

Intervention Pursed Lips Breathing Exercise for Decrease Breathlessness on Chronic Obstructive Pulmonary Disease

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Abstract: Chronic Obstructive Pulmonary Disease is a chronic lung disease characterized by limited air flow in respiratory tract that is not completely reversible and is progressive. Helped to reduce mortality in patients with chronic obstructive pulmonary disease by breathing exercises, namely Pursed Lips breathing exercise. The study aims to determine the effect of pursed lips breathing exercise on reducing the scale of tightness in patients with chronic obstructive pulmonary disease. This method is pre experimental with design using one group pre-test and post-test design, samples are 18 respondents with purposive sampling technique that is adjusted to the inclusion and exclusion criteria. Data analysis uses paired sample t-test. The results showed that the administration of pursed lips breathing exercise influenced the reduction of the tightness scale in patients with chronic obstructive pulmonary disease. Giving pursed lips breathing exercise is very effective against reducing the scale of shortness of breath in patients with chronic obstructive pulmonary disease.

1 INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a chronic lung disease characterized by limited air flow in the respiratory tract that is not completely reversible and is progressive. Some problems will arise that result in respiratory failure which is defined as ventilation failure and oxygenation failure due to respiratory center disorders, respiratory muscle disorders and acute inflammation of lung tissue that causes shortness of breathing (Muliasaria, Indrawatib, 2018 and Endrian, Noviati, Trisnawati, et al, 2019).

World Health Organization (WHO) report there is 600 million people got COPD in the world with 65 million people heavy COPD. In 2002 COPD was the fifth leading cause of death in the world and is estimated to be the third leading cause of death worldwide in 2030. More than 3 million people died from COPD in 2005, which is equivalent to 5% of all deaths globally (WHO, 2015).

Mortality due to COPD is increasing. As for the World Health Organization (WHO) report in the World Health Report in 2012, five major lung diseases accounted for 17.4% of all deaths in the world, each with 7.2% lung infections, COPD 4.8%,

tuberculosis 3.0%, lung cancer / trachea / bronchi 2.1%, and asthma 0.3%.

Decreased quality of life in COPD patients is supported by the results of a study conducted by Reherison in France in 2009-2010 of 400 COPD sufferers over 40 years. The results showed that COPD affected the decline in quality of life in 50.6% of respondents with a p value < 0.02. Decreased quality of life in COPD patients was most influenced by decreased tolerance of activity (Reherision, 2014).

According to the Gold Initiative for Chronic Obstructive Lung Disease (GOLD), which is referred as COPD, is lung disease that can be prevented and treated, characterized by a continuous flow of air that is usually progressive and is associated with an increased inflammatory response in the airways and lungs to particles or gases that are poisonous or dangerous (GOLD, 2015).

In Indonesia, prevalence of COPD cases according to the Ministry of Health of Republic of Indonesia (2014) mentions in Central Java Province as much as 3.4%. The results of the North Sumatra Provincial Health Office research, in 6 (six) General Hospitals in North Sumatra, COPD Incidence Rate (AK) in 2010 was 5.8% and in 2014 it increased by 7.2% (DINKES, 2014) .

However, this does not rule out the possibility that this percentage figure can increase along with the increasing number of smokers, and air pollution that exceeds the threshold in North Sumatra Province. Based on the results of preliminary study survey which was obtained from the Medical Record of the Grandmed Lubuk Pakam Hospital, data on COPD sufferers in 2016 were as many as 170 people while in September to December 2017 there were 50 people.

Medical management of COPD clients (Zhang, Mehta 2018) among others, with pharmacological and non-pharmacological treatment. According to Ghanbari, Shirmohamadi, Paryad, 2018, the handling of COPD disease clients does not only rely on pharmacological therapy, but also non-pharmacological therapy which is carried out by Physiotherapy.

Physiotherapy is form of health service aimed at individuals or groups to develop, maintain and restore body movements and functions throughout the life cycle using manual handling, increased motion, equipment (physical, electrotherapy and mechanical), function training, communication (PMK No 56, 2016).

Some physiotherapy interventions can be done by reduced scale of tightness are warming and relaxation such as giving short wave diathermy, infrared, chest physiotherapy and effective cough exercises. One technique for administering Chest Physiotherapy is breathing exercises that can be done including inspirational muscle exercises such as pursed lips breathing exercise.

Pursed lips breathing exercise is a breathing exercise to regulate the frequency and pattern of breathing to reduce air trapping, improve alveoli ventilation to improve gas exchange without increasing respiratory work, regulate and coordinate respiratory rate so that breathing is more effective and reduce shortness of breath. Pursed lips breathing exercise is a breathing exercise for the patient sits and inspires when the patient's expiration exhales through the mouth almost closed like whistling slowly (Mendes, Moraes, Hoffman, et al, 2018).

The advantages of physiotherapy using the pursed lips breathing exercise technique are exercises that are easily performed by all patients who experience breathing problems or shortness of breath. Besides being easy to do pursed lips breathing exercise also has no side effects, just if the patient often does this exercise technique will be very helpful to reduce shortness of breath.

Some literature reveals that use of pursed lips breathing exercise seems to be an effective way of

reducing dyspnea, reducing respiratory rate, and increasing gas exchange in COPD patients. This positive effect appears to be related to the technique's ability to reduce airway constriction during recurrence of disease (Potdar, 2018).

The researchers have examined the effects of pursed lips breathing exercise on the parameters of ventilation and arterial blood gas in people with COPD. They uniformly report that the technique reduces the respiratory rate and partial pressure of carbon dioxide in arterial blood can increase tidal volume. Pursed lips breathing exercise also increases the persial pressure of oxygen in arterial blood and also the percentage of hemoglobin (Sakhaei, Sadagheyani, Zinalpoor, 2018).

The results of Sachdeva's research, Pawaria, Kalra (2018) that there is an effect of giving pursed lips breathing exercise on reducing the frequency of attacks in patients with chronic obstructive pulmonary disease. Budiono, Mustayah, Aindrianingsih, (2017) research results show that there is an effect of giving pursed lips breathing exercise to decrease Respiratory Rate (RR) and Increased Pulsed Oxygen Saturation (SpO₂) in patients with chronic obstructive pulmonary disease with p value = 0.000 for Respiratory Rate (RR).

The results of Bakti's research (2015) show that there is an effect of giving pursed lip breathing to decrease the level of shortness of breath in patients with chronic obstructive pulmonary disease with a value of $P = 0.014$ for the control group and $P = 0.002$ for the treatment group. Sachdeva, Pawaria, Kalra, research results (2018) showed that there was an effect of pursed lips breathing exercise on increasing vital lung capacity in patients with chronic obstructive pulmonary disease with a p value of 0.001. Based on the background above and the author's interest to find out more about the benefits of pursed lips breathing exercise in COPD cases. So the authors take the title "The Effect of pursed lips breathing exercise on the Reduction of Shortness Scale in COPD Patients at GrandMed Lubuk Pakam Hospital". The purpose of this study was to identify the characteristics of COPD patients undergoing inpatient at the Grandmed Lubuk Pakam Hospital in 2018.

2 METHODOLOGY

This study uses pre experimental method with the design used in this study, namely by using one group pre test and post test design. The sampling technique used in this study was to use a purposive sampling

method carried out by including all patients undergoing inpatient at the Grandmed Lubuk Pakam Hospital in April-May 2018 with a diagnosis from the doctor being a COPD and the results of a positive X-Ray Photo of COPD that meet the inclusion and exclusion criteria. The number of samples in this study were 18 people.

The therapeutic method used in this study is breathing exercises carried out to get better breathing regulation from previous breathing which is fast and shallow to become slower and deeper breathing. The purpose of breathing exercises, 1) adjust the breathing pattern and respiratory rate so that it reduces air trapping, 2) improve the ability of the chest wall movement, 3) improve ventilation without increasing respiratory energy, 4) train breathing so that tightness is reduced, 5) improve the movement of the diaphragm, 6) increase patient confidence so that it is calmer

The procedure for implementing Pursed Lips Breathing Exercise (Figure 1) includes:

- Adjust the position of the patient by sitting on a bed or chair.
- Put one patient's hand in the abdomen (just below proceccus xipoideus) and the other hand in the middle of the chest to feel the chest and abdomen movements when breathing.
- Take a deep breath through the nose for 4 seconds until the chest and abdomen feel lifted up and keep the mouth closed for inspiration and hold the breath for 2 seconds.
- Exhale through closed lips and slightly open while contracting the abdominal muscles for 4 seconds (Smeltzer, 2008).
- This exercise can be done by the patient himself every 2-3 hours as much as 6 times



Figure 1: Intervetion Purs Lips Breathing Exercise

3 RESULT

Respondents in this study were chronic obstructive pulmonary disease patients in GrandMed Lubuk Pakam Hospital in 2018. With a sample of 18 people.

Based on table 4.1 above, the number of respondents based on age 51-60 years was 5 people (27.8%), 61-70 years as many as 6 people (33.3%), 71-80 years as many as 6 people (33.3 %), and 81-90 years by 1 person (5.6%). Based on the gender of male respondents as many as 15 people (83.3%) and women as many as 3 people (16.7%). Based on the work of self-employed respondents as many as 8 people (44.4%), Farmers as many as 7 people (38.9%), and civil servants (Civil Servants) as many as 3 people (16.7%).

Based on Table 1, the MRC scale measurement results before giving pursed lips breathing exercise that has an MRC scale value of 2 are 2 people (11.1%), who have an MRC scale value of 6 people (33.3%) and those who have an MRC scale 4 grades were 10 people (55.6%).

Table 1. Result measurement breathlessness with MRC scale pretest *Pursed Lips Breathing Exercise*

MRC scale	n	Percentage
Value 0	-	-
Value 1	-	0%
Value 2	2	11,1%
Value 3	6	33,3%
Value 4	10	55,6%
Total	18	100%

According to table 2, MRC scale measurement results obtained after giving pursed lips breathing exercise, MRC scale in patients with chronic obstructive pulmonary disease has improved with a value of 1 by 1 person (5.6%), improvement in value 2 by 8 people (44.4%), improvement value 3 as much as 8 people (44.4%), and improvement in value 4 as much as 1 person (5.6%)

Table 2. Result measurement breathlessness with MRC scale posttest *Pursed Lips Breathing Exercise*

MRC scale	n	Percentage
value 0	-	-
value 1	1	5,6%
value 2	8	44,4%
value 3	8	44,4%
value 4	1	5,6%
Total	18	100%

The mean result of the MRC scale before giving pursed lips breathing exercise was 3.44 and standard deviation = 0.705. The mean of the MRC scale after giving pursed lips breathing exercise was 2.50 and standard deviation = 0.707. The difference mean Pre

and Post treatment pursed lips breathing exercise was 0.94 with a standard deviation = 0.002.

Hypothesis test results using Paired Sample T-Test obtained p value = 0,000. From these results it can be concluded that there is an effect of pursed lips breathing exercise on reducing the scale of tightness in COPD patients at Grandmed Lubuk Pakam Hospital in 2018.

4 DISCUSSION

Based on the results of 18 minority patients aged 81-90 years as many as 1 person (5.6%) and the majority age was 61-70 years and 71-80 years as many as 6 people (33.3%). The results of Fajrin, Indra & Burhanuddin, 2015 and Raad, Smith, Allen, 2019) showed that the characteristics respondents based on age were the most stable in COPD patients > 60 years (58.1%).

These results indicate in elderly patients the cardiorespiratory system decreased endurance and decreased function. Changes in the lung wall cause compliance to decrease and there is a decrease in the elasticity of the lung parenchyma, an increase in mucous glands and thickening of the bronchial mucosa. An increase in airway resistance and decreased lung function such as forced vital capacity (FVC) and first-second forced expiratory volume (Force Vital Expiration Volume 1 / FEV1) (Khairani, 2010).

Based on the results of research conducted on 18 characteristics of the majority male patients as many as 15 people (83.3%) and women as many as 3 people (16.7%).

The results of Ritianingsih, Irawaty & Handayani (2011) research showed that the characteristics of respondents based on gender were 21 male (58.3%). The results of this study are also in line with research conducted by Rahmatika in Aceh Tamiang Hospital in 2007-2008 based on the severity of severe COPD suffered by many men because awareness of treatment increased after the disease became severe (Permadi, Putra, 2018).

These results show because of the influence of association. The fewer women who smoke are likely due to the influence of norms in the community, namely female smokers are considered to have negative behavior (Almagro et al, 2010). Male activity that is very much can also cause lung disorders one of the factors is often working under the hot sun, exposed to dust for a long time and continues to repeat so that it can cause decreased

cardiorespiratory endurance and impaired lung function.

Based on the results of research conducted on 18 respondents the characteristics of the majority of jobs are entrepreneurs as many as 8 people (44.4%) and minority jobs are Civil Servants (PNS) as many as 3 people (16.7%). The results of Fajrin research, Indra, Burhanuddin 2015 and Raad, Smith, Allen, 2019) showed that the characteristics of respondents based on employment in stable COPD patients were self-employed (54.3%).

This shows that entrepreneurial work is closely related to allergic and bronchial hyperactivity, workers who work in dusty environments and are exposed to chemicals affect the nervous system and are at risk of suffering from COPD. Another factor influencing the increased risk of chronic obstructive pulmonary disease in self-employed is the smoking habit that is generally still practiced by self-employed workers.

Shortness of breath is something that is felt by the patient during inspiration and expiration, causing disruption of functional activity. Based on the results of research conducted on 18 people on the MRC scale measurement before giving pursed lips breathing exercise that has an MRC scale value of 2 people (11.1%), who have an MRC scale value of 6 people (33.3%) and who have an MRC scale value of 4 as many as 10 people (55.6%), with the average MRC scale results before being pursed lips breathing exercise treatment is mean = 3.44 with a standard deviation = 0.705.

In chronic obstructive pulmonary disease there is respiratory muscle disorder that is affected by muscle contraction and respiratory muscle strength. The loss of lung elasticity causes hyperinflation and chronic airway obstruction that interferes with the process of expiration so that the volume of air entering and leaving is not balanced and there is air trapping. Air trapping in a long time causes the diaphragm to flatten, contractions are less effective and its function as the main muscle of breathing is reduced against lung ventilation. Various intercostal muscle compensation and additional inspiration muscles commonly used in additional activities will be used continuously until the role of the diaphragm decreases to 65%. Breath volume shrinks and breath becomes short so that alveolar hypoventilation occurs which will increase O₂ consumption and decrease patient reserve power. The frequency of respiration increases as an attempt to compensate for the small airways and cause typical shortness of breath (Ubolnuar, Tantisuwat, Thaveeratitham, et al, 2019).

Based on the results of research conducted on 18 people on the MRC scale measurement after giving pursed lips breathing exercise, the MRC scale in patients with chronic obstructive pulmonary disease has improved with a value of 1 by 1 person (5.6%), improvement in the value of 2 by 8 people (44.4%), improvement in value 3 by 8 people (44.4%), and improvement in value 4 by 1 person (5.6%), with the results of the MRC scale after being given pursed lips breathing treatment mean = 2.50 with a standard deviation = 0.707.

People with COPD who experience hyperinflation of the diaphragm are lower and flatter. In that situation the movement of the respiratory muscles is not effective. Breathing pursed lips breathing exercise aims to provide subjective benefits to sufferers, namely reducing tightness, anxiety and tension due to tightness. Pursed Lips Breathing Exercise breathing is done by the patient sitting and breathing by exhaling through a closed mouth (like whistling) for 4-6 seconds. This method is expected to cause pressure during expiration so that air flow slows and increases pressure in the abdominal cavity which is passed on to the bronchioli so that airway collapse during expiration can be prevented (Sakhaei, Sadagheyani, Zinalpoor, 2018).

Besides giving pursed lips breathing exercise can regulate the frequency and pattern of breathing so as to reduce air trapping, improve alveoli ventilation to improve gas exchange without increasing respiratory work, regulate and coordinate respiratory rate so that breathing is more effective and reduce shortness of breath (Xu, He, Han, 2017).

Breathing exercises pursed lips breathing exercise consists of two mechanisms, namely deep inspiration and deep and long active expiration. The process of expiration is normally a process of exhaling without using excess energy. Breathing pursed lips breathing exercise involves a long expiration process.

Breathing exercises with pursed lips breathing exercise help improve pulmonary compliance to retrain the respiratory muscles to function properly and prevent respiratory distress (Sachdeva, Pawaria, Kalra, 2018).

Based on the analysis of the Paired T-Test, the pretestmean = 3.44 with standard deviation = 0.705 while the posttestmean average = 2.50 with standard deviation = 0.707. The analysis results obtained p value = 0,000 ($p < 0.05$) which means that there is a significant influence between the average scale of MRC before and after pursed lips breathing exercise to reduce the scale of tightness in patients with chronic obstructive pulmonary disease, and breathing

exercises pursed. These lips breathing exercises are good for physiotherapists to apply to patients with chronic obstructive pulmonary disease for the development of physiotherapy interventions (Imashiro, Minakata, Hayata, et al, 2019).

Shortness of breath in patients with chronic obstructive pulmonary disease before pursed lips breathing exercise has not yet experienced changes in the shortness of breath scale, which means that the patient is still suffering from respiratory muscle disorders that are affected by muscle contraction and respiratory muscle strength. The loss of pulmonary elasticity in COPD causes hyperinflation and chronic airway obstruction that disrupts the process of expiration so that the volume of air entering and leaving is unbalanced and there is air trapping, after pursed lips breathing exercise which can be seen from a decrease in the MRC scale, where the patient is able to adjust the frequency and pattern of breathing so as to reduce air trapping, improve alveoli ventilation to improve gas exchange without increasing respiratory work, regulate and coordinate respiratory rate so that breathing is more effective and reduce shortness of breath (Mohamed, 2019).

Pursed lips breathing exercise is a breathing exercise that consists of two mechanisms namely deep inspiration and long and deep active expiration. The process of expiration is normally a process of exhaling without using excess energy. Breathing pursed lips breathing exercise involves a long expiration process.

Deep inspiration and long expiration will certainly increase the strength of intra-abdominal muscle contraction so that the intra-abdominal pressure rises beyond the time of passive expiration. Intra-abdominal pressure which increases even stronger will certainly increase the movement of the diaphragm upward making the thoracic cavity smaller. Thorak cavity is getting smaller causing intra alveolar pressure increases so that it exceeds atmospheric air pressure (Potdar, 2018). Long exhalation when breathing pursed lips breathing exercise will also cause airway obstruction to decrease so that respiratory resistance decreases. Decreased respiratory resistance will facilitate the air inhaled and exhaled so that it will reduce shortness of breath (Mohamed, 2019).

The assumption according to the authors of this study is that pursed lips breathing exercise is a breathing muscle exercise that aims to improve the ability of the muscles of respiration, breathing patterns, lung ventilation. So that in patients with chronic obstructive pulmonary disease will cause a balance in the brain that controls the delivery of

oxygen to the tissues. Tissue carbon dioxide pressure, chest wall stretch receptors, tissue oxygen demand, oxygen delivery, and respiratory work can be fulfilled so that the patient feels relaxed and shortness of breath is reduced.

5 CONCLUSION

Based on the statistical tests and discussion above, it can be concluded that Physiotherapy interventions with lip exercises that are moved affect the reduction in shortness of breath in COPD patients.

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