

Case Report : Implementation of Pursed-Lips Breathing Technique on Respiratory Rate and Oxygen Saturation in Chronic Obstructive Pulmonary Disease (COPD) Patients in the Pulmonary Ward of Raden Mattaher Hospital Jambi

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ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is a heterogeneous pulmonary condition caused by abnormalities in the airways that result in persistent airflow obstruction. Patients with COPD often complain of shortness of breath (dyspnea), fatigue, limited physical activity, and coughing with or without sputum production. They may also experience exacerbations that require specific prevention and treatment strategies. Management of COPD symptoms can be carried out through both pharmacological and non-pharmacological approaches. One non-pharmacological intervention that can be provided to COPD patients is the pursed-lips breathing (PLB) technique. This scientific paper was designed using a case report approach. The purpose of this case report is to provide an overview of the implementation of pursed lips breathing technique on respiratory frequency and oxygen saturation of patients with COPD. The subject was one patient diagnosed with COPD, admitted to the Pulmonary Inpatient Ward at Raden Mattaher Regional Hospital in Jambi. An oximeter was used as the measuring instrument to assess oxygen saturation, and a digital timer was used to measure respiratory rate over one minute. Data were analyzed descriptively by observing respiratory rate and oxygen saturation from the first day before PLB was performed until the last day of intervention. Changes in respiratory rate and oxygen saturation were observed, where on the first day, the patient's RR was 25 breaths per minute, which decreased to 23 breaths per minute, and oxygen saturation increased from 95% to 98% after three days of therapy. Pursed-lips breathing (PLB) therapy was proven effective in increasing oxygen saturation and reducing respiratory rate in COPD patients, although the improvements were also influenced by pharmacological management, including bronchodilators and supplemental oxygen.

Keywords: Chronic Obstructive Pulmonary Disease (COPD), Oxygen Saturation, Pursed-Lips Breathing, Respiratory Rate.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) has been described as a chronic and progressive pulmonary disorder characterized by persistent airflow limitation that is not fully reversible. The Global Initiative for Chronic Obstructive Lung Disease (GOLD, 2023) has been defined as a heterogeneous condition marked by chronic respiratory symptoms—dyspnea, cough, sputum production, and/or exacerbations—caused by abnormalities in the airways, such as chronic bronchitis and bronchiolitis, and/or alveoli, such as emphysema. Structural damage to the alveoli has been associated with reduced lung elasticity and airway collapse during exhalation, which consequently has been linked to impaired ventilation and gas exchange (Agusti et al., 2023).

According to the World Health Organization (2024), COPD has been recorded as the fourth leading cause of global mortality, accounting for an estimated 3.5 million deaths in 2021, or nearly 5% of all deaths worldwide. Almost 90% of premature mortality from COPD has been reported in low- and middle-income countries. Smoking has been identified as the most dominant risk factor, responsible for 30–40% of all cases, while exposure to indoor and outdoor pollution also has been recognized as a significant contributor (Arifin, 2021).

In Indonesia, COPD has been classified as one of the four major non-communicable diseases (NCDs) and has been estimated to account for 60% of NCD-related mortality. Data from the National Basic Health Survey (Riskesdas, 2018) has revealed a prevalence of 4.5%, with the highest proportion being found in Central Sulawesi Province. This prevalence has been regarded as a substantial health burden since repeated exacerbations have been shown to require hospitalization and have increased healthcare

costs (Kemenkes RI, 2018).

Clinically, COPD patients have been reported to experience dyspnea, fatigue, wheezing, chest tightness, and chronic cough with or without sputum. Dyspnea has been recognized as the most distressing symptom, often associated with reduced activity tolerance and impaired quality of life. Oxygen saturation, normally ranging between 95–100%, has often been reduced below 95% in COPD patients, leading to hypoxemia. Such deterioration has been attributed to obstructed airflow, reduced alveolar diffusion, and ventilation–perfusion mismatch, which have been shown to compromise oxygen delivery (Mansyur, 2020).

In addition to pharmacological management, non-pharmacological strategies have been emphasized as important in COPD care. Among these, pursed-lips breathing (PLB) has been recommended as a simple and effective complementary nursing intervention. PLB has been performed by encouraging slow inspiration through the nose followed by prolonged expiration through pursed lips, which has been proven to prevent airway collapse, reduce respiratory rate, and improve oxygen saturation. Several studies have demonstrated its effectiveness: Zainuddin et al. (2024) have reported improved oxygen saturation after PLB application in COPD patients, Asmaul et al. (2023) have confirmed its role in reducing dyspnea, and Kariresa (2021) has concluded that PLB has been found to be more effective in lowering respiratory rate compared to other breathing techniques (Kariresa, 2021).

METHODS

This case report was conducted on Mr. P (54 years old) with a medical diagnosis of COPD with the results of spirometry examination FEV1: 23.9%, FVC 23.9%, Severe Obstruction and Severe Restriction treated in the pulmonary ward of Raden Mattaher General Hospital, Jambi. The research design used was a descriptive qualitative case study. The main interventions included implementation of the pursed-lips breathing technique, with supporting pharmacological treatments maintained according to the physician's orders. The measurement tools used were a pulse oximeter to assess oxygen saturation and a digital timer to measure respiratory rate over one minute. PLB therapy was performed daily for three consecutive days. Data were collected before and after each intervention session.

RESULTS

On the first day before the intervention, the patient's respiratory rate was recorded at 25 breaths per minute and oxygen saturation at 95%. After three days of PLB therapy, the respiratory rate decreased to 23 breaths per minute and oxygen saturation increased to 98%. These findings indicated that the PLB technique was effective in reducing dyspnea and improving oxygenation in this patient. The patient also reported reduced shortness of breath and felt more comfortable during daily activities.

Table 1. Observation of changes in Respiration Rate (RR) and Oxygen Saturation (SpO₂) before and after the pursed lips breathing intervention.

| Measurement Time | Respiration Rate (RR) | | Oxygen Saturation (SpO ₂) | |
|------------------|-----------------------|-------------|---------------------------------------|-------|
| | Before | After | Before | After |
| Day 1 | 29x/minute | 25 x/minute | 95% | 95% |
| Day 2 | 27x/minute | 24x/minute | 95% | 96% |
| Day 3 | 25x/minute | 23x/minute | 97% | 98% |

DISCUSSION

The breathing exercise pursed-lips breathing (PLB) was implemented on the study subject once daily for three consecutive days, with each session lasting approximately 10–15 minutes and consisting of about six breathing cycles interspersed by 2-second pauses. The technique was performed by inhaling

through the nose with lips gently closed, then exhaling slowly through pursed lips, thereby creating mild positive pressure and prolonging the expiratory phase.

Clinical evaluations revealed notable improvements: the respiratory rate (RR) was reduced from 25 to 23 breaths per minute, while oxygen saturation (SpO₂) was increased from 95% to 98% after three days of therapy. The patient also reported decreased dyspnea, sputum production, and wheezing, along with improved breath depth. These effects were attributed to enhanced synchronization between thoracic and abdominal muscles, allowing more efficient ventilation and better oxygenation.

Physiologically, patients with COPD have experienced airway obstruction due to chronic inflammation, mucus accumulation, and alveolar damage—leading to ventilation–perfusion mismatch and decreased oxygen diffusion. Through prolonged exhalation, PLB has prevented bronchiolar collapse, reduced intrathoracic pressure, and facilitated improved alveolar gas exchange, thus correcting hypoxemia and restoring SpO₂ levels.

The findings of this case have been supported by multiple previous studies. Zainuddin et al. (2024) demonstrated improved oxygen saturation following a 7–10 minute PLB session among six COPD patients in the emergency department. Similarly, a literature review by Asmaul et al. (2023) concluded that PLB was effective in alleviating dyspnea in COPD patients. Kariresa (2021) further confirmed the superiority of PLB over relaxed sitting and upper limb training techniques in lowering respiratory rate and improving oxygenation. These consistent outcomes have reinforced PLB's value as a simple, non-pharmacological nursing intervention in pulmonary care.

The application of pursed-lips breathing (PLB) in patients with COPD has been widely recognized as a beneficial technique in managing respiratory symptoms. PLB helps to maintain positive airway pressure during exhalation, preventing alveolar collapse and promoting better gas exchange. In this case, a notable improvement in oxygen saturation and a reduction in respiratory rate were observed after consistent implementation of PLB therapy. These outcomes are in line with previous studies that demonstrate the effectiveness of PLB in enhancing pulmonary function and alleviating dyspnea. However, it is important to note that the improvement observed cannot be solely attributed to PLB, as concurrent pharmacological treatments such as bronchodilators and supplemental oxygen also played a significant role in supporting respiratory function. This highlights the importance of a comprehensive approach in the management of COPD, combining both pharmacological and non-pharmacological strategies for optimal patient outcomes.

CONCLUSIONS

The implementation of pursed-lips breathing (PLB) therapy in patients with Chronic Obstructive Pulmonary Disease (COPD) was proven to be effective in improving oxygen saturation and reducing respiratory rate. However, these improvements were not solely attributed to PLB therapy but were also influenced by pharmacological interventions such as bronchodilators and supplemental oxygen. A combined approach that integrates both pharmacological and non-pharmacological strategies is essential to optimize respiratory function and enhance the quality of life in COPD patients.

REFERENCES

1. Agarwal AK, Raja A, Brown BD. Chronic Obstructive Pulmonary Disease. StatPearls [Internet]. 2023 Aug 7 [cited 2025 Jun 3]; Available from: <https://www.ncbi.nlm.nih.gov/books/NBK559281/>
2. Agustí A, Celli BR, Criner GJ, Halpin D, Anzueto A, Barnes P, et al. Global Initiative for Chronic Obstructive Lung Disease 2023 Report: GOLD Executive Summary. *Am J Respir Crit Care Med*. 2023;207(7):819–37.
3. American Thoracic Society. Chronic obstructive pulmonary disease (COPD). *Prim Care Respir J* [Internet]. 2021 [cited 2025 Jun 3];199:P1–2. Available from: [https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-\(copd\)](https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-(copd))

4. Amiar W, Setiyono E. Efektivitas pemberian teknik pernafasan pursed lips breathing dan posisi semi Fowler terhadap peningkatan saturasi oksigen pada pasien TB paru. *Indones J Nurs Sci Pract* [Internet]. 2020;3(1):7–13. Available from: <file:///C:/Users/HP/Downloads/6784-16891-1-PB.pdf>
5. Aprilen N, Indratama IMB. Profile of chronic obstructive pulmonary disease (COPD) patients in Oksibil Regional Public Hospital at 2020. *J Penyakit Dalam Udayana*. 2022;6(1):10–4.
6. Boulet LP, Boulay MÈ, Dérival JL, Milot J, Lepage J, Bilodeau L, et al. Asthma-COPD Overlap Phenotypes and Smoking :Comparative features of asthma in smoking or non-smoking patients with an incomplete reversibility of airway obstruction. *COPD J Chronic Obstr Pulm Dis*. 2018;15(2):130–8.
7. Breathing Capacity | Biology for Majors II [Internet]. [cited 2025 Jun 27]. Available from: <https://courses.lumenlearning.com/wm-biology2/chapter/breathing-capacity/>
8. GOLD Global Initiative For Chronic Obstructive Lung Disease. Global Initiative for Chronic Obstructive Lung. *A Guid Heal Care Prof*. 2023;1(3):261–6.
9. Halpin DMG, Celli BR, Criner GJ, Frith P, Victorina López Varela M, Salvi S, et al. It is time for the world to take COPD seriously: A statement from the GOLD board of directors. *Eur Respir J* [Internet]. 2019;54(1). Available from: <http://dx.doi.org/10.1183/13993003.00914-2019>
10. Kusumaningrum PR. Penerapan 3S (SDKI, SLKI, SIKI) dalam Asuhan Keperawatan di Rumah Sakit. *J Abdi Masy Indones*. 2022;2(2):577–82.
11. Laeli A, Mulyani S, Fahrurozi M. Penerapan Pursed Lip Breathing Untuk Menurunkan Sesak Napas Pada Pasien Ppok (Literature Review). *J Ilm Kesehat*. 2023;16–20.
12. Lindayani, L. P. T, Dharma T. *Praktik Belajar Lapangan Penyakit Paru Obstruktif Kronik (PPOK)*. Vol. 32. Pedoman Diagnosis & Penatalaksanaan Di Indonesia; 2017.
13. Lofrese JJ, Tupper C, Denault D, Lappin SL. Physiology, Residual Volume. *StatPearls* [Internet]. 2023 Feb 27 [cited 2025 Jun 27]; Available from: <https://www.ncbi.nlm.nih.gov/books/NBK493170/>
14. Lung Foundation Australia. General guide: Chronic obstructive pulmonary disease (COPD) - Lung Foundation Australia. 2018;1–4.
15. Organization WH. Chronic obstructive pulmonary disease (COPD) [Internet]. USA; 2024 Nov [cited 2025 Jun 3]. Available from: [https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-\(copd\)](https://www.who.int/news-room/fact-sheets/detail/chronic-obstructive-pulmonary-disease-(copd))
16. Qamila B, Ulfah Azhar M, Risnah R, Irwan M. Efektivitas Teknik Pursed Lipsbreathing Pada Pasien Penyakit Paru Obstruksi Kronik (Ppok): Study Systematic Review. *J Kesehat*. 2019;12(2):137.
17. Rochester CL, Alison JA, Carlin B, Jenkins AR, Cox NS, Bauldoff G, et al. Pulmonary Rehabilitation for Adults with Chronic Respiratory Disease An Official American Thoracic Society Clinical Practice Guideline. *Am J Respir Crit Care Med*. 2023;208(4):E7–26.
18. SMELTZER SC, Panggabean E, Bare BG, Waluyo A, Ester M. *Buku ajar keperawatan medikal-bedah* [Internet]. 8th ed. Vol. 1,3. Jakarta: Jakarta EGC; 2017 [cited 2025 Jun 4]. Available from: <https://balaiyanpus.jogjaprov.go.id/opac/detail-opac?id=23927>
19. Thalib AH, St. Arisah. Penerapan Manajemen Bersihan Jalan Nafas Tidak Efektif Sebagai Terapi Kepatenan Jalan Nafas Pada Pasien Dengan Penyakit Pneumonia Di Ruang Instalasi Gawat Darurat Rs TK II Pelamonia. *J Mitrsehat*. 2023;12(2):262–72.
20. Tim Riskesdas 2018. *Laporan Riskesdas 2018 Nasional.pdf* [Internet]. Lembaga Penerbit Balitbangkes. 2018. Available from: <http://repository.bkpk.kemkes.go.id/3514/1/Laporan-Riskesdas-2018-Nasional.pdf>
21. WHO. Tobacco and chronic obstructive pulmonary disease (COPD). [Spanish]. *Adicciones*. 2023;18 (SUPPL.:21–32.

22. Wigiyantri R, Faradisi F. Penerapan Pengaruh Teknik Posisi Semi Fowler dan Pursed Lips Breathing dalam Mengurangi Gangguan Pernafasan pada Pasien dengan Tuberculosis di RSUD Bendan Pekalongan. *J Univ Res Colloquium* [Internet]. 2022;779–83. Available from: <https://repository.urecol.org/index.php/proceeding/article/view/2382>
23. Winanti Timur K, Yakpermas Banyumas P, III Keperawatan D, Astuti D, Dyah Puspasari F. Literature Review Pengaruh Teknik Pursed Lips Breathing Terhadap Tingkat Sesak Napas Pada Pasien Penyakit Paru Obstruktif Kronis (Ppok). *J Nurs Heal* [Internet]. 2021;6(1):63–73. Available from: <http://jurnal.politeknikyakpermas.ac.id/index.php/jnh/article/view/141>
24. Yang L, Gao Z, Cao X, Wang C, Wang H, Dai J, et al. Visualizing pursed lips breathing of patients with chronic obstructive pulmonary disease through evaluation of global and regional ventilation using electrical impedance tomography. *Physiol Meas*. 2024;45(4).
25. Yari Y, Rohmah UN, Prawitasari S. Pengaruh pursed lips breathing (PLB) terhadap peningkatan saturasi oksigen pada pasien penyakit paru obstruktif kronik (PPOK): Literatur Review. *J Kesehat Holist*. 2023;7(2):36–45.