Effect of Acupressure versus Pursed Lip Breathing Intervention on Dyspnea and Pulmonary Function among Chronic Obstructive Pulmonary Disease Patients

Nagla Hamdi Kamal Khalil[1], Fatma Abdel Halim Mostafa Ahmed[2], Wafaa Mohamed Elsayed Ahmed[3], Manal Ibrahem Abd El Fatah Yassen[4], Hoda Ahmed Hussein Ahmed [5]

1Medical-Surgical Nursing Department, Faculty of Nursing, Alexandria University
2Medical Surgical Nursing, Faculty of Nursing, Mansoura University
3Medical-Surgical Nursing, Misr University of Science and technology
4Medical-Surgical Nursing Department, Faculty of Nursing, Beni-Suef University
5Medical Surgical Nursing, Modern University for Technology and Information

Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a progressive respiratory illness that is a leading cause of morbidity and mortality globally. It has a considerable impact on the patient's capacity to work and quality of life. Dyspnea is one of the most common health issues among those suffering from chronic obstructive pulmonary disease. **The study** aimed to compare the effect of acupressure versus pursed-lip breathing intervention on dyspnea and pulmonary function among chronic obstructive pulmonary disease patients. **Design:** This study was carried out using a quasi-experimental design. **Sample**: A purposive sample of 100 adult patients was selected and divided into two groups, one for acupressure (n=50) and the other for pursed-lip breathing (n=50). **Setting**: The study was conducted in the Inpatient chest Unit at Beni-Suef University Hospital. **Tools of data collection** included (1) Patient's demographic questionnaire, (2) Measurement of pulmonary function tests sheet, (3) Measurement of the sensation of breathlessness (dyspnea) by Dyspnea index, (4) The 3-min step test, and (5) Assessment of health status in chronic obstructive pulmonary disease patient questionnaire. **Results:** It was discovered that, as compared to pre-intervention, there was a significant improvement and increase in forced vital capacity FVC, forced expiratory volume in one second FEV 1, and FEV1 /FVC. More than the acupressure group, the dyspnea index decreased after pursed-lip breathing. The CAT score questionnaire improved both before and after the intervention. Pre and post 3min step test post-intervention, the dyspnea index was much lower. **Conclusion**: Pursued-lip breathing was found to be beneficial in alleviating dyspnea in COPD patients, but acupressure had just a little effect. The COPD Assessment Test Questionnaire (CAT) score questionnaire, as well as the Dyspnea index in COPD patients, improved. **Recommendation**: Applying pursed-lip breathing intervention is recommended to control dyspnea and improve ventilatory functions among COPD patients.

Keywords: Acupressure, Pursed-lip breathing, Dyspnea, Pulmonary functions, Chronic obstructive pulmonary disease.

Introduction

Around the world, chronic obstructive pulmonary disease (COPD) is a leading cause of illness and mortality. COPD exacerbations (regular worsening of cough, dyspnea, and sputum production) are a major factor in decreasing lung function, reduced quality of life, the need for urgent care or hospitalization, and increased healthcare costs. Dyspnea is a multifaceted, subjective ailment that can have a big impact on a patient's quality of life **(Prevention of Acute Exacerbations of COPD, 2018)**. In 2017, chronic obstructive pulmonary disease (COPD) claimed the lives of nearly 3.2 million people over the world, a rise of 17.5 percent from 2007. It's because of prolonged exposure to risk factors, including smoking, as well as an aging population (**HALPIN et al., 2019**).

In the final year of life, COPD patients often feel severe dyspnea. It's more common as the disease progresses, with 90-95 percent of COPD sufferers having it by the end **(Belman et al., 2017**). Dyspnea is the most prevalent and debilitating symptom of chronic obstructive pulmonary disease (COPD), and it is the

predominant symptom that limits physical activity in more advanced disorders. Its severity and amplitude grow as the underlying disease advances, resulting in significant disability. Dyspnea has a significant impact on the quality of life (QoL) of patients with severe COPD, to the point where they feel isolated and describe themselves as 'existing' rather than 'living. (**Dorman et al., 2017**)

Panic episodes can lead to a lack of physical activity, deconditioning, a decrease in functional status, a decrease in quality of life, as well as disability and anxiety in COPD patients (**Miravitlles et al., 2019**). A range of pharmacological and non-pharmacological therapies can be used to treat dyspnea (**Bianchi et al., 2017**). Non-pharmacological interventions such as oxygen masks and pursed-lip breathing training can assist modify the emotional and cognitive experience of dyspnea.

In the clinical setting, no pharmaceutical interventions that affect the emotional and/or cognitive experience of dyspnea, such as acupressure and breathing training, may help relieve breathlessness. In traditional Chinese medicine, acupressure is one of the most common therapeutic modalities. It is a supplementary treatment that stimulates acupoints with the fingers and palms while maintaining energy balance (**Rocker et al., 2017**). Techniques like pursed lips breathing (PLB), which tries to prolong active expiration by constricting the lips, can be used in breathing training. PLB has been demonstrated to reduce respiratory rate and dyspnea while also improving tidal volume and oxygenation at rest when compared to spontaneous breathing (**Edmonds et al., 2015).**

Pursed Lip Breathing (PLB) is a useful strategy for reducing COPD symptoms, increasing activity tolerance, increasing oxygen saturation, and improving ventilation and gas exchange. Minutes of ventilation was increased, tidal volume was increased, and functional lung capacity was optimized, resulting in these improvements. As a result, pursed-lip breathing has been found to improve lung emptying **(Hariyono et al., 2017).**

Significance of the study:

Globally, chronic obstructive pulmonary disease (COPD) is a primary cause of illness and mortality. COPD is the third greatest cause of death in the world, accounting for 5% of all fatalities. It is anticipated that 64 million people worldwide will get COPD by 2030 **(Soriano et al., 2017; De & Padilla, 2017).** COPD was shown to be prevalent in high-risk Egyptians at 9.6%. COPD in grades 2 and 3 is more common (69 percent and 17 percent, respectively), while grade 1 is less common (3 percent). As a result, raising COPD knowledge in the general public, particularly among high-risk persons, can help with the early detection of the condition (**Said et al., 2015)**.

Pursed Lip Breathing (PLB) is an excellent technique that decreases dyspnea in COPD and improves ventilation (**Hariyono et al., 2017)**. Chronic obstructive pulmonary disease is preventable and can be treated by a variety of pharmacological and non-pharmacological methods. Hence, the researchers conducted the study to compare the effect of acupressure versus pursed-lip breathing implementation on dyspnea and ventilatory functions among chronic obstructive pulmonary disease patients.

Aim of the study:

To compare the effect of acupressure versus pursed-lip breathing intervention on dyspnea and pulmonary function among chronic obstructive pulmonary disease patients

Hypothesis

Adult patients who are receiving pursed-lip breathing will have a lower grade of dyspnea and an increase in pulmonary functions than those who receive acupressure techniques.

Subjects and Methods:

Research design:

The quasi-experimental research design was utilized to achieve the aim of the present study. Quasi-experimental research is used in the study in which patients are selected into some different treatment groups to compare the real effectiveness and safety of non-randomized treatments **(Maciejewski, 2020).**

Settings:

The research was carried out at Beni-Suef University Hospital in the inpatient chest department. There are 40 beds for male patients and 26 beds for female patients in the inpatient chest department. A lab for pulmonary function tests is located in the chest department. These settings were chosen because they have a high frequency of patients and they serve the largest portion of the population from both rural and urban locations.

Subjects:

Based on the Epi info7 program, which was used to estimate the sample size using the following parameters, a purposive sample of 100 adult patients with COPD were selected. The total population at the aforementioned hospital in 2017 was 271 people, with an expected frequency of 90%, an accepted error of 10%, a confidence coefficient of 95%, and an estimated sample size of 100 COPD patients.

They were divided into two equal groups of 50 adult patients each, which were assigned at random and alternately.

• Pursed lip breathing exercises are introduced to the study group (A).

• Acupressure sessions are given to the control group (B).

Inclusions criteria included:

- Adult patients agree and can communicate.
- Grade C of COPD stages

Tools for data collection:

Tool I: The patient's demographic questionnaire was developed by the researchers after reviewing the related literature and research studies **(Prevention of Acute Exacerbations of COPD, 2018; Global Initiative for Chronic Obstructive Lung Disease, 2019),** it included age, sex, educational level, occupation, and residence.

Tool II: Measurement of pulmonary function tests sheet:

Pre and post-intervention pulmonary function tests were measured using a spirometer to determine forced vital capacity (FVC) and forced expiratory volume in one second (FEV 1) (a Jaeger Vyntus IOS spirometer was used).

Tool III: Measurement of the sensation of breathlessness (dyspnea) by: Dyspnea index (fifteen-count breathlessness score): The patient was asked to take a deep first breath and count from 1 to 15 in around 8 seconds, with the therapist counting how many breaths the patient took in between (**Steinhorn, 2018**). When the patient was at rest and immediately after the 3-minute step test, this index was calculated.

Tool IV: The 3-min step test: The patient was asked to step up and down a single step which was 20cm high 22cm in depth. The stepping rate was between 14 and 16 steps per min for 3min (**Borel et al., 2016**).

Tool V: Assessment of health status in COPD patient by: COPD Assessment Test Questionnaire. The CAT Questionnaire has eight items with values ranging from 0 to 5, for a total score of 0 to 40 (**POS-GRADUAAO, 2018**). The higher the score means the more serious the condition. Pre-intervention and post-intervention scores were recorded, and changes in the score were calculated using statistical analysis.

Scoring:

Range of CAT scores from 0–40. Higher scores denote a more severe impact of COPD on a patient's life. The difference between stable and exacerbation patients was five units. No target score represents the best achievable outcome.

Validity of the tools:

Tools were submitted to five experts professors, two professors in the field of chest diseases, and three in medical-surgical nursing to test for face validity and the necessary modifications were carried out**.**

Reliability of the tools:

The reliability of tools was tested using Cronbach's alpha. The reliability coefficient for tool II was (0.92), tool III was (0.87), tool IV was (0.88), and tool V was (0.84), which means all tools were reliable.

Methods:

Before the conduction of the study, an official letter from the Faculty of Nursing was submitted to the general director of Beni-Suef University Hospital and to the Head of the

above-mentioned hospital for obtaining permission to carry out the study after a complete explanation of the study aim.

Pilot Study:

A pilot study was conducted before the actual study and was done on 10% of the sample (10 patients to test the feasibility and applicability of different items of the tool to establish the most practical and comprehensive way of obtaining necessary data. Pilot study results were excluded from the actual study.

Data collection procedures:

- After receiving administrative approval, data collecting began in early March 2021 and lasted for three months, from early March to the end of June 2021. Three days a week, from 9 a.m. to 1 p.m., researchers gathered data in the previously mentioned setting.
- Implementation of the study was carried out through four phases (assessment, planning phase, implementation phase, and evaluation phase).

Assessment Phase:

Initial assessment: was carried out to collect baseline data for both groups using the tool I, II, III, IV, and V. It was done one-month post sessions for both groups to compare the effect of acupressure versus pursed-lip breathing implementation on dyspnea and pulmonary function among chronic obstructive pulmonary disease patients.

II. Planning phase:

The researchers established the acupressure and pursed-lip breathing interventions aims, priorities, contents, and expected effects based on the data acquired during the assessment phase and literature study.

Goals and expected outcome of the intervention:

- The practice of acupressure sessions.
- The practice of pursed-lip breathing exercise.
- Decreasing grade of dyspnea.

III. Implementation phase:

- The acupressure or pursed-lip breathing exercise interventions were applied individually for each patient in a separate room at the waiting hall at the previously selected setting. Patients were divided into two groups (A &B).
- In group (A) which demonstrated acupressure, patients were asked to repeat acupressure and PLB techniques until the researcher was assured that the patient had gained the skills.
- Acupressure includes stimulating key points along the body's meridians called acupoints, using finger massage in a circular movement, in a clockwise direction at six acupoints (LU1, LU7, LU9, LI 4, LI11, and K 3) as shown in, to stimulate the flow of energy and correct any imbalances. Acupressure session repeated 3 times /week.

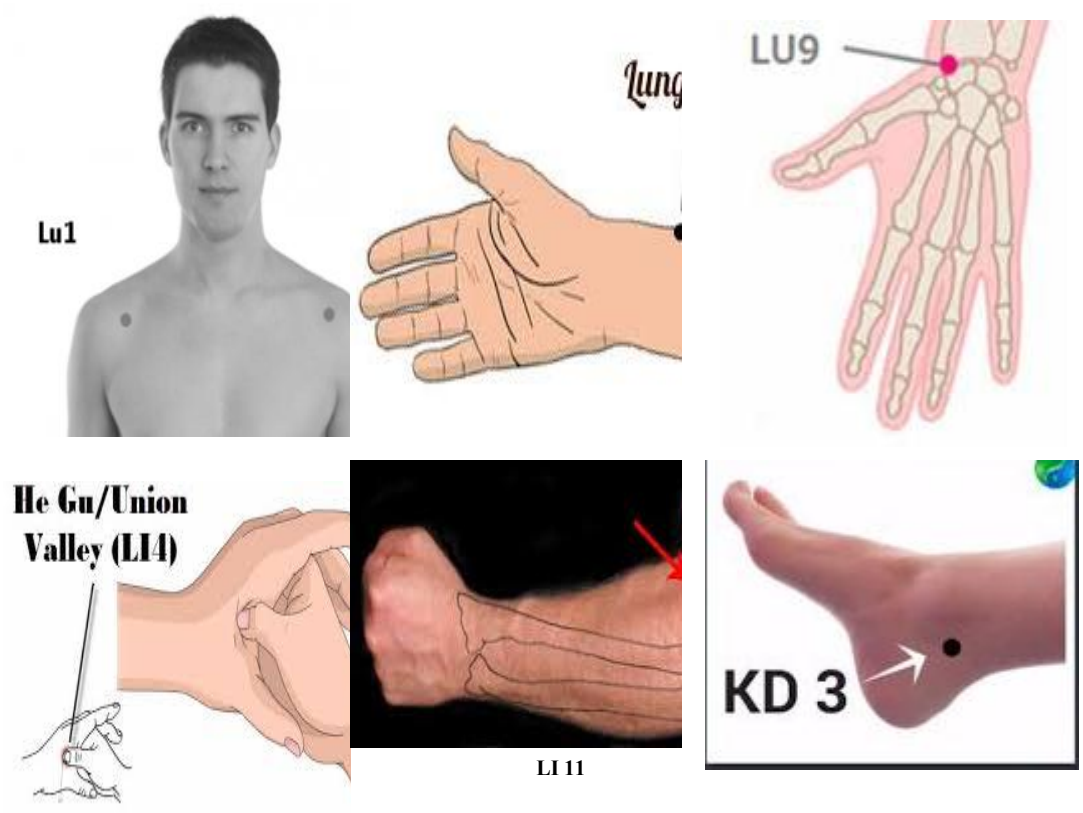

Figure No (1) Acupressure points used in this study (Lee & Frazier, 2011)

- Patients in group (B) who practiced pursed-lip breathing were encouraged to lie down in a comfortable position before relaxing their neck and shoulder muscles. Then, while keeping his mouth closed, slowly inhale via his nose for two counts. The patients were instructed to hold their breath for three minutes and pucker or purse their lips as if trying to whistle or gently flicker a candle flame. Then, while counting to four, slowly and gently exhale through your pursed lips.
- Patients were asked to repeat pursed-lip breathing implementation until the researchers were assured that the patient had gained full skills.
- In the pursed-lip breathing group, the patients were instructed to begin with calm breathing for 3 repetitions and 5 seconds of rest, then diaphragmatic breathing for 3 repetitions, 10 seconds of rest, and then pursed-lip breathing for 8 repetitions (with 5-second rest between every 4 repetitions of PLB). During the first week, the patient did 3-4 sets every session with a one-minute rest between each set, with the number of sets gradually increasing until it reached 4 sets by the end of the week (**Ealias & Babu, 2016**).

Evaluation phase:

- Every adult patient in both groups follow-up was re-evaluated after one month to compare the effect of acupressure versus pursed-lip breathing implementation on dyspnea and pulmonary function among chronic obstructive pulmonary disease patients using the same pretest study tools (II, III, IV, and IIV).

Ethical considerations:

Written informed consent was obtained from each adult patient after explaining the aim of the study. Privacy and confidentiality for each adult patient were assured. The patient has the right to be withdrawn at any time from research participation.

Statistical analysis

After the data was collected, it was transferred into specifically designed formats that could be fed into a computer. Statistical Package for Social Sciences was used to process and analyze the data (SPSS ver.18). Descriptive statistics are those that describe something. The mean, median, and standard deviation are terms that are used to describe and summarized a quantitative value. Quantitative variables are described and summarized using counts (numbers) and percentages from the total. Statistical analysis: Cronbach's Alpha is a test of reliability. It was used to assess the trustworthiness of all tools. It has a maximum value of (1.0) and a minimum accepted value of (0.7); below this level, the instrument is unreliable. The Mann-Whitney U test for quantitative variables and chi-square, Monte Carlo tests for qualitative factors were used to compare the two groups. All results were interpreted at a 5% level of significance (P-value is considered statistically significant if was P≤0.05).

Result:

Table (1) revealed that more than half (58% and 54%) of the adult patients in the Acupressure group and PLB group aged from 50 to less than 55 years old respectively. The vast majority of patients (94%) in the acupressure group and 98% in the PLB group were males. Concerning the education level, it was observed that (46%) of the adult patients were read and write in the acupressure group and 46% in the PLB group. Regarding occupation, it was noticed that the vast majority of adult patients (94% and 98%) had manual work in the Acupressure and PLB groups' respectively. There was no statistically significant difference regarding all items of demographic characteristics.

Table (2): Illustrated that in pre-intervention, there was no significant difference in FEV 1, FVC, FEV1 /FVC, or CAT between the two groups (p>0.05). In the BLP and Acupressure groups, there was a significant increase in FEV1, FVC, and FEV1 /FVC post-intervention compared to pre-intervention (p<0.001).

Table (3) showed that pre-intervention, there was no significant difference in CAT total score between the two groups (p>0.05). There was a significant drop in CAT total score post-intervention compared to pre-intervention in the BLP group, but not in the Acupressure group (p < 0.001), indicating that BLP intervention had a favorable effect.

Table (4): Portrayed that there was no significant difference in mean value dyspnea index between pre and post 3 minutes between both groups pre-intervention (p>0.05). There was a significant decrease in mean value dyspnea index between pre and post 3 minutes post-intervention in the BLP group was less than in the acupressure group compared with that pre-intervention (p<0.001).

Table (1): Distribution of adult patients with COPD in both study groups concerning their demographic data

Demographic data	Acupressure group A (n=50)		PLB group B (n=50)		X2	P
	No.	%	No.	%		
Age						
50-< 55	29	58	27	54		1.450
55- ≤ 60	21	42	23	46	1.063	
Gender						
					1.033	1.340
Male	47	94%	49	98%		
Female	3	6%	1	2%		
Educational level						
Illiterate	20	40%	17	34%		1.443
Read &write	23	46%	23	46%	1.055	
Primary education	4	8%	6	12%		
Secondary education	3	6%	4	8%		
Occupation						
Housewife	3	6 %	1	2%	1.027	0.553
Manual work	47	94%	49	98%		

Table (2): Mean values of FEV 1, FVC, FEV1 / and FVC pre and post-interventions in PLB group and acupressure group

Items	PLB group (n=50) Mean+SD	Acupressure group (n=50) Mean+SD	T-test	P
FEV1 (L):				
Pre-intervention	1.53±0.33	1.48±0.37	2.12	0.02*
Post-intervention	2.04±0.5	1.73±0.33		
FVC (L):				
Pre-intervention	2.54±0.43	2.55±0.36	8.28	0.001*
Post-intervention	3.16±0.45	3 ±0.31		
FEV1/FVC (%):				
Pre-intervention	52.81±8.74	53.9±10.17	7.42	0.001*
Post-intervention	63.16±8.5	58.66±12.44		

****highly significance at 0.001 levels**

Table (3): Mean values of CAT pre and post-interventions in PLB group and acupressure group

CAT	PLB group (n=50) Mean+SD	Acupressure group (n=50) Mean+SD	T-test	P
CAT:				
Pre-intervention	32.53±4.30	33.27±3.09	16.45	0.001*
Post-intervention	12.74±4.08	17.69±8.1		

****highly significance at 0.001 levels**

Table (4): Mean values of dyspnea index pre and post-interventions in the BLP group and acupressure group

Dyspnea index	PLB group (n=50) Mean+SD	Acupressure group (n=50) Mean+SD	T-test	P
Dyspnea index pre 3 minutes intervention:				
Pre-intervention	2	2	4.87	0.001*
Post-intervention	0	1		
Dyspnea index post 3 minutes intervention:				
Pre-intervention	3	3	4.89	0.001*
Post-intervention	1	2		

****highly significance at 0.001 levels**

Discussion

Chronic obstructive pulmonary disease COPD is a group of disorders with a variety of causes, processes, and physiological effects. It is a sickness that may be avoided and managed (**Mirza et al., 2018**). Plunged lips breathing (PLB) is a ventilatory method commonly used by adult patients diagnosed with chronic obstructive pulmonary disease (COPD) to reduce dyspnea. These treatments were found to improve ventilatory function and decrease dyspnea.

The vast majority of patients in both the acupressure and the PLB groups were males, according to the findings of the current study. This finding is consistent with **Al Ghobain, et al., (2017),** who investigated the "Prevalence of chronic obstructive pulmonary disease among smokers attending primary healthcare clinics" in Saudi Arabia and discovered that men were twice as likely to be affected as women. According to the Global Initiative for Chronic Obstructive Lung Disease (**Global Initiative for Chronic Obstructive Lung Disease, 2019)**, COPD affects men and women about equally. This high percentage of male gender was ascribed to their smoking, according to the experts.

Concerning education, the current study found that in both the acupressure and the PLB groups, less than half of the adult patients could read and write. Low educational levels were identified to be a risk factor for COPD, according to the **(National Clinical Guideline Centre, 2018**). A study in Malopolska by

Nizankowska-Mogilnicka, Mejza, and Buist (2017) found that a poor level of education is connected to a higher prevalence of COPD.

The current study discovered that in the acupressure and PLB groups, there was a significant increase in FEV 1, FVC, and FEV1 /FVC post-intervention compared to pre-intervention ($p<0.001$). **Sadei et al., (2019**) discovered that breathing strategies such as pursed-lip breathing and diaphragmatic breathing have a substantial increase in FEV1 /FVC values in a study titled "Efficacy of Pulmonary Exercises in Chronic Obstructive Pulmonary Disease."

The findings of the current study illustrated that a significant decrease in CAT was found post-intervention compared with that pre-intervention in the acupressure group and the PLB group ($p <0.001$). This reflected the positive effects of acupressure and PLB in improving ventilatory functions and decreasing dyspnea. This result comes in agreement with the study done by **Smid et al., (2017)** about "Responsiveness and MCID estimates for CAT, CQC, and HADS in patients with COPD undergoing pulmonary rehabilitation" and found that PLB has a positive effect and improving the CAT score.

Lin et al. (2019) investigated the "Effects of breathing exercises utilizing home-based positive pressure in the expiratory phase in patients with COPD" and displayed that using PLB helped patients with severe COPD improve their CAT score and overall health.

Furthermore, **Shivangi et al. (2018**) showed that PLB can be used to improve ventilatory functions and decrease dyspnea as an alternative to pursed-lip breathing in a study entitled "Effect of Pursed Lip Breathing on Dyspnea in Healthy Individuals."

The current study found that in the BLP and acupressure groups, there was a significant decrease in dyspnea index between pre and post 3 minutes post-intervention compared to pre-intervention ($P=0.001$). According to the researchers, this is related to the importance of PLB intervention and implies that PLB intervention was more successful than acupressure intervention in reducing dyspnea among adult COPD patients.

This finding is confirmed by a study conducted by **Maind et al., (2018**), which compared the effects of pursed-lip breathing and mouth taping on dyspnea and emphasized that PLB was beneficial in improving post-test dyspnea status and vital metrics.

Sari (2016), who investigated the effect of self-efficacy on lip breathing to reduce tightness and improve oxygen saturation in COPD patients, reported that PLB generates a statistically significant improvement in reducing dyspnea.

Similarly, in a study titled "Reactivation of the parasympathetic System with pursed lips after physical exercise," **Garzón (2017)** discovered that PLB reduces RR and increases SpO2 and that using PLB can relieve dyspnea while exercising. The data support the benefits of pursed-lip breathing in the therapy of dyspnea in the individual patient with advanced COPD, according to **Maind et al., (2018**), who conducted "Comparison between The Effect of Pursed-Lip Breathing and Mouth Taping on Dyspnea". According to patients, there is a reduction in the severity of dyspnea after PLB as a result of PLB training and practice. From the researchers' point of view, this is attributed to the importance of PLB intervention and implies that PLB intervention is more successful than acupressure intervention to decrease the grade of dyspnea among patients with COPD.

The findings of this study are also supported by a study carried out by **Sachdeva et al., (2018)** entitled "Effectiveness of Pursed Lip Breathing Versus Mouth Mask on Dyspnea and Functional Capacity in Acute Exacerbation of Chronic Obstructive Pulmonary Disease," which indicated that pursed-lip breathing relieved dyspnea significantly better than mouth mask. Similarly, **Maind et al., (2018**) showed that PLB was successful in enhancing the reaction to post-test dyspnea status and vital measures in a study comparing the effects of pursed-lip breathing and mouth taping on dyspnea.

Conclusion:

Based on the findings and hypothesis of the current study, it was concluded that pursued-lip breathing was found to be beneficial in alleviating dyspnea in COPD patients, but acupressure had just a little effect. The COPD Assessment Test Questionnaire (CAT) score

questionnaire as well as the Dyspnea index in COPD patients improved.

Recommendation:

In light of the current study results, the following recommendations are proposed:

• Nurses must understand the value of demonstrating and demonstrating pursed-lip breathing to reduce the severity of dyspnea.

• All nurses should receive training on how to use pursed-lip breathing.

• All patients should be given a training program to encourage them to use pursed-lip breathing.

• Future research should include a large-scale replication of the current trial.

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