

Research Paper

Effect of Diaphragmatic Respiratory Training on Some Pulmonary Indexes in Older People With Chronic Obstructive Pulmonary Disease



Mojtaba Amini<sup>1</sup>, \*Mandana Gholami<sup>1</sup>, Hossein Abed Natanzi<sup>1</sup>, Nader Shakeri<sup>1</sup>, HamidReza Haddad<sup>2</sup>

1. Department of Physical Education and Sports Science, Faculty of Humanities and Social Sciences, Science and Research Branch, Islamic Azad University, Tehran, Iran.  
2. Department of Internal Medicine, Faculty of Medical Sciences, Qazvin University of Medical Sciences, Qazvin, Iran.



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**ABSTRACT**

**Objectives** Chronic Obstructive Pulmonary Disease (COPD) is one of the most important progressive pulmonary disorders. Diaphragmatic dysfunction is an essential factor in the worsening and progression of symptoms in patients with COPD. Therefore, we investigated the effect of diaphragmatic respiratory training on some pulmonary indexes in these patients.

**Methods & Materials** This quasi-experimental study type with pre-test-post-test design, 16 male patients (Mean±SD=55±5.4 y) with moderate COPD were selected through convenient sampling method and were randomly divided into two groups of 8 (diaphragmatic training and control group). A demographic questionnaire was used to control the inclusion criteria. Maximal inspiratory pressure, forced expiratory volume in 1 second, and respiratory rate per minute were measured by laboratory equipment. The training group performed the respiratory exercises 3 sessions per week for 8 weeks. The control group did not do any exercise. After the end of training, the pulmonary indexes were re-evaluated. Statistical data were analyzed by ANOVA and Tukey's post hoc test in SPSS V. 21.

**Results** The results indicated that diaphragmatic respiratory exercises had a significant effect on pulmonary indexes (P=0.001). There was no improvement in any of the variables in the control group (P>0.05).

**Conclusion** Diaphragmatic respiratory training seems to play an essential role in improving the respiratory indexes of patients with pulmonary disease. The results of our study showed that respiratory training improves the respiratory function of patients and should be included in the pulmonary rehabilitation program for these patients.

**Extended Abstract**

**1. Introduction**

**C**hronic Obstructive Pulmonary Disease (COPD) is one of the leading causes of mortality in developing countries and has an increasing rate. It is the fourth leading cause of death in the United States. Ac-

cording to estimates by the World Association of Chronic Obstructive Pulmonary Diseases, COPD will be ranked 3 out of the 6 most common causes of death in the world by 2020 and is expected to become the fifth most debilitating disease [1]. The patients with COPD lose bodyweight and alter diaphragm muscle with reduced thickness [8]. In Diaphragmatic Breathing (DB), the focus is on the diaphragm muscle as the most important respiratory muscle. In this type of exercise, we would like to know whether the dia-

\* **Corresponding Author:**

**Mandana Gholami, PhD.**

**Address:** Department of Physical Education and Sports Science, Faculty of Humanities and Social Sciences, Science and Research Branch, Islamic Azad University, Tehran, Iran.

**Tel:** +98 (912) 1491868

**E-mail:** gholami\_man@yahoo.com

phragm muscle alone can improve pulmonary function in these patients [9]. In Iran, because of the weakness in disease prevention, these techniques are not considered a part of the complementary program of clinical treatment for the promotion of patients' health.

## 2. Materials and Methods

This research is a quasi-experimental study with a pre-test-post-test design conducted in 2017. The sampling was performed for 2 months on patients with COPD referred to Velayat Hospital in Qazvin city, Iran. Sixteen patients with a Mean±SD age of 55±5.4 years suffering from COPD with moderate severity were selected using purposive and convenience sampling method. They were randomly assigned into two groups of DB (n=8) and control (n=8) by the specialist. The diagnosis of COPD was based on a spirometry test, where the ratio of Forced Expiratory Volume (FEV<sub>1</sub>) to the Forced Vital Capacity (FVC) should be less than 70%. All patients had no cardiovascular, hepatic, gastrointestinal, and peripheral edema problems, and they were all in the intermediate stage of the disease.

All subjects were matched by a pulmonary practitioner for drug use. Laboratory instruments and a demographic form were used to confirm the inclusion criteria. These criteria were the stability of the patient's medical condition to attend the exercise program, no history of chronic diseases, and no definitive diagnosis of the disease by a specialist. The diaphragmatic breathing technique was taught to the patients in one training session. Before the start of the exercises, the patients' Respiration Rate (RR) was recorded per minute while resting. Lung function was tested by the spirometer measuring FEV<sub>1</sub> and FEV<sub>1</sub>/FVC ratio. Then, their Maximal Inspiratory Pressure (MIP) was measured by a body box in the hospital in the presence of a physician and laboratory expert. The DB group received diaphragmatic breathing exercises for 8 weeks, 3 sessions per week, each taking 1 hour. The control group received no training. At the end of

the sessions, pulmonary factors of FEV<sub>1</sub>, MIP, and RR were measured and recorded again. The data were analyzed using ANOVA and Tukey post hoc test at a significant level of P<0.05.

## 3. Results

The results of the Independent t-test showed no significant difference between the two groups regarding age, body mass index, and weight (P>0.05), indicating the homogeneity of the two groups in terms of demographic characteristics. The results of the Shapiro-Wilk test indicated the normal distribution of the quantitative data; hence, parametric methods were used to analyze the data. The results of the study showed that the patients, who received breathing exercise, had higher FEV<sub>1</sub> compared to its pre-test score, and the increase was statistically significant (P<0.05).

The FEV<sub>1</sub> before the workout was 68.2 and increased to 69.2 after exercise, indicating the effect of DB exercise in this group. There was a significant decrease in RR in the DB group, which was a sign of improvement and change in the respiratory pattern of patients from shallow and rapid breathing to deep and slow breathing (P=0.00). Various studies have used the MIP variable to evaluate the diaphragm muscle since it is the best indicator for this evaluation. The amount of MIP in the DB group was 73.7 before the intervention and significantly increased to 84.7 after the intervention (P=0.00). Table 1 presents the overall comparison of the DB and control groups before and after intervention by the paired t-test. According to the obtained values, the pre-test and post-test scores of pulmonary factors in the control group were almost equal, and none of them increased significantly (P>0.05).

## 4. Conclusion

**Table 1.** The Mean±SD of FEV<sub>1</sub>, MIP, and RR values in the study groups and their comparison

Variables	Control Group			DB Group		
	Mean±SD		Sig.	Mean±SD		Sig.
	Pre-test	Post-test		Pre-test	Post-test	
FEV <sub>1</sub>	3.89±68.5	4±68.76	0.13	3.89±68.5	8.74±69.2	0.018
RR	22.2±75.79	5.76±22.3	0.08	1.88±22.1	1.78±19.2	0.000
MIP	2.81±73.3	4±74.49	0.25	7.46±73.2	7.48±84.3	0.000

Patients with COPD have superficial, rapid, and inadequate breathing. Fear of exposure to the shortness of breath prevents physical activity in these patients [11]. Finding the best method for its treatment has always been the subject of various studies. In this regard, physiotherapists have tried to increase lung function and respiratory capacity by using respiratory muscle training and exercises [12]. The therapeutic outcomes in these patients not only should be focused on pulmonary function changes but also should affect the quality of life of these patients. The present study showed that diaphragmatic breathing exercise was effective in improving the pulmonary function and respiratory pattern of patients with COPD. This type of training can be used for pulmonary rehabilitation to reduce symptoms and prevent worsening. There is a need for a pulmonary rehabilitation program in health centers because of the impact of this type of diaphragmatic breathing exercise.

## Ethical Considerations

### Compliance with ethical guidelines

This article has a code of ethics from Islamic Azad University of Science and Research Branch Tehran. All the ethics of research are adhered to. Written consent was obtained from all participants in the study and all participants were fully aware of the research process and whenever possible, they could be excluded from the study. All participants' information was kept confidential.

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### Authors' contributions

All authors contributed in preparing this article.

### Conflicts of interest

The authors declared no conflict of interest.

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