



# To Assess the Effectiveness of Selected Breathing Exercises among Chronic Obstructive Pulmonary Disease Patients

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## Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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## ABSTRACT

Mortality rate of chronic obstructive pulmonary disease (COPD) is more than 3 million people every year, making it 3rd largest cause of death in the world. It has been estimated that by the year 2030. chronic obstructive pulmonary disease will become the third biggest cause of death. chronic obstructive pulmonary disease (COPD) is a progressive irreversible airway disease characterized by emphysema and chronic bronchitis, resulting in breathlessness, cough and sputum as the disease progresses, subjects with COPD experience increasing deterioration of their health-related quality of life (HRQOL), with greater impairment in their ability to work and declining participation in social and physical activities. Hence practicing pursed lip breathing exercise in their daily routine will improve their breathing pattern and quality of life.

### Objectives:

1. To assess the breathing pattern of chronic obstructive pulmonary disease patient.
2. To assess the effectiveness of selected breathing exercises among the chronic obstructive pulmonary disease patients.

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3. To associate the effectiveness of selected breathing exercises among chronic obstructive pulmonary disease patient with their demographic variables.

**Materials and Methods:** The research approach used for the study was interventional evaluatory approach. The study was conducted in respiratory unit at Wardha City Maharashtra, India, using one group pre test post test design without control group. Non probability purposive sampling technique was used for selecting 60 COPD patients. On the first day pre test assessment of breathing pattern with the help of borg rating scale and provided pursed lip breathing exercise for 20 minutes, 2 times in a day and it was continued for 15 days followed by post test on the 15<sup>th</sup> day. The data collected, tabulated and analysed in terms of objectives of study using descriptive and inferential statistics.

**Results:** The mean post test score. The overall comparison of selected breathing exercise among COPD patients at rest pre test score was higher 3.48 with SD of  $\pm 1.25$  when compare with at rest post test score which was 0.91 with SD of  $\pm 0.85$ . The statistical Student's paired t test implies that the difference in the selected breathing exercise among COPD patients was found to be 18.98 which is statistically significant at 0.05% level of significance. Also the overall comparison of selected breathing exercise among COPD patients during activity pre test score was higher 7.95 with SD of  $\pm 1.50$  when compared with during activity post test score which was 2.76 with SD of  $\pm 1.02$ . The statistical Student's paired t test implies that the difference in the selected breathing exercise among COPD patients was found to be 18.98 which is statistically significant at 0.05% level of significance. Hence it is statistically interpreted that effectiveness of selected breathing exercises among COPD patients at rest and during activity in post test was effective. The tabulated values was much higher than the calculated' values at 5% level of significance, also the calculated 'p-value which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence the association of effectiveness of selected breathing exercises is statistically not associated with demographic variables.

**Conclusion:** According to the results of this study, patients with Chronic Obstructive Pulmonary disease patients who practiced pursed lip breathing exercise 20 minutes, 2 times a day for 15 days had improvement of the breathing pattern which was statistically proved. Hence pursed lip breathing exercise was cost effective, non invasive, and highly feasible. Hence the researcher concluded that pursed lip breathing exercise can be practice as an effective intervention on improving breathing pattern among chronic obstructive pulmonary disease patients.

*Keywords: Breathing exercise; borg scale; chronic obstructive pulmonary disease.*

## 1. INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a progressive, non recoverable airway disease defined by emphysema and chronic bronchitis, resulting in breathlessness, cough and sputum. As the disease progresses, subjects with COPD experience a growing decline in their health related quality of life (HRQOL) with a substantial deterioration in their ability to work and a reduction in their participation in social and physical activities [1].

Chronic obstructive pulmonary disease (COPD) is a major respiratory disease affecting the quality and length of life around the globe. The World Health Organization describes COPD as a lung disease characterized by recurrent obstruction of lung airflow which obstructs normal breathing and is not completely reversible [2].

It is estimated that COPD is at risk of 3.15 million deaths per year and that there were 251 million COPD diseases worldwide in 2016 [3].

It is the term used to refer to chronic lung diseases that restrict lung airflow, but Chronic Obstructive Pulmonary Disease (COPD) does not refer to a specific disease. Today chronic emphysema and bronchitis are no longer used but are treated with COPD. The signs of COPD are ' need for oxygen, ' excessive sputum development, breathlessness, chronic coughing. COPD is not just a "smoker's cough," but also a low diagnostic, critically lung disease that may increasingly lead to death [4].

The healthcare burden of COPD can be as high as \$50 billion in countries like US where COPD is the third leading cause of mortality [5]. Due to its association with smoking and environmental pollution, the burden is much higher in low and middle-income countries. An estimation shows

that more than 90% COPD-related deaths happen in those countries and India is no exception for such a tremendous public health problem [3,6].

## 2. MATERIALS AND METHODS

The research approach used for the study was interventional evaluatory approach. The study was conducted in respiratory unit at Wardha City Maharashtra, India, using one group pre test post test design without control group. Non probability purposive sampling technique was used for selecting 60 COPD patients. On the first day pre test assessment of breathing pattern with the help of borg rating scale and provided pursed lip breathing exercise for 20 minutes, 2 times in a day and it was continued for 15 days followed by post test on the 15<sup>th</sup> day. The data collected, tabulated and analysed in terms of objectives of study using descriptive and inferential statistics.

### 2.1 Description of the Tool

The tool consists of two section.

**Section A-** It consists of demographic variables of the chronic obstructive pulmonary diseases patients such as age, gender, education, income, occupation, duration of disease, knowledge regarding breathing exercise, source of information, number of hospital visits respectively.

**Section B-** Pursed lip breathing exercise.

- Borg scale score at rest and during activity.
- Score interpretation.

**Table 1. Blue print and score method of the perceived exertion measured by borg scale**

Level of breathing exercise	Score Range
Very Light Activity	≤1
Light Activity	2-3
Moderate Activity	4-6
Vigorous Activity	7-8
Very Hard Activity	9
Max Effort Activity	10

## 3. RESULTS

### 3.1 Distribution of Chronic Obstructive Pulmonary Disease Patients with Regards to Demographic Variables

1. Majority of the subjects were in the age group of 51-60 years that is 31.7%, 28.30% were in the age group of 61-70

years, 20% were in the age group of 41-50 years and more than 70 years.

2. Majority of the samples 58.30% were females, and 41.70% were males.
3. Majority of the subjects were having family income of Rs 20001 and more that is 36.70%,, 30% had between 15001-20000 Rs, 18.30% had between 10001-15000 Rs and 15% were 9000-10000 Rs.
4. Majority of the subjects 36.7% were educated up to primary, 21.70% were educated up to secondary, 18.3% were illiterate, 18.3% were educated up to higher secondary, 3.3% were graduates and 1.70% were PG and above.
5. Majority of the subjects 30% farmer, 28.3% were doing private services, 20% were labour, 13.3 were in government service, and only 8.3% were from other profession.
6. Majority of the subjects were 33.30% tobacco chewers, 26.70% were household smokers, 23.30% had habits of cigarette smoking, 13.30% had habit of passive smoking and 3.30% had other habit.
7. Majority of the subjects were 33.30% had duration of disease 2-3 years, 23.30% had duration of disease 3-4 years and more than 4 years.
8. Majority of the subjects were 70% had knowledge about breathing exercise and 30% of them had no knowledge about breathing exercise.
9. Majority of the subjects were 23.30% had information from relatives 23.30% had information from friends, 13.30% had information from mass media and other sources.
10. As per number of hospital visits majority of the subjects 35% visited more than 6 times, 23.30% visited between 3-4 times, 21.70% visited between 5-6 times and 20% visited 1-2 times.

### 3.2 Assessment of Breathing Pattern among Chronic Obstructive Pulmonary Disease Patients

#### 3.2.1 Distribution of COPD patients according to level of selected breathing exercises at rest

In pre test 3.33% subjects were having very light activity at rest. 48.33% were having light activity, 48.33% were having moderate activity. Were as in post test at rest 80% had very light activity, 18.33% had light activity and 1.67% had moderate activity.

Mean breathing exercise score at rest pre test was  $3.48 \pm 1.25$  and in at rest post test it was  $0.91 \pm 0.85$ .

### **3.2.2 Distribution of COPD patients according to level of selected breathing exercises during activity**

In pre test during activity no subjects had very light activity and light activity, 16.67% had moderate activity, 43.33% had vigorous activity, 25% had very hard activity, were as 15% had max effort activity. In post test 8.33% had very light activity, 66.67% had light activity and 25% had moderate activity.

Mean breathing exercise score during activity pre test was  $7.95 \pm 1.50$  and during activity post test it was  $2.76 \pm 1.02$ .

### **3.3 Effectiveness of Selected Breathing Exercises among the Chronic Obstructive Pulmonary Disease Patients**

#### **3.3.1 Significance of difference between selected breathing exercises among the COPD patients at rest pre and post test**

The overall comparison of selected breathing exercise among COPD patients at rest pre and post test which reveals that at rest pre test score was higher 3.48 with SD of  $\pm 1.25$  when compared with at rest post test score which was 0.91 with SD of  $\pm 0.85$ .

The statistical Student's paired t test implies that the difference in the selected breathing exercise among COPD patients was found to be 18.98 which is statistically significant at 0.05% level of significance.

Hence it is statistically interpreted that level of selected breathing exercises among COPD patients at rest post test was effective. Thus H1 is accepted and H0 is rejected.

#### **3.3.2 Significance of difference between selected breathing exercises among the COPD patients during activity pre and post test**

The overall comparison of selected breathing exercise among COPD patients during activity pre and post test which reveals that during activity pre test score was higher 7.95 with SD of

$\pm 1.50$  when compared with during activity post test score which was 2.76 with SD of  $\pm 1.02$ .

The statistical Student's paired t test implies that the difference in the selected breathing exercise among COPD patients was found to be 32.60 which is statistically significant at 0.05% level of significance.

Hence it is statistically interpreted that level of selected breathing exercises among COPD patients during activity post test was effective. Thus H1 is accepted and H0 is rejected.

### **3.4 Association Effectiveness of Breathing Exercise with Selected Demographic Variables of Chronic Obstructive Pulmonary Disease Patients**

#### **3.4.1 Association of effectiveness of selected breathing exercises at rest post test with demographic variables**

The association of level of selected breathing exercises with demographic characteristics of COPD patients. The tabulated values was much higher than the calculated' values at 5% level of significance. Also the calculated 'p-value which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted that socio-demographic characteristics of COPD patients is statistically not associated with their level of selected breathing exercise at rest post test.

#### **3.4.2 Association of effectiveness of selected breathing exercises during activity post test with demographic variables**

The association of level of selected breathing exercises with demographic characteristics of COPD patients. The tabulated values was much higher than the calculated' values at 5% level of significance except for occupation. Also the calculated 'p-value which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence it is interpreted socio-demographic characteristics of COPD patients is statistically not associated with their level of selected breathing exercise during activity post test.

## **4. DISCUSSION**

The study was conducted to assess the effectiveness of selected breathing exercises among chronic obstructive pulmonary disease

patients it was aimed to improve breathing pattern at rest and during activity. The mean post test score. The overall comparison of selected breathing exercise among COPD patients at rest pre test score was higher 3.48 with SD of  $\pm 1.25$  when compare with at rest post test score which was 0.91 with SD of  $\pm 0.85$ .

The statistical Student's paired t test implies that the difference in the selected breathing exercise among COPD patients was found to be 18.98 which is statistically significant at 0.05% level of significance.

The overall comparison of selected breathing exercise among COPD patients during activity pre test score was higher 7.95 with SD of  $\pm 1.50$  when compared with during activity post test score which was 2.76 with SD of  $\pm 1.02$ .

The statistical Student's paired t test implies that the difference in the selected breathing exercise among COPD patients was found to be 18.98 which is statistically significant at 0.05% level of significance.

Hence it is statistically interpreted that effectiveness of selected breathing exercises among COPD patients at rest and during activity in post test was effective. Thus H1 is accepted and H0 is rejected.

The tabulated values was much higher than the calculated' values at 5% level of significance. Also the calculated 'p-value which was much higher than the acceptable level of significance i.e. 'p'=0.05. Hence The association of effectiveness of selected breathing exercises is statistically not associated with demographic variables.

A similar study conducted by Mrs. R. Latha, at tamilnadu to investigate the effectiveness of Pursed Lip-Breathing Exercise on breathing pattern among 100 patients with Chronic Obstructive Pulmonary Disease patients. Study conducted with Pre experimental –one group pre test post test research design with 100 samples selected in consecutive sampling technique at Medical Ward. Pursed-Lip Breathing Exercise for 3 minutes, 3 times day for about 10 days was given to the subjects. Findings: There is significance difference between the pre and post test mean score (150.14- 171.32). The findings suggests that the Pursed Lip Breathing Exercise can be practice regularly by patients with Chronic

Obstructive Pulmonary Disease to improve the breathing pattern [7].

G Dechman [8] conducted a study to evaluate the efficacy of pursed-lip breathing (PLB) and diaphragmatic breathing (DB) in the rehabilitation of people with chronic obstructive pulmonary disease (COPD) remains unclear. This review examines the evidence regarding the usefulness of these techniques in improving the breathing of people with stable COPD.. Pursed-lip breathing slows the respiratory rate, and evidence suggests that this decreases the resistive pressure drop across the airways and, therefore, decreases airway narrowing during expiration. This decrease in airway narrowing may account for the decreased dyspnea some people experience when using this technique. Diaphragmatic breathing has negative and positive effects, but the latter appear to be caused by simply slowing the respiratory rate. They concluded evidence supports the use of PLB, but not DB, for improving the breathing of people with COPD [8].

A similar study was conducted to assess the effectiveness of teaching programme on pulmonary rehabilitation. The objective of the study was to assess the short-term and long-term effects of pulmonary rehabilitation on quality of life. They selected Forty-three out patients with COPD. Patients were randomized to one of three treatment groups: exercise training alone, exercise training plus activity training, and exercise training plus a lecture series. The mean treatment period was 10 weeks. The study concluded that teaching programme with exercise training was effective in improving the knowledge of pulmonary rehabilitation among patient with COPD [9].

Most of the study population belongs to the age group of more than 60 years (68.3%), whereas remaining were between 45 and 60 years (31.7%). There was male predominance (67.1%) among study population as compared to females (32.9%). Guleria et al. have reported similar findings in their study where the maximum number of patients had the age of onset between 40 and 70 years. This findings is in agreement with the study by Narayanagowda et al., in which of 107 patients, the most common age group was 55–65 years (40.19%). The next common age group was 65–75 years (32.71%). This is because it was more commonly seen in patients with advanced lung disease as an expression of deterioration in host defenses at the bronchial mucosal level.

This findings correlate well with the study conducted by Niranjana Mambally Rachaiah et al., in which males accounted for 88%, with a male-female ratio of 6.33:1. In the present study, all males were smokers, six females patients were nonsmokers, but all of them were exposed to smoke of burnt fuels which is very common in the rural Indian population. In this part of the country, cooking is predominantly by using wood and cow dung. This is possibly a strong risk factor for the development of COPD among female patients. This findings is in agreement with the study by Narayanagowda et al., in which out of 107 patients, 72 were male patients [10-11].

Most of the study population were underweight (52%) followed by normal weight (36.9%), overweight (8.9%), and obese (2.8%). In the study population, 55% had COPD from more than 5 years and 45% had for <5 years.

History of smoking was observed in 49% of the study population, and most of the study population had smoking index of 30–39 packs (35%) followed by 20–29 packs (31%), 10–19 packs (14%), and more than 40 packs (14%). History of biomass exposure was observed in 36.9% of the study population. Similarly, the study by Narayanagowda et al., in which out of 72, 45 (62.5%) were smokers and 27 (37.5%) were nonsmokers.

Breathlessness (98%) was the most common presenting complaint among study population followed by cough (80%), expectoration (44.9%), fever (23.7%), chest pain (22.3%), loss of weight and appetite (19.1%), and hemoptysis (2.57%). Most of the study population were MMRC dyspnea of Grade III (40%) followed by Grade IV (24.9%), Grade II (23.4%), Grade I (9.7%), and Grade 0 (2%). Similarly, in the study conducted by Sunil Babu et al., 100% of the patients presented with breathlessness and cough. Many had peripheral edema and distension of the abdomen. Padmavathi et al. reported dyspnea in 100%, pedal edema in 90.4%, and cyanosis in 83.2% of group.

Rhonchi (71%) was the most common respiratory findings amongst study population followed by decreased breath sound (39%), crepitation (69%), and bronchial breathing (21%).

On chest X-ray and HRCT thorax, normal, emphysema, consolidation, bronchiectasis, cavity, pleural effusion and mass was observed in 32%, 56%, 11.7%, 10%, 19.4%, 2.9%, and 8.9% respectively.

Most of the study population had GOLD Stage C (38%) followed by GOLD Stage B (37%), GOLD Stage D (13%), and GOLD Stage A (12%). This findings is in agreement with the study conducted by Ladeira et al., in which GOLD Stage B (50%) followed by GOLD Stage C (28%) [12-13].

There was a significant decrease in spirometry parameters such as forced-expiratory volume in 1 s (FEV1), forced-vital capacity (FVC), and FEV1/FVC as the GOLD staging increases [14].

Acute exacerbations of COPD is conveniently treated with beta agonist and anticholinergic nebulisations, antibiotics, oxygen supplementation, NIPPV, and steroids. Rarely SSP can complicate COPD. Our patient had consolidation/ partial collapse of the middle lobe along with closed pneumothorax that further aggravated the dyspnoea. A pneumothorax is an accumulation of air in the pleural cavity. Spontaneous pneumothorax (SP) is a cardiopulmonary emergency [15-16]. SSP usually complicates COPD in females more than 60 years of age. It requires immediate treatment [2]. The most common pathology of SSP in COPD is rupture of an apical sub pleural bleb or bulla which occurs in 50-70% of cases [17-18]. Thirty percent of the SSP complicating COPD may not require intercostal tube insertion [19-20]. Cases of COPD with acute exacerbations who do not improve predictably with adequate therapy, SSP should be ruled out. A second CXR or HRCT might be required. In this case the crisis might have been triggered by dual phenomena, that is; infection and SSP. SSP occurs more in emphysema predominant COPD. If the pneumothorax occupies less than 15% of the hemithorax and the patient is asymptomatic then conservative therapy with high flow oxygen is need or else in symptomatic cases the standard treatment is tube thoracostomy [21-23,24].

## 5. CONCLUSION

According to the results of this study, patients with Chronic Obstructive Pulmonary disease patients who practiced pursed lip breathing exercise 20 minutes, 2 times a day for 15 days had improvement of the breathing pattern which was statistically proved. Hence pursed lip breathing exercise was cost effective, non invasive, and highly feasible. Hence the researcher concluded that pursed lip breathing exercise can be practice as an effective intervention on improving breathing pattern

among chronic obstructive pulmonary disease patients.

## CONSENT

As per international standard or university standard, patient's written consent has been collected and preserved by the author(s).

## ETHICAL APPROVAL

Ethical clearance taken from Ref. No. DMIMS (DU)/IEC/Jan-2018-19/7765.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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