

Effect of Breathing Retraining on Exercise Capacity and Quality of Life in Patients with Grade-II (GOLD) COPD

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Abstract:-

BACKGROUND: Chronic obstructive pulmonary disease (COPD) is a lung disease characterised by chronic obstruction of lung airflow that interferes normal breathing and it is not fully reversible. Conditions like chronic bronchitis and emphysema are no longer used but they are included with COPD diagnosis. Smoking is one of the major cause for COPD, in which the airways becomes inflamed and damaged.

OBJECTIVE: To find out the effects of breathing retraining program or exercise capacity and quality of life in patients with grade II (GOLD) COPD patients.

METHODOLOGY: Quasi experimental. 20 subjects selected and intervention given on alternative days for a period of 4 weeks. Pulse oximeter and arm pedocyclometer used during intervention.

OUTCOME MEASURES: Clinical chronic obstructive pulmonary disease (COPD) questionnaire, 5 sit to stand test.

RESULT: The result of this study shows that there is improvement in the symptoms, functional state and total score among 20 COPD patients while there is no improvement in the mental state among 19 of them. There was improvement in the exercise capacity of the patient.

CONCLUSION: The study concludes that the COPD patients exhibited improvement in the exercise capacity and quality of life due to breathing retraining.

Keywords: Diaphragmatic Breathing Exercise, 5 Sit to Stand

I. INTRODUCTION

India contributes a significant and growing percentage of COPD mortality which is estimated to be amongst the highest in the world. More than 64.7 estimated age standardised death rate per 100,000 amongst both the genders¹.

Chronic obstructive pulmonary disease (COPD) is a lung disease characterised by chronic obstruction of lung airflow that interferes normal breathing and it is not fully reversible. Conditions like chronic bronchitis and emphysema are no longer used but they are included with COPD diagnosis¹. Smoking is one of the major cause for COPD, in which the airways becomes inflamed and damaged.

The other causes for COPD may include air pollution, chemical fumes or dust. A few number of people get COPD through hereditary (genetic) due to rare protein deficiency which leads to lung disorder. As the disease worsens the symptoms become more severe³.

The major cardinal symptoms of COPD condition are:

Dyspnoea

Chest pain

Haemoptysis

Cough

Sputum

Depending on the level of airflow obstruction the Global Initiative for COPD classified into mild, moderate and severe groups.

Mild(stage1) – FEV1(Forced expiratory volume in 1 second) at least 80% of predicted value)

Moderate (stage 2) – FEV1 between 50% and 79% of predicted value.

Severe (stage 3) – FEV1 between 30% and 49% of the predicted value.

Very severe (stage 4) – FEV1 less than 30% of the predicted value¹⁰.

Although COPD has no proper treatment and hence cannot be cured at least breathing retraining can be given to increase their exercise capacity and improve the quality of life by slowing the progression of COPD

The main aim of breathing retraining is to relieve and control dyspnoea and to prevent abnormalities such as dynamic inflammation linked with COPD. There are various stages involved in breathing retraining such as: Pursed lip breathing, Leaning forward and Diaphragmatic breathing^{5,6}.

Pursed Lip Breathing – The technique is done with the neck and shoulder muscle relaxed. Air is breathed in for two seconds through the nose, keeping the mouth closed and then

the air is breathed out through pursed lips. This technique is used to ease breathlessness and calm the patients down⁴.

Leaning Forward –The technique is done by sitting with the trunk leaned forward and forearms rested on the thighs. The procedure is done to counteract dyspnoea^{8,9}.

Diaphragmatic Breathing - It is a technique which is done by contracting the diaphragm, a muscle which is situated horizontally between the thoracic cavity and abdominal cavity. It is usually done in COPD patients to improve factors such as pulmonary function, cardiorespiratory fitness, respiratory muscle length, and respiratory muscle strength^{8,9}.

Upper Arm Extremity Training: It is an additional physical training which was given to the patient with arm pedocyclometer⁷.



Figure – 1 Pulse Oximeter



Figure - 2 Arm Pedocyclometer

II. METHODOLOGY

Study Design: Quasi-Experimental

Study Type: Pre and Post test

Study Setting: SRM Hospital and Research centre, kattankulathur

Sampling Method: Convenient sampling

Sample Size: 30

Study Duration: 4week

Inclusion Criteria

Both the gender with the age group 30-60

Patients of moderate COPD, stage II – according to GOLD criteria

Stable medical treatment (no changes <4 weeks before starting of the baseline testing)

Exclusion Criteria

Musculoskeletal, rheumatic, cardiac or neurological disorders that might affect the exercise performance in training and tests

Previous lung surgery

Malignant disease

Patients with cognitive deficit

Acute exacerbations of COPD that require a change in pharmacological management within 4 weeks preceding the start of intervention

Materials Used

Pulse oximeter

Arm Pedocyclometer

III. PROCEDURE

20 Participants was selected on the basis of inclusion and exclusion criteria. The participants were explained about the procedure and informed consent form was obtained. The intervention was given on alternative days for a duration of 4 weeks. The patients baseline data was collected and recorded for statistical analysis.

Pre-test was done by using 5 sit to stand test and Clinical chronic obstructive pulmonary disease (COPD) questionnaire. Participants were instructed to keep the arms crossed over the anterior chest wall, sit on a chair without any arm support and stand immediately. This was repeated for 5 times continuously and the duration to complete the test was noted. This value was used to compare with the post-test values of 5 sit to stand exercise to find out the participants exercise capacity. Participants were encouraged to do true marking on the COPD questionnaire to find out the quality of life.

The patient was made to sit in fowler’s position and to relax shoulders as much as possible and the patient was asked to inhale through the nose feeling the air moving into their abdomen. Purse their lip like they are blowing the candle and then breath out slowly taking twice as long to exhale as they took to breath in. Pursed Lip Breathing is a breathing retraining strategy often spontaneously and voluntarily employed by COPD patients in order to relieve and control dyspnoea during exercise or daily activities. Leaning Forward will help patients to relieve breathlessness, it decreases EMG activities of many respiratory muscles.

Diaphragmatic Breathing (DB), it is intended to help the patients to use the diaphragm correctly while breathing to strengthen the diaphragm, decrease oxygen demand, use less energy to breath. The patient is made to lie in supine position with their knee relaxed and head supported, the patient is asked to place one hand on their upper chest and other just below their ribcage. This will allow them to feel their diaphragm move as they breathe. Subjects are instructed to breathe in slowly through their nose so that their stomach moves out against their hand. The hand on the upper chest should remain as still as possible. The subjects are asked to tighten their stomach muscles letting them fall inwards as they exhale through pursed lips. The hand on the upper chest should remain as still as possible.

Arm pedocyclometer was used to increase upper extremities physical activity during breathing retraining. Pulse oximeter was fixed on the index finger of patients hand to check the pulse rate and oxygen saturation during the exercise training.

After giving 4 weeks of intervention for the participants, post-test was done using 5 sit to stand test and Clinical chronic obstructive pulmonary disease (COPD) questionnaire to find out the improvement in exercise capacity and quality of life of the participants.



Figure – 3 Patient performing over arm pedocyclometer

Outcome Measures

- Clinical chronic obstructive pulmonary disease (COPD) questionnaire
- Symptoms, Functional state, Mental state, Total score
- 5 sit to stand test

IV. DATA ANALYSIS

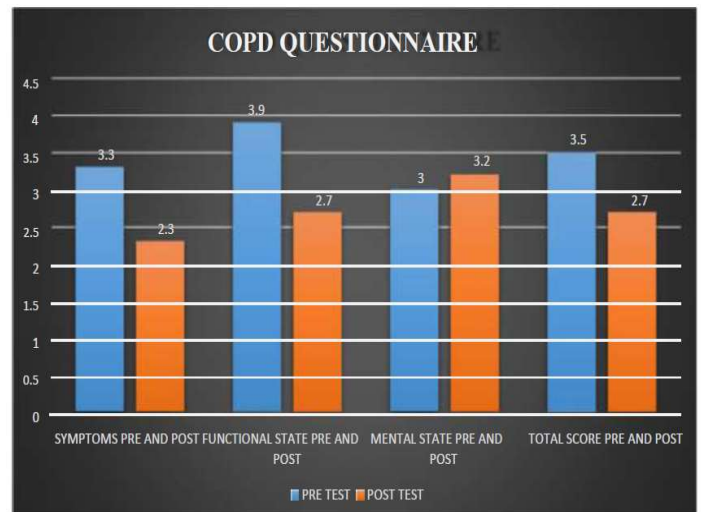
This is a Quasi-experimental study done to find out the effects of breathing retraining on exercise capacity and Quality of life. The collected data were tabulated and analysed using descriptive and inferential statistics. The statistical package for social science (SPSS) version 25 for Windows was used for data analysis

TABLE 1 PRE AND POST TEST VALUE OF 5 SIT TO STAND AND COPD QUESTIONNAIRE

VARIABLES	TEST	MEAN	STD. DEVIATION
5 SIT TO STAND	PRE-TEST	25.7	0.5
5 SIT TO STAND	POST-TEST	24.1	0.5
SYMPTOMS	PRE-TEST	3.3	0.07
SYMPTOMS	POST-TEST	2.3	0.07
FUNCTIONAL STATE	PRE-TEST	3.9	0.10
FUNCTIONAL STATE	POST-TEST	2.7	0.14
MENTAL STATE	PRE-TEST	3.0	0.27
MENTAL STATE	POST-TEST	3.2	0.31
TOTAL SCORE	PRE-TEST	3.5	0.10
TOTAL SCORE	POST-TEST	2.7	0.07

This table shows the Pre-test and Post-test mean values of 5 sit to stand and COPD questionnaire.

GRAPH 1 QUALITY OF LIFE AMONG COPD PATIENTS



GRAPH 2 EXERCISE CAPACITY OF COPD PATIENTS

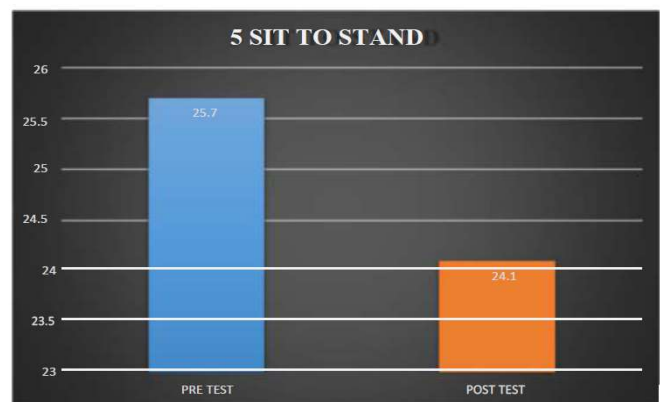


TABLE 2 CORRELATION BETWEEN PRE AND POST TEST VALUES OF COPD QUESTIONNAIRE

VARIABLES	N	CORRELATION	Sig.
SYMPTOMS PRE AND POST	20	.708	.000
FUNCTIONAL STATE PRE AND POST	20	.710	.000
MENTAL STATE PRE AND POST	20	.904	.000
TOTAL SCORE PRE AND POST	20	.882	.000

This table shows the correlation between the Pre-test and Post-test score of COPD questionnaire which comprises of components such as symptoms functional state, mental state, total score.

TABLE 3 CORRELATION BETWEEN PRE AND POST TEST VALUES OF 5 SIT TO STAND

VARIABLES	N	CORRELATION	Sig.
5 STS PRE AND POST SCORE	20	.934	.000

This table shows the correlation between the Pre-test and Post-test score of 5 sit to stand which shows the exercise capacity of COPD patients.

V. RESULTS

Table 1, graph 1 and graph 2 shows the mean values of pre-test and post-test score of 5 sit to stand which is 25.7 and 24.1 respectively and COPD Questionnaire for symptoms - 3.3 and 2.3, functional state - 3.9 and 2.7, mental state - 3.0 and 3.2, total score - 3.5 and 2.7 among grade II COPD questionnaire which proves that there is a significant improvement in the exercise capacity and quality of life due to breathing retraining in the COPD patients when compared with the pre-test values.

Table 2 shows the correlation of pre-test and post-test scores COPD questionnaire which has components such as symptoms, functional state, mental state and total score. The components of COPD Questionnaire such as symptoms, functional state and total scores pre-test value correlates at significant level ($p < 0.005$) with the post-test values of symptoms, functional state and total score while the pre-test scores of mental state correlates at significant level ($p < 0.005$) with the post-test scores.

Table 3 shows the correlation of pre-test and post-test scores of 5 sit to stand which shows the exercise capacity of COPD patients. In this the pre-test score of 5 sit to stand correlates at significant level ($p < 0.005$) with the post-test score of 5 sit to stand.

VI. DISCUSSION

The aim of the study is to find out the effects of retraining on exercise capacity and quality of life in patients with grade II (GOLD) COPD patients. The study was performed as an

experimental study and only the grade II COPD patients were included. The patients baseline data was noted. Then the exercise capacity and the quality of life for 20 subjects was analysed through 5 sit and stand test COPD Questionnaire respectively.

Earlier studies displayed that breathing retraining can show improvement in COPD patients but none of the studies were done to prove that breathing retraining can improve the exercise capacity and quality of life in grade II COPD patients.

In a study done by Troosters, Thierry PT in (2001) concluded that patients with reduced exercise capacity who experience less ventilatory limitation to exercise and more reduced respiratory and peripheral muscle strength are more likely to improve with exercise training. Improvements in quality of life after exercise training were significant but remained unpredictable with variables included in the present trial.

According to M.A Spruit, R. Gosselink, (2002) concluded that resistance training and endurance training have similar effects on peripheral muscle force, exercise capacity and health related quality of life in COPD patients with peripheral muscle weakness.

The 5 sit to stand test showed a mean pre-test value of 25.7 and a post value of 24.1 which significantly proved that there is an improvement in the exercise capacity of the COPD patients. So this study reveals that there is improvement in the exercise capacity and quality of life among grade II COPD patients. The exercise capacity and quality of life was measured through 5 sit to stand test and COPD questionnaire.

The COPD Questionnaire which analysed the quality of life in COPD patients had three main components namely: Symptoms, Functional state, mental state and Total score. The three components were measured before and after giving breathing retraining. The symptoms showed a pre-test score of 3.3 while the post test score is 2.3, Function state showed a pre-test score of 3.9 while the post test score is 2.7, Mental state showed a pre-test score 3.0 while the post test score is 3.2, Total score showed a pre-test score of 3.5 while the post test score is 2.7 which significantly showed that there was improvement in the quality of life due to breathing retraining in COPD patients.

Among 20 subjects, all the 20 of them showed an improvement in symptoms, functional state and total score while only one among the 20 subjects showed an improvement in mental state.

The pre-test scores of 5 sit to stand correlate significantly with the post test score of 5 sit to stand. The components of COPD Questionnaire such as symptoms, functional state, mental state and total scores pre-test value correlates well ($p < 0.05$) with the post-test values of symptoms, functional state, mental state and total score Therefore the study reveals that breathing retraining has an effect over exercise capacity and quality of life in grade II COPD patients.

VII. CONCLUSION

The study concludes that the COPD patients exhibited improvement in the exercise capacity and Quality of life due to breathing retraining.

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