung function and Multidimensional Dyspnea profile.

Study Design: Randomized controlled trial.

Methodology: Two groups were designed; in one group Pulmonary Rehabilitation Program was applied in other group both PRP and IMT was given. Patients were recruited into two groups by simple random technique. Pre-treatment measurements were taken and then Sessions of 4 weeks with 5 days per week were given and post treatment assessment was done. Data was evaluated by using SPSS version 24. Independent sample t-test was applied to determine any significant difference between Pre-treatment and Post-treatment Functional pulmonary assessment between two groups.

Results: Findings revealed that differences between two groups were statistically significant ($p < 0.05$) and also statistically significant difference were observed within group analysis ($p < 0.05$) with respect to dyspnea, fatigue, quality of life.

Practical Implication: This study considered moderate COPD patients for Inspiratory Muscle training (IMT) along with Multi-Disciplinary Approach in slowing down the worsening of disease and in this way prevented the future complications.

Conclusion: It was concluded that inspiratory muscle trainer group was more effective as compare to standard rehabilitation in improving pulmonary function testing and reducing dyspnea among COPD patients.

Keywords: Dyspnea, Inspiratory Muscle Training and Pulmonary Rehabilitation Programme.

INTRODUCTION

COPD is one of the most common diseases of respiratory system falling in obstructive category and is associated with breathing difficulties and narrowing of airways. COPD and Asthma are the two most common types of diseases of the airways having same category of obstruction. They both have ranked among the first 20 respiratory problems leading to the disability across globe and were graded 8th (COPD) and 23rd (asthma) as causes as reported by disability-adjusted life years in 2015¹. Use of Tobacco is very popular in Pakistan among the adult population. In which 19.1% of population falling in adult category used tobacco or tobacco related products as per the following ratio; 12.4% smoker & 7.7% smokeless tobacco consumers. Following this, 10.4% of the youth use tobacco^{2,3}.

The most common Symptoms are Cough with Sputum and Shortness of Breath that will progress over time and ultimately will cause trouble in daily activities of Life⁴ and poor capacity to Physical Exercise while on the other hand specific association with the COPD are Depression, quality of life, Anxiety, Cardiovascular Problems, Chronic Bronchitis and any Comorbid condition^{5,6}.

Patients with such sort of Typical Cough with Sputum are at higher risk of COPD if they have been exposed to the Smoke in any form. While Emphysema denotes abnormal presence of air or any other form of Gas in Lung tissue⁷. There are many environmental risk factors responsible for COPD like, active and passive smoking, mineral dust from person work place, dangerous fumes from industry, and burning of garbage add indoor pollution for the patients⁸. After the smoking session improvement in pulmonary function has been improved but has not cleared its association to COPD. It is most likely that sputum burden and cough could be reduced by quitting smoking^{9,10}.

Clinical decisions regarding the treatment are generally made keeping in view the symptomatic response of the patients to

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the different classes of drugs for example response to the treatment with Bronchodilators, in contrast to the spirometry findings that have very vague and poorly defined level of predictions regarding the symptomatic response. Even then, spirometry has a vital role in making diagnosis of COPD. it is advisable if we may use this criteria as an information as to assess the progression of disease^{11,12}.

With current Management plan include vaccination, avoidance of exposure to smoke, inhaled bronchodilators, use of corticosteroids & Pulmonary Rehabilitation Program. Many patients receiving long-term Chest Physical Therapy consisting of Pulmonary Rehabilitation Program are getting benefit that not only decrease the progression of disease but also provide improved quality of life^{13,14}. Pulmonary Rehabilitation is based on Multi-Disciplinary Approach. It consists of the following strategies, energy saving techniques, aid for daily activities, physical training, nutritional support, patient education for enhancement of self-management skills, and smoking cessation. PRP can be provided by utilizing some established rehabilitation programs and following the recommend guidelines for pulmonary rehabilitation programs which consists of 6 weeks of duration that also includes supervised sessions for minimum of two times a week and a structured education program^{15,16}.

Previously most studies were on pharmacological management or implementation of one or two respiratory techniques on Severe COPD patients. So it is necessary to consider moderate COPD patients for Inspiratory Muscle training (IMT) along with Multi-Disciplinary Approach in slowing down the worsening of disease and in this way prevent the future complications. The aim of study was to find out the effects of Inspiratory muscle trainer on dyspnea in moderate COPD patients during Pulmonary Rehabilitation in terms of improvement of pulmonary lung function and Multidimensional Dyspnea profile that measures Unpleasantness, Emotional response and immediate response.

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The objective of the study was to find out the effects of Inspiratory Muscle Trainer on dyspnea in moderate COPD patients during Pulmonary Rehabilitation in terms of improvement of pulmonary lung function and Multidimensional Dyspnea profile.

METHODOLOGY

The study design was Randomized Controlled trial. Sample size of 52 was measured by using G power Analysis Software, Version (3.1.9.2) with 0.80 power of study, with 0.05 margin of error and 95% confidence interval.¹⁷ Although 58 patients were recruited by assuming 10% attrition rate. Patients were divided into two groups. In this group A, 26 patients were treated with Standardized pulmonary rehabilitation program along with Inspiratory Muscle Training for a duration of 4 weeks, 5 days per weeks. In group B, 26 patients were treated with Standardized pulmonary rehabilitation program for a duration of 4 weeks, 5 days per week^{18,19}. Patients were recruited by convenient sampling technique and then allocated to groups by Simple Random Sampling by sealed opaque enveloped. Inclusion criteria was as follows; Moderate cases of COPD as per Gold Criteria were recruited with FEV₁=50–79, with significant history of smoking¹⁸. Those patients were excluded with Red Flags Like: night sweats, fever, Malaise, any history Of Recent fall, trauma & Fracture, Lobectomy/ Pneumonectomy in previous 6 Months, Pneumothorax/Presence of Bulla and Unstable Cardiovascular Diseases²⁰. Outcome measure were pulmonary function test and Multidimensional Dyspnea Profile. Pre and post 4 weeks reading were recorded.

Statistical analysis: Data was evaluated by using SPSS version 24. All qualitative data was presented in frequency form and

quantitative data was in the form of mean \pm SD. Independent sample t-test was applied to determine any significant difference between Pre-treatment and Post-treatment Functional pulmonary assessment between two groups.

RESULTS

Comparison of socio-demographic variable like age and Body Mass Index (BMI), Height and Weight across both groups. The mean age of participants in group A was 30.46 \pm 6.94 years and in group B was 29.57 \pm 6.21 years. BMI in group A was 25.19 \pm 4.11 kg/m² and in group B was 25.23 \pm 3.66 kg/m². Height in group A was 5.34 \pm 0.27 kg/m² and in group B was 5.34 \pm 0.27 kg/m². Weight in group A was 65.07 \pm 7.17 kg/m² and in group B (Pulmonary Rehabilitation was 64.96 \pm 7.51 kg/m².

The results showed that there was statistically significant difference between two groups with p value < 0.05. FEV₁ to greater extent in Inspiratory Muscle Training group with means value 2.40 \pm 0.68 liters as compared to Conventional asthmatic rehabilitation with mean 2.29 \pm 0.67 liters. FVC to greater extent in Inspiratory Muscle Training group with means value 3.10 \pm 0.69 liters as compared to Conventional asthmatic rehabilitation with mean 3.17 \pm 0.84 liters. FEV₁ /FVC ratio to greater extent in Inspiratory Muscle Training with means value 76.41 \pm 7.72% as compared to Conventional asthmatic rehabilitation with mean 72.50 \pm 7.01%. PEF_r to greater extent in Inspiratory Muscle Training group with means value 7.14 \pm 0.46 L/min as compared to Conventional asthmatic rehabilitation with mean 6.68 \pm 0.37 L/min as shown in table-1.

Table-1: Comparison of Multidimensional Dyspnea Profile Between Groups

Multidimensional Dyspnea Profile		Treatment groups		p-value
		A (Mean \pm SD)	B (Mean \pm SD)	
Unpleasantness	Pre-treatment	7.80 \pm 0.89	7.92 \pm 0.79	0.33
	Post-treatment	2.96 \pm 0.77	3.00 \pm 0.74	0.05*
Emotional response	Pre-treatment	24.42 \pm 1.85	24.15 \pm 2.42	0.26
	Post-treatment	8.96 \pm 2.44	8.30 \pm 2.39	0.03*
Immediate response	Pre-treatment	39.23 \pm 2.30	40.38 \pm 3.17	0.4
	Post-treatment	14.46 \pm 1.98	15.30 \pm 2.52	0.01*

*Statistically significant

DISCUSSION

The aim of study is to determine the effects of Inspiratory Muscle Training on dyspnea in moderate COPD patients during Pulmonary Rehabilitation in terms of 6 Minute Walk Test that measures two different aspects of dyspnea and fatigue and Multidimensional Dyspnea profile that measures Unpleasantness, Emotional response and Immediate response and Saint George Respiratory Questionnaire that measure quality of life.

A study was conducted by Duruturk, et al on chronic COPD patients, After 8 weeks in the experimental group, mean maximum inspiratory pressure improved by -17.6 ± 0.18 cm H₂O, mean 6-minute walk test improved by 47.8 \pm 1.46 m, and dyspnea from 4.48 \pm 2.12 points to 9.0 \pm 2.27 points. The results were statistically different between groups ($p < .05$). The results are consistent with our study but this study was on chronic COPD and for 8 weeks. In our study duration was different and IMT along with multidimensional approach was used¹⁸. Recent study was conducted on to determine the role of pulmonary rehabilitation role in asthmatic patients and COPD patients. The conclusion of study was that 5 time sit to stand was a satisfied consequence measure of pulmonary rehabilitation in asthma patient. After pulmonary rehabilitation, the 5 time sit to stand enhanced significantly in both populations (by a median value of -1.7 s) and (by a median value of -1.1 s) in subjects with COPD and asthma, respectively; $p = .17$ between groups, $p < .001$ for both. So, physiotherapy treatment must be first priority in asthma. The current study is on two

physiotherapy treatments with statistically significant results of both interventions^{13,21}.

The results of another study came into agreement with our findings which showed statistically significant results between pulmonary rehabilitation programme and pharmacological treatment. The study done on 26 patients who were suffering from asthma. There was significant decreased from 39.5 to 33.6 ($p < .001$) on LCADL in both group analysis. The results are similar to current study with decrease from 39.66 to 30.58 ($p < .001$) on LCADL in both group analysis. While in this study there is improvement on MDP scale among inspiratory muscle training group²².

CONCLUSION

It was concluded that effects of inspiratory muscle trainer was more effective as compare to standard group in improving lung function testing and reducing dyspnea.

Author's contribution: RN&WZ: Overall supervision, write up and literature review, MH&II: Statistics application, analysis literature review, help in write up, AS&MK: Literature review help in write-up.

Limitations: Sample size was very small and financial limitations followed by low man power for follow-ups.

Conflict of interest: None

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