

EFFECT OF BREATHING EXERCISES ON BIOPHYSIOLOGICAL PARAMETERS AND QUALITY OF LIFE OF PATIENTS WITH COPD AT A TERTIARY CARE CENTRESudin Koshy¹, Rugma Pillai S²**HOW TO CITE THIS ARTICLE:**

Sudin Koshy, Rugma Pillai S. "Effect of Breathing Exercises on Biophysiological Parameters and Quality of Life of Patients with COPD at a Tertiary Care Centre". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 65, November 27; Page: 14175-14182, DOI: 10.14260/jemds/2014/3898

ABSTRACT: The study was aimed to assess the effect of breathing exercises on biophysiological parameters and quality of life of patients with COPD at a tertiary care centre. **OBJECTIVES:** were to assess selected biophysiological parameters of COPD patients and to assess quality of life of COPD patients and to assess the effect of breathing exercise on quality of life. **METHODOLOGY:** 40 subjects were selected from Medical wards of Sree Gokulam Medical College Hospital, Venjaramoodu, Trivandrum, and were assessed using tools like questionnaires to collect socio-demographic data, biophysiological parameters, dyspnea assessment scale and fatigue severity scale to assess the dyspnea and fatigue severity respectively and clinical COPD questionnaire to assess the quality of life of COPD patients. Breathing exercise was given 15 minutes 3 times a day during post admission days and on discharge a leaflet was given for reinforcement and follow up was done through telephonic inquiry. Pre-test was given before intervention and post test was conducted on return to OPD to all the participants. The data were analyzed by descriptive and inferential statistics. **RESULTS:** The present study findings showed that there was significant difference in mean pre and post-test values at $p < 0.01$ for respiratory rate, fatigue severity score and quality of life score and at $p < 0.05$ for heart rate. Change in dyspnea grading was also found to be significant. There was no significant difference in mean pre and post-test values of PEFr. **INTERPRETATION:** The findings of the present study revealed that breathing exercises can improve biophysiological parameters like respiratory rate, heart rate, dyspnea and fatigue while it could not cause any improvement in PEFr of COPD patients. So this intervention can be practised in care of patients with COPD in various settings.

KEYWORDS: COPD, breathing exercise, biophysiological parameters, quality of life.

INTRODUCTION: Chronic obstructive pulmonary disease (COPD) is a disease state characterized by airflow limitation that is not fully reversible. This definition of COPD, provided by the Global Initiative for Chronic Obstructive Lung Disease, provides a broad description that better explains this disorder and its signs and symptoms.¹

Bronchodilators form the main stay in the pharmacological treatment of COPD. But the airflow limitation in COPD is not fully reversible. So the pharmacological therapy alone is not sufficient to attain the goals of COPD management. In recent studies have shown that non-pharmacological interventions have a significant role in improving the quality of life in patients with COPD.²

This is more relevant in cases of moderate to severe cases of COPD. These patients with higher grades of dyspnoea avoid physical activity leading to deconditioning of skeletal muscles. This leads to the vicious circle of dyspnea, exercise avoidance, physical deconditioning, increased

ORIGINAL ARTICLE

breathlessness, increasing disability and depression. One of the aims of non-pharmacological intervention is to break this vicious circle and to improve exercise capacity and functional status.³

The breathing pattern of most people with COPD is shallow, rapid, and inefficient. The more severe the disease, the more inefficient will be breathing pattern. With training this type of upper chest breathing can be changed to diaphragmatic breathing. Breathing exercises improve functional status of COPD patients by reducing the respiratory rate and improving alveolar ventilation. The types of breathing exercises which have found to be beneficial are pursed lip breathing and diaphragmatic breathing.⁴

The pursed lip breathing prolongs exhalation and thereby prevents bronchiolar collapse and air trapping. Diaphragmatic breathing trains the patient on using the diaphragm instead of the accessory muscles of the chest to achieve maximum inhalation. COPD patients can have ineffective coughing patterns. Huff coughing is a technique that can be taught to COPD patients. Effective coughing conserve energy, reduce fatigue and facilitate removal of secretions.⁵

Pulmonary rehabilitation including breathing exercises attempts to return patients to their highest possible functional capacity. The rehabilitative approach to the care of COPD patients have shown to improve independence and quality of life.

Significance of the Study: The WHO estimates that COPD as a single cause of death share the 4th and 5th places with HIV/AIDS (after coronary heart disease, cerebrovascular disease and acute respiratory infection) and in 2000, 2.74 million people died of COPD worldwide. In 1990, a study by the World Bank and WHO ranked COPD 12th in the burden of disease; by 2020, it is estimated that COPD will be ranked 5th.¹

Since the pathology in COPD is not fully reversible we have to give more importance in developing non-pharmacological therapies in the management of COPD. The study was aimed to assess the effect of breathing exercises on biophysiological parameters and quality of life in patients with COPD at a tertiary care centre.

OBJECTIVES: To assess the effect of breathing exercise on selected biophysiological parameters and quality of life of patients with COPD.

Operational Definitions:

- **Breathing exercises:** In this study, breathing exercises refer to diaphragmatic breathing, pursed lip breathing and coughing for 15 minutes, 3 times a day.
- **Quality of life:** In this study quality of life refers to self-reported patient satisfaction as measured by quality of life scale.
- **Selected biophysiological parameters:** In this study the selected biophysiological parameters were heart rate, respiratory rate, PEFr, fatigue and dyspnea.

Setting of the Study: The setting chosen for the study was Sree Gokulam Medical College and Research Foundation a 550 bedded multi-specialty medical college, with all general departments and super specialty with twenty four hours casualty and critical care units. It is an educational institution cum-research centre.

ORIGINAL ARTICLE

Population: Population of the present study included patients with COPD admitted in medical wards of Sree Gokulam Medical College hospital.

Sample Size: 40 patients with COPD.

Inclusion Criteria: The study included patients who are admitted in SGMCH with a definite diagnosis of COPD and are willing to participate in the study.

Exclusion Criteria: COPD patients with acute exacerbation and critically ill.

Ethical considerations: Formal permission to conduct the study was obtained from the Director, SGMCH & RF.

Clearance was obtained from Institutional Ethical Committee. Informed written consent was obtained from the participants after detailed explanation.

RESULTS:

Table 1: Frequency (N=40).

Characteristics	Frequency	Percentage(%)
Age(in years)		
41-50	2	5
51-60	8	20
>60	30	75
Sex		
Male	34	85
Female	6	15

Table 1 shows that majority(75%) of the subjects belonged to the age group more than 60 years, about (20%) of the subjects had age between 51 and 60 yrs, and (5%) had age between 41 and 50yrs respectively. It also shows that among the subjects majority (85%) were male and (15%) were females.

Mean age of male and female patients were 63.5 and 61.3 respectively.

Table 2: Frequency and percentage distribution according to history of admissions with COPD.

History of admission	Frequency	Percentage(%)
Once	5	12.5
Twice	8	20
Thrice	8	20
> 3 times	19	47.5

ORIGINAL ARTICLE

Table 2 reveals that (47.5%) had more than 3 admissions with COPD, (20%) got admitted twice with COPD in the past and another (20%) were admitted thrice and (12.5%) were admitted only once with COPD in the past 1 yr.

Table 3: Frequency and percentage distribution according to smoking duration and years of smoking cessation (n=31)

Characteristics	Frequency	Percentage(%)
Duration of smoking		
<5 yrs	1	3.2
5-10 yrs	9	29
10-15 yrs	9	29
15-20 yrs	12	38.7
Years of smoking cessation		
<1 yr	6	19.4
1-2 yrs	7	22.6
2-3 yrs	3	9.6
>3 yrs	15	48.4

Table 3 shows that (38.7%) of smokers had cigarette smoking habit for 15 to 20 yrs, (29%) smoked for 10 to 15 yrs, (29%) smoked for 5 to 10 yrs and (3.2%) smoked for less than 5 yrs. It also shows that majority (48.4%) stopped smoking for more than 3 yrs, (22.6%) stopped smoking 1 to 2 yrs before, (19.4%) stopped smoking 1 to 2 yrs before and (9.6%) stopped smoking for less than 1 yr.

Effect of breathing exercise on the selected biophysiological parameters heart rate, respiratory rate, fatigue and dyspnea.

In order to find out the significance of difference between the pre-test and post-test values of biophysiological parameters like heart rate, respiratory rate and PEFR, fatigue and quality of life, the following hypothesis is formulated and was tested using paired 't' test; for dyspnea Wilcoxon Signed Ranks Test was used to test the hypothesis and data were presented in tables below.

Table 4:

Characteristics	Mean	N	SD	Paired t
Pre-heartrate	73.8	40	11.6	2.28*
Post heart-rate	70.8	40	9.8	
*significant at p<0.05		SD-Standard Deviation,		
Table value of paired t-2.04		N-Number of subjects		

ORIGINAL ARTICLE

Table 4 shows that mean heart rate in pre-test was 73.8 +/-11.6 which were decreased to 70.8 +/-9.8 after intervention. The difference in mean values were statistically significant ($p<0.05$).Hence it can be interpreted that breathing exercise has a significant effect on the heart rate of patients with COPD.

Table 5: Mean, SD and t value of pre and post-test values of respiratory rate.

Characteristics	Mean	N	SD	Paired t
Pre-RespiratoryRate	20.8	40	3.4	
Post-RespiratoryRate	18.2	40	2.8	9.55**
**significant at $p<0.01$			SD-Standard Deviation,	
Table value of Paired t- 2.75			N-Number of subjects	

Table 5 shows that mean Respiratory rate in pre-test was 20.8 +/- 3.4 which was decreased to 18.2 +/-2.8 after intervention. The difference in mean values were statistically significant at ($p<0.01$).Hence it can be interpreted that breathing exercise has a significant effect on the respiratory rate of patients with COPD.

Table 6: Mean, SD and t value of pre and post-test values of PEFR in L/min (N=40)

Characteristics	Mean	N	SD	Paired t
Pre-PEFR	475	40	16.6	1.28
Post-PEFR	489	40	14.1	
			SD-Standard Deviation,	
			N-Number of subjects	

Table 6 shows that mean PEFR (L/min) value in pre-test was 475 +/- 16.6 which was increased to 489 +/- 14.1 after intervention. The differences in mean values were not statistically significant. Hence it can be interpreted that breathing exercise has no significant effect on PEFR of patients with COPD.

ORIGINAL ARTICLE

Dyspnea grade	Pre		Post		Z	P
	Frequency	Percentage	Frequency	Percentage		
Grade 1	8	20	9	22.5	3.61	0.00
Grade II	11	27.5	21	52.5		
Grade III	20	50	10	25		
Grade IV	1	2.5	0	0		

Table 7: Frequency, percentage and Z value of pre and post-test dyspnea grade (N=40)

Table 7 reveals that during pre-test half of the subjects (50%) had grade III dyspnea, followed by 27.5% with grade II dyspnea, 20% with grade I dyspnea, and 2.5% with grade IV dyspnea. During post-test, more than half (52.5%) had only grade II dyspnea, 25% had grade III dyspnea, and 22.5% had grade I dyspnea and none had grade IV dyspnea. The Z value obtained from Wilcoxon Signed Ranks Test is 3.61 which is significant at $p < 0.01$. Hence it is interpreted that breathing exercise has a significant effect on dyspnea of patients with COPD.

Table 8: Mean, SD, and t value of pre and post-test values of fatigue severity score (N=40).

Characteristics	Mean	N	SD	Paired t
PreFSSscore	35.5	40	11.4	9.61**
Post FSSscore	22.6	40	5.9	
**significant at $p < 0.01$		SD-Standard Deviation,		
Table value of Paired t- 2.75		N-Number of subjects		

Table 8 reveals that mean Fatigue severity score value in pre- test was 35.5+/-11.4 which was decreased to 22.6+/-5.9 after intervention. The difference in mean values were statistically significant ($p < 0.01$). Hence it can be interpreted that breathing exercise has a significant effect on fatigue of patients with COPD.

Effect of breathing exercise on quality of life.

Table 9: Mean, SD, and t value of pre and post-test values of quality of life (N=40).

Characteristics	Mean	N	SD	Paired t
Pre qolscore	28.8	40	8.8	9.5**
Post qol score	21.9	40	6.5	
**significant at $p < 0.01$		SD-Standard Deviation		
Table value of Paired t -2.75		N-Number of subjects		

Table 9 shows that mean QoL score value in pre-test was 28.8 +/- 8.8 which was decreased to 21.9 +/-6.5 after intervention. The difference in mean values were statistically significant ($p < 0.01$). Hence it can be interpreted that breathing exercise has a significant effect on the quality of life of patients with COPD.

DISCUSSION:

1: Demographic Data: Majority (75%) of the subjects belonged to the age group of above 60 years, about (20%) of the subjects had age between 51 and 60 yrs, and (5%) had age between 41 and 50 yrs respectively.

Among the subjects majority (85%) were male and (15%) were females.

Nearly half of the subjects (47.5%) had more than 3 admissions with COPD, (20%) had admission twice with COPD in the past and another (20%) were admitted thrice and (12.5%) were admitted only once with exacerbation of COPD in the past 1 year.

Most of the subjects (77.5%) had cigarette smoking as the major risk factor, (12.5%) had occupational exposure as the major risk factor, (7.5%) had respiratory infections and (1.5%) had air pollution as the major risk factors respectively.

More than one by fourth of the smoker subjects (38.7%) had the habit of cigarette smoking for 15 to 20 yrs, (29%) smoked for 10 to 15 yrs, (29%) smoked for 5 to 10 yrs and (3.2%) smoked for less than 5 yrs.

Majority (48.4%) stopped smoking for more than 3 yrs, (22.6%) stopped smoking 1 to 2 yrs before, (19.4%) stopped smoking 1 to 2 yrs before and (9.6%) stopped smoking for less than 1 yr.

2: Effect of breathing exercise on biophysiological Parameters:

Respiratory Rate: Mean Respiratory rate in pre-test was 20.8 +/- 3.4 which was decreased to 18.2 +/-2.8 after intervention. The difference in mean values were statistically significant at ($p < 0.01$). So it is interpreted that breathing exercise has a significant effect on the respiratory rate of patients with COPD.

Heart Rate: Mean heart rate in pre-test was 73.8 +/-11.6 which was decreased to 70.8 +/-9.8 after intervention. The difference in mean values were statistically significant ($p < 0.05$). Hence it is interpreted that breathing exercise has a significant effect on the heart rate of patients with COPD.

PEFR: Mean PEFV value in pre-test was 47.5 +/- 16.6 which was increased to 48.9 +/- 14.1 after intervention. The difference in mean values was not statistically significant. Hence it can be interpreted that there breathing exercise has no significant effect on the PEFV of patients with COPD.

Dyspnea: During pre-test half of the subjects (50%) had grade III dyspnoea, followed by 27.5% with grade II dyspnea, 12.5% with grade I dyspnea, 7.5% with grade 0 dyspnea and 2.5% with grade IV dyspnoea.

During post-test more than half (52.5%) had only grade II dyspnea, 25% had grade III dyspnea, and 15% had grade I dyspnea, 7.5% had grade 0 dyspnea and none had grade IV dyspnea. The Z value obtained from Wilcoxon Signed Ranks Test is 3.61 which is significant 0.01. Hence it is interpreted that breathing exercise has a significant effect on dyspnea of patients with COPD.

ORIGINAL ARTICLE

Fatigue Severity: Mean Fatigue severity score value in pre- test was 35.5+/-11.4 which was decreased to 22.6+/-5.9 after intervention. The difference in mean values were statistically significant ($p < 0.01$). Hence it can be interpreted that breathing exercise has a significant effect on fatigue of patients with COPD.

3: Effect of breathing exercises on quality of Life: Mean QoL score value in pre-test was 28.8 +/- 8.8 which was decreased to 21.9 +/-6.5 after intervention. The difference in mean values were statistically significant ($p < 0.01$). Hence it can be interpreted that breathing exercise has a significant effect on the quality of life of patients with COPD.

CONCLUSION: Regular breathing exercises shows significant improvement in biophysiological parameters like heart rate, respiratory rate, dyspnea, fatigue and quality of life of patients with COPD.

REFERENCES:

1. Global Strategy for Diagnosis, Management, and Prevention of COPD (2014).
2. Jorine E. Hartman, H. Marika Boezen et al: Physical activity recommendations in patients with COPD. *Respiration* 2014; 1:10-17.
3. William MacNee, Stephen Rennard: Facts on Chronic Obstructive Pulmonary disease 2006; 7: 96.
4. Holland AE1, Hill CJ, Jones AY, McDonald CF. Breathing exercises for chronic obstructive pulmonary disease. *Cochrane Database Syst Rev.* 2012 Oct 17; 10.
5. Cigna, Joseph A. PhD, MSPT; Turner-Cigna, Lauren M. PT, Rehabilitation for the Home Care Patient with COPD. September 2005; 23 (9): 578-584.

AUTHORS:

1. Sudin Koshy
2. Rugma Pillai S.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Pulmonology, Sree Gokulam Medical College and Research Foundation, Venjaramoodu, Thiruvananthapuram, Kerala.
2. MSC Nursing Student, Sree Gokulam Medical College and Research Foundation, Venjaramoodu, Thiruvananthapuram, Kerala.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Sudin Koshy,
Chackuthara House,
Pullad P. O, Pin-689548,
Pathanamthitta District,
Email: drsudinkoshy@gmail.com

Date of Submission: 27/10/2014.
Date of Peer Review: 28/10/2014.
Date of Acceptance: 22/11/2014.
Date of Publishing: 25/11/2014.