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DECREASED EXPIRATORY PEAK CURRENT IN COPD PATIENTS WITH BUTEYKO BREATHING TECHNIQUES

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ABSTRACT

Chronic obstructive pulmonary disease is still a threat to the world community COPD will have a negative impact on the health of sufferers. The purpose of this study was to analyze the effect of buteyko breathing on expiratory peak currents in COPD patients. This research is a type of quantitative research with a pre-experimental design through a one group pre-post test design approach. The sample in this study was 58 COPD patients who fit the inclusion criteria. The tools used for data collection are peak flow meters to measure expiratory peak flows and SPO for buteyko breathing exercises. The results of the study included the average value of the peak expiratory current before giving buteyko breathing was 158.34 L / minute with a standard deviation of 69.1899. The average peak expiratory current after buteyko breathing is 144.42 L/min with a standard deviation of 16.21961. The difference in the increase in expiratory peak current before buteyko breathing and after buteyko breathing was 24.91. The paired t test results are p value of 0.001, it was found that there was a significant effect of buteyko breathing on the increase in expiratory peak current of COPD patients. Structured breathing exercises from buteyko exercise have the potential to increase lung capacity, allow for more efficient oxygen uptake, help achieve deeper and more efficient breathing, potentially affect oxygen saturation levels.

Keywords

Buteyco exercise, COPD, Expiratory peak current

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a group of chronic lung diseases that last a long time and are accompanied by increased resistance to airflow (Paramitha, P, 2020). Chronic obstructive pulmonary disease is a preventable and treatable disease, characterized by persistent airflow limitation, is progressive, and is accompanied by a chronic inflammatory response in the pulmonary airway due to harmful gases or particles. Exacerbations and comorbidities contribute to the worsening of the disease. Chronic obstructive pulmonary disease is a chronic inflammatory process of the lung, including chronic bronchitis with fibrosis accompanied by small airway obstruction,

and emphysema with dilation of the air cavity accompanied by destruction of the lung parenchyma, decreased lung elasticity, and obstruction of the small airway Chronic obstructive pulmonary disease (Prastyanto, D., & Kushartanti, W. (2019). Chronic obstructive pulmonary disease still a threat to the world community (Quaderi, S. A., & Hurst, 2018). COPD will negatively affect the health of the sufferer. This disease has a prognosis that will continue to worsen over time, One of the impacts that will be felt by patients is the presence of productive cough that occurs continuously. One risk factor for COPD is secondhand smoke exposure (PDPI, 2017).

COPD is associated with a high prevalence of comorbid conditions that will further negatively impact prognosis and quality of life. Exacerbations are the most important cause of morbidity in COPD. Once a patient comes to an emergency facility or undergoes hospital treatment for worsening or exacerbation, there is a high risk for re-treatment and mortality. Mortality in patients hospitalized for exacerbations with hypercapnia and acidosis is estimated at 10%. Mortality was 40% in patients requiring mechanical ventilation 1 year after treatment and mortality was 49% due to various causes 3 years after the patient was discharged from previous treatment (Ananta Wijaya, I. K., Mertha, I. M., & Ari Rasdini, I. G. A. (2020).

Based on the World Health Organization (WHO) report in the World Health Report 2000 states, five major lung diseases constitute 17.4% of all deaths in the world, each consisting of lung infections 7.2%, COPD (Chronic Obstructive Pulmonary Disease) 4.8%, Tuberculosis 3.0%, lung / tracheal / bronchial cancer 2.1% and COPD 0.3% (Kementrian Kesehatan RI, 2014).

The incidence of COPD in Indonesia is increasing. The results of the Basic Health Research of the Indonesian Ministry of Health in 2018, found the prevalence of chronic obstructive pulmonary disease (COPD) in Indonesia as much as 3.7%. A high prevalence indicates that the management of COPD has not been successful. Various factors are the cause of the situation, namely various deficiencies in terms of knowledge about COPD, conducting evaluation after therapy, systematics and implementation of management, prevention efforts and counseling in the management of COPD. Given this, the best management of COPD must be done early with various preventive measures so that sufferers do not experience COPD attacks (*Smeltzer*. *2011*).

The assessment of the degree of obstruction can be determined by monitoring the Expiratory Peak Current (APE). APE monitoring is important to assess the severity of COPD, degree of diurnal variation, treatment response during an acute attack, detection of worsening before it becomes serious, long-term treatment response, and identification of triggers such as environmental exposure. In patients with COPD, the APE value is at normal values. APE examination is easy and simple to assess the weight of airway obstruction using a Peak Flow Meter. Peak Flow Meter is relatively cheap and can be carried everywhere, so the examination can not only be done in clinics, hospitals but can be done at the patient's home independently, but not many COPD sufferers understand and use it (PDPI, 2017).

The problem of peak expiratory current also occurred in the previous study conducted by Wijaya et al., 2020, namely the average peak expiratory current of patients before the administration of Buteyko breathing technique was 75.764%, which if interpreted that the average flow of 22 respondents experienced mild obstruction (APE 60-80%). From the 22 respondents, the average respondent expiratory peak current was 75.764% (95% CI: 72.72-78.81%) with a standard deviation of 6.872%, the lowest respondent expiratory peak current was 63.68% and the highest expiratory peak current was 85.75%. Based on the results of the interval estimation, it

can be concluded that 95% is believed to be the average peak current of expiration before the administration of Buteyko's breathing technique. This shows that respiratory obstruction still has a great influence on the peak flow of expiration.

The number of COPD sufferers in Indonesia, of course, requires a solution so that COPD can be reduced, in addition to doctor treatment, there must be treatment outside that that serves as therapy to help reduce COPD symptoms. The right therapy in order to help and reduce COPD sufferers in Indonesia, namely with complementary (nonpharmacological) therapies, one of which can be done by breathing techniques. In this technique, breathing techniques are taught when patients have COPD. One of the methods developed to improve breathing in COPD patients is breathing techniques, which can include aerobic exercise, gymnastics, and breathing techniques such as Thai chi, Yoga, Mahatma, Buteyko and Pranayama. Buteyko is a therapy that studies breathing techniques designed to slow and reduce the entry of air into the lungs, if this technique is practiced frequently and regularly, it can reduce the symptoms and severity of breathing problems. The advantages of Buteyko's breathing exercises are, (1) encouraging the patient to breathe slightly, (2) training the patient's breathing pattern using a series of breathing exercises, (3) improving control of COPD symptoms and the recurrence rate of COPD (Juwita, L., & Sary, I. P., 2019).

Buteyko breathing techniques have been shown to be effective in lowering the recurrence rate of COPD. This buteyko breathing technique can be seen results in one week if done 1 time a day for 20 minutes regularly by holding your breath through the nose and exhaling through the nose in a comfortable position (Arif, M., & Elvira, M., 2018). Buteyko Breathing Technique is a series of breathing exercises that are carried out simply as COPD management management which aims to reduce airway constriction with the principle of shallow breathing exercises. Buteyko is a therapy that studies breathing techniques designed to slow and reduce the entry of air into the lungs, if this technique is practiced frequently and regularly, it can reduce the symptoms and severity of breathing problems (Juwita, L., &; Ine, P. S., 2019). From the background above, researchers are interested in conducting research on the effect of buteyko exercise on decreasing expiratory peak current in COPD patients.

METHOD

This research is a type of quantitative research with a pre-experimental design through a one group pre-post test design approach. The pre-experimental design is carried out through the provision of intervention in the form of buteyko breathing exercises, where the intervention or provision of buteyko breathing exercises will be applied to one group while the measurement process is carried out before the intervention or pre-test is applied and after the intervention or post-test is applied. The population in this study is all COPD patients in Sumberkembar hamlet. Samples were obtained by taking some members of the population using purposive sampling techniques. There are two variables in this study, namely Buteyko breathing exercises and peak expiratory current. The action is given to the sample object for 15 minutes. 5 minutes before and 5 minutes after the measurement of the peak expiratory flow. The tools used for data collection are peak flow meters to measure expiratory peak flows and SPOs for buteyko breathing exercises. Data collection is tabulated with general and special data tabulation formats. Data analysis using univariate and bivariate

analysis. The statistical test used is the paired t test.

The Paired T Test statistical analysis test found that the expiratory peak current has a p value = 0.000 < α 0.05, it can be concluded that H0 is rejected or Ha is accepted which means that there is an effect of buteyko breathing on the expiratory peak current in COPD patients in the Working Area of public healthcare Pandan Mojokerto.

This research has been conducted an ethical test and has received an ethical approval with a number 114/KEPK-SM/2023.

RESULTS

Table 1. Frequency Distribution of Respondents The Effect of Buteyko Breathing on Expiratory Peak Current in COPD Patients

Characteristics of Respondents	Frequency	
	f	%
Age		
Early elderly	30	52
Middle elderly	20	34
Old elderly	8	14
Gender		
Male	4	7
Female	54	93
Education		
No school	2	3
Elementary school	51	89
Primary High School	5	8
Senior High School	0	0
Smoking Habits		
Smoke	55	95
No Smoking	3	5
Total	58	100

Table 2. Expiratory Peak Current Before (Pre Test) Buteyko Breathing

Variabel	Mean	Median	Standar Deviasi	Min-Max
Expiratory peak current	195.95	195	69.1899	65-340

(Table 2) shows that the average value of expiratory peak current before buteyko breathing is 158.34 L/min with a standard deviation of 69.1899.

Table 3. Expiratory Peak Current Before (Post Test) Buteyko Breathing

Variabel	Mean	Median	Standar Deviasi	Min-Max
Expiratory peak current	220.86	200	76.3943	120-350

(Table 3) shows that the average peak expiratory current after buteyko breathing is 144.42 L/min with a standard deviation of 16.21961.

Table 4 **The effect of buteyko breathing on the peak expiratory current in COPD patients**

Variabel	Mean		Selisih	95% CI		*P Value*
	Pre	Post		Lower	Upper	
EPC	195.95	220.86	24.91	39.354	10.447	0.001

(Table 4) shows the results of the Paired T Test statistical analysis test found that the expiratory peak current has a p value = 0.000 < α 0.05, it can be concluded that H0 is rejected or Ha is accepted which means that there is an effect of buteyko breathing on the expiratory peak current in COPD patients.

DISCUSSION

The difference in the increase in expiratory peak current (APE) before buteyko breathing and after buteyko breathing was 24.91 with a p value of 0.001, it was found that there was a significant effect of buteyko breathing on the increase in expiratory peak current (APE) of COPD patients.

Expiratory Peak Current is the maximum velocity value of current generated during expiration or exhalation, which usually occurs in the first 150 milliseconds of the forced expiratory maneuver (Mangunnegoro, 2011, in Ariyastuti, 2018). According to Laim, et al, (1998) in Emi (2016) the normal APE rate for adult men is around 500-700 L / minute, while for adult women ranges from 280-500 L / minute. The decrease in the value of the expiratory peak current indicates a narrowing of the respiratory tract (Indonesian Association of Lung Doctors, 2003).

There are several breathing therapies that aim to correct hyperventilation and restore normal carbon dioxide tension. Breathing biofeedback using a manometer to monitor end-tidal carbon dioxide levels during breathing training is one approach to treating hypomania. Biofeedback training that employs the use of a capnometer aims at normalizing end-tidal CO2 at approximately 5%. There are various systems for capnometry biofeedback available to the practitioner and in recent years these have become increasingly available. Other breathing therapists use no instrumentation and rely on a combination of slow controlled breathing, breathing pattern correction and relaxation strategies. The Buteyko Breathing Technique (BBT) is yet another technique whose primary aim is the correction of acute and chronic hypocapnia. It uses a unique set of breathing techniques in which breath holding is combined with reduced volume breathing. BBT exercises aim to increase carbon dioxde and reset chemoreceptor thresholds however they may also be useful in reducing hyperinflation (Chauhan, R, 2013).

The main breath control technique of the Buteyko Breathing method is reduce volume breathing, where the individual tries to decrease minute volume and raise alveolar CO2 by reducting tidal volume, i.e. the size of the inhalation and exhalation phase of each breath. It is particularly important that patients relax during reduce volume breathing to counteract their body's natural tendency to increase respiratory rate as a response to decreased tidal volume (Courtney, R. 2014).

The Buteyko method is a purported method of "retraining" the body's breathing pattern to correct for the presumed chronic hyperventilation and hypocapnea, and thereby treat or cure the body of these medical problems (Sharma et all, 2019).

Buteyko Breathing Technique is a series of breathing exercises that are carried out simply as COPD management management which aims to reduce airway constriction with the principle of shallow breathing exercises. The buteyko breathing technique is a technique to correct hyperventilated diaphragmatic (chest) breathing and slow down the frequency of breathing to normalize. This technique is done by breathing through the nose (Juwita, L., &; Ine, P. S., 2019).

This breathing approach teaches a more controlled breathing pattern, by lowering the rapid, shallow breathing rate, avoiding hyperventilation and decreased levels of carbon dioxide in the blood. Structured breathing exercises from the Buteyko Exercise Technique have the potential to increase lung capacity, allowing for more efficient oxygen absorption. A focus on relaxation and stress reduction can help achieve deeper and more efficient breathing, potentially affecting oxygen saturation levels. The potential reduction of inflammation in the respiratory tract may also play a role in increased airflow and oxygen saturation (Baig, B. et all, 2024).

According to the Bohr effect, when there is enough carbon dioxide pressure in the blood and lungs, oxygen is more easily released. Conversely, when

carbon dioxide levels are low, hemoglobin molecules are less able to remove oxygen from the blood. Another function of carbon dioxide is to relax smooth muscles found in the airways, arteries and capillaries, allowing breathing and blood flow to be smooth. Loss or reduction of carbon dioxide due to excessive breathing will cause narrowing of the respiratory tract. Breathing calmly will maintain carbon dioxide levels in the body and blood vessels and respiratory tract will not narrow. Healthy breathing is breathing from the nose because it allows the body to utilize nitric oxide gas and carbon dioxide which both play a role in opening blood vessels. The way of breathing determines the amount of carbon dioxide in the blood (Mckeown P, 2019).

This is in line with the results of Afiyah's research, 2018 with the results of the analysis The buteyko technique aims to improve the breathing patterns of COPD patients by maintaining a balance of CO2 levels and cellular oxygenation values which can ultimately reduce COPD symptoms. The buteyko method is used primarily as a natural technique to reduce the symptoms and severity of COPD.

Decreased physical activity (PA) in patients with COPD is related with a poor prognosis. A study was conducted to show that PA is a key therapeutic approach. Meanwhile far few approaches have been found effective in this group. The result found the intensity and amount of PA can be suggestively augmented by using a 12-week semi-automated tele coaching interventionin patients of COPD.for the management of patients of chronic obstructive disease, PR with multiprofessional education core components of exercise training has a vital role. As the exercise indices of cardiopulmonary efficiency and recovers clinical symptoms (Saeed, A. ,2022).

In the process of giving buteyko breathing, there was 1 respondent who experienced an increase of 150 L / minute and was in the green zone with a figure of 450 L / minute. This is because the gender of the respondent is male. Physiologically, men have a greater lung capacity so that the peak expiratory current also increases significantly. According to Yunus (2007), based on normal APE values, APE values in men are greater than female APE values. The average vital capacity of young adult men is approximately 4.6 liters and young females approximately 3.1 liters. Men have stronger muscles in the respiratory system compared to women so the ability to expirate tends to be greater than women (Guyton and Hall 2012).

In addition, there was 1 respondent who did not experience an increase / fixed. This is due to the lifestyle of respondents who are not awake as in male respondents, namely they have a habit of smoking. Smoking is one of the main factors that can accelerate the decline in lung function, most of the smokers will experience obstructive pulmonary disease and some will experience severe lung function damage. This causes changes in the airway and pulmonary parenchyma. Smoking habits have an impact on damage to organs, especially the lungs. Smoking can cause changes in the structure of the airway and pulmonary parenchyma. This change in airway structure can be in the form of hypertrophy and hyperplasia of the mucous glands, so that it can affect the APE value (Yunus 2007).

These results are in accordance with the results of Anhar et al's research 2022, APE values in patients who performed Buteyko breath exercises before and after the Buteyko breath exercises showed a significant change in APE values, the group before the intervention,the APE score was p = 0.00.

Meanwhile, the average ACT value after the intervention was p = 0.00 (Ihwan, A., Nugraha, A., & Negara, C. K. 2022).

CONCLUSIONS

Based on the results of the study it can be concluded; The average increase in expiratory peak current (APE) in COPD patients before buteyko breathing was 158.34 with a standard deviation of 69.1899. The average peak expiratory current after buteyko breathing is 144.42 with a standard deviation of 16.21961. The difference in the increase in expiratory peak current (APE) before buteyko breathing and after buteyko breathing was 24.91 with a p value of 0.001, it was found that there was a significant effect of buteyko breathing on the increase in expiratory peak current (APE) of COPD patients.

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