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CASE REPORT: COMBINED PURSED-LIP BREATHING AND CHEST CLAPPING FOR INEFFECTIVE AIRWAY CLEARANCE DURING ACUTE ASTHMA EXACERBATION

Fathiya Luthfil Yumni[a] , Mariyatul Kiptiyah[b]

[a]Doctoral Program, University of Airlangga, Surabaya, 60115, Indonesia

[b]Faculty Health and Science, University Muhammadiyah of Surabaya, Surabaya, 60113, Indonesia

**Corresponding author: Fathiyaluthfilyumni.ac.id@gmai.com*

Abstract

Background: Asthma is a chronic inflammatory airway disease characterized by reversible airway obstruction and bronchial hyperresponsiveness. During an asthma attack, bronchoconstriction and mucus accumulation may impair ventilation and cause ineffective airway clearance. Non-pharmacological nursing interventions such as Pursed Lips Breathing (PLB) and chest clapping may improve respiratory status; however, evidence regarding their combined application in asthma attack patients remains limited. **Case Summary:** This case report describes a 56-year-old hospitalized female patient admitted to a general medical ward with an asthma attack presenting with dyspnea, increased respiratory effort, ineffective airway clearance, and secretion accumulation. Clinical findings included accessory respiratory muscle use, reduced breathing depth, and decreased oxygen saturation. **Investigation and Diagnosis:** Diagnostic assessment included physical examination, spirometry, blood gas analysis (BGA), and pulse oximetry. Initial findings showed FEV1 34.82% (0.72 L), $PaCO_2$ 63.1 mmHg, pH 7.18, and SpO_2 84% without oxygen support, indicating respiratory acidosis and impaired respiratory function. The nursing diagnosis established was ineffective airway clearance related to excessive secretions and airway obstruction secondary to asthma attack. **Management:** Nursing care was provided based on Indonesian Nursing Intervention Standards (SIKI) Respiratory Monitoring (I.01014) combined with PLB and chest clapping for three consecutive days, three times daily, including respiratory monitoring, secretion management, education, and breathing exercises. **Outcome:** Clinical improvement was observed after intervention. FEV1 increased to 52.25% (1.65 L), $PaCO_2$ decreased to 44.56 mmHg, pH improved to 7.36, and SpO_2 increased to 98%. Dyspnea and accessory muscle use decreased, while breathing depth improved. **Discussion :** In this patient, the use of combined Pursed-Lip Breathing and chest clapping was associated with favorable changes in airway clearance indicators and respiratory parameters during hospitalization. As this report describes a single patient, these findings should be interpreted cautiously and may help inform future studies evaluating the role of these nursing interventions in patients with asthma attacks.

Keywords: Asthma; Chest Clapping; Pursed-Lip Breathing according to alphabetical order

INTRODUCTION

Asthma is a chronic inflammatory disease of the airways characterized by bronchial hyperresponsiveness, persistent inflammation, and reversible airway obstruction. In an asthma attack condition, there is an increase in inflammation, bronchospasm, mucosal edema, and excessive mucus production, which can lead to impaired ventilation and reduced airway patency. Common clinical manifestations include dyspnea, wheezing, cough, tachypnea, use of accessory respiratory muscles, and increased secretions, which may lead to the nursing diagnosis of ineffective airway clearance. This condition may increase the risk of secretion retention, decreased oxygen saturation, respiratory muscle fatigue, and even respiratory failure if not managed optimally (Herdman & Kamitsuru, 2021; Global Initiative for Asthma [GINA], 2024).

Globally, asthma remains a significant health problem with a high incidence rate, affecting approximately 262–363 million cases and causing more than 450,000 deaths annually, mostly due to delayed treatment and poor disease control (World Health Organization [WHO], 2024). In Indonesia, the prevalence of asthma based on the 2018 Basic Health Research (Riskesdas) ranges from 2.4–2.6%, while in East Java it is approximately 2.5%, indicating that asthma remains one of the major respiratory health problems (Ministry of Health of the Republic of Indonesia, 2018; Primarani & Megatsari, 2022). In clinical practice, patients with asthma attacks still frequently require hospital care due to ventilation impairment and secretion accumulation.

In nursing practice, the problem of ineffective airway clearance in patients with asthma attacks requires both pharmacological and non-pharmacological interventions. One non-pharmacological intervention that can be applied is Pursed Lips Breathing (PLB), a breathing exercise that helps prolong the expiratory phase, reduce air trapping, and improve alveolar ventilation (Nguyen & Duong, 2025). In addition, chest clapping is used to assist secretion mobilization, thereby facilitating sputum expectoration. However, clinical evidence regarding the combination of PLB and chest clapping in asthma attack patients with the nursing diagnosis of ineffective airway clearance is still limited, particularly in the form of a clinical case report.

Therefore, this case report aims to describe the application of the combination of Pursed Lips Breathing and chest clapping in a patient with an asthma attack and the nursing diagnosis of ineffective airway clearance, as well as to evaluate changes in the patient's clinical condition after nursing interventions.

CASE PRESENTATION

The patient, Mrs. M, is a 61-year-old Javanese female, Muslim, married, and a housewife with two children and one grandchild. She resides in a densely populated residential area located approximately 5 meters from a public waste disposal site. The household environment is characterized by inadequate ventilation, with the bedroom lacking windows and ventilation available only at the front of the house. Her body mass index (BMI) was 23.9 kg/m². She had never smoked and had no history of secondhand smoke exposure. The patient reported no known drug or food allergies. Based on her previous clinical history, she was diagnosed with moderate persistent bronchial asthma. During the previous 12 months, she had experienced two asthma exacerbations requiring emergency department visits and hospitalization.

The patient was admitted to the Emergency Department of RSUD Haji Provincial Hospital, East Java, on October 14, 2025, at 15:30 WIB, presenting with chief complaints of dyspnea and fever. The dyspnea had persisted for three days before admission and progressively worsened on the fourth day, prompting her family to bring her to the hospital. The patient had a known history of bronchial asthma and routinely used a Seretide inhaler during exacerbations; however, her symptoms did not respond to home treatment during the current episode. In addition, she had comorbid diabetes mellitus and hypertension, which were managed with insulin (10 units), Forxiga/Fonylin MR 60 mg, and amlodipine 10 mg, respectively.

On reassessment conducted on October 20, 2025, the patient continued to report dyspnea, productive cough, and wheezing. She stated that previous episodes of dyspnea were typically accompanied by a productive cough and chest tightness, prompting her family to seek immediate medical attention whenever her symptoms worsened. Vital signs revealed a blood pressure of 149/60 mmHg, a pulse rate of 73 beats/min, a respiratory rate of 24 breaths/min, a body temperature of 36.4°C, and an oxygen saturation (SpO_2) of 84%. The patient was conscious and fully oriented (compos mentis), with a Glasgow Coma Scale (GCS) score of E4V5M6. The fall risk assessment score was 50, and the pressure injury risk assessment score was 17. Respiratory examination revealed the use of accessory respiratory muscles, including nasal flaring and intercostal retractions. Auscultation demonstrated wheezing over the left upper lung field.

CLINICAL REASONING

Clinical Assessment Findings

Mrs. M presented with dyspnea, fever, productive cough, and wheezing. The clinical assessment revealed increased work of breathing, characterized by the use of accessory respiratory muscles, nasal flaring, and intercostal retractions. Objective findings included tachypnea (respiratory rate of 24 breaths/min), hypoxemia (SpO_2 84% without oxygen support), and wheezing on auscultation in the left upper lung field. The patient also reported a previous history of bronchial asthma, recurrent episodes of dyspnea accompanied by productive cough and chest tightness, and routine use of a Seretide inhaler during asthma exacerbations.

Interpretation of Findings

The combination of subjective and objective findings indicated impaired ventilation associated with airway narrowing and excessive mucus accumulation. The presence of wheezing suggested bronchospasm, while productive cough and secretion accumulation indicated difficulty in clearing airway secretions. The use of accessory respiratory muscles and reduced oxygen saturation reflected increased respiratory effort and compromised respiratory function. These findings suggested that airway obstruction and ineffective secretion clearance were the primary clinical problems requiring immediate nursing attention.

Differential Diagnosis

Several differential diagnoses were considered based on the presenting symptoms, including acute asthma exacerbation, pneumonia, acute exacerbation of chronic obstructive pulmonary disease (AECOPD), and congestive heart failure. An acute asthma exacerbation was considered the most likely diagnosis due to the patient's established history of bronchial asthma, recurrent episodes of dyspnea with wheezing, response pattern to asthma medication use, and clinical signs of bronchospasm and increased work of breathing. Pneumonia was considered due to the presence of fever and productive cough; however, the absence of dominant infectious signs and the presence of characteristic asthma-related symptoms supported asthma exacerbation as the primary condition. AECOPD was considered less likely due to the absence of a smoking history and a previous diagnosis of chronic obstructive pulmonary disease. Congestive heart failure was also considered but was less consistent with the patient's clinical presentation and respiratory findings.

Nursing Diagnosis

Based on the integration of subjective data, objective findings, and the patient's medical history, the prioritized nursing diagnosis was ineffective airway clearance related to increased mucus production and bronchospasm, as evidenced by dyspnea, productive cough, wheezing, use of accessory respiratory muscles, and decreased oxygen saturation. This diagnosis was prioritized over other potential nursing problems because airway clearance directly affects ventilation and oxygenation, and impaired airway patency may contribute to further respiratory deterioration if not addressed promptly.

Rationale for Intervention Selection

The selection of combined Pursed-Lip Breathing (PLB) and chest clapping was based on the identified physiological problems. PLB was selected to promote controlled expiration, reduce airway collapse, and improve ventilation efficiency by prolonging expiratory time. Chest clapping was implemented to facilitate the mobilization of airway secretions and support mucus clearance. Therefore, the combination of these interventions was considered appropriate to address the patient's ineffective airway clearance by targeting both airway obstruction and secretion retention.

DIAGNOSTIC ASSESSMENT

Table 1. Summary of relevant diagnostic findings

Examination	Result	Clinical Interpretation
Physical Examination (Respiratory Status)	The patient experienced dyspnea, increased use of accessory respiratory muscles, and reduced depth of breathing.	These findings indicate increased work of breathing and impaired respiratory mechanics, suggesting compromised ventilation associated with airway obstruction.
Spirometer (Pre-Intervention FEV1)	34,82% (0,72 L)	The markedly reduced FEV_1 indicates severe airflow limitation and reduced expiratory capacity, which is consistent with obstructive airway impairment commonly observed during asthma exacerbation.
Blood Gas Analysis (Pre-Intervention)	$PaCO_2$: 63.1 mmHg; pH: 7.18; HCO_3: 25.3; BE: 2.26	The increased $PaCO_2$ with decreased pH indicates acute respiratory acidosis caused by carbon dioxide retention, suggesting inadequate alveolar ventilation due to increased airway resistance and respiratory compromise.
Pulse Oximetry	SpO_2: 84% without oxygen support	The reduced oxygen saturation indicates impaired oxygenation, reflecting the severity of the respiratory disturbance.
Clinical Assessment (Nursing Outcome Classification: Breathing Pattern – L.01004)	Increased dyspnea, increased use of accessory respiratory muscles, and decreased depth of breathing.	These findings supported the identification of impaired respiratory function and served as baseline indicators for evaluating nursing outcomes..
Clinical Evaluation After Intervention	Dyspnea decreased, accessory muscle use reduced, and breathing depth improved.	These changes indicated improvement in respiratory clinical indicators following the nursing intervention.

Diagnostic reasoning

The diagnostic assessment demonstrated evidence of acute respiratory compromise characterized by airflow limitation, impaired ventilation, carbon dioxide retention, and hypoxemia. The reduced FEV_1 (34.82%, 0.72 L) indicated significant expiratory airflow obstruction, while elevated $PaCO_2$ (63.1 mmHg) accompanied by respiratory acidosis (pH 7.18) suggested inadequate ventilation due to increased airway resistance. The presence of dyspnea, wheezing, productive cough, and increased use of accessory respiratory muscles further supported the clinical interpretation of an acute asthma exacerbation with impaired airway clearance.

The diagnostic findings were also evaluated in relation to other possible causes of respiratory distress. Pneumonia was considered due to the presence of fever and productive cough; however, the dominant clinical

features of bronchospasm, previous asthma history, wheezing, and obstructive spirometry findings were more consistent with asthma exacerbation. Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) was considered less likely due to the absence of smoking history and lack of previous COPD diagnosis. Congestive heart failure was also considered but was not supported by the respiratory examination findings and the patient's clinical history.

Based on the integration of clinical findings, spirometry results, blood gas analysis, oxygen saturation, and patient history, the final diagnosis was established as an acute asthma exacerbation accompanied by ineffective airway clearance due to bronchospasm and increased airway secretions. These findings provided the clinical basis for implementing respiratory nursing interventions, including Pursed-Lip Breathing (PLB) and chest clapping, aimed at supporting ventilation and facilitating airway secretion clearance.

THERAPEUTIC INTERVENTION

Nursing interventions were provided based on the Indonesian Nursing Intervention Standard (SIKI), specifically Respiratory Monitoring (I.01014), which includes observational, therapeutic, educational, and collaborative components aimed at improving the patient's respiratory condition. Respiratory monitoring included assessment of respiratory rate, breathing pattern, breathing depth, use of accessory respiratory muscles, oxygen saturation, and signs of respiratory distress. Therapeutic interventions included positioning to optimize ventilation, secretion management, education regarding effective breathing techniques, and collaboration with the medical team for pharmacological management.

The interventions were implemented for three consecutive days, with a frequency of three sessions per day. The expected outcomes were based on the Indonesian Nursing Outcome Standard (SLKI), specifically the Breathing Pattern outcome (L.01004), including reduced dyspnea, decreased use of accessory respiratory muscles, improved breathing depth, and improved respiratory comfort. The patient received Pursed-Lip Breathing (PLB) exercises as a respiratory nursing intervention. PLB was performed in a semi-Fowler position to facilitate lung expansion and reduce respiratory effort. The patient was instructed to inhale slowly through the nose and exhale slowly through pursed lips while maintaining an inspiration-to-expiration ratio of 1:2. Each breathing cycle consisted of a slow inhalation followed by prolonged exhalation through pursed lips. Each PLB session was conducted for approximately 10 minutes and consisted of six breathing cycles, with a 2-second rest interval between each cycle. The exercise was performed three times daily for three consecutive days under the guidance and supervision of a nurse.

Chest clapping was performed as an adjunctive airway clearance technique to facilitate the mobilization of respiratory secretions. The patient was positioned according to the targeted lung segment to optimize secretion mobilization and maintain patient comfort. Manual percussion was performed by a nurse using a cupped-hand technique over the specific affected lung segments while avoiding bony prominences and sensitive areas. Each chest clapping maneuver was performed for approximately 10 seconds per targeted lung segment and was administered three times daily for three consecutive days. The intervention was combined with effective coughing techniques to assist in the removal of airway secretions.

The combination of PLB and chest clapping was selected based on the patient's clinical problems, including airway obstruction, increased work of breathing, and secretion accumulation. PLB was intended to promote controlled expiration, reduce airway collapse, and improve ventilatory efficiency, whereas chest clapping was aimed at facilitating mucus mobilization and supporting airway clearance. These interventions were implemented as supportive nursing strategies to address the patient's ineffective airway clearance and respiratory symptoms.

THERAPEUTIC SEQUENCE

Clinical management was carried out in stages over a three-day period based on the Indonesian Nursing Intervention Standard (SIKI), specifically Respiratory Monitoring (I.01014), to achieve the targeted outcomes of

the Indonesian Nursing Outcome Standard (SLKI), namely Breathing Pattern (L.01004), characterized by improved respiratory status. The main respiratory interventions consisted of Pursed-Lip Breathing (PLB) exercises and chest clapping, which were performed throughout the three-day intervention period.

Day 1 (Initial Assessment and Stabilization)

On the first day, a comprehensive respiratory assessment was conducted, including evaluation of respiratory rate, breathing pattern, breathing depth, use of accessory respiratory muscles, dyspnea severity, oxygen saturation, and signs of respiratory distress. These assessments were performed to determine the severity of respiratory impairment and establish the basis for nursing interventions. The findings indicated dyspnea, increased work of breathing, decreased oxygen saturation, and increased use of accessory respiratory muscles. Therefore, interventions were initiated to support respiratory function through semi-Fowler positioning, respiratory monitoring three times daily, Pursed-Lip Breathing (PLB) exercises, and chest clapping.

PLB exercises were performed three times daily, with each session lasting approximately 10 minutes. The patient was instructed to perform slow inhalation through the nose followed by prolonged expiration through pursed lips using an inspiration-to-expiration ratio of 1:2. Chest clapping was also performed on the first day by a nurse as an airway clearance technique to assist secretion mobilization.

Day 2 (Therapeutic Adjustment and Reinforcement)

On the second day, clinical evaluation showed a reduction in dyspnea intensity; however, the patient continued to demonstrate the use of accessory respiratory muscles. Therefore, respiratory interventions were continued and reinforced. PLB exercises were maintained three times daily, with each session lasting approximately 10 minutes, while the patient was guided to perform effective inspiration and expiration techniques. Chest clapping was also continued on the second day, performed by a nurse three times daily to support airway secretion clearance. Patient education regarding breathing techniques and effective coughing was reinforced to encourage active participation in respiratory management.

Day 3 (Evaluation of Clinical Response)

On the third day, evaluation demonstrated further improvement in respiratory status, indicated by reduced dyspnea, decreased use of accessory respiratory muscles, improved breathing depth, and improved oxygenation parameters. The established interventions were continued without major modification. PLB exercises were continued three times daily, with each session lasting approximately 10 minutes, and chest clapping was performed by the nurse on the third day to maintain airway clearance. The patient was also encouraged to continue PLB exercises independently as a supportive strategy for respiratory symptom management after discharge.

This three-day sequence of interventions followed the Indonesian Nursing Intervention Standard (SIKI) Respiratory Monitoring (I.01014), incorporating respiratory assessment, therapeutic interventions, education, airway clearance techniques, and continuous evaluation of patient response.

CASE TIMELINE

Table 2. Clinical case timeline

Time	Clinical Event	Investigation	Treatment	Outcome
Day 0	The patient presented with respiratory complaints, including	Initial respiratory assessment was performed, including evaluation of	Nursing interventions were initiated based on the Indonesian Nursing Intervention Standard (SIKI)	Initial evaluation showed persistent dyspnea, decreased oxygen saturation, and increased work of

	dyspnea, increased work of breathing, ineffective airway clearance, and an ineffective breathing pattern.	respiratory rate, breathing pattern and depth, use of accessory respiratory muscles, auscultation of breath sounds, oxygen saturation monitoring, spirometry, and blood gas analysis as baseline clinical data.	Respiratory Monitoring (I.01014), including respiratory monitoring, semi-Fowler positioning, assessment of respiratory distress signs, secretion management, and initial education on effective breathing techniques. The patient was introduced to Pursed-Lip Breathing (PLB) and chest clapping as supportive airway clearance interventions.	breathing; however, the patient tolerated therapeutic positioning and breathing exercises.
15 October 2025 (Day 1 – First Interventio n Day)	The patient continued to experience mild-to-moderate dyspnea with visible use of accessory respiratory muscles.	Further evaluation of respiratory rate, breathing pattern, breathing depth, oxygen saturation, and response to respiratory interventions was conducted. Respiratory monitoring was performed three times daily.	Respiratory interventions were continued. PLB exercises were performed three times daily, with each session lasting approximately 10 minutes, under nursing supervision to ensure correct inspiratory and expiratory techniques. Chest clapping was also performed by the nurse three times daily to facilitate airway secretion clearance.	A subjective reduction in dyspnea was observed; however, accessory respiratory muscle use remained present.
16 October 2025 (Day 2 – Second Interventio n Day)	Clinical improvement was noted with reduced dyspnea intensity and improved breathing comfort.	Reassessment showed a more regular breathing pattern and improved respiratory depth. Evaluation was conducted to determine the need for intervention modification.	No major changes were made to the intervention plan; however, reinforcement of education and optimization of PLB exercises were provided to enhance ventilatory effectiveness.	Use of accessory respiratory muscles began to decrease, and the patient demonstrated improved ability to perform PLB independently.
23 Octiber (Day 3-Last Interventio n)	The patient's respiratory condition showed significant improvement compared to admission.	Final evaluation of respiratory indicators was conducted based on the Indonesian Nursing Outcome Standard (SLKI) Breathing Pattern (L.01004).	Therapeutic interventions were maintained until discharge. The patient was educated to continue PLB exercises independently after treatment.	Clinical improvement was observed, including reduced dyspnea, decreased use of accessory respiratory muscles, and improved breathing depth.
Follow-up	The patient was advised to attend scheduled follow-up visits and maintain learned breathing techniques.	Ongoing evaluation may be conducted to assess respiratory status and the patient's ability to perform independent	Continuation of regular Pursed Lips Breathing exercises and maintenance of activity within tolerance levels.	Stable respiratory condition is expected to be maintained, with minimized risk of symptom recurrence.

		breathing exercises at home.		

OUTCOME AND FOLLOW-UP

Parameter	Pre-Intervention	Post-Intervention (After 3 Days)	Clinical Interpretation
Clinical Symptoms	Dyspnea, increased use of accessory respiratory muscles, and reduced depth of breathing	Reduced dyspnea, decreased use of accessory respiratory muscles, and improved depth of breathing	Indicates improvement in respiratory status in accordance with the Indonesian Nursing Outcome Standard (SLKI) Breathing Pattern (L.01004)
FEV1 (%)	34,82%	52,25%	An increase in expiratory pulmonary function was observed during the treatment period. However, this improvement cannot be attributed solely to PLB because other treatments were administered concurrently.
FEV1 (L)	0,72 L	1,65 L	Expiratory lung capacity increased during the treatment period, potentially reflecting the combined effects of PLB and concurrent clinical management.
$PaCO_2$ (mmHg)	63,1	44,56	The reduction in $PaCO_2$ indicates decreased carbon dioxide retention and improved alveolar ventilation during the combined treatment period.
pH	7,18	7,36	The pH increased toward the physiological range, indicating improvement in respiratory acidemia during treatment.
HCO_3	25,3	22,3	The change in bicarbonate accompanied the normalization of pH and $PaCO_2$ and should be interpreted in conjunction with the overall arterial blood gas findings.

Base Excess (BE)	2,26	1,8	Respiratory acidosis resolved during the treatment period, suggesting improved alveolar ventilation following combined clinical management.
Blood Gas Analysis Interpretation	Respiratory acidosis	Normal	Peripheral oxygen saturation improved during the treatment period. This improvement may have resulted from the combined effects of PLB, pharmacological therapy, and supportive hospital care.
SpO_2 (%) tanpa bantuan oksigenasi	84%	98%	No adverse events or complications associated with PLB were observed during the intervention period.
Complication	None observed	None observed	The patient tolerated the intervention well
Short-term Follow-up	—	The patient was advised to continue Pursed Lips Breathing (PLB) independently	PLB was recommended as an adjunctive self-management technique alongside continued adherence to the prescribed medical treatment and follow-up plan.

The evaluation results demonstrated progressive improvement in Mrs. M's respiratory status over the three-day treatment period. During this period, Respiratory Monitoring (I.01014), based on the Indonesian Nursing Intervention Standard (SIKI), and Pursed Lips Breathing (PLB) were implemented as adjunctive nursing interventions alongside concurrent pharmacological therapy and supportive hospital management. At the initial assessment, the patient presented with dyspnea, increased use of accessory respiratory muscles, and reduced depth of breathing. Objective findings showed an increase in FEV1 from 34.82% (0.72 L) to 52.25% (1.65 L). Arterial Blood Gas analysis also showed resolution of respiratory acidosis, with $PaCO_2$ decreasing from 63.1 mmHg to 44.56 mmHg and pH increasing from 7.18 to 7.36. In addition, SpO_2 increased from 84% to 98% without supplemental oxygen, indicating improved oxygenation during the treatment period.

Clinically, the patient experienced reduced dyspnea, decreased use of accessory respiratory muscles, and improved depth of breathing, consistent with improvement in the Indonesian Nursing Outcome Standard (SLKI) Breathing Pattern (L.01004). No complications associated with PLB were observed, and the patient tolerated the exercises well. However, because PLB was administered concurrently with pharmacological therapy and supportive hospital care, the observed improvements cannot be attributed solely to PLB. The findings should therefore be interpreted as reflecting the combined effects of comprehensive clinical

management, with PLB serving as a supportive nursing intervention. At discharge, the patient was advised to continue PLB independently at home as an adjunct to the prescribed treatment and follow-up plan.

DISCUSSION

The case of Mrs. M illustrates the clinical complexity of managing acute respiratory impairment in a patient with asthma. At the initial assessment, the patient presented with dyspnea, increased use of accessory respiratory muscles, reduced breathing depth, and hypoxemia. Objective findings included an FEV1 of 34.82% (0.72 L), $PaCO_2$ of 63.1 mmHg, pH of 7.18, and SpO_2 of 84% without supplemental oxygen, indicating severe ventilatory impairment accompanied by respiratory acidosis (Mousa et al., 2023). Because subjective symptoms such as dyspnea may not fully reflect the severity of airway obstruction and gas-exchange impairment, spirometry, arterial blood gas analysis, and pulse oximetry were used to support clinical assessment and monitor changes during treatment.

Nursing management was implemented according to the Indonesian Nursing Intervention Standard (SIKI) Respiratory Monitoring (I.01014), including respiratory assessment, therapeutic positioning, patient education, and continued monitoring. Pursed Lips Breathing (PLB) was incorporated as an adjunctive non-pharmacological intervention intended to promote controlled expiration, reduce respiratory effort, and improve breathing regulation. Over the three-day treatment period, FEV1 increased to 52.25% (1.65 L), $PaCO_2$ decreased to 44.56 mmHg, pH increased to 7.36, and SpO_2 increased to 98% without supplemental oxygen. These objective changes were accompanied by reduced dyspnea, decreased use of accessory respiratory muscles, and improved breathing depth, consistent with improvement in the Indonesian Nursing Outcome Standard (SLKI) Breathing Pattern (L.01004).

The symptomatic improvement observed in this case is consistent with the case report by Rahmi et al. (2022), in which three days of PLB exercises in a patient with bronchial asthma were associated with reduced dyspnea and respiratory rate. However, that report primarily evaluated short-term clinical symptoms, whereas the present case additionally documented changes in spirometric and arterial blood gas parameters. Despite this difference, both reports were based on uncontrolled case observations and therefore could not establish that PLB was the direct cause of the observed improvement.

The findings should also be interpreted in relation to controlled studies of breathing retraining in asthma. Thomas et al. (2009) found that breathing exercises improved asthma-related health status and patient-centered outcomes but did not produce corresponding improvements in asthma pathophysiology. Similarly, Bruton et al. (2018) reported that physiotherapy-based breathing retraining improved quality of life in adults with incompletely controlled asthma, although it had little effect on pulmonary function or airway inflammation. These findings suggest that breathing interventions may be particularly beneficial for symptom perception, dysfunctional breathing, and self-management, while their direct effects on airway obstruction and objective lung function remain uncertain.

Evidence regarding chest physiotherapy and airway clearance interventions in acute asthma is also inconsistent. Asher et al. (1990) reported that chest physiotherapy, when added to pharmacological treatment, did not improve lung function in most children recovering from acute severe asthma. Although the population and intervention differed from those in the present case, this finding indicates that respiratory physiotherapy techniques do not uniformly produce measurable pulmonary function improvement in asthma. Airway clearance interventions may be more relevant when mucus retention or substantial airway secretions are present and should not be routinely assumed to improve airflow obstruction in every patient.

The relatively large changes in FEV1, $PaCO_2$, pH, and SpO_2 observed in Mrs. M therefore require cautious interpretation. PLB may have supported controlled expiration, reduced respiratory effort, and improved the patient's ability to manage dyspnea. However, the objective improvement may also have reflected the effects

of concurrent pharmacological therapy, supportive hospital management, therapeutic positioning, repeated clinical monitoring, and the natural resolution of the acute exacerbation. Because these treatments were administered during the same period, their individual effects could not be separated.

Several additional limitations should be considered. First, this report involved only one patient and lacked a control or comparison condition, limiting causal inference and generalizability. Second, the intervention and observation period lasted only three days, preventing evaluation of sustained benefit, adherence after discharge, or symptom recurrence. Third, spirometry is effort-dependent and may be affected by patient cooperation, fatigue, familiarity with the procedure, timing of bronchodilator administration, and measurement conditions. If the timing of spirometry, blood gas analysis, and oxygen discontinuation was not standardized, differences between the pre- and post-intervention assessments may also have influenced the results. Fourth, changes in respiratory symptoms were not compared using a standardized dyspnea instrument, which may have increased the risk of observer and reporting bias. Finally, clinical characteristics such as baseline asthma control, previous treatment, severity of the exacerbation, comorbidities, and airway secretion burden may have influenced the patient's response.

Consequently, the findings do not demonstrate that PLB independently caused the observed physiological improvement. Rather, PLB may be considered a feasible and well-tolerated adjunctive nursing intervention within comprehensive asthma management. Controlled studies with larger samples, standardized intervention protocols, consistent timing of physiological measurements, validated symptom instruments, and longer follow-up are needed to determine the specific contribution of PLB to respiratory symptoms, lung function, gas exchange, and clinical recovery in patients with acute asthma.

LIMITATION

This case report has several limitations that should be considered when interpreting the findings.

1. Single-patient design and inability to establish causality

This report involved only one patient; therefore, the findings cannot be generalized to broader populations with asthma or other respiratory conditions. More importantly, a single-patient case report without a control or comparison group cannot establish a causal relationship between Pursed Lips Breathing (PLB) and the observed clinical improvement. The temporal association between the intervention and the outcomes should not be interpreted as evidence that PLB directly caused the changes in respiratory symptoms, pulmonary function, oxygen saturation, or arterial blood gas parameters.

2. Short intervention and observation period

PLB was implemented over a three-day period. Consequently, the short-term changes observed during hospitalization may not represent sustained improvement, and the long-term effectiveness of PLB on respiratory symptoms, pulmonary function, and gas exchange could not be determined.

3. Absence of post-discharge follow-up

Patient evaluation was limited to the hospitalization period, with no post-discharge assessment. Therefore, adherence to independent PLB practice, persistence of clinical improvement, symptom recurrence, and longer-term outcomes could not be evaluated.

4. Concurrent therapies and potential confounding factors

PLB was administered alongside pharmacological treatment, supportive hospital management, therapeutic positioning, respiratory monitoring, and other nursing interventions. These concurrent treatments, as well as the natural resolution of the acute exacerbation, may have contributed to the

observed improvement. Because the effects of these interventions could not be separated, the independent contribution of PLB remains uncertain.

5. Potential measurement-related limitations

Although objective measures, including FEV1, arterial blood gas analysis, and SpO_2, were used, several factors may have influenced the pre- and post-intervention results. Spirometry is effort-dependent and may be affected by patient cooperation, fatigue, familiarity with the procedure, and the timing of bronchodilator administration. Similarly, variations in the timing and conditions of arterial blood gas and oxygen saturation measurements may have affected the comparability of the findings.

6. Limited comprehensiveness of clinical data

Additional information, including baseline asthma control, exacerbation severity, previous treatment history, comorbidities, airway secretion characteristics, standardized dyspnea scores, and detailed medication timing, was not fully available. The absence of these data limited the ability to comprehensively interpret the patient's response and identify other factors that may have influenced the clinical outcomes.

Accordingly, the findings should be interpreted as a descriptive observation of clinical improvement during comprehensive hospital management rather than as evidence of the effectiveness or causal effect of PLB. Further studies involving larger samples, comparison groups, standardized intervention protocols, and longer follow-up periods are required to determine the specific contribution of PLB to clinical and physiological outcomes in patients with asthma.

LEARNING POINTS

1. In this case, serial assessment using respiratory symptoms, accessory muscle use, breathing depth, FEV1, arterial Blood Gas Analysis, and SpO_2 provided a more comprehensive evaluation of respiratory impairment than subjective symptoms alone.
2. Objective respiratory monitoring was important for identifying the severity of ventilatory dysfunction and documenting changes during the three-day treatment period, including changes in FEV1, $PaCO_2$, pH, and SpO_2.
3. The improvement observed after the implementation of Pursed Lips Breathing occurred within comprehensive hospital management that also included pharmacological therapy, supportive care, therapeutic positioning, and respiratory monitoring. Therefore, the independent effect of PLB could not be determined.
4. PLB was feasible and well tolerated as an adjunctive nursing intervention in this patient. Direct observation and repeated instruction were important to ensure that the patient performed the breathing technique correctly.
5. Active patient participation was essential because the patient was expected to understand, practise, and subsequently perform PLB independently. Assessing the patient's ability to demonstrate the technique was therefore an important component of nursing evaluation.
6. Education for independent PLB practice should include clear instructions regarding the breathing technique, the appropriate time to use it, and the need to continue prescribed medical treatment. Independent breathing exercises should be presented as supportive self-management rather than as a replacement for pharmacological therapy or clinical follow-up.
7. Pre- and post-treatment measurements may support clinical decision-making, but changes observed in a single-patient case report should be interpreted descriptively and cannot establish the effectiveness or causal effect of PLB.

CONCLUSION

In the case of Mrs. M, improvement in respiratory status was observed over a three-day treatment period during which Respiratory Monitoring and Pursed Lips Breathing (PLB) were implemented as part of comprehensive nursing and medical management. The observed changes included an increase in FEV1,

normalization of arterial Blood Gas Analysis parameters, improvement in SpO_2 without supplemental oxygen, reduced dyspnea, decreased use of accessory respiratory muscles, and improved breathing depth.

PLB was feasible and well tolerated as an adjunctive nursing intervention in this patient. However, because PLB was provided concurrently with pharmacological therapy, supportive hospital management, therapeutic positioning, and other nursing interventions, its independent contribution to the observed improvement could not be determined. Therefore, these findings should be interpreted as a descriptive clinical observation rather than evidence of the definitive effectiveness of PLB. Further studies involving larger samples, comparison groups, standardized intervention protocols, and longer follow-up periods are needed to evaluate the specific effects of PLB on respiratory symptoms, pulmonary function, and gas exchange in patients with asthma.

ETHICAL CLEARANCE

This report describes nursing care provided to a single patient as part of routine clinical management and did not involve experimental procedures or changes to the prescribed treatment. Formal ethics committee review was not obtained before preparation of the case report. Written informed consent for publication was obtained from the patient. The authors maintained patient confidentiality and privacy by removing personally identifiable information and reported the case in accordance with professional and patient safety standards.

PATIENT CONSENT

Written informed consent was obtained from the patient for the publication of this case report, including clinical data related to the care process and clinical outcome evaluation. The patient's identity was kept confidential by omitting any personal information that could reveal her identity. All clinical information presented in this report is used solely for academic purposes and scientific development, while maintaining the principles of patient privacy and confidentiality.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest related to the writing or publication of this case report. The entire manuscript preparation process was conducted independently without any influence from external parties that could affect the objectivity of the findings and interpretation of the reported case.

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AUTHORS' CONTRIBUTION

The first author contributed to case conceptualization, clinical data collection, implementation of nursing care, data analysis, and manuscript drafting. The second author contributed to academic supervision, validation of clinical analysis, and substantive manuscript revision. The third author contributed to methodological review, evaluation of scientific content, and manuscript refinement. All authors have read, reviewed, and approved the final version of the manuscript for publication.

DATA AVAILABILITY

The supporting data for this case report cannot be publicly shared due to patient confidentiality considerations and ethical restrictions. Limited information may be made available upon reasonable request to the corresponding author, provided that patient anonymity is maintained.

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LIST OF ABBREVIATIONS

BGA = Blood Gas Analysis
BE = Base Excess
CO_2 = Carbon Dioxide
ECG = Electrocardiography
FEV1 = Forced Expiratory Volume in One Second
FiO_2 = Fraction of Inspired Oxygen
HCO_3 = Bicarbonate
MRI = Magnetic Resonance Imaging
$PaCO_2$ = Partial Pressure of Carbon Dioxide in Arterial Blood
PLB = Pursed Lips Breathing
PPOK = Penyakit Paru Obstruktif Kronik (Chronic Obstructive Pulmonary Disease/COPD)
RSUD = Rumah Sakit Umum Daerah
SIKI = Standar Intervensi Keperawatan Indonesia
SLKI = Standar Luaran Keperawatan Indonesia
SpO_2 = Peripheral Oxygen Saturation
TTV = Tanda-Tanda Vital

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