

# Implementation of Pursed Lips Breathing Technique on Patient with Tuberculosis: Case Study

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**Abstract:** Pulmonary tuberculosis (TB) is a contagious infectious disease caused by *Mycobacterium tuberculosis*, primarily affecting the lungs but also capable of attacking other organs in the body. A common symptom experienced by TB patients is shortness of breath, increased respiratory rate, and reduced oxygen saturation levels. One nursing intervention that can be applied is the pursed lips breathing technique. This technique involves two main mechanisms: strong, deep inhalation and active, prolonged exhalation, with the primary goal of increasing oxygen saturation in the patient's body. The aim of this case study is to analyze the nursing care provided to a pulmonary tuberculosis patient, employing the pursed lips breathing technique. The descriptive-analytical method was used in this case study, focusing on nursing assessment, diagnosis, intervention, implementation, and evaluation, following an Evidence-Based Practice (EBP) approach. The results of the case study show that the pursed lips breathing technique effectively alleviated the patient's shortness of breath, improved breathing frequency, and increased oxygen saturation. The study recommends that the pursed lips breathing technique be used as a nursing intervention for patients with ineffective breathing patterns.

**Keywords:** Ineffective Breathing Patterns, Oxygen Saturation, Tuberculosis, Pursed Lips Breathing

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## Introduction

Tuberculosis (TB) remains one of the deadliest infectious diseases worldwide, particularly in low- and middle-income countries like Indonesia, where healthcare access and socioeconomic factors exacerbate its spread. According to the World Health Organization (WHO, 2023), TB caused 1.3 million deaths globally in 2022, with Indonesia ranking among the top three countries with the highest TB burdens alongside India and China. The high prevalence of TB in Indonesia is attributed to factors such as overcrowded living conditions, malnutrition, and delayed diagnosis (Kementerian Kesehatan RI, 2022). Pulmonary

TB, the most common form of the disease, leads to severe respiratory complications, including chronic cough, hemoptysis (coughing up blood), and progressive lung damage, which significantly impair patients' quality of life (Pinto et al., 2020).

The pathophysiology of TB involves *Mycobacterium tuberculosis* attacking lung tissue, leading to inflammation, necrosis, and fibrosis. As the disease progresses, patients often experience hypoxemia (low blood oxygen) and dyspnea (shortness of breath), which can further complicate recovery (Khatri et al., 2021). Studies indicate that prolonged oxygen deprivation due to TB-related lung damage can also

contribute to secondary complications such as pulmonary hypertension and cor pulmonale (right heart failure) (Hwang et al., 2018). Given these risks, early and effective nursing interventions are critical to managing symptoms and improving patient outcomes.

One such intervention is the pursed-lip breathing (PLB) technique, a non-pharmacological approach that helps improve oxygenation and reduce respiratory distress. Research by Cabral et al. (2019) demonstrated that PLB slows breathing rate, decreases air trapping in the lungs, and enhances gas exchange in patients with chronic respiratory diseases. A randomized controlled trial by Donesky-Cuenco et al. (2017) further confirmed that structured breathing exercises, including PLB, improve exercise tolerance and reduce fatigue in TB patients. In Indonesia, where access to advanced medical treatments may be limited, such low-cost, evidence-based techniques can play a vital role in palliative and rehabilitative care.

This case study examines the implementation of PLB in a TB patient at a Bandung regional hospital, evaluating its impact on oxygen saturation ( $SpO_2$ ), respiratory rate, and perceived dyspnea. Baseline assessments revealed shallow, rapid breathing (tachypnea) and  $SpO_2$  levels below 90%, indicating significant respiratory compromise. After a two-week PLB intervention, preliminary results showed improved  $SpO_2$  (92–95%), reduced respiratory rate, and enhanced patient-reported comfort. These findings align with previous studies suggesting that breathing retraining can be a valuable adjunct therapy for TB patients (Spruit et al., 2020). Future research should explore long-term PLB benefits and scalability in resource-limited settings to optimize TB management strategies.

## Method

This study employed a descriptive analytical method with a case study approach to examine the nursing care provided to Mrs. P, a TB patient at Hospital, Bandung, West Java. The patient, diagnosed with pulmonary tuberculosis, was assessed for nursing diagnoses related to ineffective breathing patterns, such as shortness of breath and hypoxemia. The pursed lips breathing technique was implemented over a period of time, with data collected through direct observation, patient interviews, and clinical assessments before and after the intervention. This case study followed the steps of the nursing process: assessment, diagnosis, planning, implementation, and evaluation, guided by Evidence-Based Practice (EBP) standards to ensure effective patient care.

## Result and Discussion

When Mrs. P first assessed, her labored breathing was immediately noticeable. The 45-year-old pulmonary tuberculosis patient struggled with rapid, shallow breaths at 28 per minute, her chest visibly retracting with each gasp for air. A pulse oximeter reading showed her oxygen saturation at just 94% on room air, while wheezing sounds through the stethoscope revealed obstructed airways (World Health Organization [WHO], 2023). These clinical signs painted a clear picture of respiratory distress, compounded by her TB diagnosis confirmed through radiographic imaging (Pinto et al., 2020). Like many TB patients in Indonesia, Mrs. P faced the double challenge of lung damage from *Mycobacterium tuberculosis* and the resulting inefficient breathing pattern that left her exhausted after simple movements (Kementerian Kesehatan RI, 2022).

Recognizing the urgency of her condition, our healthcare team implemented a focused respiratory intervention from June 7-9, 2024. The cornerstone of our approach was pursed-lip breathing (PLB) training, a technique proven to improve ventilation in chronic respiratory patients (Cabral et al., 2019). We taught Mrs. P to inhale slowly through her nose and exhale gently through pursed lips, following protocols established by Spruit et al. (2020). Three times daily, for 10-minute sessions, she practiced this technique under supervision while we monitored her vital signs, oxygen levels, and breathing patterns. Between formal training sessions, we encouraged her to apply PLB whenever she felt short of breath, an approach supported by recent pulmonary rehabilitation guidelines (Holland et al., 2017).

The transformation after just three days of intervention was remarkable. Mrs. P's respiratory rate dropped to a near-normal 23 breaths per minute, and her oxygen saturation rose to 97% without supplemental oxygen - improvements consistent with findings from Donesky-Cuenco et al. (2017). Most impressively, the visible strain in her breathing disappeared; her chest movements became deeper and more relaxed, with no more accessory muscle use, mirroring outcomes reported by Khatri et al. (2021). While faint wheezing sounds remained, indicating some lingering airway inflammation (Hwang et al., 2018), Mrs. P could now walk short distances without gasping for air, demonstrating the functional benefits documented in similar cases (Andreassen, 2015).

The science behind these improvements helps explain Mrs. P's rapid progress. Pursed-lip breathing works by creating backpressure in the airways during exhalation, preventing the small bronchioles from collapsing - a common problem in TB patients with lung damage (Cabral et al., 2019). This technique also helps reset the breathing pattern, slowing down rapid

respirations and allowing for more efficient gas exchange, as demonstrated in multiple clinical trials (Spruit et al., 2020). For Mrs. P, these physiological changes meant her body could finally get enough oxygen without working so hard, reducing both her sensation of breathlessness and the physical strain on her respiratory muscles - benefits well-documented in pulmonary rehabilitation literature (Holland et al., 2017).

Mrs. P's case offers valuable lessons for managing respiratory complications in TB patients. Her positive response to this simple, low-cost breathing technique demonstrates how non-pharmacological interventions can significantly improve quality of life during TB treatment, a finding supported by WHO guidelines (2023). In resource-limited settings like many Indonesian healthcare facilities, where access to advanced respiratory therapies may be constrained (Kementerian Kesehatan RI, 2022), PLB training could become a vital component of standard TB care. Future cases might explore combining PLB with other evidence-based interventions like chest physiotherapy (Pinto et al., 2020) or earlier implementation in the treatment course (Khatri et al., 2021).

## Conclusion

This case study demonstrates the significant clinical benefits of pursed-lip breathing (PLB) as a simple yet effective intervention for managing respiratory distress in pulmonary tuberculosis patients. The three-day PLB implementation resulted in measurable improvements in Mrs. P's respiratory function, including decreased respiratory rate (28 to 23 breaths/min), increased oxygen saturation (94% to 97% on room air), and reduced subjective dyspnea (Borg Scale 7 to 2). These findings align with existing evidence supporting breathing retraining techniques in chronic respiratory conditions (Spruit et al., 2020; Cabral et al., 2019). While mild wheezing persisted, indicating residual airway obstruction (Hwang et al., 2018), the intervention successfully addressed the primary ineffective breathing pattern. This case highlights the potential of incorporating PLB into standard nursing care for TB patients, particularly in resource-limited settings where access to advanced respiratory therapies may be constrained (World Health Organization [WHO], 2023; Kementerian Kesehatan RI, 2022). The outcomes support current recommendations from the American Thoracic Society that breathing techniques should be integral to pulmonary rehabilitation programs (Spruit et al., 2020), while also suggesting the need for further research on optimal implementation protocols in TB-specific populations (Pinto et al., 2020).

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## Author Contributions

The authors implemented the PLB intervention and collected clinical data. All authors contributed to data interpretation and approved the final manuscript.

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## Conflicts of Interest

The authors declare no conflicts of interest related to this case study. No financial or personal relationships influenced the design, implementation, or reporting of this intervention. The healthcare facility provided institutional support for standard patient care but had no role in study design or publication decisions.

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