

The Effect of Walking Exercise and Pursed Lips Breathing on Signs and Symptoms of COPD Patients: A Systematic Review

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Abstract: World Health Organization (WHO) at Global Status of Non-communicable diseases in 2015 explained that COPD is the 4th largest non-communicable disease in the world. Dyspnea, increased respiratory rate, decreased oxygen saturation and activity intolerance are typical symptoms in COPD patients. These symptoms correlate to pulmonary function abnormalities such as impairment of FEV1 and FEV1/FVC. The condition of the patients will become worse if they don't get therapy and rehabilitation. The purpose of this systematic review was to identify research about the effect of walking exercise and pursed lips breathing to clinical symptoms, lung function, and exercise tolerance of COPD patients. Search articles through database: Pro quest, Scopus, Science Direct, and EBSCO published between 2007 -2017. There are sixteen research journals. Based on the search results, found 43 journals. After being selected according to the inclusion criteria, 16 journals have been reviewed. Eleven journals used pursed lips breathing intervention, while 5 journals on walking exercise intervention in COPD patients. The application of walking exercise and pursed lips breathing improved symptoms, lung function, and exercise tolerance in COPD patients. We suggest to do further research with larger sample quantities, increase exercise frequency and the need for further monitoring.

1 INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a pulmonary disease that can lead to exacerbations and progressive life-threatening (GOLD, 2017). Chronic Obstructive Pulmonary Disease (COPD) is a chronic lung disease that causes the limitation of air flow in the lung causing interference with the lung function. Decreased lung function occurs due to chronic inflammatory changes in the proximal, peripheral and pulmonary vascular channels. This condition results in decreased ventilation function in the lung, and the patient will experience an increase in breathing frequency with expiratory length (Black and Hawks, 2014).

World Health Organization (WHO) in Global Status of Non-communicable Diseases 2015 explains that COPD is the fourth major non-communicable disease in the world that has high mortality after ischemic heart disease, stroke and lung cancer. Globally, an estimated 3 million deaths are caused by this disease in 2015 ie, 5% of all deaths worldwide in that year. More than 90% of

COPD deaths occur in developing countries with a weak economic level (WHO, 2017).

Shortness of breath and activity intolerance are major complaints in COPD patients. The shortness of breath in COPD patients is progressive, irreversible, and lowers tolerance in activity. The presence of inflammation, fibrosis, and luminal exudate in the respiratory tract associated with decreased FEV1 and FEV1/FVC ratios. Decreased FEV1 is a characteristic symptom of COPD, peripheral respiratory tract obstruction causes air trapped and leads to hyperinflation. Hyperinflation reduces the inspiratory capacity of functional residual capacity, especially during exercise (dynamic hyperinflation), seen as dyspnea and limited exercise capacity. Hyperinflation that develops early in the disease is the main mechanism of the onset of dyspnea (GOLD, 2017).

Pulmonary function in patients with COPD will get worse if the therapy and rehabilitation are not well done. COPD patients will experience an exacerbation and result in respiratory failure. Patients will also experience complications of heart function abnormalities. Therefore, it requires the

management of therapy and treatment of complex rehabilitation in order to improve the lung function of COPD patients. Rehabilitation therapy for COPD patients that can be applied to improve lung function is to control breathing Pursued Lips Breathing (PLB). Pursued Lips Breathing (PLB) is a ventilation maneuver technique by pursing lips during expiration (Spahija et al., 2010). Breathing exercises are performed to get better breathing arrangements from quicker and shallower breathing to slower and deeper breathing. The purpose of this exercise is to reduce and control shortness of breath.

Another therapy that can be done for the rehabilitation of COPD patients is by doing light exercise. Mild exercise gradually in COPD patients can improve exercise tolerance, as well as decrease dyspnea and fatigue. One form of mild exercise recommended for activity therapy is walking exercise. The purpose of this study was to conduct a systematic review of walking exercise and pursed lips breathing on clinical symptoms, lung function, and exercise tolerance of COPD patients.

2 METHODS

In this study, the authors identified the journal publication of research results on the use of walking exercise and Pursued Lips Breathing in patients with COPD. The results of this systematic review is expected to be applied to health services, especially nursing. This systematic review is presented in the form of article consisting of; abstract, introduction, method, result and discussion, conclusion, and bibliography.

Search articles using PICOT framework (Population: COPD patient in criteria of GOLD I, II, III, and IV with stable condition, Intervention: Pursued Lips Breathing and walking exercise, Control: -, Outcome: Clinical symptoms, Pulmonary function, and Exercise Tolerance, Time: 2007 - 2017, based on the keywords determination of walking exercise, pursed lips breathing, and COPD. No other restrictions were used to maximize literature search. Database search results; Ebscho, Science Direct, Elsevier, Sage Journals, Scopus, ProQuest, Pub Med, limited range of 10 years 2007 to 2017 got 43 journals and after further reading, 16 International Journals were chosen to be reviewed.

The literature inclusion criteria was quantitative research on the use of walking exercise and pursed lips breathing on clinical symptoms, lung function, and exercise tolerance of COPD patients with a 10 year limitation (2007-2017). Quantitative research should meet the criteria of PICOT. The population

used was the COPD patients with the criteria of GOLD I, II, III, and IV. The patients were stable and were not undergoing an acute exacerbation. Intervention used in the form of walking exercise or pursed lips breathing. Comparison in this study consisted of at least 1 group of intervention groups or groups of placebo and intervention, outcomes produced were clinical symptoms, pulmonary function, and exercise tolerance. All studies used English. From all journals, there were 43 journals and after further election 16 International Journals were chosen to be reviewed.

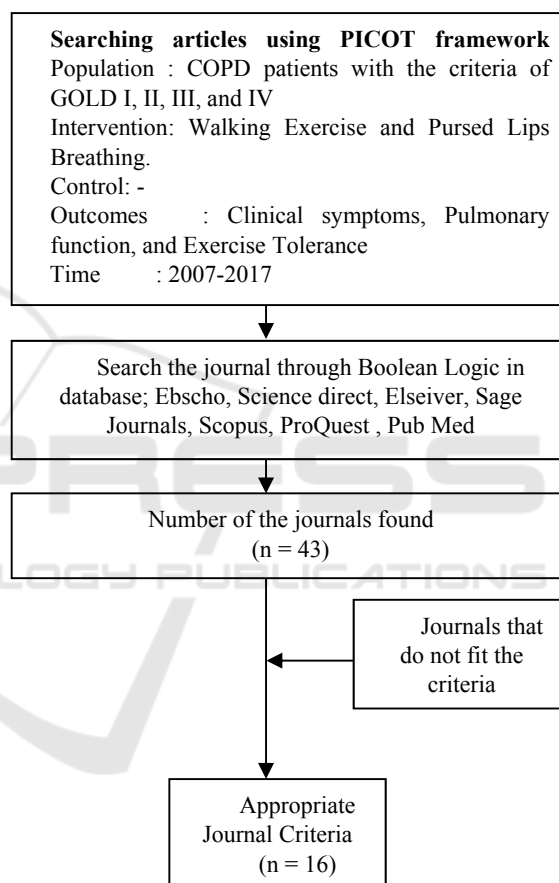


Figure 1: Searching Strategy

3 RESULTS

Based on the results review of 16 journals, the data were collected from United Nation of America for 2 journals, Canada for 2 journals, North Korea for 1 journal, Italia for 1 journal, Brazil for 3 journals, India for 1 journal, Netherlands for 3 journals, Germany for 1 journal, and Sweden for 1 journal. Total of all respondents in the literature were 539 respondents. The research design consisted of 5

journals with Randomized control trial, 9 journals Randomized cross over study and 2 journals cross sectional study.

Based on 16 journals reviewed, there were 5 journals using walking exercise and 11 journals using pursed lips breathing in patients with COPD. Pursed Lips breathing is a breathing technique for breathing for 2 seconds through the nose with the mouth closed, then slowly releasing air for 4-6 seconds with a conical mouth (Bhatt *et al.*, 2013). Respiratory technique is done by various methods. There were 6 journals that apply pursed lips breathing during exercise. 6 journals applied the PLB when the patient is rested and relaxes with duration of 10 minutes. 1 journal applied PLB at the time of recovery after light exercise. 1 journal applied PLB with a combination of mouth taping, and 1 journal applied PLB in 3 different positions i.e. PLB applied with neutral sitting position, arm support position, or arm and head support position.

From the results of those journals' review, walking exercise was applied with several methods. Research conducted by Gagnon, P., *et al.*, applied walking exercises by performing a warm-up phase for 90 seconds, followed by a casual walking exercise in open areas and flat floors. The walk was 10 meters (Gagnon *et al.*, 2012).

Research conducted by Roos, P., *et al.* applied exercise training and home base walking program for 10 weeks. Exercise training was carried out by applying treadmill and cycling program for 10 minutes and the patient was educated to apply home based walking exercise at least 30 minutes per session, at least once a week, and exercise time was added 5 minutes per week (de Roos *et al.*, 2017).

Research conducted by Dreher, M., *et al.*, applied 6 MWT and Stair-climbing in the hospital area (Dreher *et al.*, 2008). This is similar to a study conducted by Vaes, Anouk., Et al., which implemented 6 MWT by comparing walking with a collar and modern drainage (Vaes *et al.*, 2012). Research conducted by Leung, Regina W. M. *et al.*, applied walking exercise at the hospital for 8 weeks. The exercise performed 3 times per week with exercise duration of 30 to 45 minutes per session (Leung *et al.*, 2010).

The clinical symptoms analyzed by this systematic review consisted of dyspnea, respiratory rate (RR), and oxygen saturation (SaO₂). RR measurements were done manually, whereas to assess oxygen saturation using pulse ox-meter. Measurement of dyspnea was by using instrument in the form of questionnaire. There were 2 journals that assessed dyspnea with Visual Analog Scale (VAS), 3 journals with mMRC Dyspnea Scale, 6 Journals with Borg Scale dyspnea, 1 journal with BDI Scale, and 1 journal with Chronic Respiratory Disease

Questionnaire Dyspnea Scale. Pulmonary function in the results of the study was measured using a spirometer.

There were several measurements to measure the exercise tolerance of COPD patients i.e. 2 journals using 6 MWD test, 2 journals with Endurance Shuttle Walking Test, 1 journal with 6 MWT test, 1 journal with walking test treadmill, 1 journal with physical function scale, 1 journal with ISWT, 1 journal with ESWT and 1 journal with Personal Activity Monitor (PAM).

The results of the journal analysis showed that walking exercise and pursed lips breathing provide a positive impact on the improvement of clinical symptoms, lung function and exercise tolerance. There were 6 journals for the improvement on shortness of breath symptom, 6 journals decreased RR, and 5 journals for increased oxygen saturation. In addition, the improvement of lung function was looked significant.

There were 2 journals of FEV₁ grade upgrades, 2 FVC value improvement journals, 2 PEFr score improvement journals, 1 FEV₁ / FVC grade improvement journal and 2 TV value refining journals. Interval walking exercise and pursed lips breathing significantly had a positive impact on exercise tolerance; as many as 9 journals have improved exercise tolerance in the respondents.

4 DISCUSSION

This systematic review identified one of breathing techniques that was pursed lips breathing (PLB) and light exercise that was walking exercise applied to COPD patients. Identification was aimed at reviewing the benefits of applying pursed lips breathing and walking exercise to clinical symptoms, lung function and exercise tolerance. Based on the study of 16 journals, it was known that there were 12 journals which reviewed the benefits of pursed lips breathing and walking exercise on the change of clinical signs and symptoms of COPD patients. There were improvements in oxygen saturation, respiratory rate and dyspnea scale of COPD patients.

Study conducted by Bhatt, *et al.*, found that after applying Pursed Lips breathing, patients would experience increased exercise capacity. Patients revealed decreased dyspnea, and RR frequency. Respiratory control during the pursed lips breathing period caused decreased vicious cycle interrupts in air trapping. This occurred because of lower central nervous transmission, and led to a lower dissociation between actual ventilator signals and

perceived effort, resulting in lower perceived dyspnea perception (Bhatt *et al.*, 2013).

Based on research conducted by Leung *et al.*, it was known that the grand walk training could reduce dyspnea and Respiration Rate (RR). In addition, this exercise could reduce the production of carbon dioxide, and increased minute ventilation when compared to basic data. Reduction of carbon dioxide and minute ventilation could increase the oxidative capacity of trained muscles with walking exercise, thereby reducing dyspnea (Leung *et al.*, 2010).

Based on the results of 16 journals review, it was known that there were 4 journals of research which proved that pursed lips breathing and walking exercise gave advantage towards lung function improvements, namely FEV1 (%), FVC, PEFr and FEV1 / FVC. This breathing technique used a second pursing strategy lips together during exhale. Thus, the airways became exposed, with respiratory pressure back and air emptying process when expiration became better (Maind *et al.*, 2015).

In a study conducted by Bhatt, *et al*, found that the breath-control technique with pursed lips breathing increased 20% FEV1 and FVC, and reduced water trapping. Reduction of hyperinflation was due to an increase in expiratory volume resulting in an increase in tidal volume. Decreased respiratory frequency also occurred due to adjustment of time perfusion and ventilation (VA / Q). In addition, by doing Walking exercise, it could improve the efficiency and capacity of the oxygen transport system, increased VO2 max, improved aerobic and anaerobic work capacity, increased cardiac output and stroke volume, increased blood distribution efficiency and shortened recovery time (Bhatt *et al.*, 2013).

Based on the results of 16 journals review, it was known that there were 9 journals of research which proved that pursed lips breathing and walking exercise gave advantage against improvement of exercise tolerance in COPD patients. Physical exercise in people with COPD resulted in increased exercise tolerance due to increased maximum work capacity with low oxygen consumption. Improved exercise tolerance was an indication of the efficient use of oxygen in the tissues and tolerance of lactic acid. Based on research conducted by de Roos, et al, it was known that the combination of exercise training and home based walking program could improve Physical activity (PA). Patients who had an increased level of exercise tolerance, then the use of peripheral oxygen could be efficient (de Roos et al., 2017).

Walking exercise and pursed lips breathing performed regularly can improve clinical signs and symptoms, lung function and physical activity of COPD patients. This is because by doing this exercise, the patient is able to increase expiratory strength characterized by increased FEV1, as well as tidal volume improvement. So that the perfusion of ventilation to the maximum and the activity tolerance for the better.

5 CONCLUSIONS

Systematic review on Evaluation for the Effect of Walking Exercise and Pursed Lips Breathing on Clinical Symptoms, Lung Function and Exercise Tolerance of COPD Patients found that the application of pursed lips breathing and walking exercise techniques could provide positive improvement in COPD patients. This was certainly very effective if applied to COPD patients, since lung damage was not completely reversible, so it was important to keep patients in stable condition and prevent exacerbations.

The nursing implication of this systematic review was improving the health of COPD patients. Walking exercise and Pursed lips breathing could be applied in nursing care in patients with COPD. This could be included in the nursing care plan by conducting health education to the patient, that was about how to do walking exercise and pursed lips breathing and its benefits to COPD patients. Nurses could evaluate the successful implementation of walking exercise and pursed lips breathing and its clinical effects.

The lack of this systematic review is on the criteria of research journals, ie not having uniformity in terms of research methods. The journal in this study revealed that the research method did not always use the control group as a comparison.

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