



**IMPLEMENTATION OF BUTEYKO BREATHING TECHNIQUE ON THE RESPIRATORY FREQUENCY AND OXYGEN SATURATION IN ASTHMA PATIENTS: A CASE STUDY**

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**ABSTRACT**

Monitoring respiratory frequency and oxygen saturation in asthma patients is important to evaluate the severity of attacks, assess response to therapy, and detect complications such as hypoxia or respiratory failure. The Buteyko breathing technique is a type of breathing exercise commonly given to patients with asthma. This therapy aims to reduce respiratory frequency, increase CO<sub>2</sub> levels, and improve oxygen saturation in asthma patients. Objective to report the effectiveness of implementing the Buteyko breathing technique in reducing respiratory frequency and improving oxygen saturation in asthma patients. Descriptive design with a case study approach with subjects of 2 asthma patients. Sampling was carried out using a purposive sampling technique. The intervention given was Buteyko breathing for 15 minutes. The inclusion criteria set included patients diagnosed with asthma, patients with good vision and hearing function, patients who had never participated in breathing exercises, and those willing to be given the Buteyko technique. The inclusion criteria in this case were patients with a history of heart failure, kidney failure, and smoking. Data were obtained by interview, observation, and viewing patients' medical records. In this case study, instruments included a physical examination sheet, oximetry vital signs monitoring sheet, blood pressure monitor, thermometer, watch, and nursing documentation sheet. Data were analyzed using simple descriptions with average values. There was a decrease in respiratory frequency from 32.5 x/minute before intervention to 23.5x/minute and an increase in the average oxygen saturation value of 92.5% to 98.5%. Buteyko breathing can be applied to reduce asthma symptoms, which are characterized by a decrease in respiratory frequency, an increase in oxygen saturation, and reduced complaints of shortness of breath in patients.

Keywords: asthma; buteyko breathing; oxygen saturation; respiratory rate

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**INTRODUCTION**

Asthma is one of the most common non-communicable diseases, and it is defined as chronic airway inflammation that causes the narrowing of the small airways in the lungs (Svenningsen & Nair, 2018). This is characterized by respiratory symptoms, such as wheezing, chest tightness, coughing, and shortness of breath, which can vary with intensity and time. The World Health Organization (WHO) data showed that asthma affected approximately 262 million people in 2019 and caused 455,000 mortalities (Dharmage et al., 2019). Asthma patients require monitoring of respiratory frequency and oxygen saturation to evaluate the severity of the attack, assess response to therapy, and detect serious complications such as hypoxia (lack of oxygen in the tissues). Data on respiratory frequency and oxygen saturation are related to managing and adjusting therapy for asthma patients (Dragonieri & Carpagnano,

2021). Monitoring respiratory frequency and oxygen saturation in asthma patients will provide important information to optimize asthma management, including adjusting medication doses and using breathing apparatus (Rogliani et al., 2020). Moreover, this monitoring can also help asthma patients recognize the signs of worsening attacks so that they can immediately seek necessary medical treatment.

The therapy provided to treat asthma emergencies is by administering oxygenation and medications such as bronchodilators (Pratiwi & Chanif, 2021). Besides providing pharmacological therapy, after an asthma emergency is resolved, patients can be provided non-pharmacological therapy, one of which is breathing exercises. The Buteyko breathing technique is one of the breathing exercises commonly provided to asthma patients. This therapy aims to reduce respiratory frequency, increase CO<sub>2</sub> levels, and improve oxygen saturation in asthma patients (Abouelala. Fatma et al., 2019). In implementing the Buteyko breathing technique, patients are taught to reduce their respiratory frequency by controlling their breathing and breathing through their nose slowly and deeply. By reducing the respiratory frequency, patients can maintain more balanced COD levels in their bodies. This can help reduce the narrowing of the airway and control asthma symptoms (John David & R Patil, 2022). The Buteyko breathing technique also teaches patients to avoid mouth breathing and hyperventilation. By taking breath through the nose, patients can use the body's natural mechanism to regulate airflow and maintain optimal humidity and temperature when breath enters the lungs (J. Vagedes et al., 2021). In several studies, the implementation of the Buteyko breathing technique has been proven effective in reducing respiratory frequency, increasing CO<sub>2</sub> levels, and improving oxygen saturation in asthma patients (Elsaid & Zahran, 2023). Several studies also showed that this technique can help reduce asthma symptoms, reduce the use of necessary medications, and increase patients' quality of life. (J. Vagedes et al., 2021). According to the findings, this case study aims to report the effectiveness of providing Buteyko breathing technique therapy in helping to reduce respiratory frequency and improve oxygen saturation in asthma patients.

## **METHOD**

The implementation of this journal used a descriptive design with a case study approach. The subjects of the study were 2 patients. The sampling was conducted using a purposive sampling technique, where patients were taken at the Emergency Department of Universitas Sebelas Maret Hospital from October 16, 2023, to October 20, 2023. Data collection in this case study was obtained by interviews, observations, and supporting examinations from patients' medical records. The researcher used therapeutic communication in conducting interviews and nursing assessments of patients. In the orientation stage, the researcher tried to ask about the general health condition of patients. In the work stage, the researcher carried out a nursing assessment, starting from the identity, patient complaints, predisposing factor, precipitation factor, history of diseases and allergies, treatment history, and medical therapy obtained by patients. In the termination stage, the researcher ended the nursing assessment by expressing gratitude, then carried out a return time contract to implement nursing on patients. Before implementation, the researcher explained the purpose of the treatment given and asked for consent from the patient or family regarding the willingness to be taught the Buteyko breathing technique. Instruments used in this case study were a physical examination sheet, oximetry vital signs monitoring sheet, blood pressure monitor, thermometer, watch, and nursing documentation sheet.

The inclusion criteria in this case study were patients diagnosed with asthma, those with good hearing and vision function, those who never participated in breathing exercises, and those

willing to be given the Buteyko technique exercise. The exclusion criteria were patients with a history of heart failure, hypertension, kidney failure, and patients who smoke. During the preparation of the Buteyko breathing technique, patients were in a sitting position with an upright posture, and patients were asked to breathe normally for 2 minutes. After that, patients took a shallow breath through the nose, then held their breath as long as possible according to their ability until they felt an urge to breathe. When exhaling, it was done slowly on counts of 1 to 5. After that, patients were asked to breathe normally for 10 seconds. Patients were asked to hold their breaths again by covering their noses using their fingers according to their ability until they felt the urge to breathe again. Next, patients were asked to breathe normally through their nose, then repeat the entire process for  $\pm$  15 minutes. The SOP in this study was guided by the SOP of the Buteyko breathing technique by Fittarsih (2021). Nursing evaluation on one patient was carried out  $\pm$  10 minutes after the patient was taught the Buteyko breathing technique. Evaluation was carried out by re-measuring the oxygen saturation and respiratory rate. The data analysis method used in implementing this case study was a simple description using average values.

**RESULTS**

This case study was conducted in the Emergency Department of UNS Hospital with a description of patients, as seen in Table 1.

Table 1.

Description of Respondents

Patients' Data	Patient K	Patient H
Age	7 Years Old	21 Years Old
Gender	Female	Female
Diagnosis	Bronchial Asthma	Mild Persistent Asthma
History of Disease	History of asthma and bronchitis	History of asthma and appendectomy surgery in 2019
History of Allergies	Dust and cold	Cold

Table 1 shows that patients were female at 7 and 21 years old. The medical diagnoses are bronchial asthma and mild persistent asthma. Both patients have a history of asthma.

**Case Reports**

**Patient 1**

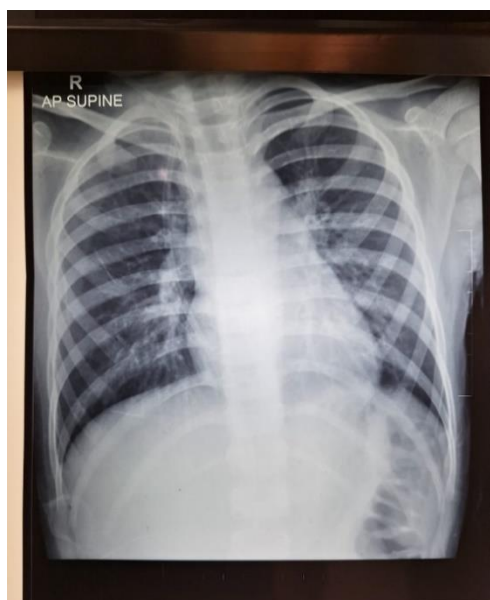
The assessment was carried out on October 16, 2023, at 7.30. The patient was a 7-year-old girl who came to the emergency department with a complaint of shortness of breath 1 day ago. The shortness of breath got worse this morning after dawn. Before going to the hospital, the patient's mother said that she had vomited 3 times. The patient's mother said that she had a cold and cough for 4 days. The patient's mother gave her a Ventolin inhaler at home, but it only improved for a while. During the assessment, the patient said she had shortness of breath and was uncomfortable breathing. The patient's mother said that her child had a history of asthma since 1st grade. The patient was coughing up phlegm, where the phlegm was white like a gel. The patient's mother said that her child's asthma recurred when exposed to dust and too-cold air. The patient's mother said that before having shortness of breath, the patient's mother took her child for a car-free day.

The results of the patient's physical examination obtained a pulse of 135x/minute, a temperature of 36.7°C, SPO2 of 94%, and respiration of 35x/minute. The results of the lung examination showed that there were no visible lesions to the chest, the movement of the right and left chest were the same, irregular breathing, vocal tactile fremitus was felt the same, sonor percussion, the wheezing sound was heard, the patient apparently breathed using accessory respiratory muscles, CRT < 2 seconds, no cyanosis, the patient looked restless, the

patient said nausea, there was an increase in BW saliva: 21.7 Kg. On chest x-ray examination, bronchopneumonia was seen. The results of the patient's laboratory examination can be seen in Table 2

Table 2.  
The Laboratory Examination of Patient 1

Type of Examination	Results	Unit	Normal Value
<b>HEMATOLOGY</b>			
Hemoglobin	12.6	g/dl	11.5-15.5
Hematocrit	38	%	35-45
Thrombocytes	342	thousands/ul	150-450
Leukocytes	11.33	thousands/ul	4.50-14.50
Erythrocytes	5.39	million/ul	4.00-5.20
Neutrophil Lymphocyte Ratio	11.80	-	1.00-3.13
Absolute Lymphocyte Count	840	/ul	1500-4500
<b>Count Types</b>			
Lymphocytes	7.7	%	30.0-48.0
Monocytes	3.4	%	0.0-5.0
Neutrophils	87.7	%	29.0-72.0
Eosinophils	0.8	%	0,0-4,0
Basophils	0.4	%	0.0-1.0



Chest X-ray of Patient K

Based on the data analysis, the main nursing diagnosis was that Airway clearance was ineffective and correlated with bronchospasm, which was proven by the patient saying shortness of breath, wheezing, RR of 35x/minute, irregular breath, and coughs. Nursing Intervention was arranged according to the Indonesian Nursing Intervention Standards (SIKI), where asthma management includes monitoring frequency and depth of breathing, monitoring breath sounds, monitoring oxygen saturation, setting semi-Fowler position, administering oxygen, installing an intravenous line for drug administration, and collaboration in administering bronchodilators. The implementation includes pharmacological and non-pharmacological therapy. When the patient arrived, setting a semi-fowler position was carried out, followed by administering Ventolin nebulizer 1 respule, 5 ccs of NaCl 0.9%, and an intravenous injection of methylprednisolone 20 mg. After 15 minutes, the patient was taught the Buteyko breathing technique. The evaluation was carried out for 15 minutes after Buteyko

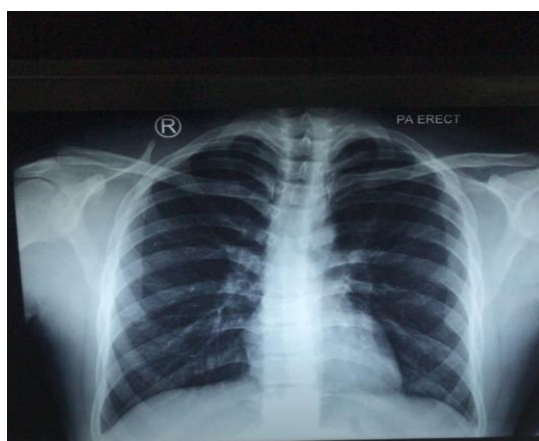
therapy. The results of the evaluation were obtained. The patient said that shortness of breath was reduced, looked calmer, no wheezing was heard, and the patient was still coughing. The patient's vital signs were pulse of 92x/minute, respiration of 25x/minute, oxygen saturation of 99% room air, and temperature of 36.8°C.

**Patient 2**

The assessment was carried out on October 17, 2023, at 14.55. The patient was a 21-year-old woman with shortness of breath since the morning. The patient has inhaled Symbicort but has not improved. During the assessment, the patient said she had shortness of breath and was uncomfortable breathing. The patient said that she had a history of asthma since childhood and received Symbicort, which was used when the patient had shortness of breath. The patient said that the asthma recurred if the patient often had activities outside and was tired. The patient said that 3 days ago, asthma also recurred but improved after being administered Symbicort. The results of the patient's physical examination obtained blood pressure of 126/98 mmHg, a pulse of 125x/minute, a temperature of 36.1°C, SPO2 of 90%, and respiration of 32x/minute. The results of the lung examination showed that there was no visible lesion to the chest, the movement of the right and left chest were the same, regular breathing, vocal tactile fremitus was felt the same, sonor percussion, the wheezing sound was heard, the patient apparently breathed using accessory respiratory muscles, CRT < 2 seconds, no cyanosis, the patient looked restless. On the thorax x-ray examination, the patient was in a normal state. The results of the laboratory examination are attached in Table 3.

Table 3.  
The Laboratory Examination of Patient 2.

Type of Examination	Results	Unit	Normal Value
<b>HEMATOLOGY</b>			
Hemoglobin	13.5	g/dl	11.5-15.5
Hematocrit	37	%	35-45
Thrombocytes	282	thousands/ul	150-450
Leukocytes	15.54	thousands/ul	4.50-14.50
Erythrocytes	6.49	million/ul	4.00-5.20
Neutrophil Lymphocyte Ratio	11.80	-	1.00-3.13
Absolute Lymphocyte Count	1553	/ul	1500-4500
<b>Count Types</b>			
Lymphocytes	10.5	%	30.0-48.0
Monocytes	3.4	%	0.0-5.0
Neutrophils	84.9	%	29.0-72.0
Eosinophils	0.4	%	0.0-4.0
Basophils	0.2	%	0.0-1.0



Chest X-ray of Patient H

Based on the data analysis, the main nursing diagnosis was that airway clearance was ineffective and correlated with bronchospasm, proven by the patient saying shortness of breath, wheezing, and RR of 32x/minute. Nursing Intervention was arranged according to the Indonesian Nursing Intervention Standards (SIKI), where asthma management includes monitoring frequency and depth of breathing, monitoring breath sounds, monitoring oxygen saturation, setting semi-Fowler position, administering oxygen, installing an intravenous line for drug administration, and collaboration in administering bronchodilators. The first implementation was the installation of oxygen with the nasal cannula of 3 lpm, setting a semi-fowler position, and then the patient was administered Combivent nebulizer 1 respule. After that, checking the patient's respiration and saturation resulted in a saturation of 95% with a nasal cannula of 3 lpm and respiration of 26x/minute. After 15 minutes of administering the nebulizer, the patient was taught the Buteyko breathing technique; then an evaluation was carried out. The results of the evaluation showed that shortness of breath was reduced, there was no use of accessory muscles for breathing, and wheezing was reduced. BP: 109/75, Pulse: 85x/minute, Respiration: 22x/minute, SPO2: 98% room air, Temperature: 36.8°C. The intervention's results were measured by comparing the patient's respiratory frequency and oxygen saturation before and after the intervention (Table 4). There were gradual changes in the patient's respiratory frequency and oxygen saturation after 15 minutes of Buteyko breathing therapy.

Table 4.  
The Comparison of the Results of Respiratory Frequency and Oxygen Saturation Before Intervention

	Pre Treatment		Post Treatment	
	Respiration	Spo2	Respiratory Rate	Spo2
Patient K	35x/minute	95%	25x/minute	99%
Patient H	32x/minute	90%	22x/minute	98%
Average	33.5x/minute	92.5%	23.5x/minute	98.5%

Table 4, implementing Buteyko breathing therapy in patient K shows a decrease in respiratory frequency from 35x/minute to 25x/minute. The oxygen saturation shows an increase from 95% to 99%. Patient H has decreased respiratory frequency from 32x/minute to 22x/minute. Meanwhile, the oxygen saturation increased from 90% to 98%. The average respiratory rate of both patients before intervention is 33.5x/minute, and after intervention is 23.5x/minute. Meanwhile, the average saturation before intervention is 92.5% and after intervention is 98.5%.

## DISCUSSION

Breathing techniques are useful for reducing asthma symptoms by improving appropriate breathing patterns. Asthma patients experience hyperventilation characterized by rapid and shallow breathing. Shallow and continuous breathing interfere with the physiological process, causing CO<sub>2</sub> bound in the blood to not perform effectively. In asthma cases, the Buteyko technique is required to maintain CO<sub>2</sub> by controlling the breath and slowly taking breaths through the nose. (Hassan et al., 2022). One of the Buteyko technique procedures is control pause, which is useful to reduce hyperventilation. In carrying out a control pause, the nose is closed with fingers at the end of exhalation, and then the BTH (breathing holding time) is counted in seconds. Patients must close their noses until there is a desire to breathe. Then, patients carry out inspiration and expiration normally. When exhaling, the mouth must be closed. Control pause will reset abnormal breathing rhythm or reset the brain's respiratory center to reduce asthma symptoms. (Danur et al., 2019).

The Buteyko breathing technique produces nitric oxide as a bronchodilator, vasodilator, tissue permeability, immune system, oxygen transport, insulin response, memory, and mood. It gradually reduces hyperventilation during regular exercise, increasing the carbon dioxide level in the blood. This will maintain the balance of blood pH through the formation of carbonic acid and bicarbonate and reduce forced expiration and pressure in chest wall muscles, causing shortness of breath. (Fittarsih et al., 2021). The results of this case study showed that using the Buteyko breathing technique can help reduce complaints in asthma patients by increasing oxygen saturation and decreasing respiratory frequency. This result is in line with the study by (Mahmoud et al., 2018), which showed that Buteyko breathing exercise has a positive impact on asthma patients. A study conducted by K. Vagedes et al. (2024) also concludes that the results of their study show initial evidence that the Buteyko breathing technique can be an effective intervention for children with asthma. K. Vagedes et al. (2024) stated that the Buteyko breathing technique has clinically effective results because the Buteyko breathing technique carried out independently by the patients can be considered supporting therapy in asthma treatment, which deserves greater attention in clinical practice. A study by Kusuma Arini Putri et al. (2019) stated that this technique can improve diaphragmatic breathing and relieve asthma symptoms.

The implementation of the Buteyko breathing technique has become an interesting topic in asthma treatment. This technique teaches patients to control their breathing by reducing the frequency and volume of breathing (Mohamed et al., 2019). Asthma patients often experience hyperventilation, which is rapid and shallow breathing. Hyperventilation can provoke asthma symptoms such as shortness of breath, cough, and wheezing. By reducing the respiratory frequency, the Buteyko breathing technique can help control the symptoms (Rogliani et al., 2020). A study conducted on asthma patients who implemented the Buteyko breathing technique showed a significant reduction in respiratory frequency. Patients are trained to inhale through the nose with slower and deeper breathing. Within a few weeks or months, patients can reduce their normal respiratory frequency to approximately 12-20 times per minute, compared to the higher rates previously (Mahmoud et al., 2018). A reduction in respiratory frequency is associated with increased asthma control and reduced related symptoms. Oxygen saturation measures the amount of oxygen bound to red blood cells in the body (Mendonça et al., 2021). Asthma patients often experience a reduction in oxygen saturation during an asthma attack due to inflammation and narrowing of the airways. In several studies, the implementation of the Buteyko breathing technique has been correlated to the increase in oxygen saturation in asthma patients. The Buteyko breathing technique teaches the patient to inhale through the nose and hold the breath for a moment after exhaling the air. By reducing the frequency and volume of breathing, patients can reduce oxygen loss through breathing and increase oxygen circulation in the body (Anshu et al., 2023). This can cause an increase in oxygen saturation.

## **CONCLUSION**

The results of the case study show that the patient's respiratory frequency and oxygen saturation improved after receiving the Buteyko breathing technique, with an average respiratory frequency of 23.5x/minute and an average oxygen saturation of 98.5%. From the results of this case study, it can be concluded that the Buteyko breathing technique can be implemented to reduce asthma symptoms, which are characterized by a reduction of respiratory frequency, an increase in oxygen saturation, and decreased shortness of breath in patients. The implementation of the Buteyko breathing technique has a positive impact on asthma patients. By reducing excessive respiratory frequency and teaching patients to control

their breathing, this technique helps control asthma symptoms, increase asthma control, and increase patients' quality of life.

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