

Optimizing Breathing Patterns in Asthma Patients Through Purse Lip Breathing Technique

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Abstract:

Asthma is a leading cause of global morbidity and mortality, accounting for 17.4% of deaths worldwide. As one of the top 10 non-communicable diseases, asthma significantly impacts patients and their families. Characterized by recurrent and reversible airway obstruction, asthma often leads to ineffective breathing patterns. This study explored the impact of pursed-lip breathing (PLB) therapy on reducing respiratory rate in asthma patients with ineffective breathing patterns at Dr. Haryoto Hospital, Lumajang. A case study design was employed from June 14 to June 18, 2024, involving a single asthma patient who met the criteria of dyspnea, abnormal breathing patterns, and the use of accessory respiratory muscles. Data collection included objective and subjective measurements using observation sheets, physical examination tools, and standard operational procedures. PLB therapy was administered over five days, with three daily sessions, each lasting 5 to 15 minutes. The patient, presenting with symptoms such as shortness of breath, chest tightness, prolonged expiratory phase, and abnormal breathing patterns, showed significant improvements following PLB therapy. Results indicated a reduction in respiratory rate by 6.76 breaths per minute, an increase in SpO₂ by 3.44%, and a decrease in pulse rate by 51.62 beats per minute. PLB therapy effectively reduced respiratory effort, alleviated dyspnea, enhanced oxygen transport, and strengthened respiratory muscles. This study demonstrates that PLB therapy is an effective non-pharmacological intervention for managing asthma symptoms. Nurses are encouraged to incorporate PLB therapy into patient education to empower asthma patients to manage their symptoms independently.

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INTRODUCTION

Asthma is a chronic respiratory disease that can attack individuals of various ages, from children to adults (Lee et al., 2025; Fernandes et al., 2024). Asthma symptoms can vary from mild to severe and, in some cases, can even cause death. Although this disease cannot be cured, asthma attacks can be controlled so that the frequency of recurrence can be reduced. If not treated properly, asthma can develop into a chronic disease that lasts for months or even years (Huang et al., 2024; Oyenuga et al., 2024).

Asthma attacks the respiratory system with symptoms such as wheezing, coughing, shortness of breath, and difficulty breathing, which can appear especially at night or early in the morning (Postma et al., 2024; Shan et al., 2024). If not treated immediately, asthma can cause increased morbidity to more serious conditions, including death (Kurnianto et al., 2022). Asthma is also

included in the 10 non-communicable diseases that cause death and have a significant impact on sufferers and their families (Guillen, 2024; Wang & Sun, 2024).

Several factors, such as cold nights, air pollution, weather changes, unstable emotions, and exposure to allergens and irritants, can trigger asthma attacks. These factors cause two types of inflammatory responses, namely early and late asthma reactions, which can lead to chronic inflammation due to increased airway response to stimuli (Chatkin et al., 2022). Chronic inflammation causes narrowing of the airways, resulting in difficulty breathing, especially during more prolonged and more difficult expirations (Obling et al., 2022; Zhou et al., 2024).

In asthma patients, one of the nursing problems that often arises is ineffective breathing patterns, namely inspiration or expiration, that cannot provide adequate ventilation. This is caused by reduced oxygen entering the lungs due to respiratory obstruction (Kurniawan & Setiawan, 2022; Zahirah & Daniati, 2024). One intervention that can be done to help patients overcome the problem of ineffective breathing patterns is to use the Pursed Lip Breathing (PLB) technique. This method can help reduce the rate of respiration and improve the breathing patterns of asthma patients by slowing down the expiratory process through pursed lips, thereby providing better ventilation (Andrian & Rosyid, 2024). Researchers are motivated to conduct a study titled "Implementation of Pursed-Lip Breathing in Asthma Patients with Ineffective Breathing Patterns at Dr. Haryoto Lumajang Regional Hospital" to investigate further the potential benefits of this therapy for asthma patients facing challenges with ineffective breathing patterns.

STUDY DESIGN

This study was carried out in the Kenanga Room of Dr. Haryoto Lumajang Regional Hospital from June 14 to June 18, 2024. The location was selected due to the high incidence of asthma cases and the availability of medical facilities to support nursing interventions, particularly Pursed Lip Breathing therapy for patients experiencing ineffective breathing patterns.

The research population consisted of asthma patients with ineffective breathing patterns who were treated in the Kenanga Room. A single patient was selected as the sample based on specific inclusion and exclusion criteria. The inclusion criteria included adult patients aged 17 to 65 with abnormal respiratory rates ($RR > 24$ breaths per minute), use of accessory respiratory muscles, a prolonged expiratory phase, absence of severe complications, and willingness to participate in the study. The exclusion criteria excluded patients with severe complications that impacted breathing or those unable to complete the study.

The study was carried out systematically, selecting patients who met specific criteria. During the intervention phase, Pursed-Lip Breathing therapy was provided over three meetings, each consisting of three sessions lasting 5 to 15 minutes. Data collection methods included direct observation, patient interviews, and medical assessments, such as measuring respiratory rate (RR), oxygen saturation, and respiratory frequency before and after the therapy. Changes in breathing patterns were analyzed by comparing post-intervention data with baseline measurements.

The instruments used in this study consisted of a sphygmomanometer to measure blood pressure, an oximeter to monitor oxygen saturation, a thermometer to record body temperature, a stopwatch to time the breathing exercises, and guidelines for Pursed-Lip Breathing. The exercise involved inhaling through the nose and exhaling through pursed lips conducted thrice daily for 5 to 15 minutes. Data will be analyzed descriptively to examine the effect of Pursed Lip Breathing on lung function, focusing on changes in respiratory frequency, oxygen saturation, and accessory respiratory muscle use. Post-intervention data will be compared with baseline data to evaluate the

therapy's impact. The results will be analyzed to determine the significance of changes and compared to existing literature.

This research was approved by the Health Research Ethics Committee (KEPK) of the Faculty of Nursing, Jember University, under certificate No. 174/UN25.1.14/KEPK/2024, issued on May 7, 2024. Patients were informed of the study's purpose, procedures, benefits, and risks, and consent was obtained from participants or their guardians. The study adhered to beneficence and non-maleficence, prioritizing patient safety and well-being.

PATIENT INFORMATION

This study was conducted in the Kenanga Room, Dr. Haryoto Lumajang Regional Hospital, at Jalan Basuki Rahmat Number 5, Lumajang District, Lumajang Regency, East Java. Dr. Haryoto Lumajang Regional Hospital is a government-owned regional hospital that is the primary referral for health centers, clinics, and private hospitals in Lumajang. The Kenanga Room was chosen for this study because it is a class three inpatient room that handles cases of disease in male patients, ranging from adolescents to the elderly. The Kenanga Room has 13 rooms with different bed capacities: rooms 1-5 with two beds, rooms 6, 7, and 10-13 with four beds, and rooms 9 and 10 with three beds.

The assessment was conducted on June 14, 2024, in the Kenanga Room, Dr. Haryoto Regional Hospital. In the initial stage, the researcher explained the intent and purpose of the visit and obtained consent from the patient, Mr. S, to conduct an interview and direct observation with the patient and his family.

Mr. S is a 64-year-old patient suffering from Bronchial Asthma. He previously worked as a farm laborer and sickle maker but is currently unemployed due to his advanced age. The patient is Muslim and has an elementary school education. The patient lives in Darungan Hamlet, Kedungjajang, Lumajang Regency. Mr. S came to the ER on June 14, 2024, at 10:20 WIB, and was transferred to the Kenanga inpatient room at 13:31 WIB. Another informant besides Mr. S is his wife, Mrs. S, who is 56 years old. The patient's main complaint was shortness of breath and a feeling of heaviness in the chest that often recurred due to excessive activity. The patient has a habit of doing too much activity around the house, so shortness of breath often occurs, especially after activity or when the medication runs out. Previously, the patient routinely checked at the lung polyclinic at Wijaya Kusuma Hospital, Kedungjajang Health Center, and Dr. Haryoto Hospital. However, when the medication ran out, his shortness of breath recurred. The patient also had a history of active smoking and was exposed to cigarette smoke in the surrounding area.

CLINICAL FINDINGS

The patient's sleep pattern showed that before he was sick, he slept soundly from 21.00 to 04.00 WIB. However, his sleep time became irregular when he was sick, and he also had difficulty sleeping. The patient's diet was 3 times daily, with portions adjusted during hospitalization. The patient consumed water orally before being admitted to the hospital, but he received intravenous fluids during hospitalization.

Physical examination showed that the patient was weak, short of breath, and restless, with blood pressure of 130/80 mmHg, body temperature of 36.5°C, pulse rate of 142x/minute, respiratory rate of 30x/minute, and SpO₂ of 94%. The head and neck examination revealed no abnormalities. A lung examination identified wheezing in the right upper lobe, accompanied by shortness of breath and the use of accessory respiratory muscles. The cardiac assessment showed an elevated pulse

rate, while the abdominal and musculoskeletal examinations were unremarkable. The patient exhibited a stable mental condition and good orientation and cognitive abilities.

As part of the diagnostic workup for bronchial asthma, a laboratory examination was conducted on Friday, June 14, 2024. The prescribed therapy included the administration of 1500 cc of Ringer's lactate infusion per day, nebulization with Combivent (2.5 mg) three times daily, and oxygen via nasal cannula at 3 L/min. Intravenous medications provided included methylprednisolone sodium succinate (62.5 mg, 1/2 ampoule, 3x/day), Ranitidine (25 mg, 1/2 ampoule, 2x/day), Antrain (2 ml, 3x/day), Ceftriaxone (1 gram, 3x/day), and subcutaneous terbutaline sulfate (0.3 ml, 1/3 ampoule, 3x/day).

Laboratory tests revealed an elevation in direct bilirubin levels to 0.37, attributed to hypoxia resulting from severe asthma attacks. This condition can damage liver cells, impair liver function, and elevate direct bilirubin levels in the bloodstream. Furthermore, asthma attacks trigger a significant systemic inflammatory response that impacts organ function, including the liver, through mechanisms of inflammation and oxidative stress (Han et al., 2021). The observed leukocyte increase in this patient is linked to chronic asthma, which induces tissue damage, oxidative stress, and the release of inflammatory mediators that promote leukocyte migration to aid tissue repair (Habib et al., 2022).

On June 14, 2024, the patient showed vital signs of BP: 130/80 mmHg, RR: 30x/min, Pulse: 142x/min, Temperature: 36.5°C, and SpO₂: 94% (with nasal cannula 3 lpm). The patient exhibited tachypnea, shallow breathing, accessory muscle fatigue, prolonged expiratory phase, and wheezing in the right upper lobe. Pursed lip breathing (PLB) therapy was initiated, 5 minutes 3 times daily. By June 15, 2024, vital signs improved: BP: 117/72 mmHg, RR: 26x/min, Pulse: 99x/min, Temperature: 36.7°C, and SpO₂: 96%. Breathing remained tachypneic, but the patient could now cough and expel phlegm. Nebulization with Combivent and supportive intravenous therapies were administered alongside PLB therapy. On June 16, 2024, vital signs continued to stabilize: BP: 101/64 mmHg, RR: 24x/min, Pulse: 96x/min, Temperature: 36.8°C, and SpO₂: 97%. Breathing patterns improved, with reduced accessory muscle fatigue and better expiratory phase lengthening. PLB therapy duration increased to 5–7 minutes per session. By June 17, 2024, vital signs normalized: BP: 100/60 mmHg, RR: 23x/min, Pulse: 91x/min, Temperature: 36.5°C, and SpO₂: 99%. The wheezing resolved, and expiration became easier. PLB therapy continued at 7 minutes, 3 times daily. On June 18, 2024, the patient maintained stable vital signs: BP: 116/72 mmHg, RR: 22x/min, Pulse: 90x/min, Temperature: 36.7°C, and SpO₂: 99%. PLB therapy effectively improved respiratory patterns and overall oxygenation.

The five-day evaluation of Mr. S revealed significant improvements following the application of pursed lip breathing therapy. On the first day, the patient complained of severe shortness of breath, chest tightness, prolonged expiratory phase, use of accessory respiratory muscles, tachypnea, and wheezing in the right upper lobe, with vital signs: RR 27x/min, Pulse 99x/min, SpO₂ 96%, and respiratory ventilation of 13.5 L/min. By the second day, dyspnea slightly decreased, chest tightness reduced, and accessory muscle use and expiratory phase prolongation lessened, with RR 24x/min, Pulse 80x/min, SpO₂ 97%, and ventilation at 12 L/min.

On the third day, symptoms improved, with decreased shortness of breath, reduced wheezing, and better breathing patterns. Vital signs showed RR 21x/min, Pulse 83x/min, SpO₂ 98%, and ventilation at 10.5 L/min. By the fourth day, the patient no longer experienced shortness of breath, chest tightness had resolved, accessory muscle use had diminished, and wheezing had disappeared, with SpO₂ reaching 99%. On the fifth day, the patient's respiratory pattern was normal, with RR 20x/min, Pulse 82x/min, SpO₂ 99%, and no need for supplemental oxygen.

The intervention led to measurable improvements: a 6.76x/min decrease in RR, a 3.44% increase in SpO₂, and a 51.62x/min reduction in pulse rate. This therapy effectively reduced dyspnea, accessory muscle use, and expiratory phase prolongation while enhancing respiratory depth and frequency. The intervention was successful and can be continued independently, offering valuable support in managing asthma with ineffective breathing patterns.

THERAPEUTIC INTERVENTION

Nursing Problem Characteristics of Ineffective Breathing Patterns

The leading causes of asthma include gender, smoking habits, and exposure to air pollution. Men tend to experience asthma more due to smoking habits, the nicotine content of which is addictive and causes disorders of the respiratory tract (Wang et al., 2021; Sio et al., 2021). In addition, air pollution is also a trigger for asthma that often occurs from childhood to adulthood (Hu et al., 2024; Lee et al., 2024). In this case, the patient was an active smoker and had worked as a farm laborer, which increased the risk of asthma due to exposure to dust and allergens such as wood dust and smoke (Fangal et al., 2024; Jouneau et al., 2022).

Difficulty breathing in asthma patients is caused by inflammation of the bronchi, which narrows the respiratory tract and reduces the amount of air entering the lungs. As a result, patients often breathe through their mouths, which worsens bronchospasm and causes hyperventilation (Byrne et al., 2023). In this case, the patient, Mr. S, a 64-year-old with a 10-year history of asthma, showed an ineffective breathing pattern characterized by tachypnea (30x/min), rapid pulse (142x/min), low SpO₂ (94%), and wheezing in the right superior lobe. After undergoing Pursed Lip Breathing therapy for five days, there were significant changes: decreased respiratory rate (6.76x/min), decreased pulse (51.62x/min), and increased oxygen saturation (3.44%). These results indicate improvements in ventilation and oxygenation in line with the theory that this breathing technique helps reduce bronchospasm, increase respiratory efficiency, and reduce respiratory muscle fatigue (Das et al., 2022).

The nursing problem of ineffective breathing patterns in asthma patients is caused by bronchial narrowing and airway obstruction due to chronic inflammation. Accessory respiratory muscles, prolonged expiratory phase, and abnormal breathing patterns characterize this condition. This diagnosis is relevant to the subjective and objective findings in patient Mr. S, so intervention techniques such as Pursed Lip Breathing are an effective solution to improve ineffective breathing patterns.

Implementation of Pursed Lip Breathing

Pursed-lip breathing (PLB) involves inhalation through the nose followed by slow exhalation through lips shaped as if blowing out a candle. This method enhances air exchange in the lungs, improves oxygenation, strengthens respiratory muscles, optimizes respiratory system function, and alleviates shortness of breath and asthma symptoms (Yang et al., 2022; Dodange et al., 2024). It has also been shown to increase oxygen saturation, lower pulse rates, and regulate breathing frequency. This exercise is typically performed for 15 minutes, three times a day, under specific instructions: relaxing the muscles, inhaling slowly through the nose for three seconds, and exhaling gently through pursed lips for four seconds. PLB is suitable for use during the acute phase or as a long-term preventive measure, except in cases of contraindications such as pneumothorax, severe cardiovascular conditions, or reduced consciousness (Zuriati & Surya, 2020; Mitsunagnern et al., 2021).

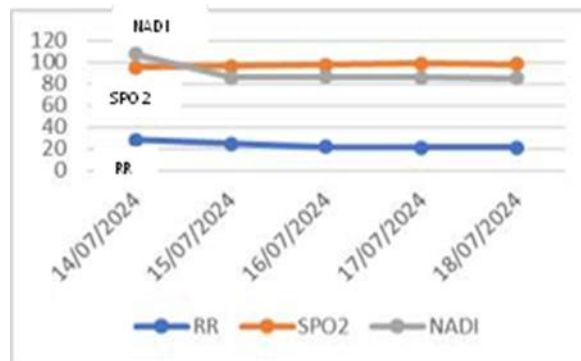


Figure 1. Average RR, Pulse, SpO2 Graph

In the case of Mr. S, before therapy, his respiratory rate (RR) was 30 breaths/minute, pulse rate 142 beats/minute, and oxygen saturation (SpO₂) 94%. After five days of therapy, the average RR decreased to 23.24 breaths/minute, the pulse rate dropped to 90.38 beats/minute, and SpO₂ increased to 97.44%. These changes represented a reduction in RR by 6.76 breaths/minute, an increase in SpO₂ by 3.44%, and a decrease in pulse rate by 51.62 beats/minute. As explained, the improvements were supported by the patient's cooperative attitude and willingness to follow the therapy. The authors concluded that the issue of ineffective breathing patterns in Mr. S was successfully resolved, and the desired outcomes were achieved. This therapy is recommended for independent practice as a maintenance strategy.

DISCUSSION

The findings of this study demonstrate that the application of pursed lips breathing (PLB) therapy significantly improves respiratory parameters in patients with ineffective breathing patterns due to asthma. The results showed a marked reduction in respiratory rate (RR) from 30 breaths per minute to 23.24 breaths per minute, an increase in oxygen saturation (SpO₂) from 94% to 97.44%, and a substantial reduction in pulse rate from 142 beats per minute to 90.38 beats per minute after five days of therapy. This finding aligns with previous studies (Kurnianto et al., 2022), which demonstrated a significant decrease in respiratory effort and improvement in oxygenation with a p-value of 0.000. Both studies highlight the effectiveness of PLB as a non-pharmacological intervention for improving respiratory function in asthma patients. Additionally, the efficacy of PLB in reducing respiratory distress and improving oxygenation further reinforces the results of this study (Alzate et al., 2024).

This study is interesting since it focuses specifically on long-term asthmatic patients with a history of active smoking and occupational exposure to allergens, such as those who work as laborers or farmers. These results highlight PLB therapy's versatility and efficacy in a high-risk group. The viability of using PLB therapy as a self-management tool for asthma patients is also highlighted in this study, which significantly aids in fostering patient autonomy in treating their respiratory disorders.

This study has significant clinical implications. The findings highlight the value of PLB therapy as an affordable, non-pharmacological treatment that can improve oxygenation, lessen respiratory distress, and encourage better management of asthma symptoms, all of which can improve the quality of life for asthma patients. Particularly for patients in places with limited resources, the results can aid in the creation of thorough asthma management guidelines in healthcare settings.

However, this study has several limitations. The sample size was limited to a single case, which restricts the generalizability of the findings to a broader population. Future studies with larger

sample sizes are necessary to validate these results. The study did not evaluate long-term adherence to PLB therapy or its impact on asthma exacerbation frequency over an extended period. Further research could also explore the combination of PLB with other interventions, such as physical activity or dietary modifications, to enhance overall patient outcomes.

CONCLUSION

This study concludes that Pursed-Lip Breathing (PLB) therapy is a practical non-pharmacological approach to improving respiratory patterns in asthma patients experiencing ineffective breathing. The results indicate significant enhancements in respiratory rate, oxygen saturation, and pulse rate after consistent application of PLB over five days. These findings highlight the potential of PLB as a straightforward, affordable, and accessible method for managing asthma symptoms and improving patients' quality of life. The study emphasizes that PLB can serve as an independent self-management technique for addressing ineffective breathing patterns, offering a practical solution, particularly for asthma patients with limited access to medical care. It is recommended that healthcare professionals incorporate PLB into routine asthma treatment plans and educate patients on its benefits and application. Future research should involve larger sample sizes and investigate the long-term impacts of PLB therapy across diverse populations to strengthen and broaden these findings.

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CONFLICT OF INTEREST

The authors of the paper "Implementation of Pursed Lip Breathing on Patients with Asthma and Ineffective Breathing Pattern at Dr. Hospital Haryoto Lumajang" affirm that they have no conflicts of interest. No financial or personal relationships have influenced the findings or conclusions reported in this research; the study was carried out with total honesty and integrity.

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