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# Airway Management Using the Active Cycle of Breathing Technique to Improve Oxygen Saturation in Patients with Bronchial Asthma in the Emergency Department

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**Abstract**

**Introduction:** Bronchial asthma is a chronic inflammatory disease of the airways that causes airway obstruction and decreased oxygen saturation, particularly during acute attacks. Oxygen therapy plays an essential role in maintaining oxygen saturation within the range of 95–98%. One of the nursing interventions for airway management in patients with bronchial asthma is the Active Cycle of Breathing Technique (ACBT).
**Methods**: This study employed a descriptive design with a case study approach. The research was conducted in the Emergency Department of Ibnu Sina Hospital, involving one patient as the subject.
**Results:** The patient, a 52-year-old female, initially presented with complaints of shortness of breath, chest pain, and productive cough. Her respiratory rate was 27 breaths per minute, and oxygen saturation was 91%. After three sessions of ACBT, the respiratory rate decreased to 22 breaths per minute, oxygen saturation increased to 96%, and clinical signs of dyspnea were reduced. The findings indicate that ACBT is effective in alleviating shortness of breath, as evidenced by improved oxygen saturation and normalized breathing patterns.
**Conclusion:** The study concludes that the Active Cycle of Breathing Technique (ACBT) is effective as a non-pharmacological intervention to reduce dyspnea in patients with bronchial asthma. Given its clinical benefits, this technique can be recommended as part of a holistic approach to airway management in bronchial asthma, particularly for patients seeking complementary strategies alongside pharmacological therapy.

**Keywords:** Bronchial asthma, Active Cycle of Breathing Technique, oxygen saturation.

## INTRODUCTION

According to the World Health Organization (WHO), asthma affected approximately 335 million people worldwide in 2020 and caused around 455,000 deaths. Meanwhile, the Global Asthma Network (GAN) estimated that by 2025 the number will continue to rise, reaching 400 million cases with about 250,000 deaths caused by this disease (1). Based on data from the Indonesian Ministry of Health (Kemenkes, 2022), the prevalence of asthma in Indonesia reached 4.5% of the total population, or approximately 12 million people, making asthma one of the most common diseases among Indonesians by the end of 2020. Around 455,000 people die each year from asthma globally (2). The prevalence of asthma in Indonesia is 5% of 12.5 million people diagnosed with the disease, with a total of 1,017,290 identified cases.

The 2022 Basic Health Research (RISKESDAS) reported that the prevalence of asthma reached 4.5% of the total population, equivalent to approximately 1,017,290 cases. Yogyakarta recorded the highest prevalence, while North Sumatra had the lowest. Additionally, a report from the Riau Provincial Health Office indicated an increase in

bronchial asthma cases, with 26,085 individuals diagnosed in 2022. In Indonesia, nineteen provinces recorded asthma prevalence rates above the national average, including Aceh (3).Bronchial asthma is one of the respiratory system diseases that can affect all age groups, both children and adults (4). The symptoms of asthma include wheezing, a sensation of chest tightness, and difficulty breathing, especially at night (5). The triggering factors of bronchial asthma include allergies, respiratory infections, weather changes, environmental exposure, and psychological stress that can lead to asthma attacks in patients(6). Other contributing factors include age, genetics, gender, socioeconomic status, and environmental conditions (7).

Bronchial asthma is a chronic obstructive pulmonary disease characterized by chronic airway inflammation, bronchial narrowing, and increased mucus production, leading to airway obstruction and ventilation disorders. This condition often results in decreased oxygen saturation ($SpO_2$), especially during acute attacks, which can adversely affect vital organ function and patients' quality of life. Therefore, preventing hypoxemia is a crucial aspect of bronchial asthma management (8). One of the important strategies to address oxygenation disorders in asthma patients is the administration of oxygen therapy. According to the Global Initiative for Asthma (2023), the target oxygen saturation in acute asthma patients is 94–98% to prevent hypoxemia without causing hyperoxia (8).Oxygen is one of the most fundamental human needs, essential for maintaining cellular metabolism, sustaining life, and supporting organ activity.

Normally, oxygen is obtained through inhalation from the atmosphere and transported throughout the body by the circulatory system (9). Oxygen therapy involves delivering oxygen to the body through specific devices (10).A study by Ruangsomboon (2021) demonstrated that high-flow nasal oxygen therapy significantly improved oxygen saturation and reduced the work of breathing more effectively than conventional oxygen in patients with severe asthma attacks. This finding emphasizes the importance of optimizing oxygenation as an integral component of bronchial asthma management (11). The use of high-flow nasal cannula (HFNC), a non-invasive ventilation device, can meet oxygen needs in both adults and children with respiratory disorders such as bronchial asthma, reduce respiratory effort, and improve patient comfort (12). Research by Thalib (2023) revealed that oxygen therapy can increase oxygen saturation levels, maintain airway patency, and improve respiratory effectiveness. This therapy helps patients breathe more easily and reduces dyspnea in bronchial asthma patients. The use of nasal cannula at 1–6 L/min has been shown to effectively increase oxygen saturation in the body. After oxygen therapy, the airways become more open, facilitating breathing in asthma patients (Thalib, 2023)(13).However, oxygen administration alone is insufficient without considering airway patency and the presence of secretions.

Therefore, an alternative intervention that effectively reduces dyspnea is the Active Cycle of Breathing Technique (ACBT). This technique combines several breathing strategies that help manage shortness of breath (14).ACBT is a non-invasive method consisting of three main components: Breathing Control (BC), Thoracic Expansion Exercises, and Forced Expiration (Huff). The breathing control phase involves gentle diaphragmatic breathing for 20–30 seconds to prevent fatigue and breathlessness. If dyspnea persists, this phase should continue until breathing becomes relaxed and controlled before proceeding. Patients are instructed to inhale through the nose and exhale through the mouth with both hands on the abdomen to feel the rise and fall of the abdominal wall.The second phase, thoracic expansion exercises (deep breathing), requires the patient to take three to five slow, deep breaths through the nose for four seconds, hold for 2–3 seconds, and exhale gently through the mouth for six seconds. This exercise trains respiratory muscles, expands the chest wall, and mobilizes sputum for easier expectoration. The final phase, forced expiration (huffing), aims to expel sputum from the lungs. Patients perform the first and second phases two to three times before proceeding to huffing, after which they are encouraged to cough to expel secretions using an open mouth and a forced, quick exhalation from the back of the throat (15).Each ACBT cycle is typically performed for approximately two minutes and repeated three times (16).

A study conducted by Praitama (2021) on the effectiveness of ACBT in improving functional capacity in post-tuberculosis bronchiectasis patients showed that ACBT significantly reduced dyspnea, improved chest expansion, enhanced sputum clearance, and increased lung functional capacity (17). Another study applying ACBT for 15 minutes over five cycles in COPD patients with ineffective breathing patterns reported a decrease in respiratory rate from 30 to 25 breaths per minute (Kusumawati, Winairni & Widarti, 2020)(18). Several studies confirmed the

effectiveness of ACBT in bronchial asthma patients, showing reduced respiratory rates, increased oxygen saturation, and improved sputum clearance (19). According to Iftitah Rahmawati Syafriningrum (2022), ACBT—which includes breathing control, thoracic expansion, and forced expiration—is effective in reducing asthma symptoms (20).Although the benefits of ACBT and oxygenation have been proven separately, research evaluating their combined effect on improving oxygen saturation remains limited. Theoretically, combining ACBT with oxygen therapy may produce synergistic effects in enhancing ventilation and oxygenation among bronchial asthma patients (21).Based on this background, the author was interested in conducting a case study titled "Airway Management Using the Active Cycle of Breathing Technique (ACBT) to Improve Oxygen Saturation in Patients with Bronchial Asthma in the Emergency Department of Ibnu Sina Hospital, Makassar." The results of this study are expected to serve as a foundation for developing effective and applicable non-pharmacological nursing interventions for airway management in bronchial asthma patients.

## METHODS

The research employed a descriptive design with a case study approach**.** The study was conducted in the Emergency Department (ED) of Ibnu Sina Hospital**,** involving one patient as the subject. The sampling process was based on inclusion criteria, namely: (1) patients experiencing shortness of breath diagnosed with bronchial asthma, (2) patients who were conscious and able to communicate, and (3) patients who agreed to participate. The exclusion criteria were: (1) unconscious patients and (2) patients who did not consent to participate.The Active Cycle of Breathing Technique (ACBT) intervention was administered three times, each session lasting 10–15 minutes**.** Before the intervention, the patient received a detailed explanation of the procedure and therapeutic benefits, and verbal informed consent was obtained prior to treatment. The patient's identity and confidentiality were maintained according to nursing ethical principles**.**

## RESULTS

On May 22, 2025, at 09:30 WITA**,** a 52-year-old female, identified as *Mrs. S*, was brought by her family to the Emergency Department (ED) of Ibnu Sina Hospital, Makassar**.** The patient resided at *Jl. Kerung-kerung Lr. 12, Makassar*, was female, Muslim, and worked as a housewife. The main complaints reported by the patient were shortness of breath accompanied by chest pain during breathing, productive cough, and fatigue**.** The patient was conscious (compos mentis) with a Glasgow Coma Scale (GCS) score of 15 (Eye: 4—spontaneous opening; Verbal: 5—well oriented; Motor: 6—obeys commands). The primary assessment (A–B–C–D–E) findings were as follows:

- Airway (A): Airway was *not patent*; sputum was present, and *wheezing* breath sounds were detected.
- Breathing (B): The patient experienced dyspnea with the use of *accessory respiratory muscles*.
- Circulation (C): No signs of shock or bleeding were observed; acral areas were warm, and no cyanosis was detected.
- Disability (D): The patient appeared weak and fatigued; thus, activities of daily living (ADLs) such as urination, defecation, and ambulation to the bathroom were assisted by family members.
- Exposure (E): No deformities, lacerations, or edema were observed.

Based on secondary assessment, the patient had no history of drug allergies and was not taking any medications. However, the patient had a history of bronchial asthma for approximately five years**.**On the same date and time (May 22, 2025, 09:30 WITA), subjective data indicated that the patient felt *shortness of breath and heaviness when breathing*, while objective data showed respiratory rate (RR): 27 breaths per minute and oxygen saturation ($SpO_2$): 91%. Based on these findings, the nursing diagnosis identified was Ineffective Breathing Pattern related to airway obstruction**.**

The second data analysis showed the following:

- Subjective data: The patient reported experiencing chest pain**,** described as:
  - *P (Provocation):* chest pain,
  - *Q (Quality):* feels like pressure,
  - *R (Region):* located in the chest area,
  - *T (Timing):* intermittent and worsens with movement.
- Objective data: The patient appeared grimacing, weak, and restless, with a pain scale of 3**.** Based on these findings, the nursing diagnosis was Acute Pain related to physiological injury agents**.**

The third data analysis revealed:

- Subjective data: The patient complained of fatigue and weakness**.**
- Objective data: ADLs were assisted by family members. Based on these findings, the nursing diagnosis established was Activity Intolerance related to weakness**.**

DISCUSSION

The Active Cycle of Breathing Technique (ACBT) is a therapeutic intervention that helps reduce shortness of breath, thereby decreasing the sensation of dyspnea experienced by patients. This intervention has been proven effective in alleviating respiratory distress, emphasizing the importance of implementing ACBT as a non-pharmacological airway management strategy.In this case study, the patient, identified as *Mrs. S*, a 52-year-old woman, was admitted to the Emergency Department of Ibnu Sina Hospital on Thursday, May 22, 2025, with a medical diagnosis of bronchial asthma**.** During the assessment phase, the data indicated that Mrs. S experienced shortness of breath, productive cough, wheezing sounds, use of accessory respiratory muscles (+), rapid and shallow breathing pattern, ineffective coughing, chest pain with a pain scale of 3, fatigue, and weakness. The patient was given oxygen therapy via nasal cannula at 4 L/min, with vital signs as follows: BP 115/80 mmHg, HR 118 bpm, Temp 36.7°C, RR 27 breaths/min, and $SpO_2$ 91%**.** Based on the findings, the nursing diagnoses established were Ineffective Breathing Pattern, Acute Pain, and Activity Intolerance**.**In developing the nursing care plan for Mrs. S, who experienced an ineffective breathing pattern, acute pain, and activity intolerance, the interventions were designed according to problem prioritization, objectives, and expected outcomes to meet the patient's needs optimally. The nursing care plan in this case referred comprehensively to the standards stated in the Indonesian Nursing Diagnosis Standards (SDKI)(22)**,** the Indonesian Nursing Outcome Standards (SLKI)(23)**,** and the Indonesian Nursing Intervention Standards (SIKI)(24) to ensure consistency between theoretical and clinical practice. Based on the assessment results, the selected interventions included breathing pattern management, pain management, and energy management**.**

According to Adawiah (2021)**,** in patients with respiratory disorders such as bronchial asthma and COPD, the accumulation of secretions in the airway can hinder gas exchange and increase the respiratory workload, which is characterized by an elevated respiratory rate and decreased oxygen saturation (25). Therefore, before performing interventions, a comprehensive assessment is necessary to ensure that the planned intervention is aligned with the patient's needs and clinical condition. Based on this consideration, the Active Cycle of Breathing Technique was selected to reduce the dyspnea experienced by the patient.In this study, the author focused on improving oxygen saturation and breathing pattern by using the Active Cycle of Breathing Technique. Based on the initial assessment, the patient was admitted with complaints of shortness of breath. ACBT was applied as a non-pharmacological therapy to reduce dyspnea. Initially, the patient was instructed to perform breathing control exercises for 20–30 seconds, repeated 3–5 times. Gentle, relaxed diaphragmatic breathing was used to prevent fatigue and further dyspnea. If breathing difficulty persisted, this phase was continued until respiration became relaxed and controlled before proceeding to the next cycle. During this phase, the patient was asked to inhale through the nose and exhale through the mouth while placing both hands on the abdomen to feel the rise and fall during inspiration and expiration.

The next phase was thoracic expansion exercises (deep breathing), where the patient was instructed to take three to five slow and deep breaths through the nose for three seconds, hold for 2–3 seconds, and exhale slowly through the mouth for six seconds as if sighing. This exercise helps train respiratory muscles, increase chest wall expansion, and mobilize sputum, making it easier to expel. The final stage was forced expiration (huffing), which aims to clear sputum from the lungs. The patient performed the first and second techniques two to three times before proceeding to huffing. Afterward, the patient was encouraged to cough as effectively as possible, taking deep breaths while keeping the mouth open and exhaling forcefully from the back of the throat.

After repeated implementation, the patient reported reduced shortness of breath and an improved breathing pattern. These findings are consistent with the study conducted by Sondakh et al., which demonstrated that the Active Cycle of Breathing Technique in bronchial asthma patients led to a decrease in respiratory rate and an increase in oxygen saturation. The therapy was highly effective in reducing dyspnea and promoting sputum clearance among bronchial asthma patients. The data obtained before intervention indicated decreased oxygen saturation, increased respiratory rate, and the presence of additional breath sounds. However, after applying the ACBT technique, the patient's condition improved, as evidenced by a decrease in respiratory rate, diminished additional breath sounds, and increased oxygen saturation ($SpO_2$).

## CONCLUSIONS

The application of the Active Cycle of Breathing Technique (ACBT) was effective in reducing dyspnea in patients with bronchial asthma, as evidenced by a decrease in respiratory rate from 27 breaths per minute to 22 breaths per minute after a 6-hour observation period, during which ACBT was performed three times for 15 minutes per session. This technique can be utilized as a non-pharmacological intervention for airway management in healthcare settings.It is recommended that healthcare professionals receive training related to this technique to ensure consistent and evidence-based implementation. In addition, patient and family education regarding the ACBT should be provided so that the technique can be independently practiced at home, thereby enhancing the patient's quality of life and supporting optimal asthma management.

## AUTHOR'S CONTRIBUTION STATEMENT

Conceptualization: HA, JA; Methodology: RH,MG,F; Data Collection: HA, JA; Formal Analysis: RH; Writing Original Draft: JA; Writing Review & Editing: HA,JA. All authors have read and approved the final manuscript.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest related to this study.

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