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EFFECTIVENESS OF BOX BREATHING ON RESPIRATORY RATE AND OXYGEN SATURATION IN PATIENTS WITH COPD

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ABSTRACT
Chronic obstructive pulmonary disease (COPD) is a leading cause of death, with the majority of symptoms such as cough, dyspnea, and sputum production causing increased airway resistance. Breathing exercises are an important part of the pulmonary rehabilitation program, including box breathing. Objective: The purpose of this study was to analyze the effectiveness of box breathing on breathing frequency and oxygen saturation in patients with COPD at Idaman Banjarbaru Hospital. Method: research design Pretest-Posttest Control Group Design. The sample of this study was 20 respondents divided into 2 groups, namely the first group was the intervention group which was given Box Breathing treatment for 3 consecutive days with a duration of 15 minutes a day and the second group was the control group which only received therapy according to what was given by the hospital with purposive sampling. The research instrument was an observation sheet-bivariate data analysis using a Paired t-test and an Independent t-test. Results: There is a significant difference in the intervention group with the control group after being given box breathing on breathing frequency with an effectiveness value of 99.17%, but there is no significant difference in the intervention group with the control group after being given box breathing on oxygen saturation. It is recommended that the intervention of giving box breathing be used as one of the nursing interventions in patients with COPD as a management action for complaints of tightness.

Keywords: box breathing; COPD; oxygen saturation; respiration rate

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a major cause of death and loss and a large burden on society due to large health costs (Burg et al, 2020). Chronic obstructive pulmonary disease (COPD) is characterized by blockage of the respiratory tract that is largely irreversible and includes emphysema and chronic bronchitis. Airway obstruction is usually progressive and is often associated with an abnormal inflammatory response of the lungs to harmful particles or gases such as tobacco in smokers (Afonso, 2017)COPD is included in the top ten most common chronic diseases in the world. According to the World Health Organization (WHO), COPD causes the third most deaths in the world with 2.9 million deaths in 2019. COPD sufferers in Indonesia in 2013 were recorded at 3.7% or around 9.2 million. (Widyawati, 2021). Data obtained through a preliminary study of COPD cases at RSD Idaman Banjarbaru was 293 people in 2022.

COPD is characterized by the presence of chronic respiratory symptoms and airflow which is associated with significant morbidity and mortality in adult obstruction (Çolak, 2021). Apart from progressive airway limitation, COPD also causes symptoms such as coughing, dyspnea, and phlegm production (Zafari, 2022). COPD causes airway resistance to increase, and the volume of air entering and leaving the lungs decreases, causing a lower tidal volume and a related slow rate of gas exchange, so the body's response to balance this is by increasing levels of the heart rate and reducing oxygen in the arteries (Kurian, 2022) The relationship between dyspnea and respiratory rate is particularly interesting in COPD patients. Several studies state the importance of monitoring RR which can be sought in the early detection of COPD where RR more than 25 times per minute is considered a sign of COPD exacerbation. An RR value of more than 25 times per minute is considered a sign of exacerbation of COPD, while the normal RR range in adults is around 12-20 times/minute (Al-Halhouli, 2021).

Breathing exercises have become an important part of a comprehensive pulmonary rehabilitation program for COPD patients. There are several breathing exercises such as slow and deep breathing, active breathing, pursed lip breathing, relaxed breathing, diaphragmatic breathing, and ventilation feedback training, which have been carried out to reduce lung hyperventilation and improve respiratory muscles in COPD patients (Ubolnuar, 2019). Although there is literature regarding the effectiveness of deep breathing exercises on respiratory conditions, the effectiveness of breathing exercises in a breathing box (BB) on COPD lung measurements has not been carried out. Its role is slow and increases respiratory efficiency and oxygen saturation at rest. However, this type of breathing is associated with a breathing pattern that is prone to causing respiratory muscle fatigue. Reducing the duty cycle (inspiratory time as a proportion of total respiratory cycle time) may be an attractive option, but has not been studied (Gosselink, 2004).

The existence of a link between breathing exercise methods and lung ventilation and COPD cases is also experienced by many patients treated at RSD Idaman Banjarbaru, therefore prospective researchers are interested in researching breathing box breathing exercises on the effectiveness of lung ventilation.Based on the results of the preliminary study obtained, no one knows about non-pharmacological management, namely Box Breathing, which can increase respiratory frequency and oxygen saturation in patients with COPD. Based on this, The aim of the research is to analyze the effectiveness of box breathing on respiratory rate and oxygen saturation in patients with COPD at RSD Idaman Banjarbaru.

METHOD

The research was Pretest-Posttest Control Group Design. The independent variable is Box Breathing intervention and the dependent variables are respiratory rate and oxygen saturation. The determining variables are age, gender, comorbidities, smoking history, and length of suffering. The sample size in this study was 20 respondents divided into 2 groups, each consisting of 10 people. The first group was the intervention group which was given Box Breathing treatment which was given for 3 consecutive days for 15 minutes a day and the second group was the control group which was not given treatment but received therapy according to what was given by the hospital) with purposive sampling. The instrument used is an observation sheet. The tool needed to measure respiratory rate is a watch and lung function is pulse oximetry. Bivariate data analysis used a Paired t-test and an Independent t-test.

RESULTS

Table 1.
Respondent characteristics of patients with COPD at RSD Idaman Banjarbaru (n = 20)

Respondent characteristics	Intervention group		Control group	
	f	%	f	%
Gender				
Man	7	70	8	80
Woman	3	30	2	20
Age (years)				
45-54	3	30	4	40
55-65	7	70	6	60
Long-suffering (years)				
<5	4	40	5	50
≥5	6	60	5	50
Smoking history				
Yes	6	60	7	70
No	4	40	3	30
Concomitant disease				
Yes	10	100	9	90
No	0	0	1	10

Table 1, the majority of respondents were male, 70% in the intervention group, and 80% in the control group, and the majority were aged 55-65 years, 70% in the intervention group and 60% in the control group, the majority had suffered for ≥5 years. years, 60% in the intervention group and 50% in the control group, the majority had a history of smoking, 60% in the intervention group and 40% in the control group, and the majority had comorbidities, 100% in the intervention group and 90% in the control group.

Table 2.
Results of independent t-test analysis of differences in mean between the intervention group and the control group on respiratory frequency and oxygen saturation in patients with COPD at RSD Idaman Banjarbaru (n=20)

Variable group	Mean	SD	P value	95%CI
Respiratory rate				
Intervension	19,20	1,033	0,033	-3,056-(-0,144)
Control	20,80	1,932		
SaO2				
Respiratory rate	98,10	1,524	0,151	-0,879-2,679
Intervension	97,20	2,201		

Table 2, the mean respiratory frequency in the intervention group was 19.20, in the control group it was 20.80, with a standard deviation of 1.033 in the intervention group 0.151 in the control group 1.932, with the lower and upper limits of the 95% confidence level being -3.056 -(-0.144) and the results of the independent t-test analysis were 0.033 (ρ value <0.05), which means that H0 was rejected, meaning there was a significant difference between the intervention group and the control group after being given box breathing in terms of respiratory frequency.The mean oxygen saturation in the intervention group was 98.10, and in the control group was 97.20, with a standard deviation of 1.524 in the intervention group, and 2.201 in the control group, with the lower and upper limits of the 95% confidence level being -0.879-2.679 and the results analysis of the independent t-test was 0.151 (ρ value >0.05) which means that H0 was accepted, meaning there was no significant difference between the intervention group and the control group after being given box breathing on oxygen saturation.

Table 3.

Analysis of the effectiveness of giving box breathing on respiratory frequency in patients with COPD at RSD Idaman Banjarbaru (n=20)

Variable	Normal	Increase in respiratory rate	Total
Performed box breathing	10 (100%)	0 (0%)	10 (100%)
Not performed	6 (60%)	4 (40%)	10 (100%)

Table 3 that the effectiveness of giving box breathing on respiratory frequency shows that the success rate of giving box breathing is greater than the control group.

DISCUSSION

COPD is a progressive respiratory disease that can be prevented and treated in the form of airflow obstruction involving the respiratory tract, lung parenchyma, or both (GOLD, 2019). Factors that influence COPD patients include smoking history, exposure to cigarette smoke, age, rate of decline in FEV1, hypoxemia, pulmonary artery pressure, resting heart rate, weight loss, reversibility of airflow obstruction, and comorbidities (Hinkle et al, 2022). A symptom that often appears in people with COPD is dyspnea which is defined as awareness of respiratory discomfort that varies in intensity. This disease usually starts mildly and is only visible when doing heavy activities, such as climbing stairs and exercising (Honan, 2018). Deep breathing exercise is a relaxation technique that has various benefits, including increasing lung ventilation and oxygenation in the blood (Nipa et al, 2021). One breathing exercise technique is box breathing which is also called balanced breathing, or breathing equivalent to inhaling and exhaling which can contribute to the acid/alkaline balance in the blood (Hall, 2023). In this study, differences were found between before and after the intervention and in the control group. According to research by Nambi et al. (2021) who researched the pranayama breathing technique. The slow inspiration technique helps improve thoracic mobility and lung function by mobilizing the chest and lung field activity. Slow, relaxed breathing can give the patient time to exhale so that no air is trapped.

The results for measuring oxygen saturation also showed differences between before and after the procedure in the intervention group and control group. The breathing exercises carried out can increase ventilation efficiency by increasing lung field activity, optimizing alveolar ventilation, and increasing blood flow to areas of the lungs that normally have poor perfusion which can increase oxygen saturation in the body (Steinman et al, 2024). Deep and slow breathing can increase the tidal volume of the lungs which triggers maximum alveolar involvement to carry out gas exchange so that oxygen in the blood can increase (Bilo et al, 2012) There is a difference in the average value in the control group because the group was given routine treatment to improve patient recovery even though there was an increase in the proportion of respiratory frequency of 40%. This states that apart from routine interventions, other therapies that can improve the patient's lung function, such as breathing exercises, also need to be considered as complementary therapies. According to Gowen & Gale (2019), complementary and alternative therapies are a broad domain of healing resources that includes all health systems, modalities, and practices as well as the theories and beliefs that accompany them, in addition to the theories and beliefs inherent in the politically dominant health system in society or a particular culture in a particular historical period.

CONCLUSION

There was a difference in the mean before and after being given Box Breathing in the Intervention Group and Control Group in Patients with COPD regarding respiratory frequency and oxygen saturation. There was a significant difference between the intervention group and the control group after being given box breathing on breathing frequency with an effectiveness value of 99.17% in normalizing breathing frequency, but there was no significant difference in the intervention group and the control group after being given box breathing on oxygen saturation. It is recommended that the intervention of giving box breathing be used as one of the nursing interventions for patients with COPD as an action to treat complaints of shortness of breath.

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