THE EFFECT OF PURSED LIP BREATHING EXERCISE ON RESPIRATORY RATE IN PATIENT WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE: A CASE STUDY

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Abstract

Introduction:
Chronic Obstructive Pulmonary Disease(COPD) is a chronic lung disease accompanied by airflow limitation that is not fully reversible. Airflow obstruction is generally progressive and is associated with an abnormal inflammatory response of the lungs to noxious particles or gases. The most common problems include chronic cough, increased sputum and shortness of breath. This increase in sputum and shortness of breath can affect changes in the respiratory rate of COPD patients.

Case Presentations:
A 55-year-old male patient complained of shortness of breath and cough. The patient works as a textile factory worker. The patient was diagnosed with COPD by a Lung Specialist and referred for physiotherapy to improve breathing patterns so that the respiratory rate returns to normal.

Management and Outcomes:
Effect of Pursed Lip Breathing Exercise to determine the respiratory rate in patient with

Discussions:
After physiotherapy intervention and evaluation were carried out, it was found that there was a decrease in the respiratory rate of 24 times per minute and T1: 19 times per minute. This happens because the pursed lip breathing exercise mechanism itself is a technique that focuses on expiration by deliberately inhibiting the shape of the lips that make it difficult for air to escape, thus requiring the help of diaphragm and abdominal muscle contractions to expel the air so that the volume of air will increase.

Conclusion:
After the physiotherapy session, the results showed that there was a The effect of pursed lip breathing exercise on respiratory rate in COPD patients is to provide a decrease in respiratory rate.

Keywords: Pursed Lip Breathing Exercise, Respiratory Rate, COPD

Introduction

The Chronic Obstructive Pulmonary Disease(COPD) is a chronic lung disease accompanied by airflow limitation that is not fully reversible. Airflow obstruction is generally progressive and is associated with an abnormal inflammatory response of the lungs to noxious particles or gases[1]. A COPD can be caused by chronic bronchitis, emphysema or both. In 2020, the World Health Organization (WHO) estimates that the third most common cause of death is COPD after coronary heart disease and stroke. WHO estimates that in 2020 the prevalence of COPD will continue to increase from 6th in the world to 3rd in the world as a cause of death. Data from the 2018 Basic Health Research (RISKESDAS) states that the prevalence of COPD in Indonesia is 4.4%[2]. The prevalence of COPD is higher in men compared to women, but this can also increase due to the lifestyle of women who smoke. Although smoking is the most studied risk factor for COPD, it does not mean it is the only risk factor for COPD. Everyone can also be exposed to various types of particles during his life. Therefore, this disease can also be caused by excessive irritation of particles that are irritating to the respiratory tract. The risk factors for COPD depend on the total number of irritating particles inhaled by a person during his life, including genetic factors, age and sex, preexisting pulmonary function disorders, exposure to harmful particles, socioeconomic status, asthma and airway hyperreactivity, chronic bronchitis, and infections[3]. This is in line with the pathophysiology of COPD, namely the loss of lung elasticity which causes hyperinflation and airway obstruction with disturbances in expiration so that the volume of air in and out is not balanced[4]. These problems of COPD can affect the patient's basic daily activities such as self-care and movement. The most common problems include chronic cough, increased sputum and shortness of breath. This increase in sputum and shortness of breath can affect changes in the respiratory rate of COPD patients[5]. Diaphragmatic breathing, deep breathing, yoga breathing and pursed lip breathing are breathing exercises that can improve breathing patterns to be more effective and also reduce shortness of breath[6]. Pursed lip breathing is practicing breathing with pursed lips during expiration to overcome airway spasm, because maintaining positive pressure in the airways during expiration stimulates the bronchi to relax. Which can then lead to a decrease in air entrapment or residual volume thereby stimulating the alveoli in the lung floor more broadly[7].

Case Presentation

A 55-year-old male patient in December 2019 came to BBKPM Surakarta for an examination because the patient complained of shortness of breath and cough since 1 week ago. The patient has been working as a textile factory worker in Surakarta since 10 years ago. The patient came to BBPKM Surakarta and immediately performed SpO2 examination and spirometry to determine the patient's FEV1. Then the patient was diagnosed with COPD by a Lung Specialist and given medication and returned to control after 10 days. After 10 days the patient came for control and was referred for physiotherapy due to short and irregular breathing patterns. Then in January 2020 the patient had his first Physiotherapy session, here a vital sign examination was carried out in the form of respiratory rate, heart rate, and blood pressure to determine the patient's condition before getting the action. From the results of the examination, it was found that the respiratory rate was past normal limits, which caused the patient to experience shortness of breath or heavy breathing. The purpose of this physiotherapy action is to improve breathing patterns so that the respiratory rate returns to normal.

Method

A case study conducted to this study and had been approved by Health Sciences Faculty, Universitas Muhammadiyah Surakarta (1292.3/C.8-III/FIK/VIII/2021).

Management and Outcome

The intervention was given based on the problems that the patient experienced and needed, such as feeling short of breath so that the breathing pattern was irregular and caused the respiratory rate to be above the normal limits of adults. The intervention that can be given is Pursed Lip Breathing Exercise which is intended to improve breathing efficiency and reduce shortness of breath better during daily activities. Prior to the intervention, the respiratory rate was measured, followed by the administration of Pursed Lip Breathing Exercise and an evaluation of the respiratory rate was carried out again. Respiratory rate can be calculated visually by inspection or using a stethoscope. Respiratory rate is calculated in 15, 30 and 60 seconds, as follows[8]:

- 6 months :25-40x/ minute
- 3 years :20-30x/ minute
- 6 years :18-25x/ minute
- 10 years :15-20x/ minute

- Adult :12-20x/ minute

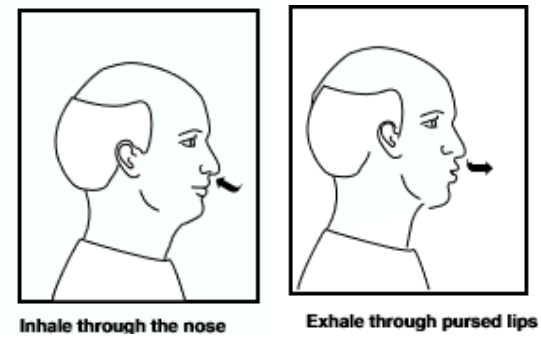
With the procedure for measuring respiratory rate as follows[15]:

- Respondents are in a comfortable position, a reclining sitting position or half lying with relaxed shoulders and neck.
- The respondent is asked to calm down and breathe spontaneously normally
- The researchers began to calculate the respiratory rate for 60 seconds.
- Try so that the respondent does not know when the respiratory rate examination is carried out for objective and accurate results.
- This measurement was carried out 2 times, accurately in pre and post test of the intervention
- For pre test is done before giving intervention
- And for the post test, it is done for 1 minute after the intervention

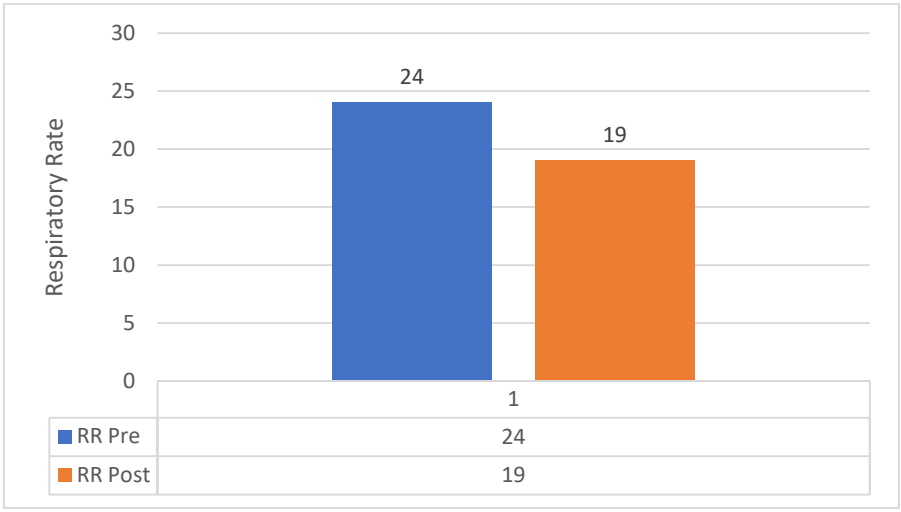
Then proceed with the provision of interventions in the form of Pursed Lip Breathing Exercise, it is a breathing technique in which air is inhaled through the nose slowly (like inhaling the scent of a rose) and followed by exhaled slowly through the mouth with pursed lips (like blowing out a candle). Pursed Lip Breathing is usually done in a sitting, lying, or standing position. Pursed Lip Breathing is 5 minutes[3] with 8 to 10 repetition[9].

The procedure for implementing the Pursed Lip Breathing Exercise is as follows[15]:

- Respondents are in a comfortable position, namely a reclining sitting position or half lying with relaxed shoulders and neck.
- Give directions to the respondent to inhale through the nose with the mouth tightly closed.
- Purse your mouth and exhale slowly through your mouth.
- Exhale longer than inspiration, which is 2 counts for inspiration and 4 counts for expiration
- Repeat the above steps 10 times with a 5 minute practice time
- Within 1 minute, do 2 repetitions and give a break



After physiotherapy intervention and evaluation were carried out, it was found that there was a decrease in the patient's respiratory rate which was described in the diagram below.



The results of the Respiratory Rate measurement that have been carried out in 60 seconds with the value of validity and reliability are 0.90[10]. After giving the intervention, it showed a change in the form of a decrease in the respiratory rate To: 24 times per minute and T1: 19 times per minute.

Discussion

Respiratory rate

A CPOD often experienced problems with shortness of breath or dyspnea. This can affect changes in respiratory rate in patients with chronic obstructive pulmonary disease[11]. Where the respiratory value of the data from this study is 24x/minute, which means that the respondent's respiratory rate is not normal. The normal value for adult between 12-20x/minute. This increase in sputum and shortness of breath can affect changes in the respiratory rate of COPD patients. And from The Latin

America Project for the Investigation of Obstructive Lung Disease (PLATINO) researching the prevalence of COPD increases in people over 40 years[5].

Pursed Lip Breathing Exercise

This breathing technique is often used by patients with COPD for pulmonary rehabilitation programs in their daily activities. It is a breathing technique that helps to improve breathing efficiency and better reduce shortness of breath during daily activities[12]. Which serves to increase efficiency in breathing and to reduce dyspnea[13]. When inspiratory intra-alveolar pressure decreases and is lower than atmospheric pressure, air flows into the lungs until the intra-alveolar pressure equals atmospheric pressure, then when the expiration of the lungs decreases again, the intra-alveolar pressure increases. Air slowly moves from high intra-alveolar pressure to low atmospheric pressure. The outflow of air will stop when these two pressures are equal[14]. And the pursed lip breathing exercise mechanism itself is a technique that focuses on expiration by deliberately inhibiting it with a curved lip shape that makes it difficult for air to escape, so it requires assistance from contraction of the diaphragm and abdominal muscles to expel the air so that the air volume will increase.

Conclusion

After taking physiotherapy measures in cases of COPD (Chronic Obstructive Pulmonary Disease) by giving Pursed Lip Breathing Exercise to see if there is a change in the patient's respiratory rate after a physiotherapy session, the results show that there is an effect of pursed lip breathing exercise on respiratory rate in patients with chronic obstructive pulmonary disease, namely provide a decrease in the respiratory rate. However, this study also has limitation that the absence of other specific examinations such as the presence of accessory muscle spasms, accumulation of sputum and a decrease in the expansion of the thoracic cage which can also affect the patient's respiratory rate. While the advantage of this study is that researchers can determine the spontaneous effect of giving Pursed Lip Breathing Exercise on Respiratory Rate in COPD patients where this can improve the patient's breathing pattern and supported activities better. As well this study could be a reference for clinicians and researchers to manage the patients with COPD or to improve the further researchs.

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References

1. Ikawati, Z. (2016). Therapeutic Management of Respiratory System Diseases (first). Yogyakarta: Science Exchange.
2. The health profile of the province of Central Java in 2018. (2018). Central Java province health profile 2018. Central Java Provincial Health Office, 1–253. https://doi.org/10.4049/jimmunol.1100709
3. Maselli, DJ, Bhatt, SP, Anzueto, A., Bowler, RP, DeMeo, DL, Diaz, AA, Make, BJ (2019). Clinical Epidemiology of COPD Insights From 10 Years of the COPD Gene Study. Chests, 156(2), 228–238. https://doi.org/10.1016/j.chest.2019.04.135
4. Barusso, MS, Gianjoppe-Santos, J., Basso-Vanelli, RP, Regueiro, EM, Panin, JC, & Di Lorenzo, VAP (2015). Limitation of activities of daily living and quality of life based on COPD combined classification. Respiratory Care, 60(3), 388–398. https://doi.org/10.4187/respcare.03202
5. GOLD. (2018). Global Initiative for Chronic Obstructive. In Global Obstructive Lung Disease (sixth, p. 142). Retrieved from www.goldcopd.org
6. Sunitha G, & Ravi. (2013). Effect of Deep Breathing on Respiratory Parameters in Healthy Young Individuals. Journal of Evolution of Medical and Dental Sciences, 2(19), 3305–3312. https://doi.org/10.14260/jemds/698
7. lunges. (2014). Breathing Exercises and Coughing. Respiratory Care.
8. Yuan, G., Drost, N., & Mclvor, A. (2013). Respiratory Rate and Breathing Pattern. MUMJ, 10(1), 23–25. Retrieved from http://www.mumj.org/Issues/v10_2013/articles/v10_23.pdf
9. Babu, B., Ealias, J., & Venunathan, A. (2016). Pursed Lip Breathing Exercise – a Self-Management Approach Anveshana International Journal of Research in Pharmacy and Life Sciences Pursed Lip Breathing Exercise – a Self-Management Approach Towards Shortness of Breath. 1(September). Retrieved from https://www.researchgate.net/publication/311518951%0APURSED
10. Drummond, GB, Fischer, D., & Arvind, DK (2020). Current clinical methods of measurement of

respiratory rate give imprecise values. ERJ Open Research, 6(3), 00023–02020. https://doi.org/10.1183/23120541.00023-2020

11. Borge, CR, Hagen, KB, Mengshoel, AM, Omenaas, E., Moum, T., & Wahl, AK (2014). Effects of controlled breathing exercises and respiratory muscle training in people with chronic obstructive pulmonary disease: Results from evaluating the quality of evidence in systematic reviews. BMC Pulmonary Medicine, 14(1). https://doi.org/10.1186/1471-2466-14-184
12. de F. Fregonezi, GA, Resqueti, VR, & Guell Rous, R. (2011). Pursed Lips Breathing. Archivos de Bronconeumología ((English Edition)), 40(6), 279–282. https://doi.org/10.1016/S1579-2129(06)70099-4
13. Ramos, E., Vanderlei, L., Ramos, D., Teixeira, L., Pitta, F., & Veloso, M. (2009). Influence of pursed-lip breathing on heart rate variability and cardiorespiratory parameters in subjects with chronic obstructive pulmonary disease (COPD). 13(4).
14. Shine, G., Saad, S., Nusaibath, S., Shaik, AR, & Padmakumar, S. (2016). Comparison of Effectiveness of Diaphragmatic Breathing and Pursed-Lip Expiration Exercises in Improving the Forced Expiratory Flow Rate. 3(2), 154–158.
15. Roberts, S. E., Schreuder, F. M., Watson, T., & Stern, M. (2017). Do COPD patients taught pursed lips breathing (PLB) for dyspnoea management continue to use the technique long-term? A mixed methodological study. *Physiotherapy (United Kingdom)*, *103*(4), 465–470. https://doi.org/10.1016/j.physio.2016.05.006