



Effect of Controlled Breathing Exercise on Dyspnea in Patients with Chronic Obstructive Pulmonary Disease (COPD)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

COPD (chronic obstructive pulmonary disease) is one of the most frequent life-threatening disorders afflicting people all over the world. COPD patients have increased work of breath and dyspnea as a result of pathophysiological changes in the airway, tissue, and vascular supply to the lungs. These changes increase airway resistance and air trapping, and decrease lung compliance, resulting in higher work of breath and discomfort. This study was undertaken to assess the effect of controlled breathing on dyspnea in patients with chronic obstructive pulmonary disease (COPD). A quasi experimental design was used with purposive sampling technique with 25 patients in each study and control group. Breathing pattern was assessed through modified Borg dyspnea scale. The obtained t value between the control and study groups was 2.64 and 2.07 respectively, which

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was significant at the $p=0.05$ level, which shows that the controlled breathing exercise was more beneficial for the study group in lowering dyspnea in chronic obstructive pulmonary disease patients. The study concluded that the controlled breathing is more effective in improving the level of dyspnea among COPD patients and this can be given as a regular treatment options for them to improve their lung compliance

Keywords: Controlled breathing; dyspnea; chronic obstructive pulmonary disease COPD).

1. INTRODUCTION

COPD (chronic obstructive pulmonary disease) is one of the most frequent life-threatening disorders afflicting people all over the world [1]. COPD patients experience increased work of breath and dyspnea as a result of pathophysiological changes in the airway, tissue, and vascular supply to the lungs [2]. These changes increase airway resistance and air trapping, and decrease lung compliance, resulting in increased work of breath and dyspnea. Experience of dyspnoea originates from interactions among many physiological, psychological, social, and environmental elements and may cause subsequent physiological and behavioural responses, according to the American Thoracic Society [3].

In individuals with chronic obstructive pulmonary disease (COPD), dyspnea is a common and debilitating symptom. Greater intrinsic mechanical stress of the inspiratory muscles, increased mechanical constriction of the chest wall, functional inspiratory muscle weakening, and increased ventilatory demand due to temperature are all few established pathophysiological variables that contribute to dyspnea. Dyspnea management is a key goal of COPD treatment, which is an irreversible respiratory illness. Controlled breathing is used to treat dyspnea in addition to some traditional treatments such bronchodilator therapy, exercise training, and oxygen therapy.

Dyspnoea can be treated with both pharmacological and non-pharmacological methods. Ventilation support such as BiPAP, relaxation techniques, counselling, sitting near a well ventilated open window, music therapy, and dyspnoea alleviating positions are examples of non-pharmacological care [4]. Diaphragmatic and pursed lip breathing exercises are two popular and effective deep breathing exercises.

Additionally, active expiration, slow and deep breathing, pursed-lips breathing (PLB), relaxation treatment, certain body positions, inspiratory

muscle training, and diaphragmatic breathing are all examples of controlled breathing exercises. These exercises have a wide range of objectives, including bettering (regional) ventilation and gas exchange [5]. Controlled breathing helps patients with COPD reduce dyspnea by minimising dynamic hyperinflation of the rib cage and enhancing gas exchange, increasing respiratory muscle strength and endurance, and optimising the thoraco-abdominal motion pattern [6-7].

For COPD patients, breathing exercise (BE) has long been an important aspect of a comprehensive pulmonary rehabilitation program. Slow and deep breathing, active expiration, pursed-lip breathing (PLB), relaxation breathing, and diaphragmatic breathing are all examples of BE (DBE), to reduce lung hyperventilation and improve respiratory muscle function, exercise tolerance, and quality of life in COPD patients, ventilatory feedback (VF) training has been advised [8]. Therefore, this study was undertaken to assess the effect of controlled breathing exercise on dyspnea in patients with chronic obstructive pulmonary disease (COPD).

2. MATERIALS AND METHODS

For this study, quasi experimental design was used with purposive sampling technique. Demographic variables such as age, gender, education, occupation, marital status, family income, family history of COPD, duration of illness, smoking habits and ongoing breathing trouble were collected. Breathing pattern was assessed through modified Borg dyspnea scale which has a score of zero to 10. The score interpretation include mild (1-2), moderate (3-4), severe (5-6), very, very severe (7-8) and almost maximum dyspnea (9-10). Convenience sampling technique was used to choose study participants who met the inclusion criteria. There were 25 patients in the study group and 25 in the control group. The subjects are given a brief description of the study's goal.

After ensuring confidentiality and no harm on the intervention, each subject's oral consent is sought. Before each breathing exercise, the dyspnea scale was utilized to determine the level of breathing difficulty in the study group. The study group was given the controlled breathing practice twice a day for 15-20 minutes each time in 10 days. One hour after each breathing exercise, the study group underwent a post-test. The control group led normal life and followed the regular advice given by the physician.

All participants who were included in the study were free of aggravation for at least 2 weeks. Patients who had other organ failure, malignancy, or were unable to comply were excluded from the study. During the exacerbation, all patients received normal medical treatment, including systemic steroids, inhaled bronchodilators, and oxygen, as prescribed by their physician.

During a 6 weeks period, 50 volunteers were recruited among patients admitted to the hospital's respiratory care unit and diagnosed with a non-infectious COPD exacerbation. The rehabilitation approach for patients with chronic obstructive pulmonary disease includes controlled breathing (COPD). The controlled breathing practice included relaxation techniques, pursed-lips breathing, and active expiration. Relaxation aims to improve breathing efficiency by lowering breathing frequency and increasing tidal volume. Pursed-lips breathing

promote expiration by necessitating active and extended expiration while also preventing airway collapse followed by active expiration by contraction of abdominal muscles. This was taught to the patients of the study group and was monitored carefully by the investigators throughout the practice. The patients were given 3 - 5 minutes of rest during each exercise.

3. RESULTS

According to the above Table 1, the demographic characteristics of the COPD patients were given. Among the patients, majority of the patients were in the age group of 56 – 58 years in control and study group while 76% and 68% were men respectively in control and study group. Forty eight percent of control group patients studied up to high school where as it were 40 % in the control group. Majority of the patients in both the group were married and were earning above 5000 rupees per month. Forty four percent and 32% of the COPD patients had the family history of COPD respectively in control and study group.

The obtained t value between the control and study groups was 2.64 and 2.07 respectively, which was significant at the p=0.05 level, as shown in the Table 2 above. As a result, it may be stated that the controlled breathing exercise was more beneficial for the study group in lowering dyspnea in chronic obstructive pulmonary disease patients.

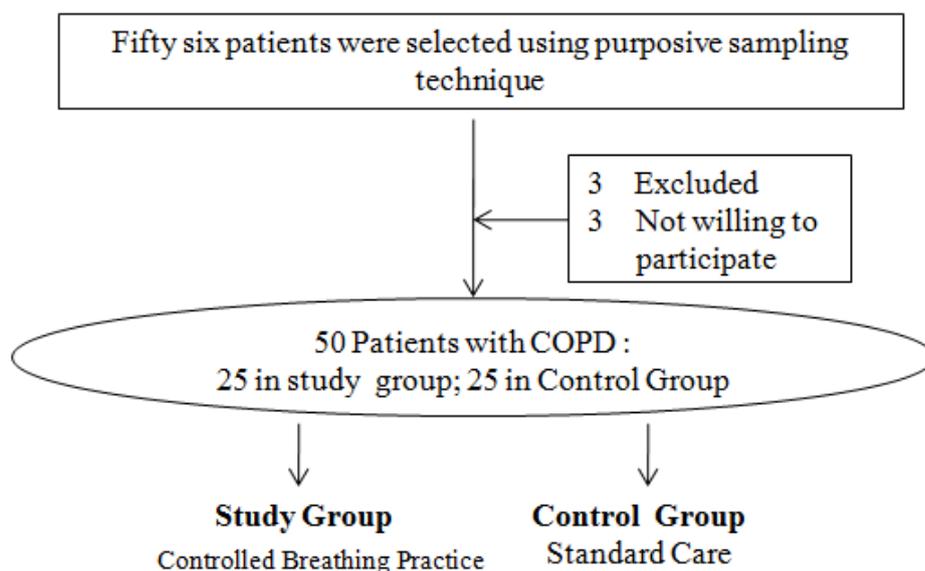


Fig.1. Schematic representation of the sample selection

Table 1. Distribution of demographic variables of COPD patients

Demographic variables	Control group		Study group	
	n	%	n	%
Age in (years)				
a)50-52 years	4	16	3	12
b) 53-55 years	6	24	7	28
c) 56-58 years	10	40	12	48
d)59-60years	5	20	3	12
Gender				
a) Male	19	76	17	68
b) Female	6	24	8	32
Educational status				
a) No formal education	3	12	5	20
b) Primary	5	20	4	16
c) High school	12	48	10	40
d) Higher secondary	5	20	6	24
Occupation				
a) Industrial workers	6	24	7	28
b) Private employee	13	52	11	44
c) Government employee	3	12	4	16
d) Self employee	3	12	3	12
Marital status				
a) Married	19	76	18	72
b) Unmarried	2	8	3	12
c) Divorce	1	4	0	0
d) Widow	3	12	4	16
Monthly income of the family				
a) < 5000	0	0	1	4
b) 5000-10000	13	52	17	68
c) >10000	12	48	7	28
Family history of COPD				
a) Yes	11	44	8	32
b) No	14	56	17	68
Duration of illness				
a) < 1 year	13	52	14	56
b) 2-5 year	12	48	11	44
Smoking habits				
a) Yes	7	28	4	16
b) No	18	72	21	84
Continuous breathing difficulty present at				
a)wake up	2	8	1	4
b)walking	6	24	7	28
c)sleeping at night time	4	16	3	12
d) exercise	13	52	14	56

Table 2. Comparison of pre and post test level of dyspnea among COPD patients

Group	Pre test	Post test	Mean difference	't' value
	Mean SD	Mean SD		
Study	8.47± 1.82	2.14 ±1.63	6.33	2.64*
Control	8.65 ±1.42	6.01 ±1.41	2.64	2.07

There was an association between the level of dyspnea and demographic variables such age and family history of COPD in patients with chronic obstructive pulmonary disease at p =0.05

confidence level. It shows that the age of the patient and his/her family history of COPD has a significant association with the level of dyspnea. Other demographic characteristics of the patients

did not show any association with the level of dyspnea among both the groups.

4. DISCUSSION

The goal of this investigation was whether controlled breathing exercises could help individuals with chronic obstructive lung disease (COPD) with dyspnea. In this study, most of the study participants did not have the habit of smoking and had breathing difficulty during exercise i.e.52 % in control and 58% in study group.

For COPD patients, pulmonary rehabilitation has become standard of care. In this study, controlled breathing exercise was used as rehabilitation and to find out the effect of it on the level of dyspnea among COPD patients. The obtained 't' value between the control and study groups was 2.64 and 2.07 respectively, which was significant at the $p=0.05$ level, as shown in the Table 2 above. As a result, it may be stated that the controlled breathing exercise was more beneficial for the study group in lowering the level of dyspnea. The study conducted by Gosselink et al. [8] also concluded that slow and deep breathing improves breathing efficiency and oxygen saturation at rest of COPD patients. Similar study findings were reported in the study on efficacy of deep breathing exercise on dyspnoea among COPD patients by Heera Jayasheela [9] which concluded that deep breathing exercise had reduced dyspnoea among patients with COPD.

Also, a study on effects of diaphragmatic breathing exercise on the degree of breathlessness in patients with Chronic Obstructive Pulmonary Disease by Budiman, Garnewi S. [10] concluded that after the intervention, the Mean and SD score of breathlessness decreased from 3.420.53 to 1.640.13 ($P=0.001$). Hence, the patients with COPD should be educated and motivated to perform the controlled breathing exercise to strengthen the respiratory muscles and reduce the level of dyspnea by the health care practitioners and this should be done under supervision until the patients gain expertise in the controlled breathing exercise at home.

There was an association between the level of dyspnea and demographic variables such age and family history of COPD in patients with chronic obstructive pulmonary disease at $p=0.05$ confidence level. It shows that the age of the

patient and his/her family history of COPD has a significant association with the level of dyspnea. Similar study findings were reported in a study by Karthika, K. [11] on a quasi experimental study to evaluate the effectiveness of deep breathing exercise among patients with Chronic Obstructive Pulmonary Disease who are aged between 50-60 years in selected hospitals at Dindigul District which showed that the age of the patient was associated with the level of dyspnea. Other demographic characteristics of the patients did not show any association with the level of dyspnea among both the groups.

5. CONCLUSION

According to the study findings, controlled breathing exercise is more effective in improving the level of dyspnea among COPD patients and this can be given as a regular treatment options for them to improve their lung compliance.

DECLARATION

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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