

Effect of Combining Diaphragmatic and Pursed Lips Breathing Exercises on Clinical Outcomes of Elderly Patients with Chronic Obstructive Pulmonary Disease

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Abstract: Chronic obstructive pulmonary disease (COPD) is a serious illness leads to increase mortality among old adults every year. Breathing exercises aim to reduce dyspnea. In stable patients, diaphragmatic breathing with pursed lips can improve the oxygenation, reduce breathing frequency and dyspnea. Aim of the study: was to examine the effect of combining diaphragmatic and pursed lips breathing exercises on the clinical outcomes of elderly patients with COPD. Subjects & Method: Design: A quasi-experimental design with pre and posttest was adopted. Setting: The study was carried out at the inpatient units and outpatient clinics of the chest hospital in Al-Mahalla, El-Gharbiya Governorate, Egypt. Subjects: A total of 105 elderly patients. Tools: Three tools were used to collect the data included the structured interview questionnaire, COPD Assessment Test, and Dyspnea-12 scale. Results: The mean age of the participants was 68.3 ± 7.2 years old. One third of them were farmers and 45% were workers who were exposed to respiratory occupational hazards and had low income (51.4%). The reported risk factors for the disease were the exposure to gases and chemicals during work (45%), cigarette smoking (36.2%), illiteracy (32.4%), living in poor ventilated houses (22.9%), history of lung infections during childhood (24.8 %), coal heating (15.2%), and family history (15.2%). There was a statistically significant difference between the pre and posttest regarding the patient's dyspnea scale score, respiratory rate, SaO₂, CAT scale score, and pulse ($P < 0.001^*$). Conclusion: The elderly who practiced the diaphragmatic plus pursed lips breathing exercise had better clinical outcomes than the pretest. They had a reduction in respiratory rate, dyspnea and CAT score, pulse, and increased SaO₂ during the posttest. Recommendations: The diaphragmatic plus pursed lips breathing exercise should be integrated within the plan of care and the patients should incorporate this breathing exercise into their lifestyle to reduce their exacerbations and hospital readmission.

Keywords: Chronic obstructive pulmonary disease (COPD), elderly, diaphragmatic and pursed lips breathing exercise.

1. INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common complex, preventable and treatable disease (Cortopassi & Gurung, 2017; Houben-Wilke et al., 2018). It is an abnormal inflammatory lung condition (Rabe & Watz, 2017) characterized by persistent airflow limitation (Al Karn et al., 2018) that occurs due to obstructive bronchiolitis and emphysema (Hayashi et al., 2018). It is the leading cause of morbidity and mortality worldwide and has a major impact on personal, social, and economic status (Katherine, Safka & Andrew, 2014; Cortopassi & Gurung, 2017). In addition, the lost productivity and high treatment cost can affect the nation on a broader scale (Hossain et al., 2018).

The number of COPD patients worldwide increased from 227 million cases to 384 million cases with 11.7% prevalence, where the highest prevalence occurred in the United States and Southeast Asia (Bafadhel, 2016). It is expected to become the third leading cause of death in the world by 2030 (Shergis et al., 2014; Burney et al., 2015) and still increasing with an aging population (Incalzi et al., 2014; Soriano et al., 2017; Agustí & Faner, 2018). Globally, chronic obstructive pulmonary disease is estimated to cause 3.17 million deaths in 2015 which representing 5% of all global deaths in the same year. More than nine percent of deaths from the disease occur in low and middle income countries (WHO, 2016).

The overall prevalence of COPD in the Chinese adult population is 8.6% (Wang, Xu, & Yang, 2018). In Egypt, the prevalence of the disease was 9.6% (Tageldin et al., 2012) while the recent studies report a high percentage (20.7%) among patients aged more than forty years with a history of smoking of 20 packs of cigarette per year (Metwally et al., 2017). Additionally, the numbers of smokers in Egypt has doubled over the past 15 years (WHO, 2015) which predicts an increase in the number of patients who will be suffered from the disease.

COPD is more prevalent in elderly people (10%) (Agustí & Faner, 2018) and leads to premature aging (Karametos et al., 2019), reduces the lifespan and quality of life among the affected population (Hossain et al., 2018), and needs high healthcare costs (Jansson et al., 2015). It is a major reason for morbidity and mortality (WHO, 2016). It causes breathlessness, exercise intolerance, cough, difficulty with daily activities, infections, hospitalization (GOLD, 2017), reduces of gas exchange, airflow obstruction, right atrial overload and ventricular overload, and hypertrophy (Song et al., 2017). Many people with this illness have multiple other disorders (Vanfleteren et al., 2016) such as cardiovascular comorbidities (Roversi et al., 2018), carcinoma, anxiety, mental disorders, substance abuse, musculoskeletal and connective tissue disorders (Yazdi et al., 2018), and impaired pulmonary function (Medina-Mirapeix et al., 2018).

The major risk factors of COPD are tobacco smoking (GBD, 2015; GOLD, 2015; Lim et al., 2015), passive smoking (Zhang et al., 2018), occupational irritants (Diaz-Guzman & Mannino, 2014; Zhang et al., 2018), air pollution (DeVries et al., 2016), poor indoor air quality (WHO, 2018), biomass fuels (Schayck, Boudewijns, 2017), family history, low birth weight, childhood infections, smoke from home cooking and heating fuels, industrial dust and chemical fumes (Ryu et al., 2015; GOLD, 2017), exposure to dust, gas, damp, cold, foggy environment, or a combination of them (Zhang et al., 2018).

Chronic dyspnea, cough, sputum production, and exercise limitation are the common symptoms of COPD (Ford, 2015; Al Karn et al., 2018). During the course of the disease, many patients are frequently hospitalized due to exacerbations or other causes (Ford, 2015). In addition, skeletal muscle dysfunction can appear in the early stage of the disease (Passey et al., 2016). Hence, the cornerstone of diagnosis and monitoring of the patients is the assessment of lung function (Kaplan & Thomas, 2017) to determine airflow limitation measured by post-bronchodilator spirometry (Vogelmeier et al., 2017). In elderly patients, the diagnosis tends to lead the appearance of other comorbid conditions (Tényi et al., 2018).

The treatment of COPD included the pharmacological and non-pharmaceutical therapies (Abraham & Symons, 2015; Bafadhel, 2016; Viniol & Vogelmeier, 2018). The goals of treatment contain decrease exacerbations and hospitalizations, reduce dyspnea, slow progression of the disease, and decrease the mortality (Horita et al., 2017). First, the non-pharmacological therapy such as walking or breathing exercise (Ding et al., 2014; Shirley et al., 2016) provides symptomatic improvement and better quality of life (Katherine, Safka & Andrew, 2014). The cessation of smoking (Dhariwal et al., 2014; Katherine, Safka & Andrew, 2014), corticosteroids, and inhaled bronchodilators are the main treatment (Horita et al., 2017). Long acting muscarinic antagonists and long-acting β_2 -agonists, with or without inhaled corticosteroids are the treatments of choice (GOLD, 2017). The additional therapies include vaccinations, oral phosphodiesterase inhibitors, oxygen therapy, and pulmonary rehabilitation (Horita et al., 2017). Also, the patient should eat a healthy diet to maintain good health (Berthon & Wood, 2015).

Dyspnea is the symptom most frequently leads patients to seek medical attention (Miravittles et al., 2014). It must be considered during provision of the nursing care. Reducing dyspnea and fatigue is an important part of the pulmonary rehabilitation program (Ghanbari et al., 2018; Lee & Kim, 2019) that can be achieved by practice of breathing exercises (Daabis et al., 2016; Al Karn et al., 2018) which help the patient to return to the maximum level of independence in the community (Augustin & Wouters, 2017). Including exercises in the management of COPD leads to long-term clinical benefits (Ramos et al., 2019). It improves the chest wall volumes and oxygenation, and reduces breathing frequency

without increasing dyspnea. The exercises may play a role in care and symptom management and be included in routine patient care (Mendes et al., 2018). It can control symptoms, alleviate the progression, improve the exercise capacity and skeletal muscle function, and improve quality of life of the patients (Burtin & Hebestreit, 2015).

Several breathing approaches have been reported by the researchers including pursed lips breathing and diaphragmatic breathing. The pursed lips breathing is a ventilatory strategy frequently adopted spontaneously by patients with COPD to relieve dyspnea (Hillegass, 2017; Mayer et al., 2018). It is effective to reduce respiratory rates (Cancelliero-Gaiad et al., 2014), improve oxygenation (Sakhaei et al., 2018), adjust the blood pressure, and prevent cardiovascular complications (Mayer et al., 2017). While, diaphragmatic breathing can be safely recommended for the clinically stable COPD patients (Nair et al., 2019). It is one of breathing exercises to increase the chest wall tidal volume and reduce breathing frequency. It is a low cost exercises and do not require special instrumentation or continuous assistance of a health care provider (Mendes et al., 2018).

The nurse must be aware of the importance of measuring respiratory rate (Wheatley, 2018) because it is part of a full patient assessment (Kelly, 2018). It is useful for measuring decline or recovery (Wheatley, 2018). She should promote support and advice to the patients and their families to proactively treat their disease, and assess the patient ability to do the activities of daily living (Gustafsson & Nordeman, 2018). Teaching the patient to live with the disease, handling symptoms and accepting limitations (Houben-Wilke et al., 2017) also considered a vital role. The nurse can play an effective role in educating the patient about breathing exercises (Wade, 2017). Diaphragmatic and pursed lips breathing has long been incorporated as treatment components in pulmonary rehabilitation (Daabis et al., 2016; Loprinzi et al., 2016). It is one of the most important non-pharmacological interventions for breathing difficulty in patients with COPD (Booth et al., 2011). The diaphragmatic plus pursed lips breathing provides better benefits of the two breathing exercises. The nurse should instruct the patient to perform diaphragmatic breathing and then exhale the air with lips partially closed. Mendes et al., (2018) stated that the diaphragmatic plus pursed lips breathing exercise can promote a significant increase in chest wall tidal volume and its compartments as well as a reduction in respiratory rate. The combination of the two breathing exercises can provide better patient clinical outcomes.

Significance of the study:

COPD causes 3.15 million deaths per year (WHO, 2017). The noticed prevalence in Egypt was 20.7% (Metwally et al., 2017). It is more prevalent in elderly people (10%) (Agustí & Faner, 2018). It can reduce the lifespan and quality of life in addition to the lost productivity and high treatment cost (Hossain et al., 2018). It causes many health problems including breathlessness (GOLD, 2017), airflow obstruction (Song et al., 2017), cardiovascular comorbidities (Roversi et al., 2018), carcinoma, mental disorders, substance abuse, musculoskeletal disorders (Yazdi et al., 2018), and impaired pulmonary function (Medina-Mirapeix et al., 2018).

In stable elderly patients with COPD, breathing exercises can improve the pulmonary function parameters and dyspnea scores (Al-Karn et al., 2018). Diaphragmatic breathing with pursed lips can improve the oxygenation and reduce breathing frequency. The addition of pursed lips breathing to diaphragmatic breathing provides better changes in breathing parameters (Mendes et al., 2018). The nurse should instruct the patient to perform the diaphragmatic breathing technique and then exhale the air with lips partially closed. So, the geriatric and community health nurses should play their vital role in educating the elderly patients with COPD about the practice of diaphragmatic pursed lips breathing exercise to reduce dyspnea and improve their clinical outcomes.

Aim: the study aimed to examine the effect of combining diaphragmatic and pursed lips breathing exercises on the clinical outcomes of elderly patients with COPD.

Research hypothesis:

- 1- Elderly patients who will practice the diaphragmatic plus pursed lips breathing exercise will have better clinical outcomes than the pretest.
- 2- Elderly patients who will practice the diaphragmatic plus pursed lips breathing exercise will have a reduction in respiratory rate and dyspnea scale score than the pretest.

2. SUBJECTS AND METHOD

Research Design: Quasi-experimental research design with pre- posttest was used to examine the effect of combining diaphragmatic and pursed lips breathing exercises on the clinical outcomes of elderly patients with COPD. This design is one type of the quasi-experimental designs in which the data collected from the research subjects both before and after introducing the intervention (Nieswiadomy, 2012).

Study setting: The study was carried out at the inpatient units and outpatient clinics of the chest hospital in Al-Mahalla, El-Gharbiya Governorate, Egypt.

Subjects: A purposive sample consisted of 105 elderly patients who fulfilled the following inclusion criteria:-

- Aged 60 years and more,
- Patients with stable COPD,
- Alert and agree to participate in the study.

The exclusion criteria were:

- The history of recent exacerbation at the last 4 weeks
- Need for home oxygen therapy.

Calculation of the sample size: In order to calculate the required sample size, the researchers used the online creative research systems sample size calculator website. It has been searched, reviewed and checked for the calculated results based on known formulas for common research objectives (Meysamie et al., 2014). The flow rate of the target population with this specific inclusion and exclusion criteria at the free inpatient units were 916 patients per year. With a 95% level of confidence (error=5 %) and a study power of 91% the required sample size was equal 105 patients.

Tools for data collection: three tools were used to collect the data from the elderly patients included the following:

I. Structured interview questionnaire: It was designed by the researchers based on review of the related literatures. It involved three parts:

Part1:- Socio-Demographic characteristics such as age, sex, residence, marital status, educational level, working condition, previous occupation, and economic status.

Part2:-Medical history and health related data: This included questions about the client's complaints, past and present medical histories, medications, and duration of the disease. It also, included questions about the risk factors for the disease such as smoking, exposure to chemicals, dusts, and gases.

Part3:-Bio-physiological measurements: This included the respiration, blood pressure, pulse, arterial blood oxygen saturation (SaO₂), weight, height and body mass index (BMI). The BMI was estimated by dividing weight in kilogram by squared height in meters [BMI = weight (kg)/height (m)²]. A BMI of less than 18.5 was underweight, a BMI from 18.50 to 24.99 was considered normal, BMI from 25 to 29.9 was considered overweight, and BMI more than 30 was considered as obese (WHO, 2006).

2- The COPD Assessment Test (CAT) questionnaire: It is a simple tool for assessment of the health status of COPD patients. It has eight items covering cough, phlegm, chest tightness, breathlessness, activity limitation, confidence, sleep, and energy. Each item is scored from 0 to 5 giving a total score ranging from zero to forty, corresponding to the best and worst health status in patients with COPD, respectively (Jones, Tabberer, & Chen, 2011).

3-Dyspnea-12 (D-12) scale: It is a useful tool to assess dyspnea in the clinical practice which covers of twelve items and assesses the quality of this symptom, its severity and the emotional response. The 7 related to the quality of the sensation of dyspnea and 5 related to the emotional response to this sensation. Each item was graded in terms of its intensity using a four point scale (from 0 to 3), with higher scores representing greater severity (Alyami et al., 2015).

Validity and reliability of the tools:

The tools were developed by the researchers after a review of the related literature and tested for its content validity. Validity indicated the degree to which the tool measures what it was expected to measure, therefore, in this study, the questionnaire content validity was determined by a panel of three experts. Changes were carried out according to their judgment on the clarity of the sentences and relevance of the contents. Reliability was assessed by applying the questionnaire to ten clients using test-retest. Also, CAT questionnaire had an internal consistency with a Cronbach's alpha of 0.88 (Jones et al., 2009). Similarly, the Arabic version of dyspnea questionnaire demonstrated good reliability (correlation coefficient = 0.94) (Alyami et al., 2015).

Pilot study:

It was conducted on 10 older adults with COPD. This sample was excluded from the total subjects. The pilot study was carried out to test the applicability and clarity of the constructed questionnaire and detect any problems that might arise during the study.

Fieldwork:

- Before conducting the study, an official letter was issued from the Faculty of Nursing, Fayoum University and forwarded to the director of Al Mahalla Hospital for Chest Diseases, Tanta, Egypt to obtain the permission to attend the clinics. Then, the study purpose and schedule of data were clarified.

- The data collection period was covered a period of four months, from the beginning of January 2019 till the mid of April 2019 at the inpatient unit and the outpatient clinic of the chest hospital from 9 AM to 2 PM, three days per week.

- **Interviewing and assessment phase:** Initially, clinical and demographic data were collected. The average time taken for completing each sheet was around 30-45 minutes, this according to the interviewers' level of understanding and comfort. Older adults with COPD who fulfilled the inclusion criteria were interviewed individually by the researchers in the waiting area of the clinics\ inpatient rooms using the tools of research in order to obtain the baseline data (Pre-test). The aim of the study was explained for each patient to give assurance about the confidentiality of information offered and to gain their maximum cooperation. The telephone numbers of all participants were taken in order to arrange for the program practice, continuous reminders the elderly client of the breathing exercise training, assessment of the state of health, and receive any advice on the problems facing them while practicing.

- **Exercise implementation:**

Before the exercise implementation, the researchers prepare the environment to be quiet and comfortable, well ventilated, and have sufficient lighting. The participants learned how to perform the diaphragmatic plus pursed lips breathing exercise:

- Clear the mind from the things that are stressing.
- Sit down on a chair or bed with street back as possible or lie on top of the bed or on the floor with pillows under the head and knees, if preferred.
- Take a normal breath in slowly through the nose keeping the mouth closed as if smelling a flower.
- Purse the lips. Breathe out slowly through the pursed lips.
- Place one of the patient hands on the belly just below the ribs and the other hand at the top of the chest. Breathe slowly through the nose until the patient belly moves on the hand as far as it goes.
- Keep the other hand on the chest of the patient.
- The client should practice the techniques for about 3-5 minutes at a time and at least 3- 5 times daily.
- Try doing the exercise at fixed times every day to strengthen the habit. With regular practice, this technique will become easier and become part of the patient's daily breathing.

- The researchers were distributing the designed manual booklet on each participant in order to clarify the technique. This booklet contains the illustrative colored pictures and the main points of each step. Teaching methods included the role-playing, demonstration and re- demonstration to ensure correct technique performance. The researchers gave the patient's instructions about the importance of healthy nutrition and avoid smoking.
- The work plan calendar has been prepared and given to each participant to identify obstacles to the achievement of the objectives. Also, the patients were telephoned every three days to remind them about the practice of the breathing exercise.
- **Evaluation "Post-test"**: After one month each client was reassessed at the outpatient clinic of the chest hospital in Al-Mahalla using the study tools to evaluate the improvement in the clinical outcomes for the studied elderly clients. This took 2 months evaluation from mid of February 2019 to mid of the April of 2019. Then, the difference between pre-interventions and post-intervention scores were determined by using the proper statistical analysis.

Human rights and ethical considerations:

An official permission was taken from the authoritative personal in the hospital. The researchers introduced themselves to the patients who met the inclusion criteria and informed them about the aim of the current study in order to obtain their acceptance to share in this study. Written consent was obtained from them. Confidentiality and anonymity of them were assured through coding the data.

Statistical analysis: Data were coded and transformed into a specially designed format suitable for computer feeding. All entered data were verified for any errors. Data were analyzed using statistical package for social sciences (SPSS) version 20 windows and were presented in tables and graphs. Frequencies analysis was performed and mean and standard deviations were calculated for quantitative data. Also, paired sample t-test was computed. An alpha level of 0.05 was used to assess significant differences.

3. RESULTS

The study was included 105 elderly clients from the inpatient units and outpatient clinics of the chest hospital in Al-Mahalla, El-Gharbiya Governorate, Egypt, with the mean age was 68.3 ± 7.2 years old. Table (1) shows that, 64.8 % of the studied elderly were young old persons and more than half of them (52.4%) were females.

Regarding to the residence, about sixty percent of the patients (58.1%) were from urban area and married (61.9%). Likewise, 41.0% of them were illiterate and 32.4% of them had only primary education. Regarding their previous occupation, 33.3% were farmers and 45% of them were workers and exposed to respiratory occupational hazards, and had low income (51.4%). About half of the elderly patients had COPD from about five years and near to forty three percent of them recently diagnosed (< 1 year). Also, 56.2% of the participants were obese.

The data in table (2) indicated that, the risk factors for COPD among the studied elderly persons were the exposure to gases and chemicals during work (45%), cigarette smoking (36.2%) more than ten years, had a history of lung infections during childhood (24.8 %), living in poor ventilated house (22.9%), coal heating (15.2%), and family history (15.2%) of the disease. While, figure (1) summarizes the most reported factors among the studied patients that included passive smoking (85.7%), work related factors (45%), residents in urban area (58.1%) with poor ventilated houses (22.9%), illiteracy (32.4%), and history of lung infections during childhood (24.8%).

Table (3) illustrates that, the signs and symptoms of COPD among the elderly individuals were included the chest tightness (97.1%), wheezing (92.4%), dyspnea (89.5%), fatigue (81.1%), insomnia (74.3%), chronic cough (70.5%) with sputum, and anorexia (59%).

Table (4) presents that; the elderly patients performed the exercise about four times per day (3.4 ± 1.4) and along nearly three minutes of duration (2.65 ± 1.2) without difference between males and females participants. There was a statistically significant difference between the pre and posttest regarding the patients clinical outcomes including dyspnea scale score, respiratory rate, SaO₂, CAT scale score, and pulse ($P < 0.001^*$). But exacerbation occurred to some patients. The susceptibility to frequent exacerbations in COPD males (2.24 ± 1.7) was more frequent than females (1.47 ± 1.08) (table 5).

Figure (2) reveals that, there was a reduction in the total dyspnea scale score and respiratory rate during the posttest than the pretest. While, the SaO₂ increased during the posttest than the pretest indicating an improvement in the patient's respiration and blood oxygenation.

Table (1): Distribution of socio-demographic characteristics and health related data of the studied elderly people (N= 105).

Socio-demographic characteristics	No.	%
Age (In years): mean \pm SD	68.3 \pm 7.2 ^a	
Age category: 60- 69	68 (64.8%)	
70 -79	26 (24.8%)	
80+	11 (10.5%)	
Sex: Male	50	47.6
Female	55	52.4
Residence: Rural	44	41.9
Urban	61	58.1
Marital status: Single	5	4.8
Married	65	61.9
Widow	28	26.6
Divorced	7	6.7
Education: Illiterate	34	32.4
Primary	43	41.0
Secondary	23	21.8
University	5	4.8
Working condition:		
Still Work	11	10.5
Not work	94	89.5
Previous occupation:	No.=60	
Fabric worker	14	23.3
Welder	13	21.7
Farmer	20	33.3
Dealer	6	10.0
Teacher	7	11.7
Income : Enough and save	16	15.3
Enough	35	33.3
Not enough	54	51.4
Duration of the disease:		
< 1 year	45 (42.9)	
1-5 years	50 (47.6)	
> 5 years	10 (9.5)	
Height	155.6 \pm 10.7 ^a	
Weight	86.2 \pm 20.3 ^a	
BMI: Normal weight	15 (14.3%)	
Overweight	31 (29.5%)	
Obese	59 (56.2%)	

^a = mean and SD

Table (2): Distribution of the reported risk factors for COPD among the elderly patients (N=105).

Risk factors	No.	%
Current cigarette smoking:	38	36.2
Duration of smoking:	No.=38	
1-10 years	13	34.3
11-20 years	14	36.8
> 20 years	11	28.9
Water pipe smoking	10	9.5
Coal heating	16	15.2
Exposure to gases and chemicals during work	No.=60	
	27	45.0
Family history	16	15.2
Poor ventilation	24	22.9
Poor sanitation	15	14.3
Crowding in the house	6	5.7
Lung infections during childhood	26	24.8

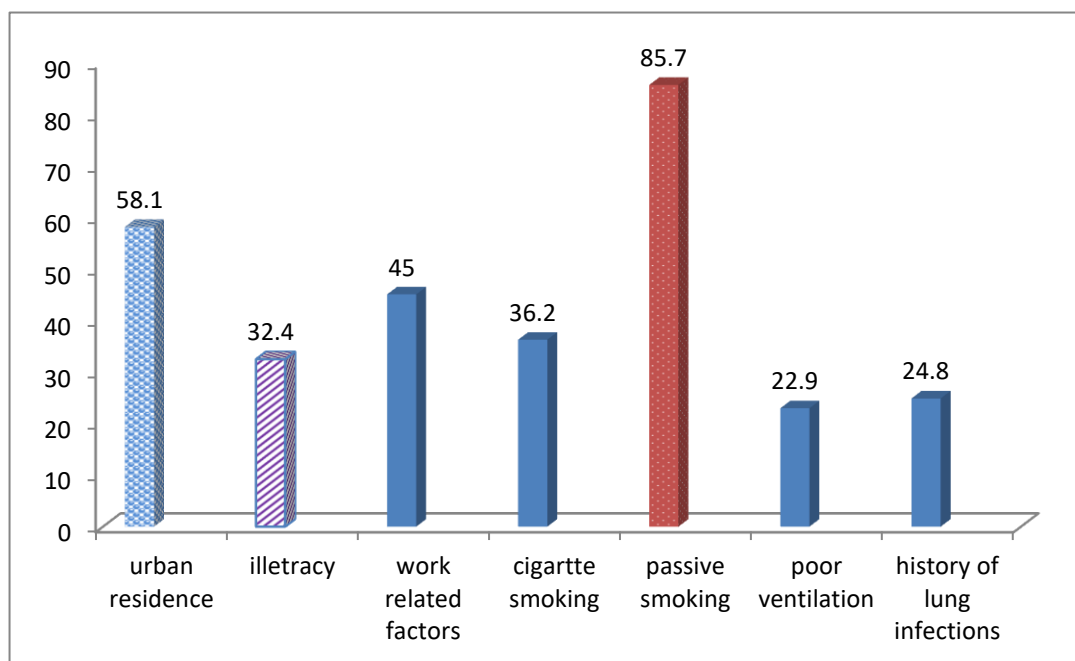


Figure (1): Distribution of the most reported factors for COPD among the studied patients.

Table (3): Distribution of COPD signs and symptoms stated by the patients.

Signs & symptoms	No.	%
Dyspnea	94	89.5
Chronic cough	74	70.5
Chronic sputum	88	83.8
Sputum color:		
White	81.0%	
Yellow	16.2%	
Bloody	2.9%	
Wheezing	97	92.4
Chest tightness	102	97.1
Insomnia	78	74.3
Fatigue	85	81.1
Loss of appetite	62	59.0

Table (4): Performance of the breathing exercise by the participants during the posttest (N= 105).

Diaphragmatic plus pursed lips breathing performance	Male	Female	Total
Frequency/day	3.46 ± 1.4	3.36 ± 1.4	3.4 ± 1.4
Duration by minutes	2.66 ± 1.1	2.6 ± 1.4	2.65 ± 1.2

Table (5): Comparison of changes in the patient's clinical outcomes before and after the intervention (N=105).

Patients clinical outcomes	Pre test	Posttest	P value
Dyspnea scale score	31.05± 9.2 ^a	22.31 ± 7.76 ^a	t= 7.2 p < 0.001*
Respiratory rate	24.01 ± 2.7 ^a	21.9 ± 3.7 ^a	t=4.9 p< 0.001*
Oxygen saturation of arterial blood (SaO ₂):			
Normal	5(4.8%)	80(76.2%)	t=15.5 p<0.001*
Less than normal	100(95.2%)	25(23.8%)	
CAT scale score	4.1 ± 0.8 ^a	3.4 ± 1.2 ^a	t=3.7 p<0.001*
Pulse	93.3 ± 7.8 ^a	85.4 ± 7.5 ^a	t=8.5 p< 0.001*
How many exacerbations occurred?			
Males			t=2.69
Females			p< 0.01*
	2.24 ± 1.7 ^a	1.47 ± 1.08 ^a	

^a = mean and SD * = significant

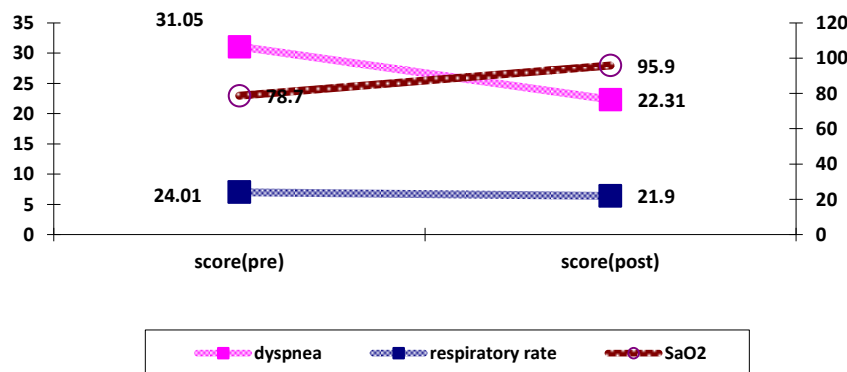


Figure (2): Comparison between the mean pre and posttest total score for dyspnea, respiratory rate, and SaO₂ for the studied participants.

4. DISCUSSION

COPD is a significant public health concern (GOLD, 2017) and one of the most commonly diagnosed diseases in the world, which impairs the quality of life of the affected people (Tabari et al., 2018). In stable elderly patients with COPD, breathing exercises can improve the pulmonary function parameters and reduce dyspnea (Al Karn et al., 2018). One hundred and five elderly patients included in the current study to examine the effect of combining diaphragmatic and pursed lips breathing exercises on the clinical outcomes of elderly patients with COPD. The results of the present study stated that sixty four percent of the studied elderly were young old persons and more than half of them were females. This results in accordance with Agustí & Faner, (2018) who mentioned that COPD is more prevalent in persons older than sixty five years of age. Similarly, other researchers reported a maximum number of COPD patients were in the same age group followed by those in more than seventy years old (Batra et al., 2018). In addition, this disease is more common in

males than in females (Adeloye et al., 2015). But this comes in contrast with the results of the present study which revealed that more than half of the patients were females. This may be related to females' patients are susceptible also to many factors affecting their respiratory system such as cleaning, removing of dust, smoke from home cooking and heating fuels without adequate ventilation, and passive smoking which increased their susceptibility to the lung diseases.

Regarding the previous occupation of the study members, forty five percent of them were workers and one third of them were farmers who were exposed to irritants, respiratory occupational hazards, and had low income (51.4%). Correspondingly, forty one percent of them were illiterate and about one third of them had only primary education which forced them to have this work. This comes in agreement with Diaz-Guzman & Mannino, (2014) who declared that certain occupations, such as farming and industrial work, which expose employees to irritants, have been linked with the development of COPD. These occupational causes are estimated to contribute to fifteen percent of the cases. The most environmental exposures include traffic pollutants and wood smoke (De Matteis et al., 2016).

There is no doubt that smoking is a serious danger affecting the community health. It causes many health problems and need a real focus and solutions. Correspondingly, Tageldin et al., (2012) conducted a cross sectional study in Egypt and showed a correlation between the cigarette smoking and the COPD related symptoms. The world health organization reported a high prevalence of tobacco smoking among males than females (WHO, 2015). Likewise, the data for the current study indicated that, the most reported risk factors for COPD among the studied elderly persons were the exposure to gases and chemicals during work, cigarette smoking, and family history of the disease. Similarly, Zhang et al., (2018) stated that most of the patients had a smoking history. More than half of them had either exposure to environmental or occupational pollution, smoke, dust, gas, passive smoking, damp, cold, foggy environment, or a combination of these in more than seventy percent of the cases.

Concerning the most common risk factors for COPD as stated by the patients, the smoking is the first but other factors such as overweight, childhood chronic cough, parental history of respiratory diseases, low socioeconomic status, and low education also considered important factors for this problem in many studies (Diaz-Guzman & Mannino, 2014; Wang, Xu, & Yang, 2018). There is a strong correlation between helplessness and pulmonary function with age, gender, and literacy (Batra et al., 2018). Added to that, Agustí & Faner, (2018) mentioned the environmental exposure, age-related degenerative changes, and genetic factors are important. In the same line, the current study summarized the obesity, illiteracy, living in poor ventilated house, coal heating, and history of lung infections during childhood as significant factors that should be taken into the considerations of the researchers.

Regarding to the signs and symptoms of COPD, dyspnea, cough, sputum production and exercise limitation are the most common stated symptoms (Al Karn et al., 2018). The main complaints for the patients included the shortness of breathing (dyspnea) and fatigue (Deng et al., 2013). The current study results illustrated that, the signs and symptoms of COPD among the elderly individuals were included the chest tightness, wheezing, dyspnea, fatigue, insomnia, chronic cough with sputum, and anorexia. The community health nurse and geriatric nurse can help the patients to reduce the intensity of these symptoms, regulate the respiratory rate and reduce dyspnea by teaching them about the breathing exercises technique. Breathing exercises can promote a significant reduction in breathing frequency (Mendes et al., 2018). It was showed positive effects including the increase in lung volumes, respiratory motion, and SpO₂ and increased oxygenation (Cancellero-Gaiad et al., 2014). Beside that respiratory rate provides a baseline for future comparisons and helps determine the patient's acuity, detecting pulmonary complications, and evaluating response to treatment (Dougherty & Lister, 2015). The elderly patients of the current study performed the diaphragmatic plus pursed lips breathing exercise about four times per day and along nearly three minutes of duration. There is a statistical significant difference between the pre and posttest regarding the dyspnea scale score, respiratory rate, SaO₂, CAT scale score, and pulse ($P < 0.001^*$). But exacerbation occurred to some patients. The susceptibility to frequent exacerbations in COPD males was more frequent than females. Exacerbations frequent among males may be related to smoking which affected on their lungs and weather changes that occurs during the spring that stimulate many natural irritants during this time of the year. Gloeckl et al., (2013) mentioned that exercise training has been shown to be effective in a number of outcomes of patients with COPD, such as reduced dyspnea. Also, Draman et al., (2013) informed that most of the patients had moderate CAT scores with forty two percent of the patients having severe airflow limitation. Another study has shown contrary results that the susceptibility to frequent exacerbations in COPD is stronger in females than in males (Sundh et al., 2015).

At the last, the effect of diaphragmatic plus pursed lips breathing technique on the patient clinical outcomes varies based on the patient health status and the degree of accurate implementation of the exercise. The current study results revealed that there was a reduction in the total dyspnea scale score and respiratory rate during the posttest than the pretest. While, the SaO₂ increased during the posttest than the pretest indicating an improvement in the patient's respiration and blood oxygenation. Likewise, Mehani, (2017) reported a statistically significant increase in HCO₃ and SaO₂ percent in the intervention group. Another study found significant difference regarding respiratory frequency at rest (Vieira et al., 2018). While the researchers of another study found no significant changes in dyspnea or end-expiratory volume of the chest wall. These results might be related to a pattern of lower hyperinflation shown in the subjects. But a significant increase in inspiratory expiratory stage ratio was observed (Mendes et al., 2018).

5. CONCLUSION

Based on the findings of the present study, the elderly participants who practiced the diaphragmatic plus pursed lips breathing exercise had better clinical outcomes than the pretest. They had a reduction in respiratory rate and dyspnea scale score. There was a statistically significant difference between the pre and posttest regarding the dyspnea scale score, respiratory rate, SaO₂, CAT scale score, and pulse. The SaO₂ increased during the posttest than pretest indicating an improvement in the patient's respiration and blood oxygenation.

6. RECOMMENDATIONS

Based on the results of the current study, the following recommendations are suggested:

- 1- The diaphragmatic breathing exercise with pursed lips should be integrated within the plan of care for COPD patients.
- 2- The elderly patients with COPD should incorporate the diaphragmatic plus pursed lips breathing exercise into their lifestyle.
- 3- Mass media can play a vital role in educating the public about the dangers of smoking with great focus on its relation to the respiratory diseases.
- 4- Establishment of breathing exercises unit in the chest disease hospitals is essential to provide inpatient and outpatient respiratory exercises training program for patients with different respiratory diseases.
- 5- Long term follow up and maintain the regular practice of the diaphragmatic plus pursed lips breathing exercise to reduce patient's exacerbation and hospital readmission.

REFERENCES

- [1] Abraham S & Symons G.(2015). Non-pharmacological management of chronic obstructive pulmonary disease. SAMJ. September 2015, Vol. 105, No. 9.
- [2] Adeloye D, Chua S, Lee C, et al. (2015). Global and regional estimates of COPD prevalence: systematic review and meta-analysis. J Glob Health 2015; 5: 020415.
- [3] Agustí, A. & Faner, R. (2018). COPD beyond smoking: New paradigm, novel opportunities. Lancet Respir. Med. 2018,6, 324–326.
- [4] Al Karn AF, Hassan WA, Abo El Fadl AA, & Mahmoud MA.(2018). Effectiveness of pulmonary rehabilitation on pulmonary function parameters and dyspnea in patients with stable chronic obstructive pulmonary disease. Egyptian Journal of Bronchology, Vol. 12 No. 2, April-June 2018. Published by Wolters Kluwer – Medknow. 12:149–153.
- [5] Alyami MM, Sue C. Jenkins, Hani Lababidi, & Kylie Hill. (2015). Arabic version of the dyspnea-12 questionnaire. Reliability and validity of an Arabic version of the dyspnea-12 questionnaire for Saudi nationals with chronic obstructive pulmonary disease. Annals of Thoracic Medicine - Vol 10, Issue 2, April-June 2015.
- [6] Augustin IM, & Wouters EFM. (2017). Process of pulmonary rehabilitation and program organization. J Card Pulm Rehabil 2017; 1: 109.

International Journal of Novel Research in Healthcare and Nursing

 Vol. 6, Issue 2, pp: (1280-1295), Month: May - August 2019, Available at: www.noveltyjournals.com

- [7] Bafadhel, M. (2016). Chronic obstructive pulmonary disease : management of chronic disease Key points. *Medicine*, 44(5), 310–313.
- [8] Batra A, Chhabra G, & Gupta PK. (2018). Helplessness in chronic obstructive pulmonary disease patients: Assessment and correlation with socio-demographic factors and spirometry-based severity. *Indian J Respir Care* 2018;7:83-7.
- [9] Berthon BS, & Wood LG. (2015). Nutrition and respiratory health – feature review. *Nutrients* 2015; 7: 1618–1643.
- [10] Booth S, Moffat C, Burkin J et al. (2011). Non-pharmacologic interventions for breathlessness. *Curr Opin Support Palliat Care* 2011; 5: 77-86.
- [11] Burney PGJ, Patel J, Newson R, Minelli C, & Naghavi M. (2015). Global and regional trends in COPD mortality, 1990-2010. *Eur Respir J*. 2015;45(5):1239–47.
- [12] Burtin C, & Hebestreit H. (2015). Rehabilitation in patients with chronic respiratory disease other than chronic obstructive pulmonary disease: exercise and physical activity interventions in cystic fibrosis and noncystic fibrosis bronchiectasis. *Respiration* 2015;89:181–9.
- [13] Cancelliero-Gaiad KM, Ike D, Pantoni CB, Borghi-Silva A, & Costa D. (2014). Respiratory pattern of diaphragmatic breathing and pilates breathing in COPD subjects. *Brazilian journal of physical therapy*. 2014;18(4):291-9.
- [14] Cortopassi, F., & Gurung, P. (2017). Chronic Obstructive Pulmonary Disease in Elderly Patients. *Clin Geriatr Med*, 33(7), 539–552.
- [15] Daabis R, Hassan M, & Zidan M. (2016). Endurance and strength training in pulmonary rehabilitation for COPD patients. *Egypt J Chest Dis Tuberc* 2016;66:231–6.
- [16] De Matteis S, Jarvis D, Hutchings S et al. (2016). Occupations associated with COPD risk in the large population-based UK Biobank cohort study. *Occup Environ Med*. 73(6):378-84.
- [17] Deng GJ, Liu Fr, Zhong QI, Chen J, Yang Mf, & He HG. (2013). The effect of non-pharmacological staged interventions on fatigue and dyspnea in patients with chronic obstructive pulmonary disease: A randomized controlled trial. *International journal of nursing practice*. 2013;19(6):636-43.
- [18] DeVries R, Kriebel D, & Sama S.(2016). Low level air pollution and exacerbation of existing COPD: a case crossover analysis. *Environ Health* 2016; 15: 98.
- [19] Dhariwal J, Tennant RC, Hansell DM, et al. (2014). Smoking cessation in COPD causes a transient improvement in spirometry and decreases micronodules on high-resolution CT imaging. *Chest*. 2014;145(5):1006-1015.
- [20] Diaz-Guzman E, & Mannino DM. (2014). Epidemiology and prevalence of chronic obstructive pulmonary disease. *Clin Chest Med* 2014 Mar;35(1):7-16. PMID: 24507833.
- [21] Ding M, Zhang W, Li K, & Chen X. (2014). Effectiveness of t'ai chi and qigong on chronic obstructive pulmonary disease: A systematic review and meta-analysis. *Journal of Alternative & Complementary Medicine*. 2014;20(2):79-86.
- [22] Dougherty L, & Lister S . (2015). *The Royal Marsden Manual of Clinical Nursing Procedures*. Chichester: Wiley-Blackwell.
- [23] Draman N, Hasnan HM, Wan Mohamed WM, & Mat Jaeb M. (2013). The Association of the COPD Assessment Test (Cat) Score with Chronic Obstructive Lung Disease (GOLD) Grade among Chronic Obstructive Pulmonary Disease (COPD) Outpatients in the North East of Peninsular Malaysia. *International Journal of Collaborative Research on Internal Medicine & Public Health*. Vol. 5 No. 9 . 2013. Pp 596-607.
- [24] Ford ES. (2015). Hospital discharges, readmissions, and ED visits for COPD or bronchiectasis among US adults: findings from the nationwide inpatient sample 2001-2012 and Nationwide Emergency Department Sample 2006-2011. *Chest* 2015;147(4):989-98.

- [25] GBD .(2015). Chronic Respiratory Disease Collaborators. Global, regional, and national deaths, prevalence, disability adjusted life years, and years lived with disability for chronic obstructive pulmonary disease and asthma, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet Respir Med* 2017; 5: 691–706.
- [26] Ghanbari A, Shirmohamadi N, Paryad E, Bazghale M, & Pourhodki RM. (2018). Effect of Breathing Exercises on Fatigue Dimensions in Patients with COPD. *Medical Science and Discovery* 2018; 5(4):1.
- [27] Global Initiative for Chronic Obstructive Lung Disease (GOLD). (2015). Global Initiative for Chronic Obstructive Lung Disease. Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease. 2015. PMID: None.
- [28] Global Initiative for Chronic Obstructive Lung Disease (GOLD). (2017): Global Strategy for the Diagnosis, Management and Prevention of Chronic Obstructive Pulmonary Disease. Updated 2017. www.goldcopd.org. Available online: <https://goldcopd.org/gold-2017-global-strategy-diagnosis-management-preventioncopd> (accessed on 4 July 2018).
- [29] Gloeckl R, Marinov B & Pitta F.(2013). Practical recommendations for exercise training in patients with COPD. *Eur Respir Rev* 2013; 22: 128, 178–186.
- [30] Gustafsson, T., & Nordeman, L. (2018). The nurse' s challenge of caring for patients with chronic obstructive pulmonary disease in primary health care. *Nursing Open*.
- [31] Hayashi, H., Ruggeri, A., Volt, F., Cornelissen, J. J., Socié, G., Sengeloev, H & Veelken, H. (2018). Chronic graft-versus-host disease features in double unit cord blood transplantation according to National Institutes of Health cGVHD Consensus criteria. *Bone marrow transplantation*, 53(4), 417.
- [32] Hillegass EA.(2017). *Essentials of cardiopulmonary physical therapy*. St.Louis, MO: Elsevier; 2017.
- [33] Horita, N., Nagashima, A., & Kaneko, T. (2017). Long-Acting β -Agonists (LABA) Combined With Long-Acting Muscarinic Antagonists or LABA Combined With Inhaled Corticosteroids for Patients With Stable COPD. *Jama*, 318(13), 1274-1275.
- [34] Hossain M, Sultana A, & Purohit N. (2018). Burden of Chronic Obstructive Pulmonary Disease in India: Status, Practices and Prevention. *Int J Pul & Res Sci*. 2018; 2(5): 555599. DOI: 10.19080/IJOPRS.2018.02.555599.
- [35] Houben-Wilke S, Augustin IM, Wouters BB, et al. (2017). The patient with a complex chronic respiratory disease: a specialist of his own life? *Expert Rev Respir Med* 2017; 11: 919–924.
- [36] Houben-Wilke S, Augustin IM, Vercoulen JH, et al. (2018). COPD stands for complex obstructive pulmonary disease. *Eur Respir Rev* 2018; 27: 180027 [<https://doi.org/10.1183/16000617.0027-2018>].
- [37] Incalzi RA, Scarlata S, Pennazza G, Santonico M, & Pedone C.(2014). Chronic Obstructive Pulmonary Disease in the elderly. *European Journal of Internal Medicine* 25 (2014) 320–328.
- [38] Jansson SA, Backman H, Ronmark E, Lundback B, & Lindberg A. (2015). Hospitalization Due to Co-Morbid Conditions is the Main Cost Driver Among Subjects With COPD-A Report From the Population-Based OLIN COPD Study. *COPD* 2015;12(4):381-9.
- [39] Jones PW, Tabberer M, & Chen W. (2011). Creating scenarios of the impact of copd and their relationship to COPD assessment test (CATTM) scores. *BMC Pulmonary Medicine* 2011; 11: 42
- [40] Kaplan A, & Thomas M. (2017). Screening for COPD: the gap between logic and evidence. *Eur Respir Rev* 2017; 26: 160113.
- [41] Karametos I, Tsioli P, Togousidis I, Hatzoglou C, Giamouzis G & Konstantinos I .(2019). Chronic Obstructive Pulmonary Disease as a Main Factor of Premature Aging. *Int. J. Environ. Res. Public Health* 2019, 16, 540;doi:10.3390/ijerph16040540.

International Journal of Novel Research in Healthcare and Nursing

 Vol. 6, Issue 2, pp: (1280-1295), Month: May - August 2019, Available at: www.noveltyjournals.com

- [42] Katherine A. Safka MD, & R. Andrew. (2014). Non-Pharmacological Management of Chronic Obstructive Pulmonary Disease. The Ulster Medical Society. *Ulster Med J* 2014;83(1):13-21.
- [43] Kelly C .(2018). Respiratory rate 1: why accurate measurement and recording are crucial. *Nursing Times*; 114: 4, 23-24.
- [44] Lee E.N., & Kim M.J.(2019). Meta-analysis of the Effect of a Pulmonary Rehabilitation Program on Respiratory Muscle Strength in Patients with Chronic Obstructive Pulmonary Disease. *Asian Nursing Research* 13 (2019). 1-10.
- [45] Lim S, Lam DC, Muttaliif AR, et al. (2015). Impact of chronic obstructive pulmonary disease (COPD) in the Asia-Pacific region: the EPIC Asia population-based survey. *Asia Pacific Fam Med* 2015; 14: 4.
- [46] Loprinzi PD, Sng E, & Walker JF. (2016). Muscle strengthening activity associates with reduced all-cause mortality in COPD. *Chronic Illn* 2016;13:140–7.
- [47] Mayer AF, Karloh M, dos Santos K, de Araujo CLP, & Gulart AA. (2017). Effects of acute use of pursed-lips breathing during exercise in patients with COPD: a systematic review and meta-analysis. *Physiotherapy*. 2017. PMID:28969859
- [48] Mayer AF, Karloh M, Santos K, de Araujo CL, & Gulart AA.(2018). Effects of acute use of pursed-lips breathing during exercise in patients with COPD: a systematic review and meta-analysis. *Physiotherapy* 104 (2018) 9–17.
- [49] Medina-Mirapeix F, Bernabeu-Mora R, Sa ´nchez-Marti ´nez MP, Montilla-Herrador J, Bernabeu-Mora M, & Escolar-Reina P. (2018). Mobility limitations related to reduced pulmonary function among aging people with chronic obstructive pulmonary disease. *PLoS ONE* 13(5): e0196152. <https://doi.org/10.1371/journal.pone.0196152>.
- [50] Mehani, S H M. (2017). Comparative study of two different respiratory training protocols in elderly patients with chronic obstructive pulmonary disease. *Clinical interventions in aging*, 12, 1705.
- [51] Mendes LP, Moraes KS, Hoffman M, Vieira DS, Ribeiro-Samora GA, Lage SM, Britto RR, & Parreira VF.(2018). Effects of Diaphragmatic Breathing With and Without Pursed-Lips Breathing in Subjects With COPD. *Respir Care*. 2018 Aug 28. pii: respcare.06319. doi: 10.4187/respcare.06319.
- [52] Metwally, M. M., Khedr, E. M., El-shinnawy, O. M., &Shaddad, A. M. (2017). Cognitive dysfunction in chronic obstructive pulmonary disease. *Journal of Current Medical Research and Practice*, 2(1), 10.
- [53] Meysamie A.,Tae F., Mohammadi-Vajari M., YoosefiKhanghah S., Emamzadeh-Fard S., & Abbassi M.(2014).Sample size calculation on web, can we rely on the results? *Journal of Medical Statistics and Informatics*. ISSN.2053-7662. 2014. <http://www.hoajonline.com/journals/pdf/2053-7662-2-3.pdf>
- [54] Miravittles M, Worth H, Soler Cataluna JJ, et al. (2014). Observational study to characterise 24-hour COPD symptoms and their relationship with patient-reported outcomes: Results from the ASSESS study. *Respiratory Research*. 2014;15:122.
- [55] Nair A, Alaparathi GK, Krishnan S, Rai S, Anand R, Acharya V, & Acharya P.(2019). Comparison of Diaphragmatic Stretch Technique and Manual Diaphragm Release Technique on Diaphragmatic Excursion in Chronic Obstructive Pulmonary Disease: A Randomized Crossover Trial. *Pulmonary Medicine Volume*. 2019.<https://doi.org/10.1155/2019/6364376>.
- [56] Nieswiadomy R. (2012). *Foundations of Nursing Research*. (2012). 6th ed. Person prentice hall. Upper Saddle River.pp:114-1129.
- [57] Passey, M. J. Hansen, S. Bozinovski, C. F. McDonald, A. E. Holland, & R. Vlahos.(2016). “Emerging therapies for the treatment of skeletal muscle wasting in chronic obstructive pulmonary disease,” *Pharmacology& Therapeutics*,vol.166,pp.56–70,2016.
- [58] Rabe KF, & Watz H. (2017). Chronic obstructive pulmonary disease. *Lancet* 2017;389:1931–40.
- [59] Ramos M, Lamotte M, Gerlier L, Svangren P, Miquel-Cases A, & Haughney J.(2019). Cost-effectiveness of physical activity in the management of COPD patients in the UK. *International Journal of COPD* 2019;14 227–239.

- [60] Roversi S, Boschetto P, Beghe B, Schito M, Garofalo M, Stendardo M, Ruggieri V, Tonelli R, Fucili A, D'Amico R, Banchelli F, Fabbri LM, & Enrico M. (2018). Breathlessness, but not cough, suggests chronic obstructive pulmonary disease in elderly smokers with stable heart failure. *Multidisciplinary Respiratory Medicine* (2018) 13:35 . <https://doi.org/10.1186/s40248-018-0148-1>.
- [61] Ryu JY, Sunwoo YE, Lee S, et al. (2015). Chronic obstructive pulmonary disease (COPD) and vapors, gases, dusts, or fumes (VGDF): A meta-analysis. *Copd: Journal of Chronic Obstructive Pulmonary Disease*. 2015;12(4):374-380.
- [62] Sakhaei S, Sadagheyani H, Zinalpoor S, Markani A, & Motaarefi H. (2018). The Impact of Pursed-lips Breathing Maneuver on Cardiac, Respiratory, and Oxygenation Parameters in COPD Patients. *Open Access Maced J Med Sci*. 2018 Oct 25; 6(10):1851-1856. <https://doi.org/10.3889/oamjms.2018.407>.
- [63] Schayck V, & Boudewijns EA. (2017). COPD and asthma: the emergency is clear, now is the time for action. *Lancet Respir Med*. 2017;5:668-9. Medline:28822789 doi:10.1016/S2213-2600(17)30308-9
- [64] Shergis, J.L., Di, Y.M., Zhang, A.L., Vlahos, R., Helliwell, R., Ye, J.M. et al. (2014). Therapeutic potential of Panax ginseng and ginsenosides in the treatment of chronic obstructive pulmonary disease. *Complement. Ther. Med*. 22, 944–953, <https://doi.org/10.1016/j.ctim.2014.08.006>.
- [65] Shirley N, Alice YM, Wilson T & Wai S. (2016). Tai chi for chronic obstructive pulmonary disease (COPD). 2016(6).
- [66] Song S, Yang PS, Kim TH, Uhm JS, Pak HN, Lee MH, et al. (2017). Relation of chronic obstructive pulmonary disease to cardiovascular disease in the general population. *Am J Cardiol*. 2017;120:1399–404.
- [67] Soriano, J.B.; Abajobir, A.A.; Abate, K.H.; Abera, S.F.; Agrawal, A.; Ahmed, M.B.; Aichour, A.N.; Aichour, I.; Aichour, M.T.E.; Alam, K.; et al. (2017). Global, regional, and national deaths, prevalence, disability-adjusted life years, and years lived with disability for chronic obstructive pulmonary disease and asthma, 1990–2015: A systematic analysis for the Global Burden of Disease Study 2015. *Lancet Respir. Med*. 2017, 5, 691–706.
- [68] Sundh J, Johansson G, Larsson K, et al. (2015). The phenotype of concurrent chronic bronchitis and frequent exacerbations in patients with severe COPD attending Swedish secondary care units. *Int J Chron Obstruct Pulmon Dis* 2015; 10: 2327–2334.
- [69] Tabari F, Razi SH, Gharabaghi M A, Torabi S, Mehran A, Mohamadinejad F, Amini F, Abbaszadeh R, & Zivlari M R. (2018). Effect of education based on family-centered empowerment model on the quality of life of elderly patients with chronic obstructive pulmonary disease (COPD). *Medical Science*, 2018, 22(91), 301-311.
- [70] Tageldin MA, Nafti S, Khan JA, et al.(2012). Distribution of COPD-related symptoms in the Middle East and North Africa: results of the BREATHE study. *Respir Med*. 2012;106 (Suppl 2):S25–S32.
- [71] Tényi Á, Vela E, Cano I, et al.(2018). Risk and temporal order of disease diagnosis of comorbidities in patients with COPD: a population health perspective. *BMJ Open Resp Res* 2018;5:e000302. doi:10.1136/bmjresp-2018-000302.
- [72] Vanfleteren, L.E.; Spruit, M.A.; Wouters, E.F., & Franssen, F.M. (2016). Management of chronic obstructive pulmonary disease beyond the lungs. *Lancet Respir. Med*. 2016, 4, 911–924.
- [73] Vieira RH, Nogueira ID, Queiroz NF, Cunha TM, Araújo ZT, Vieira WH, & Nogueira PA. (2018). Peripheral and respiratory muscle strength in chronic obstructive pulmonary disease. *Rev Bras Cineantropom Desempenho Hum* 2018, 20(2):125-133
- [74] Viniol C, & Vogelmeier CF. (2018). Exacerbations of COPD. *Eur Respir Rev* 2018; 27: 170103[<https://doi.org/10.1183/16000617.0103-2017>].
- [75] Vogelmeier CF, Criner GJ, Martinez FJ, Anzueto A, Barnes PJ, Bourbeau J, et al. (2017). Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Lung Disease 2017 Report. GOLD Executive Summary. *Am J Respir Crit Care Med* 2017;195(5):557-582.

- [76] Wade LM. (2017). A Pilot Study of Pursed-Lip Breathing, Singing, and Kazoo Playing on Lung Function and Perceived Exertion of Participants Who Smoke: University of Kansas, 2017.
- [77] Wang C, Xu J, & Yang L. (2018). Prevalence and risk factors of chronic obstructive pulmonary disease in China (the China Pulmonary Health [CPH] study): a national cross-sectional study. *Lancet* 2018; 391: 1706–1717.
- [78] Wheatley I. (2018). Respiratory rate 3: how to take an accurate measurement. *Nursing Times* [online] 114; 7, 21-22.
- [79] World Health Organization. (2006). 'BMI classification'. Global database on body mass index. Available at http://apps.who.int/bmi/index.jsp?introPage=intro_3.html. [Accessed at March 2019].
- [80] World Health Organization. WHO. (2015). Global report on trends in prevalence of tobacco smoking 2015. Geneva: World Health Organization; 2015.
- [81] WHO. (2016). Chronic Obstructive Pulmonary Disease. World Health Organization; 2016. Available from: <http://www.who.int/mediacentre/factsheets/fs315/en/index.html>.
- [82] World Health Organization. (2017). Burden of COPD; Available from: <http://www.who.int/respiratory/copd/burden/en/>.
- [83] World Health Organization. (2018). Air pollution. www.who.int/airpollution/en/ Date last accessed: May 2, 2018.
- [84] Yazdi M, Kelly SM, Lam SY, Marin M, Barbeau M, et al. (2018). The burden of illness in patients with moderate to severe chronic obstructive pulmonary disease in Canada. *Can Respir J* 19(5): 319-24.
- [85] Zhang J, Zheng J, Huang K, Chen Y, Yang J & Yao W. (2018). Use of glucocorticoids in patients with COPD exacerbations in China: a retrospective observational study. *Ther Adv Respir Dis* 2018, Vol. 12: 1–7. DOI: 10.1177/1753466618769514.