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Effect of Pursed Lip Breathing Exercise on Physiological Parameters among Patients with Chronic Obstructive Pulmonary Disease

Amany Youssef Sharaf[1], Mervat Adham Ghaleb[2], Rasha Fathy Ahmed[3]

[1,2.] Assistant professor. Medical Surgical Nursing Department- Faculty of Nursing, Alexandria University. Egypt.

[3.] Lecturer. Medical Surgical Nursing Department- Faculty of Nursing, Alexandria University. Egypt.

Abstract: **Pursed Lip Breathing exercise had been evidenced as the simplest therapeutic intervention for patients with COPD. Aim of the study: To identify the effect of pursed lip breathing exercise on physiological parameters among patients with Chronic Obstructive Pulmonary Disease. Hypothesis: Patients with Chronic Obstructive Pulmonary Disease who practice pursed lip breathing exercise experience an improvement in their physiological parameters. Setting: This study was conducted at Chest Outpatient Clinic at Alexandria Main University Hospital, Alexandria University, Egypt. Subjects: The study subjects comprised a convenience sample of 50 adult male and female patients with COPD. Tools: Two tools were used. Tool I. Bio-sociodemographic Structured Interview Schedule to assess the sociodemographic, and clinical data of patients. Tool II. Pretest/posttest Modified Respiratory Status Assessment Scale: to assess COPD patient's physiological parameters. Results: The studied patients' mean age was 46.34±10.29, more than half of them (54%) were males. High statistically significant improvement in all physiological parameters of the studied patients was detected post pursed lip breathing exercises as ($p<0.001^{*}$). Statistically significant associations between smoking habits and level of physiological parameters was noted post pursed lip breathing exercises □□(^{MC}p)= 12.687* (0.022*). Conclusion: High statistically significant improvement in the mean level of physiological parameters among the studied patients is detected post pursed lip breathing exercise. Statistically significant association was found between smoking habits, and level of physiological parameters post pursed lip breathing exercise. Recommendations: Nurses should teach COPD patients the benefits of regular practice of pursed lip breathing exercise in their daily life to improve their physiological parameters and gain a better quality of life.**

Keywords: **Pursed Lip Breathing Exercise, Physiological Parameters, Chronic Obstructive Pulmonary Disease.**

I. INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a multifactorial, and progressive condition that affects 210 million people worldwide [(1,2)]. It poses a major challenge to public health as it is the world's fourth leading cause of mortality [(3-5)]. The World Health Organization (WHO) presumes COPD to be the third foremost cause of death in the world by 2030, which continues to increase in developing countries [(6)]. Chronic Obstructive Pulmonary Disease is clearly a major health concern in developing countries, as 90% of COPD deaths occur in low- and middle-income countries [(7,8)].

According to El dine et al., (2017), COPD prevalence rate in Egypt was calculated about 10% of country population over 40 years [(9)]. Smoking is the main risk factor for developing COPD. According to WHO global survey of tobacco consumption (2015), 20% of the Egyptian adults are smokers, which increase the economic burden of the disease [(10)]. Other risk factors include; prolonged and intense exposure to occupational dusts and chemicals, in/out door air pollution such as biomass fuel used for cooking and heating in low-income countries, and a gene environment interaction [(11,12)].

COPD is a very disabling disorder that causes limitations in lungs' airflow. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung [3]. The characteristic symptoms of COPD are chronic and progressive dyspnea, cough, and sputum production that may seriously cause functional limitations and general worsening patients' quality of life [13-15]. As the symptoms of COPD progress, they can develop life-threatening complications as respiratory insufficiency, pneumonia, atelectasis, pneumothorax, cor-pulmonale, and respiratory failure [5,16]. The acuity of the onset and the severity of respiratory failure depend on the patient's baseline physiological parameters as; pulmonary and cardiovascular functions, pulse oximetry, and the severity of COPD symptoms [17]. So, Management should be directed toward enhancing care of patients, improving breathing, developing maneuvers to alleviate symptoms and lessen the progression of the disease [18].

Management of COPD patients should focus on improving inspiratory muscle functions and controls the symptoms [18]. Pulmonary rehabilitation, is directed toward assisting the patient to control or alleviate symptoms of respiratory dysfunction, accelerating exercise tolerance, enhancing quality of life, and reducing hospital admissions [19-21]. Pulmonary rehabilitation should use different methods as; health education and carrying out exercises to manage the COPD exacerbation early and appropriately [20].

Breathing exercises such as pursed lip breathing (PLB) or diaphragmatic breathing, which can be performed separately or in combination, are considered a novel part of pulmonary rehabilitation programs [22]. Breathing exercises are designed to retain the breathing pattern, reduce breathlessness, increase exercise capacity, improve respiratory muscle performance, maintain normal heart & respiratory rates, and enhance quality of life of patients with COPD [4,14,23].

Pursed Lip Breathing exercise had been evidenced as the simplest therapeutic intervention for patients with COPD [24, 25]. Ealias et al., (2016) mentioned that pursed lip breathing is a breathing exercise in which COPD patients are taught to inhale slowly through nose and exhale more slowly through pursed lips [26]. Continuous practice of pursed lip breathing exercise helps the patient to control the rate and depth of respiration, reduce the heart rate, and reduce feelings of anxiety [27,28]. Furthermore, it relieves shortness of breath and promotes comfort by reducing hyperventilation and increasing CO2 levels in the alveoli, which in turn dilates smooth muscles of airway, increases the ratio of ventilation-perfusion and increases oxygen saturation [29].

Patient education is an integral part in nursing care of COPD patients to maximize exercise capacity, and to control symptoms [30, 31]. Nurses play a crucial role in COPD patients' education that increases their ability to self-manage the disease [18,29,31]. The nurse assesses the patient's condition; provide instructions about common symptoms, and environmental triggers that worsen the symptoms. Also, the nurse should teach, demonstrate, and reinforce their patients to carry out the pursed lip breathing exercise in their daily life as an approach to conserve energy and gain a better-quality life [24]. Active nurse involvement in pulmonary rehabilitation programs can assist nurses to identify factors that motivate the patients, establish realistic outcomes expectations and provide patient teaching opportunities [31].

Pursed lip breathing exercise is a cost effective and easily applicable nursing intervention that can lead to behavior modification which increases patients' satisfaction [32]. Therefore, the aim of this study was to identify the effect of pursed lip breathing exercise on physiological parameters among patients with COPD.

Operational definitions

- **Physiological parameters** are measured by respiratory rate, pulse rate, body temperature, chest retraction, use of accessory muscles, cough, air entry, dyspnea, breathing sounds, and O_2 saturation.

- **Pursed-lip breathing exercise:** It is a breathing technique in which the patient inhales through the nose with mouth closed and exhales through mouth lips pursed tightly, provided that the exhalation was twice as long as the inhalation.

Aim of the study:

To identify the effect of pursed lip breathing exercise on physiological parameters among patients with Chronic Obstructive Pulmonary Disease.

Hypothesis:

Patients with Chronic Obstructive Pulmonary Disease who practice pursed lip breathing exercise experience an improvement in their physiological parameters.

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II. MATERIAL AND METHODS

Research Design: A quasi experimental design pre- post interventions study was used.

Setting: This study was conducted at Chest Outpatient Clinic at Alexandria Main University Hospital, Alexandria University, Egypt.

Subjects: The study subjects comprised a convenience sample of 50 adult male and female patients with COPD was recruited in this study.

The Epi info 7 program was used to estimate sample size according to the following parameters:

- Population size= 140 patients in 2019
- Expected frequency =50%.
- Maximum margin of error= 10%.
- Confidence coefficient =95%.
- Estimated sample size = 50 patients.

Inclusion criteria. Study sample was recruited according to the following criteria:

- Aged 20- 60 years old
- Clinical diagnosis of stable COPD (no exacerbations and/or hospitalization in the past 4 weeks.
- Self-report of shortness of breath when walking for 6 minutes distance. (6MWD)
- Free from malignancy, liver / renal impairment, or heart failure.
- Free from mental or psychiatric disturbance
- Alert, and able to communicate freely.

TOOLS:

Tool I. Bio-sociodemographic Structured Interview schedule: This tool was developed by the researchers based on the review of relevant literature [2, 14, 15,22] to assess the sociodemographic, and clinical data of patients. It consisted of two parts:

Part A: **Patient's sociodemographic data sheet:** It included age, sex, level of education, occupation, area of residence, and marital status.

Part B: **Clinical data sheet**: This part incorporates duration of illness, number of previous hospitalizations, smoking habits, family history of chronic obstructive pulmonary disease, co-morbid condition, and allergies.

Tool II. Pretest/posttest Modified Respiratory Status Assessment Scale: This scale was adapted from Latha (2015) [33], to assess COPD patients' physiological parameters. It consisted of 10 items: respiratory rate, pulse rate, body temperature, chest retraction, use of respiratory accessory muscles, cough, air entry, dyspnea, breathing sounds, and O_2 saturation. - This scale was a three-point likert scale ranging from zero to two, as described in table (1).

Table (1): Scoring system of Modified Respiratory Status Assessment Scale

Clinical variables	Score		
	Zero	One	Two
Respiratory rate	18-24 c/m	25-30c/m	>30c/m
Pulse rate	80- 99 b/m	100-120 b/m	>120b/m
Body temperature	37C^o	37-38 C^o	>38 C^o
Chest retraction	None	Just visible	Marked

Use of accessory Muscles	None	Moderate usage	Maximal activity
Cough	None	Nonproductive	Productive
Air entry	Bilateral	Unilateral	Diminished bilaterally
Dyspnea	Nil	On exertion (6 minutes' walk)	At rest
Breathing sounds	Normal	Occasional rales	Crepitation
O2 saturation	98-100%	95-97%	<95%

- Total responses of each patient ranged from zero to twenty according to the following scoring system:

"Normal physiological parameters" Zero score

"Mild respiratory problem" from 1-6 scores

"Moderate respiratory problem" from 7-13 scores

"Severe respiratory problems" from 14-20 scores

Method:

- Approval from the ethical committee of faculty of Nursing, Alexandria University was obtained.
- Official permissions to carry out the study from the identified setting authorities were obtained, after explaining the purpose of the study.
- Tools (I &II) were developed / adapted by the researchers after extensive review of related literature.
- Content and construct validity of the tools (I & II) were ascertained by a jury of three experts in Medical Surgical Nursing, Faculty of Nursing, and two experts in pulmonology, Faculty of Medicine, Alexandria University, modifications were done accordingly.
- Reliability of the tools (I & II) was established by using Cronbach's Alpha Coefficient Test (0.930 & 0.850 respectively) which indicated that the tools were reliable.
- A Pilot study was conducted on 10% of subjects to test feasibility and applicability of the tool and modifications were introduced accordingly. Data obtained from the pilot was excluded from the study.
- Ethical consideration: at the initial interview, each patient was informed about the purpose and benefits of the study, and a written consent for participations has been obtained. Confidentiality, privacy and anonymity of the patients' data were assured.
- **Technique for data collection:**

- After securing the administrative approval, data collection was started and continued for a period of six months (from May to end of October 2019)
- The researcher introduced herself to the selected subjects. Informed written consent was obtained. The subjects of 50 patients were interviewed individually in order to collect sociodemographic and clinical data using tool (I). The researchers assessed the physiological parameters using tool (1I).
- One teaching session related to PLB exercise was given for each patient individually (for 30-45 minutes), and explained through modified audiovisual aids, demonstration and re-demonstration based on patients' needs and level of understanding.

- To perform the PLB exercise, the subjects were trained to breathe by relaxing the neck and shoulder muscles, breathe through the nose and count up to number 2, then close the mouth. In exhalation, the patient should almost press his lips and retract the abdominal muscles; he should slowly exhale the air in his lungs through mouth by extending the exhalation time through the pursed lips counting from 1 to 5.
- Patients were asked to re-demonstrate the PLB exercise at end of the teaching session to assure that the patient had gained the skill.
- Patients were instructed that this exercise should be carried out 3-4 times per day, each for 5 minutes, and he/she was asked to gradually increase the time spend doing this exercise until reaching 10 minutes and continues for 4 weeks.
- Subjects were given logs to record their practice times and potential adverse events.
- Phone contact was maintained between the researcher and patients to ensure adherence and answer any quires raised by the patients.
- At the end of week 4, subjects completed posttest in the outpatient clinic using (Tool II).

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0**. (**Armonk, NY: IBM Corp**)** Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, standard deviation. Significance of the obtained results was judged at the 5% level.

The used tests were

1 - Chi-square test

For categorical variables, to compare between different categories

2 - Fisher's Exact or Monte Carlo correction

Correction for chi-square when more than 20% of the cells have expected count less than 5

3 - Marginal Homogeneity Test

Used to analyze the significance between the different stages

4 - Paired t-test

For normally distributed quantitative variables, to compare between two periods

3. RESULTS

Table (2): represents distribution of the studied patients according to their socio- demographic characteristics (n =50). The studied patients' age ranged between 21 and 60 years, with mean age of 46.34±10.29. More than half of the studied patients (54%) were males. In relation to educational level, the majority of the studied patients were equally divided between illiterate and bachelor graduates with 34% each. The highest percentage of the studied populations had clerical work, were married, and from urban areas (38%, 76%, 68% respectively).

Table (2): Distribution of the studied patients according to their socio- demographic characteristics (n =50)

Socio demographic characteristics (n =50)	No.	%
Age		
20 <30	4	8.0
30 <40	7	14.0
40 <50	15	30.0
50- 60	24	48.0
Min. – Max.	21.0 – 60.0	
Mean ± SD.	46.34±10.29	

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Male	27	54.0
Female	23	46.0
Education		
Illiterate	17	34.0
Read and write	12	24.0
Diploma degree	4	8.0
Bachelor degree	17	34.0
Occupation		
Manual	12	24.0
Clerical	19	38.0
House wife	9	18.0
Not working	10	20.0
Marital status		
Single	5	10.0
Married	38	76.0
Widow	4	8.0
Divorced	3	6.0
Residence		
Rural	16	32.0
Urban	34	68.0

Table (3) shows distribution of the studied patients according to their clinical data (n=50). It is observed that 42 % of the studied patients were suffering from hypertension, less than half (46%) have COPD for more than 3 years, more than half (54%) do not smoke. The majority of the studied patients were equally distributed between taking oral medications, and taking all pharmacological forms with 36% each.

Table (3): Distribution of the studied patients according to their clinical data (n=50)

Clinical Data	No.	%
Co-morbidity		
Tuberculosis	4	8.0
Hypercholesterolemia	2	4.0
Diabetes mellitus	13	26.0
Hypertension	21	42.0
None	10	20.0
Duration of illness		
Less than 1 year	5	10.0
1– 3 years	22	44.0
>3 years	23	46.0
Smoking		
Do not smoke	27	54.0
< 1 packet/day	9	18.0
More than one packet	14	28.0
Medication		
Oral Medications	18	36.0
Injections	6	12.0
Meter dose inhalers	8	16.0
All	18	36.0

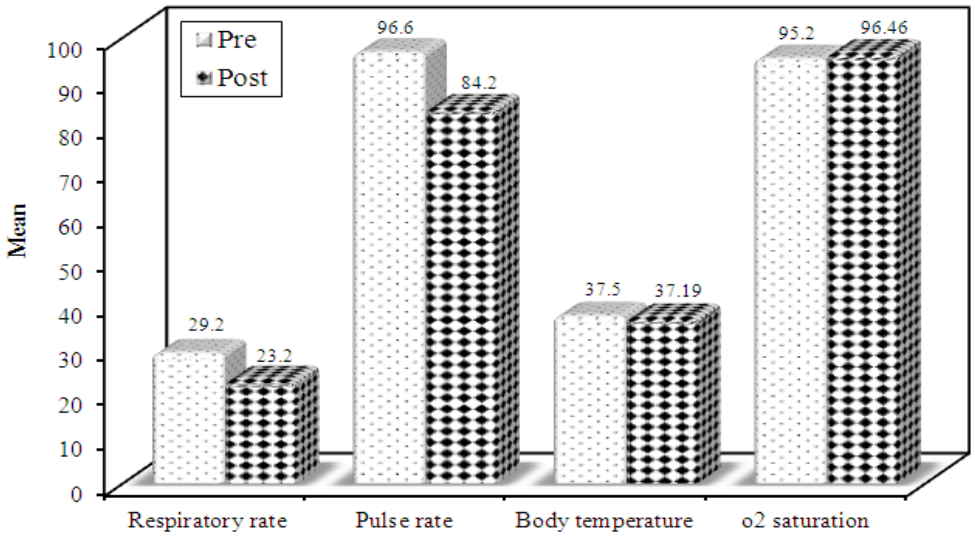
Table (4), fig (1): shows differences in the studied patients according to their mean respiratory rate, pulse rate, body temperature, and O2 saturation at pre, and post pursed lip breathing exercise. The table shows that the mean respiratory, and pulse rate of the studied patients were 29.20 ± 6.01, 96.60 ± 10.02 respectively, pre PLB which improved post PLB exercise to be 23.20 ± 5.87, 84.20 ± 8.59 respectively. Also, the mean body temperature, and O_2 saturation of the studied patients were 37.50 ± 0.49, and 95.22 ± 1.09 pre PLB which showed improvement post PLB exercise to be 37.19 ± 0.49, 96.46 ± 0.93 respectively. There are high statistically significant differences among the studied patients at pre, and post PLB exercise in the mean respiratory rate, pulse rate, body temperature, and O_2 saturation as P <0.001, P <0.001, P=0.003, P <0.001 respectively)

Table (4) Differences in the studied patients according to their mean respiratory rate, pulse rate, body temperature, and O_2 saturation at pre, and post pursed lip breathing (n=50).

Clinical variables	Pre-PLB Exercise	Post-PLB Exercise	T	P
	Mean ± SD.	Mean ± SD.		
Respiratory rate	29.20 ± 6.01	23.20 ± 5.87	6.062*	<0.001*
Pulse rate	96.60 ± 10.02	84.20 ± 8.59	7.851*	<0.001*
Body temperature	37.50 ± 0.49	37.19 ± 0.49	3.136*	0.003*
O_2 saturation	95.22 ± 1.09	96.46 ± 0.93	6.165*	<0.001*

t: Paired t-test

*: Statistically significant at p ≤ 0.05



Fig(1): Differences in the studied patients according to their mean pulse rate, respiratory rate, body temperature, and O2 saturation at pre, and post pursed lip breathing exercise.

Table (5), Fig (2) displays differences in the studied patients according to chest retraction, use of accessory muscles, air entry, and breathing sound at pre, and post pursed lip breathing (n=50). As regards chest retraction, the table shows that 76% of the studied patients had visible chest retraction pre PLB exercises, compared to 82% of them with no retraction post PLB exercises. Also 80% of the studied patients used accessory muscles during respiration pre PLB exercises, compared to only 22% post PLB exercises. In addition, 38% of the studied patients have normal breathing sound pre PLB exercise, while it reached 68% post PLB exercise. Regarding air entry, 36% of the studied patients have bilateral air entry pre pursed lip breathing exercise that have been improved to reach 72% post exercise. Statistically significant differences are noted between pre, and post PLB exercise regarding chest retraction, use of accessory muscles, air entry, and breathing sound.

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Table (5): Differences in the studied patients according to chest retraction, use of accessory muscles, air entry, and breathing sound at pre, and post pursed lip breathing exercise (n=50)

Clinical variables	Value	Pre-PLB Exercise		Post-PLB Exercise		MH	P value
		No	%	No	%		
Chest retraction	None	12	24.0	41	82.0	5.385*	<0.001*
	Just visible	38	76.0	9	18.0		
Use of accessory Muscles	None	8	16.0	39	78.0	5.284*	<0.001*
	Moderate	40	80.0	11	22.0		
	Maximal	2	4.0	0	0		
Air entry	Bilateral	18	36.0	36	72.0	4.082*	<0.001*
	unilateral	18	36.0	12	24.0		
	Diminished bilateral	14	28.0	2	4.0		
Breathing sounds	Normal	19	38.0	34	68.0	3.255*	<0.001*
	Occasional	17	34.0	12	24.0		
	Crepitation	14	28.0	4	8.0		

MH: Marginal Homogeneity Test

*: Statistically significant at $p \leq 0.05$

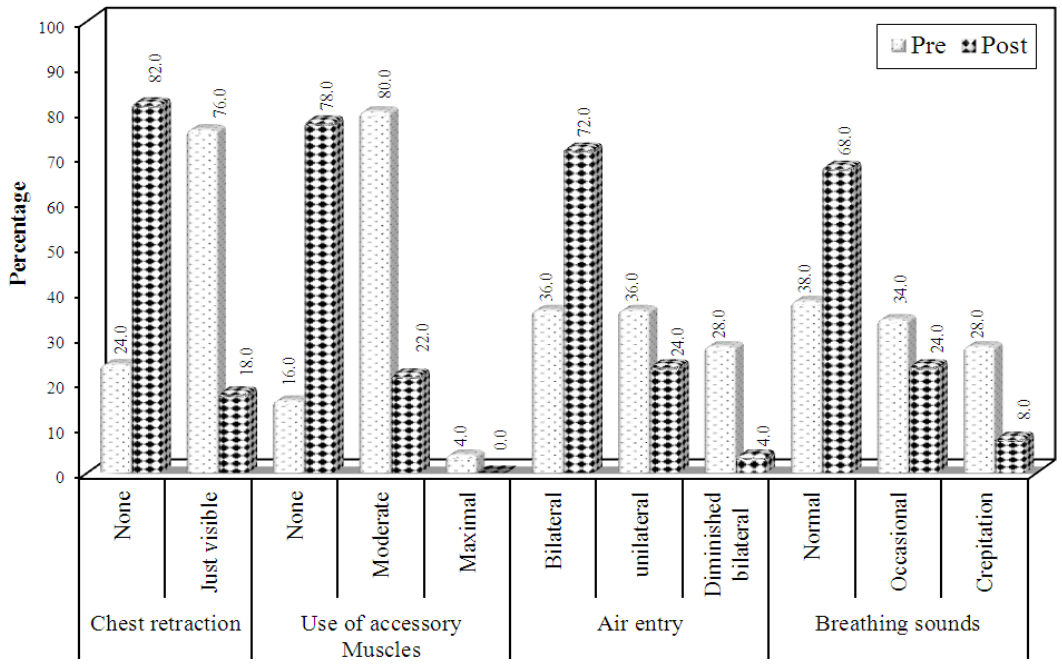

Fig (2) Differences in the studied patients according to chest retraction, use of accessory muscles, air entry, and breathing sound at pre, and post pursed lip breathing exercise (n=50)

Table (6), Fig (3) represents differences in the studied patients according to cough, and dyspnea at pre, and post pursed lip breathing exercise (n=50). The table denotes statistically significant improvement in both cough and dyspnea on exertion post PLB exercises. Also, 70% of the studied patients had productive cough pre PLB, compared to 76% who became cough free post PLB exercise. More than three quarters of the studied patients (76%) had dyspnea on exertion pre PLB, which has been improved significantly where 74% of them did not complain from dyspnea post PLB exercises.

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Table (6): Differences in the studied patients according to cough, and dyspnea, at pre, and post pursed lip breathing exercise (n=50)

Clinical variables	Value	Pre-PLB Exercise		Post-PLB Exercise		MH	P value
		No	%	No	%		
Cough	None	6	12.0	38	76.0	6.091*	<0.001*
	Nonproductive	9	18.0	12	24.0		
	Productive	35	70.0	0	0		
Dyspnea	Nil	0	0.0	37	74.0	5.821*	<0.001*
	On exertion (6MWD)	38	76.0	12	24.0		
	At rest	12	24.0	1	2.0		

MH: Marginal Homogeneity Test

*: Statistically significant at $p \leq 0.05$

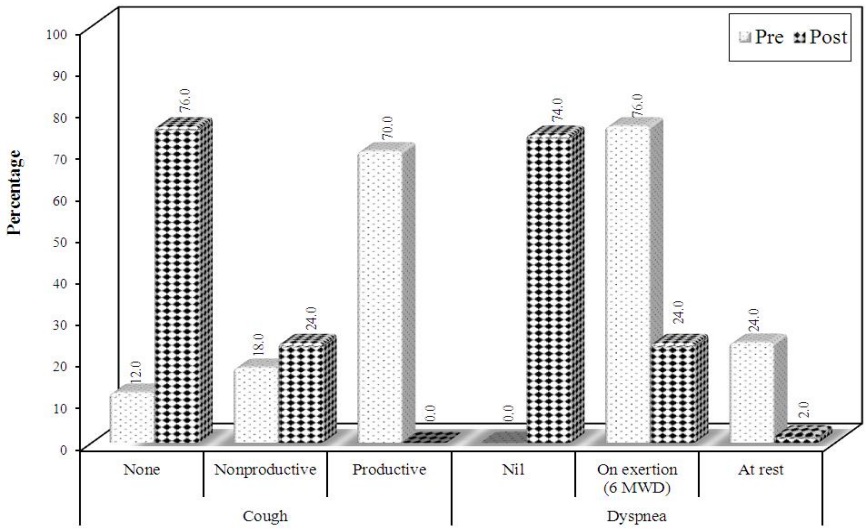

Fig (3) Differences in the studied patients according to cough, dyspnea at pre, and post pursed lip breathing exercise (n=50)

Table (7), fig (4): shows the effect of pursed lip breathing exercise on the level of physiological parameters among the studied patients using Modified Respiratory Status Assessment Scale (n=50). It represents that 68% of the studied patients were suffering from moderate respiratory problem pre PLB exercise, which has been improved post PLB exercise, as 38% of them had normal physiological parameters, and 44% had mild respiratory problem. High statistically significant improvement in the mean level of physiological parameters among the studied patients has been observed at post PLB exercise, as t= t=12.005*, p<0.001*.

Table (7), fig (4): The Effect of Pursed Lip Breathing exercise on the level of physiological parameters among the studied patients using Modified Respiratory Status Assessment scale (n=50).

Level of physiological parameter	Pre-PLB Exercise		Post-PLB Exercise		Test of sig.	P
	No.	%	No.	%		
Normal physiological parameter	0	0.0	19	38.0	MH= 5.953*	<0.001*
Mild respiratory problem	7	14.0	22	44.0		
Moderate respiratory problem	34	68.0	8	16.0		
Severe respiratory problem	9	18.0	1	2.0		
Mean ± SD.	9.96±3.81		2.72±3.53		t=12.005*	<0.001*

MH: Marginal Homogeneity Test **t: Paired t-test**

*: Statistically significant at $p \leq 0.05$

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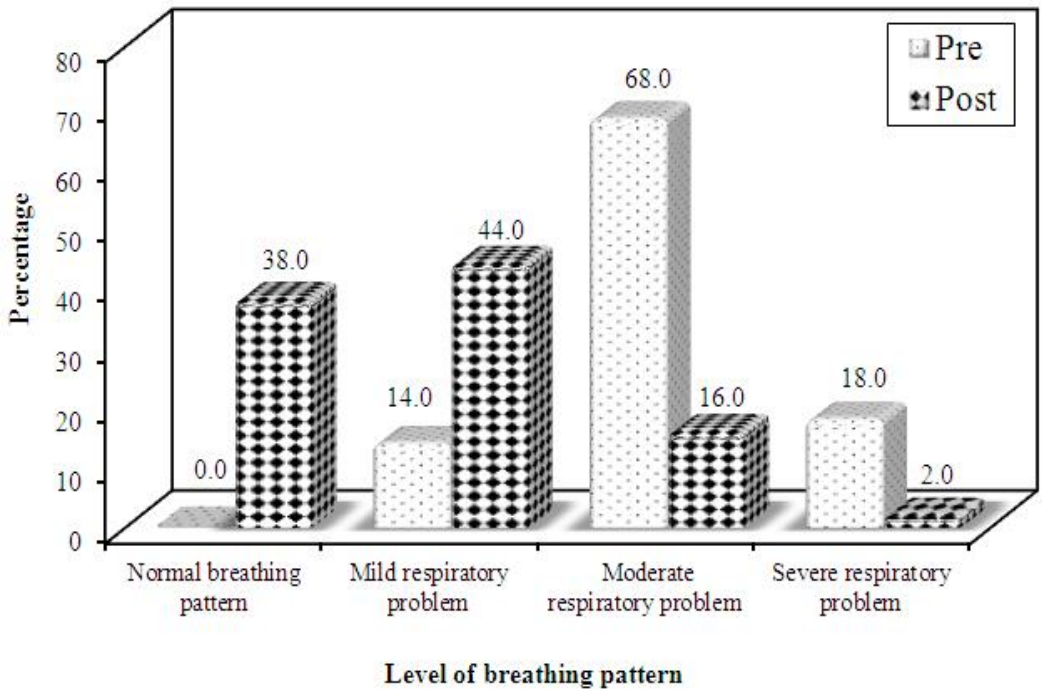

Figure (4) The Effect of Pursed Lip Breathing exercise on overall level of physiological parameters among the studied patients using Modified Respiratory Status Assessment scale (n=50).

Table (8) represents associations between level of physiological parameters, and patients' selected sociodemographic & clinical characteristics at pre, and post PLB exercise (n=50). Statistically significant association was found only between smoking habits, and the level of physiological parameters post PLB exercise, as smokers who consume more than one packet/day achieved mild to moderate levels post PLB exercise where $\chi^2(^{MC}p) = 12.687^{*}$ (0.022^{*}).

Table (8) Associations between level of physiological parameters, and patients' selected sociodemographic & clinical characteristics at pre, and post PLB exercise (n=50)

Sociodemographic & clinical characteristics	Level of physiological parameters													
	Pre PLB exercise						Post PLB exercise							
	Mild		Moderate		Severe		Normal		Mild		Moderate		Severe	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age														
20<30	1	25.0	3	75.0	0	0.0	2	50.0	1	25.0	1	25.0	0	0.0
30<40	1	14.3	6	85.7	0	0.0	3	42.9	4	57.1	0	0.0	0	0.0
40<50	2	13.3	7	46.7	6	40.0	8	53.3	3	20.0	4	26.7	0	0.0
50- 60	3	12.5	18	75.0	3	12.5	6	25.0	14	58.3	3	12.5	1	4.2
$\chi^2(^{MC}p)$	7.220(0.227)						11.089 (0.227)							
Education														
Illiterate	1	5.9	11	64.7	5	29.4	5	29.4	9	52.9	2	11.8	1	5.9
Read and write	1	8.3	8	66.7	3	25.0	5	41.7	4	33.3	3	25.0	0	0.0
Diploma degree	1	25.0	3	75.0	0	0.0	2	50.0	1	25.0	1	25.0	0	0.0
Bachelor degree	4	23.5	12	70.6	1	5.9	7	41.2	8	47.1	2	11.8	0	0.0
$\chi^2(^{MC}p)$	5.997 (0.388)						6.067 (0.863)							
Co- morbidity														
Tuberculosis	3	75.0	1	25.0	0	0.0	2	50.0	2	50.0	0	0.0	0	0.0
Hypercholesterolemia	0	0.0	2	100.0	0	0.0	0	0.0	1	50.0	1	50.0	0	0.0
Diabetes mellitus	0	0.0	10	76.9	3	23.1	4	30.8	6	46.2	2	15.4	1	7.7
Hypertension	4	19.0	14	66.7	3	14.3	10	47.6	8	38.1	3	14.3	0	0.0
Non	0	0.0	7	70.0	3	30.0	3	30.0	5	50.0	2	20.0	0	0.0
$\chi^2(^{MC}p)$	12.446(0.067)						9.368 (0.866)							

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Duration of illness														
Less than 1 year	1	20.0	3	60.0	1	20.0	3	60.0	1	20.0	1	20.0	0	0.0
1– 3 years	3	13.6	16	72.7	3	13.6	9	40.9	10	45.5	3	13.6	0	0.0
>3 years	3	13.0	15	65.2	5	21.7	7	30.4	11	47.8	4	17.4	1	4.3
χ^2(^{MC}p)	1.394 (0.945)						4.051 (0.774)							
Smoking														
Do not smoke	4	14.8	19	70.4	4	14.8	15	55.6	10	37.0	2	7.4	0	0.0
< 1 packet/day	1	11.1	5	55.6	3	33.3	3	33.3	4	44.4	2	22.2	0	0.0
More than one packet	2	14.3	10	71.4	2	14.3	1	7.1	8	57.1	4	28.6	1	7.1
χ^2(^{MC}p)	1.912 (0.795)						12.687* (0.022*)							

Normal = Normal physiological parameter Mild = Mild respiratory problem

Moderate= Moderate respiratory problem Severe = Severe respiratory problem

χ2: Chi square test

MC: Monte Carlo

4. DISCUSSION

Pursed Lip Breathing exercise had been evidenced as the simplest, and cost effective nursing intervention for patients with COPD [24,32,34]. The present study aimed to identify the effect of pursed lip breathing on physiological parameters among patients with COPD. The majority of the patients in the present study were male. This could be related to the underestimated image of smoking women in our culture. This finding was in line with Salah et al (2013) where the majority of the studied group were male [35]. In contrast, the WHO (2017) reported that COPD was more common in men previously, but due to comparatively high level of consumption of tobacco smoking and indoor air pollution, the disease now affects men and women almost equally [36].

Also, the majority of the studied patients were equally distributed between illiterate and bachelor holders. Similar findings were reported by Mohamed (2019) [18]. This may be due to decrease awareness and understanding of the disease regardless the level of education. Moreover, the majority of the studied patients were from urban areas; this could be explained by the fact that air pollution is more common in urban areas. This finding was inconsistent with CDC report (2019) which mentioned that rural populations may have more COPD-related issues due to increased exposure to secondhand smoke, and less access to smoking cessation programs compared with people living in more urban areas [37].

The current study findings highlighted a high statistically significant improvement in the mean level of physiological parameters among the studied patients post PLB exercise. This finding was in line with Ealias et al., (2016), who reported that there was statistical significance improvement in the mean physiological parameters among COPD patients post practicing PLB exercise [26]. Similarly, Singh et al., (2009) found that PLB effectively improved the physiologic indicators in patients with COPD [38].

Morika et al., (2019) reported that PLB exercise regulates the frequency and pattern of breathing, reduces shortness of breath through reducing air trapping, and improving alveoli ventilation [39]. The findings of the present study showed high statistically significant improvements in the mean respiratory rate, of the studied patients post PLB exercise. In this regard, Sakar et al., (2019) denoted that the reduction in respiratory rate among COPD patients, who practiced PLB exercise, could be due to the long period of expiration that results from PLB [40]. Ramos et al., (2009), mentioned that the decrease in respiratory rate during PLB is possibly related to better control over the respiratory cycles and increased duration of expiration, which can lead to a higher tidal volume [41].

The findings of the present study showed high statistically significant improvements in the mean pulse rate of the studied patients post PLB exercise. In this regard, Ramos et al., (2009) found that PLB exercise increased parasympathetic activity, which resulted in decreased pulse rate [41].These findings were consistent with the results of Mohamed (2010), who reported high statistically significant difference in the mean heart rate scores between pre and post pursed-lip breathing exercise. [18].

As regards O_2 saturation, a high statistically significant improvement in the mean O_2 saturation of the studied patients was detected post PLB exercise. This could be interpreted as, the increased duration of expiration during PLB, maintain the intra-bronchial pressure, homogenous lung emptying, improve gas exchange, and improve ventilation that increase O_2

saturation. Similarly, Izadi et al., (2011) noted that O_2 Saturation was significantly increased in the studied patients post pursed-lip breathing exercise [42]. On the same line, Ika et al., (2018) found that pursed-lips breathing exercises showed a significant decrease in the mean heart & respiratory rates, and significant improvement in O_2 saturation in their COPD participants [32].

In relation to body temperature, the current findings showed high statistically significant improvements in the mean body temperature of the studied patients post PLB exercise. Similar findings were reported by Mohamed (2019), who found statistically significant improvement in body temperature post PLB exercise among their studied patients [18]. However, the results of Wehieda et al., (2017) revealed that there was no statistically significant difference in their studied COPD patients regarding body temperature [31].

Sakar et al., (2019) illustrated that dynamic hyperinflation and air trapping in COPD patients place the diaphragm and intercostal muscles in a mechanically improper position. The use of accessory muscles of respiration indicates severe COPD [40]. In this context, the findings of the present study emphasized the effect of PLB exercise on the use of accessory muscle and chest retraction, where the moderate use of accessory muscles before PLB exercise have been changed to none use by the majority of the studied patients post practicing PLB exercise. Similarly, the visible chest retraction before PLB exercise among the majority of the studied patients had disappeared post PLB exercise. In this regard, Kim et al., (2012), and Latha (2015) found significant reduction in the use of accessory muscles of respiration, and in the visibility of chest retraction post practicing PLB exercise [25,33].

Jacome et al., (2014) mentioned that, in COPD patients normal respiratory sounds seem to follow the pattern observed in healthy people and the adventitious respiratory sounds are mainly characterized by inspiratory, coarse crackles and expiratory wheezes [43]. The results of the present study revealed that one third of the studied patients had normal breathing sound before PLB exercise, which show significant improvement post PLB exercise where the majority had normal breathing sound. These findings were consistent with Latha (2015), who found significant improvement in the participants' mean respiratory sounds scores post practicing PLB exercise [33]

The current study findings denoted improved ventilation, where bilateral air entry was auscultated in only one third of the studied patients before PLB exercise, compared to the majority of them post PLB. In this context, Sakar et al., (2019) found that PLB exercise increases resistance to expiratory airflow, develop a positive expiratory pressure in the airways, which in-turn reduced airway collapse, and improves ventilation [40].

Kinser et al., (2018) mentioned that PLB exercise improves breathing, as it helps the diaphragm to contract, and to create pressure on the lungs, which can release air that is trapped in the alveoli, resulting in dyspnea reduction [44]. In this prospective, the results of the present study showed that the majority of the studied patients who were suffering from dyspnea on exertion, before practicing PLB exercise became free from dyspnea post practicing PLB exercise. These findings support the concept that an increase in the strength of inspiratory muscles through breathing exercises can alleviate dyspnea [45].The current study findings were consistent with the results of AlKarn et al., (2018) who found a significant improvement in dyspnea scores among their PLB exercise group than the control group [14]. Similarly, Neild et al., (2007), and El Hoshy et al., (2017) found that PLB had significant improvement of exertional dyspnea scores in their COPD patients [46,47].

According to the current study findings, the majority of the studied patients, who were suffering from productive cough before practicing PLB exercise, became cough free post practicing PLB exercise. This could be interpreted that practicing PLB can enhance breathing muscles and may be helpful in clearing secretions and coughing. Similar findings were supported by Wehieda et al., (2017), where the majority of their studied participants became cough free post practicing PLB exercise [31].

On studying the associations between selected socio-demographic/clinical characteristics of studied patients, and their level of physiological parameters, no significant associations were detected between the studied patients' age, education, duration of illness, co- morbidity, and their level of physiological parameters pre and post PLB exercise. These findings were consistent with the Latha (2015) who reported that there were no significant associations between sociodemographic characteristics and level of physiological parameters pre and post PLB exercise [33]. Statistically significant associations were found between smoking habits, and the level of physiological parameters, as patients who consumed more than one

packet/day achieved mild to moderate levels post PLB exercise. In this context, Ealias et al., (2016) found significant associations between the level of selected physiological parameters and smoking habit among their COPD patients [26]. Latha (2015) reported similar results [33].Moreover, Menezes et al., (2005), and Wade (2017) proposed that COPD physiological parameters were positively associated with smoking [48,49].

5. CONCLUSION

In conclusion, the results of the present study indicated that the study hypothesis is accepted, as pursed-lip breathing exercise had a significant positive effect on all physiological parameters of the studied patients post PLB exercise. Statistically significant correlation was found between smoking habits, and the level of physiological parameters post PLB exercise. Therefore, PLB as an easy, inexpensive, non- invasive and non-pharmacological method is considered as an important maneuver in improving the physiological parameters among patients with COPD.

6. RECOMMENDATIONS

1. Nurses should teach COPD patients the benefits of regular practice of pursed lip breathing exercise in their daily life to improve their physiological parameters and gain a better quality of life.

1. A leaflet should be available and distributed among all COPD patients explaining the disease nature, importance of smoking cessation, progress, and management.
2. Implementing further studies with a larger sample size from different settings are required to validate the present study findings
3. Provision of educational unit in the undergraduate nursing programs related to the application of PLB exercise for COPD patients which might incorporate the findings of the present study as evidence base.

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