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Original Article

Effect of orthopneic position and pursed-lip breathing on dyspnea in patients with chronic obstructive pulmonary disease

Arifuddin[1*], Fitrian Rayasari[1], Dewi Anggraini[1], Wati Jumaiyah[1]
[1] Fakultas Ilmu Keperawatan, Universitas Muhammadiyah Jakarta, Indonesia

***Corresponding Author:**
Arifuddin
Faculty of Nursing, Universitas Muhammadiyah Jakarta, Indonesia
Email:
arieflaode7@gmail.com

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a progressive respiratory disorder characterized by persistent airflow limitation and dyspnea that significantly reduces patients' functional capacity and quality of life. Non-pharmacological nursing interventions, including breathing techniques and therapeutic positioning, have increasingly been applied to improve respiratory function and alleviate dyspnea symptoms. However, evidence regarding the combined effectiveness of orthopneic positioning and pursed-lip breathing in clinical inpatient settings remains limited.
Objective: This study aimed to evaluate the effect of orthopneic position combined with pursed-lip breathing on dyspnea indicators, including respiratory rate, oxygen saturation, and peak expiratory flow, among patients with chronic obstructive pulmonary disease.
Methods: A pre-experimental one-group pretest–posttest design was conducted in the MDR Baji Ati ward, Labuang Baji General Hospital Makassar. Seventeen hospitalized adult COPD patients meeting inclusion criteria participated in the study. The intervention consisted of orthopneic positioning combined with pursed-lip breathing exercises administered for 20–30 minutes per session, at least three times weekly for four weeks. Outcome measures included respiratory rate, oxygen saturation, and peak expiratory flow assessed before and after the intervention. Data were analyzed using paired t-test with a significance level of 0.05.
Results: The intervention significantly reduced respiratory rate from 23.4 to 18.9 breaths per minute ($p = 0.001$), increased oxygen saturation from 89.6% to 96.4% ($p = 0.001$), and improved peak expiratory flow from 256 L/min to 367 L/min ($p = 0.001$). Large effect sizes across outcomes indicated substantial clinical improvement. No adverse events were reported during the intervention period.
Conclusion: The combined application of orthopneic positioning and pursed-lip breathing effectively improved respiratory parameters and reduced dyspnea among COPD patients. This evidence-based nursing intervention represents a safe, feasible, and clinically valuable strategy for respiratory symptom management in hospitalized patients with chronic obstructive pulmonary disease.

Background

Chronic obstructive pulmonary disease represents a chronic respiratory disorder that causes progressive airflow limitation worldwide (WHO, 2021). Global health authorities report chronic obstructive pulmonary disease as a leading cause of morbidity and mortality among adult populations (WHO, 2019). The GOLD Science Committee defines chronic obstructive pulmonary disease as a chronic inflammatory condition caused by exposure to harmful particles or gases (Agustí et al., 2022). The latest GOLD strategy emphasizes prevention, diagnosis, and multidisciplinary management for chronic obstructive pulmonary disease using evidence-based approaches (Global Initiative for Chronic Obstructive Lung Disease, 2024). Earlier GOLD reports describe asthma-COPD overlap phenotypes among patients with smoking history and partially reversible airway obstruction (GOLD, 2018). Subsequent GOLD updates highlight the importance of continuous assessment for comprehensive chronic obstructive pulmonary disease management (GOLD, 2020).

Chronic obstructive pulmonary disease frequently produces dyspnea that reduces patients' daily functional capacity and sleep quality (Clímaco et al., 2022). Health disparities in low- and middle-income countries often worsen lung disease outcomes due to limited healthcare access (Meghji et al., 2021). Modern pulmonary rehabilitation defines multidisciplinary interventions that improve respiratory function and quality of life among patients with chronic respiratory disease (Holland et al., 2021). Telerehabilitation programs provide alternative rehabilitation delivery methods that maintain clinical

effectiveness for chronic respiratory patients (Cox et al., 2021). Home-based pulmonary rehabilitation combined with telecoaching improves health-related outcomes among chronic obstructive pulmonary disease patients (Şahin et al., 2023). Inspiratory muscle training interventions improve respiratory performance with or without pulmonary rehabilitation in chronic obstructive pulmonary disease patients (Ammous et al., 2023).

Breathing exercise interventions represent non-pharmacological strategies that support symptom control in chronic respiratory conditions (Yun et al., 2021). Evidence-based pursed-lip breathing protocols improve health outcomes and respiratory efficiency among chronic obstructive pulmonary disease patients (Huang et al., 2024). Comparative studies show diaphragmatic breathing combined with pursed-lip breathing improves dyspnea and exercise capacity more effectively than single breathing techniques (Riaz et al., 2024). Clinical evidence demonstrates diaphragmatic breathing exercise improves respiratory rate and oxygen saturation among respiratory patients (KK, 2024). Active cycle breathing technique exercises improve hemodynamic status in patients with pulmonary respiratory disorders (KK et al., 2025). Effective cough techniques improve airway clearance and respiratory comfort among chronic obstructive pulmonary disease patients (Marlina et al., 2025).

Behavioral modification strategies increasingly integrate digital and educational innovations to enhance patient engagement in respiratory care (Huang et al., 2023). Gamification approaches improve behavioral change outcomes through structured motivational mechanisms in healthcare interventions (Bassanelli et al., 2022). Educational gamification also enhances behavioral adherence and health outcomes across clinical populations (Kim & Castelli, 2021). Slow deep breathing combined with relaxation therapy demonstrates effectiveness in improving physiological outcomes among chronic disease patients (Ar-Razy & Rohmah, 2025). Functional health status influences self-care behavior among patients with chronic health risks (Anurak & Chaow, 2026). Nursing management interventions contribute significantly to symptom control in patients with chronic health conditions (Winda Agustina & Budianto, 2025).

Despite these advances, dyspnea management in chronic obstructive pulmonary disease still requires accessible, simple, and evidence-based nursing interventions (Huang et al., 2024). Orthopneic positioning improves thoracic expansion and facilitates respiratory muscle function in patients with breathing difficulty (Yun et al., 2021). Pursed-lip breathing enhances airway pressure control and reduces air trapping in obstructive lung disease patients (Riaz et al., 2024). Combined breathing techniques potentially optimize respiratory mechanics and symptom reduction among chronic obstructive pulmonary disease patients (Ammous et al., 2023). However, limited pre-experimental evidence evaluates the combined effect of orthopneic positioning and pursed-lip breathing on dyspnea outcomes. This evidence gap highlights the need for further clinical investigation using structured nursing interventions.

Therefore, this study aims to analyze the effect of orthopneic position and pursed-lip breathing on dyspnea reduction among patients with chronic obstructive pulmonary disease.

Methods

Study Design

This study employed a pre-experimental one-group pretest–posttest design to evaluate the effect of orthopneic positioning combined with pursed-lip breathing on dyspnea among patients with chronic obstructive pulmonary disease. The study was conducted following the TREND Statement (Transparent Reporting of Evaluations with Nonrandomized Designs) guideline from the EQUATOR Network, which provides a structured framework for reporting nonrandomized intervention studies. The design allowed measurement of outcome variables before and after the intervention within the same group to determine clinical change attributable to the Evidence-Based Nursing Practice (EBNP) application. This approach was selected because the intervention represented a structured nursing implementation within a clinical setting without random allocation. The study was conducted in the MDR (Multi-Drug Resistant) Baji Ati ward, 6th floor, Labuang Baji Hospital Makassar, between April 22, 2024, and June 14, 2024. The

hospital setting provided a controlled inpatient environment that ensured standardized monitoring of respiratory parameters and intervention adherence.

Samping

The study population consisted of all patients diagnosed with chronic obstructive pulmonary disease who received treatment at Labuang Baji Hospital Makassar in 2023, totaling 327 patients. Sample size calculation was performed using G*Power statistical software with an effect size of 0.79, alpha error probability of 0.05, and statistical power of 0.80, which produced a minimum required sample of 15 participants. The effect size was determined based on prior clinical evidence demonstrating moderate to large improvements in respiratory outcomes following breathing interventions. To anticipate potential dropout, an additional adjustment was applied, resulting in a final required sample of 17 participants. Participants were recruited using purposive sampling based on predefined inclusion and exclusion criteria. The inclusion criteria comprised adult COPD patients hospitalized in the MDR Baji Ati ward, experiencing dyspnea, fully conscious with Glasgow Coma Scale score of 15, able to communicate effectively, cooperative, and having a caregiver. The exclusion criterion included patients who discontinued participation or failed to perform pursed-lip breathing for one week during the intervention period.

Instruments

Baseline and post-intervention assessments included objective physiological measures to evaluate respiratory status. Respiratory rate was measured manually by counting thoracic movements per minute under resting conditions to ensure accuracy and consistency. Oxygen saturation was measured using a calibrated pulse oximeter placed on the patient's fingertip in a stable sitting position. Peak expiratory flow (PEF) was assessed using a standardized peak flow meter to measure maximum expiratory effort after full inspiration. All instruments were routinely used in clinical respiratory assessment and calibrated according to hospital standards prior to data collection. Measurements were conducted by trained clinical personnel to ensure inter-observer reliability and procedural consistency. The use of objective physiological indicators strengthened internal validity by minimizing measurement bias.

Intervention

The intervention consisted of the structured application of orthopneic positioning combined with pursed-lip breathing as an Evidence-Based Nursing Practice protocol for dyspnea management. The orthopneic position was performed by seating the patient upright with the torso slightly leaning forward and the elbows supported on a table or pillow to optimize thoracic expansion and reduce accessory muscle workload. Pursed-lip breathing was performed by instructing the patient to inhale slowly through the nose for approximately two seconds and exhale gently through pursed lips for four seconds to prolong expiration and prevent airway collapse. Each intervention session lasted 20–30 minutes per day and was delivered either once daily or divided into two sessions depending on patient tolerance. The intervention frequency was at least three times per week for four consecutive weeks. The structured duration and frequency were determined to ensure sufficient exposure for physiological adaptation while maintaining patient safety. Caregivers were educated to support adherence outside supervised sessions to enhance compliance and intervention fidelity.

Data Collection

Data collection was conducted in two phases: pre-intervention assessment and post-intervention assessment. Baseline measurements included respiratory rate, oxygen saturation, and peak expiratory flow, which were recorded prior to initiating the intervention. All baseline data were collected under resting conditions to ensure standardization. The intervention was then implemented according to the predetermined schedule for four weeks. Following completion of the intervention period, final measurements of respiratory rate, oxygen saturation, and peak expiratory flow were obtained using identical procedures and instruments as baseline

assessment. Consistency in timing, measurement position, and environmental conditions was maintained to reduce confounding variability. All collected data were recorded using structured observation sheets designed specifically for the study.

Data Analysis

Data analysis was performed using statistical software to examine differences between pre- and post-intervention outcomes. Descriptive statistics were used to summarize demographic characteristics and baseline clinical parameters. Normality of continuous variables was assessed prior to inferential testing to determine the appropriate statistical method. Bivariate analysis was conducted to evaluate differences in respiratory rate, oxygen saturation, and peak expiratory flow before and after intervention. The dependent (paired) t-test was used to assess mean differences between pre- and post-intervention measurements because the data were obtained from the same participants. The level of statistical significance was set at $\alpha = 0.05$. A p-value less than 0.05 indicated a statistically significant difference between baseline and post-intervention outcomes. Effect size estimation was also considered to determine the magnitude of clinical impact.

Ethical Considerations

This study adhered to ethical principles of autonomy, beneficence, non-maleficence, and justice. Ethical approval was obtained from the institutional review board prior to data collection. All participants received verbal and written explanations regarding study objectives, procedures, potential benefits, and risks. Written informed consent was obtained from each participant before enrollment. Participants retained the right to withdraw from the study at any time without affecting their medical treatment. Confidentiality of patient information was maintained by anonymizing data and storing records securely. The intervention was conducted under clinical supervision to ensure patient safety and prevent adverse respiratory events.

Results

During the implementation of the intervention, no operational barriers related to facilities, equipment, or room availability were identified. Labuang Baji General Hospital Makassar provided full institutional support that facilitated smooth execution of the study procedures. All eligible patients agreed to participate voluntarily and signed informed consent prior to inclusion in the study. Throughout the intervention period, no adverse events or negative physiological responses associated with the orthopneic position and pursed-lip breathing exercises were observed. This finding indicates that the intervention was safe, feasible, and acceptable for hospitalized patients with chronic obstructive pulmonary disease.

Table 1. Demographic Characteristics of Respondents

Variables	Frequency (n)	Percentage (%)
Gender		
Male	10	58.8
Female	7	41.2
Education Level		
Junior High School	3	17.6
Senior High School	10	58.8
Higher Education	4	23.5
	Mean	**SD**
Age (years)	46.9	6.58

Table 1 shows that characteristics of respondents included age, gender, and education level. The mean age of participants was 46.9 years (SD = 6.58), with the youngest respondent aged 35 years and the oldest aged 61 years. Male respondents constituted the

majority of the sample. Most respondents had completed senior high school education, indicating a moderate educational background among participants. These demographic characteristics suggest a relatively homogeneous adult COPD population receiving inpatient care in this setting.

Table 2. Differences in the Mean of Respiratory Rate, Oxygen Saturation, and Peak Expiratory Flow (PEF) Before and After the Intervention of Orthopneic Position and Pursed Lips Breathing

Outcome	Mean ±SD	SE	Effect Size	p-value
Respiratory Rate				
Before	23.4±3.04	1.01	1.13	0.001
After	18.9±4.62			
Oxygen Saturation				
Before	89.6 ± 5.83	1.04	-1.60	0.001
After	96.4±2.62			
Peak Expiratory Flow (PEF)				
Before	256±70.1	15.5	-1.74	0.001
After	367±60.9			

Based on table 2 showed a significant improvement in respiratory parameters after the implementation of the orthopneic position combined with pursed-lip breathing intervention. The mean respiratory rate decreased from 23.4 breaths per minute before the intervention to 18.9 breaths per minute after the intervention, indicating improved breathing efficiency. The statistical analysis revealed a p-value of 0.001, which indicates a statistically significant difference between pre- and post-intervention measurements. The calculated effect size (1.13) suggests a strong clinical impact of the intervention on respiratory rate reduction.

Oxygen saturation also demonstrated substantial improvement following the intervention. The mean oxygen saturation increased from 89.6% before the intervention to 96.4% after the intervention, indicating better oxygenation status among COPD patients. The p-value of 0.001 confirms that this increase was statistically significant. The negative effect size value (-1.60) reflects a meaningful physiological improvement, particularly in correcting hypoxemia commonly experienced by COPD patients.

Similarly, peak expiratory flow (PEF) showed marked improvement after the intervention. The mean PEF increased from 256 L/min before the intervention to 367 L/min after the intervention, indicating enhanced expiratory airflow capacity. Statistical testing yielded a p-value of 0.001, confirming a significant difference between pre- and post-intervention measurements. The effect size (-1.74) indicates a large clinical effect, suggesting that the combined intervention effectively improved pulmonary function.

Overall, these findings indicate that the combined application of orthopneic positioning and pursed-lip breathing produced significant physiological improvements in respiratory rate, oxygen saturation, and peak expiratory flow among patients with chronic obstructive pulmonary disease. The large effect sizes observed across outcomes suggest that this non-pharmacological nursing intervention has strong clinical relevance for dyspnea management in COPD patients.

Discussion

This study demonstrated that the combined application of orthopneic position and pursed-lip breathing significantly reduced respiratory rate, increased oxygen saturation, and improved peak expiratory flow in patients with chronic obstructive pulmonary disease. The findings indicate that the intervention produced clinically meaningful physiological improvements after four weeks of implementation. The reduction in respiratory rate suggests improved ventilatory efficiency

among participants. The increase in oxygen saturation reflects better oxygenation status following the intervention. The marked improvement in peak expiratory flow indicates enhanced expiratory airflow capacity. Overall, the results confirm that this non-pharmacological nursing intervention effectively alleviated dyspnea symptoms in hospitalized COPD patients.

Chronic obstructive pulmonary disease causes persistent airflow limitation that leads to dyspnea and impaired gas exchange in affected individuals (WHO, 2021). Global epidemiological data identify chronic obstructive pulmonary disease as a major contributor to respiratory disability and mortality worldwide (WHO, 2019). The GOLD strategy emphasizes symptom reduction and airflow improvement as primary goals of COPD management (Global Initiative for Chronic Obstructive Lung Disease, 2024). The observed reduction in respiratory rate in this study indicates improved ventilatory mechanics after intervention. Evidence from systematic reviews demonstrates that breathing exercises enhance respiratory muscle efficiency and reduce dyspnea in COPD patients (Yun et al., 2021). Inspiratory muscle training interventions also improve ventilatory performance in chronic obstructive pulmonary disease populations (Ammous et al., 2023).

The increase in oxygen saturation observed in this study reflects improved alveolar ventilation and reduced air trapping. COPD pathophysiology often involves ventilation-perfusion mismatch that compromises oxygen delivery (Agustí et al., 2022). GOLD reports highlight airway obstruction and hyperinflation as mechanisms contributing to hypoxemia in COPD patients (GOLD, 2020). The orthopneic position facilitates thoracic expansion and reduces accessory muscle fatigue during breathing. Evidence-based pursed-lip breathing protocols improve oxygenation outcomes in COPD patients when applied consistently (Huang et al., 2024). Comparative clinical trials show that diaphragmatic breathing combined with pursed-lip breathing improves oxygen saturation more effectively than single breathing techniques (Riaz et al., 2024).

The improvement in peak expiratory flow in this study indicates enhanced expiratory airflow capacity. Airflow limitation in COPD results from chronic inflammation and structural airway remodeling (Agustí et al., 2022). Pulmonary rehabilitation frameworks emphasize expiratory control techniques to optimize airflow and reduce dynamic hyperinflation (Holland et al., 2021). Active cycle breathing techniques improve airway clearance and pulmonary function in respiratory disorders (KK et al., 2025). Effective cough techniques also improve airway patency in chronic obstructive pulmonary disease management (Marlina et al., 2025). The observed increase in peak expiratory flow confirms that structured breathing exercises can strengthen expiratory performance in COPD patients.

These findings align with broader rehabilitation strategies for chronic respiratory disease management. Modern pulmonary rehabilitation integrates breathing exercises to improve functional capacity and quality of life (Holland et al., 2021). Telerehabilitation approaches demonstrate that structured respiratory interventions remain effective outside conventional hospital settings (Cox et al., 2021). Home-based rehabilitation programs with telecoaching improve health-related outcomes among COPD patients (Şahin et al., 2023). The treatable traits concept promotes individualized symptom-focused interventions in COPD care (Agustí et al., 2022). The present findings support the integration of orthopneic positioning and pursed-lip breathing into routine nursing practice.

Behavioral engagement plays a critical role in sustaining respiratory interventions among chronic disease patients (Anurak & Chaow, 2026). Gamification strategies enhance adherence and motivation in health behavior interventions (Bassanelli et al., 2022). Educational gamification improves behavioral change outcomes in clinical and educational settings (Kim & Castelli, 2021). Serious game interventions improve engagement and respiratory self-management in COPD patients (Huang et al., 2023). Slow deep breathing combined with relaxation therapy improves physiological outcomes in chronic disease

management (Ar-Razy & Rohmah, 2025). These theoretical perspectives suggest that structured breathing interventions may achieve sustained benefits when integrated with behavioral reinforcement strategies.

Despite promising findings, COPD management in low- and middle-income countries faces systemic healthcare challenges (Meghji et al., 2021). Healthcare systems require accessible and low-cost interventions to address chronic respiratory disease burden (WHO, 2019). Nursing management strategies contribute substantially to symptom control in chronic health conditions (Winda Agustina & Budianto, 2025). Diaphragmatic breathing interventions improve respiratory parameters in obstructive airway diseases (KK, 2024). The current study provides empirical evidence that simple positioning and breathing techniques produce measurable physiological improvements. Therefore, healthcare providers may adopt orthopneic positioning combined with pursed-lip breathing as a safe, feasible, and evidence-based nursing intervention for dyspnea management in COPD patients.

Conclusion and Recommendation

The study concludes that the application of orthopneic positioning combined with pursed-lip breathing effectively reduced respiratory rate, increased oxygen saturation, and improved peak expiratory flow among patients with chronic obstructive pulmonary disease, indicating significant improvement in respiratory function and dyspnea management. These findings demonstrate that the intervention is safe, feasible, and clinically beneficial as a non-pharmacological nursing approach for COPD patients. Healthcare providers should consider integrating this intervention into routine respiratory care to enhance patient outcomes and symptom control. Future studies should involve larger samples, longer intervention periods, and controlled study designs to strengthen evidence and generalizability. Continuous patient education and caregiver involvement are also recommended to maintain adherence and maximize long-term benefits of the intervention.

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Declaration of conflict of interest

The authors declare no competing interests.

Declaration on the Use of AI

No AI tools were used in the preparation of this manuscript.

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