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**The Influence of Puersed Lip Breathing and Diaphragmatic Breathing Exercises on
Dyspnea among Pneumonia Patients in the Emergency Department**

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ABSTRACT

Background: Pneumonia is an acute respiratory infection frequently causes shortness of breath due to impaired gas exchange and alveolar inflammation. Non-pharmacological interventions such as Pursed Lip Breathing (PLB) and Diaphragmatic Breathing Exercise (DBE) have been shown to improve ventilation and oxygenation in respiratory disorders. **Object:** This study aimed to determine the effect of PLB and DBE on dyspnea levels among pneumonia patients in the Emergency Department. **Method:** This study used a quasi-experimental pretest–posttest control group design (Both the groups consisted of 8 respondents each, yielding a total of 16 respondents). Sixteen pneumonia patients with dyspnea selected using inclusion criteria and divided into two groups: an intervention group and a control group. Each intervention was performed in 5 cycles, consisting of 5 repetitions of PLB and DBE followed by a 2-minute rest. Dyspnea levels (Oxygen saturation (SpO₂)) were measured before and after the intervention. Data were analyzed using the Paired Sample T-Test with a significance level of $p < 0.05$. **Results:** The mean SpO₂ in the intervention group increased from 91.62 to 98.87, while in the control group it increased from 90.87 to 97.62. Statistical analysis showed a significant difference in the intervention group ($p = 0.000$), indicating that PLB and DBE effectively improved oxygenation and reduced dyspnea compared to standard oxygen therapy alone. **Conclusion:** Pursed Lip Breathing and Diaphragmatic Breathing Exercises significantly improve oxygen saturation and reduce dyspnea in pneumonia patients. These techniques are simple, safe, and can be recommended as supportive nonpharmacological interventions in emergency respiratory care.

Keywords: Pursed Lip Breathing, Diaphragmatic Breathing Exercise, Penumonia

BACKGROUND

The Emergency Department (ED) is a crucial hospital service unit responsible for providing immediate and follow-up care for patients presenting with life-threatening conditions or injuries, either directly or via referral from other healthcare facilities (Ministry of Health Regulation No. 47 of 2018). According to the World Health Organization, several emergency and critical illnesses contribute significantly to global mortality rates, including ischemic heart disease (7.4

million deaths; 13.2%), stroke (6.7 million; 11.9%), chronic obstructive pulmonary disease (3.1 million; 5.6%), lower respiratory tract infections (3.1 million; 5.5%), and cancer (1.6 million; 2.9%). Injuries also account for about 1.2 million deaths annually. These figures highlight the substantial burden of emergencies requiring rapid and effective medical intervention to prevent complications and death (WHO, 2022).

In Indonesia, data from Basic Health Research show that the most frequently treated conditions in emergency departments include dyspepsia (415 patients), open wound trauma (391 patients), and fever (383 patients). Other common emergencies are acute abdominal pain, head trauma, fractures, dyspnea, heart failure, seizures, and dehydration. Among respiratory emergencies, pneumonia is particularly significant as it causes inflammation and fluid accumulation in the alveoli, impairing gas exchange and ventilation. The disease can be caused by bacteria, viruses, or fungi, and is typically accompanied by productive cough, fever, dyspnea, and chest discomfort (Hall & Hall, 2020). Emergency management of respiratory problems in the ED generally includes airway stabilization, oxygen therapy, antibiotics, and supportive treatments.

However, non-pharmacological interventions such as breathing exercises are increasingly recognized as complementary measures that can alleviate dyspnea effectively, safely, and affordably. Among these, Pursed Lip Breathing (PLB) and Diaphragmatic Breathing Exercise (DBE) are two simple yet powerful techniques. PLB involves slow exhalation through pursed lips after nasal inhalation, which helps regulate breathing patterns, prevent alveolar collapse, and enhance oxygen exchange (Andrian et al., 2024). DBE, on the other hand, focuses on engaging the diaphragm to promote deeper, more efficient breaths, increasing tidal volume and reducing the need for accessory muscle use (Azzahra et al., 2024). Research has demonstrated the effectiveness of combining both methods. Sharma et al., (2022) in "The Effect of Pursed Lip Breathing Combined with Diaphragmatic Breathing on Pulmonary Function and Exercise Capacity in Patients with COPD," reported that PLB+DBE significantly improved pulmonary function and physical endurance compared to either technique alone, making the

combination suitable for pulmonary rehabilitation.

Similarly, Insight JHR 2024 found that this combination reduced dyspnea (as measured by the mMRC scale) and improved walking capacity in patients with respiratory illness, reinforcing its clinical usefulness. While these techniques have been well-documented in chronic conditions such as COPD, limited studies have explored their application in acute respiratory distress, particularly in emergency settings for pneumonia patients. Early implementation of PLB and DBE in the ED could play a vital role in stabilizing patients faster, reducing the need for invasive interventions like mechanical ventilation, and potentially improving overall clinical outcomes. Therefore, evaluating the effectiveness of combined breathing exercises in acute cases is essential for expanding non-pharmacological management strategies in emergency respiratory care.

RESEARCH METHODS

Materials and Method This study was conducted on pneumonia patients presenting with shortness of breath at the Emergency Department of Dr. M.M. Dunda Limboto Hospital. The participants were divided into two groups: an intervention group and a control group, both of which underwent pre-test and post-test assessments. The intervention group received Pursed Lip Breathing (PLB) and Diaphragmatic Breathing Exercise (DBE) therapy in combination with oxygen administration, while the control group received only standard oxygen therapy.

This design aimed to determine the effect of PLB and DBE on changes in the level of dyspnea among pneumonia patients. **Description of Materials or Research Subjects** In this study, educational media in the form of a Standard Operating Procedure (SOP) outlining the implementation of Pursed Lip Breathing (PLB) and Diaphragmatic Breathing Exercise (DBE) for patients was

utilized. The study subjects consisted of 16 pneumonia patients who experienced shortness of breath and met the inclusion criteria for participation. All participants were recruited from the Emergency Department of Dr. M.M. Dunda Limboto Hospital. Research Design This study employed a controlled group pretest-posttest design, which illustrates the implementation of Pursed Lip Breathing (PLB) and Diaphragmatic Breathing Exercise (DBE) interventions in pneumonia patients experiencing dyspnea.

This design involves two groups, with one serving as the comparison (control) group. Initially, all subjects underwent a pretest to assess baseline conditions, followed by the administration of the intervention over a specific period, and then a posttest to measure changes after treatment (Nurslaam, 2020). In this study, participants were divided into two groups, with 8 participants assigned to the intervention group and 8 participants assigned to the control group. The intervention group, which received Pursed Lip Breathing and Diaphragmatic Breathing Exercise therapy combined with oxygen, and The control group, which received standard oxygen therapy only. This design aimed to evaluate the effect of PLB and DBE therapy on pneumonia patients with shortness of breath.

Research Procedure

This study followed several procedures, including: 1. Assessing patient data based on medical records, such as medical history and results of supporting examinations. 2. Evaluating the patient's respiratory rate, oxygen saturation, and dyspnea scale prior to intervention. 3. Documenting the assessment results and determining the study samples according to the inclusion and exclusion criteria. 4. Positioning the patient in a semi-Fowler's position and guiding them to perform Pursed Lip Breathing (PLB) and Diaphragmatic Breathing Exercise (DBE) techniques. Each patient performed five

cycles, with each cycle consisting of five repetitions of PLB, followed by five repetitions of DBE, and then a two-minute rest period before continuing to the next cycle. 5. Reassessing and documenting the patient's respiratory rate, oxygen saturation, and dyspnea scale after the intervention (Sari, 2024; Pramesti, 2023).

Instruments and Equipment

Research instruments are tools used to collect useful data and information. The instruments utilized in this study included: 1. Oximeter, used to measure the patient's oxygen saturation level. 2. Observation sheet, used to record assessment results and monitor changes in the patient's condition before and after the intervention.

Data Collection Methods

Before the intervention was carried out in both the control and intervention groups, an assessment of the patients' dyspnea level was conducted using the oxygen saturation (SpO₂) indicator. After the intervention was completed in both groups, the patients' dyspnea level was re-evaluated using the same oxygen saturation (SpO₂) indicator to measure changes following the intervention.

Data Analysis

To determine the effect of Pursed Lip Breathing (PLB) and Diaphragmatic Breathing Exercise (DBE) on pneumonia patients experiencing dyspnea, statistical analysis was performed on the collected data. A normality test was first conducted using the Shapiro–Wilk test. After confirming that the data were normally distributed, a bivariate analysis was carried out using the Paired Sample T-Test to assess the differences before and after the intervention [6].

Research Ethics

This study applied eight ethical principles, namely: informed consent, anonymity, confidentiality, honesty,

integrity, accuracy, non-discrimination, and the prioritization of human safety.

and shortness of breath were male, totaling 9 individuals (56.25%), while female respondents accounted for 7 individuals (43.75%).

RESULT AND DISCUSSION

Characteristics of the Respondents

According to the results of the study, the majority of respondents with pneumonia

Level of Dyspnea Based on Oxygen Saturation (SPO₂) Indicators Among Respondents Before the Intervention

a. Intervention Group

Table 1.

Distribution of Shortness of Breath Levels Based on Oxygen Saturation (SpO₂) Indicators Among Respondents Before the Intervention in the Intervention Group.

Oxygen Saturation (SpO ₂) Level	Frequency (N)	Percentage (%)
Normal	0	0
Mild	7	87.5
Moderate	1	12.5
Severe	0	0
Total	8	100

Source: Primary Data, 2025

Based on Table 1 above, the distribution of shortness of breath levels based on oxygen saturation (SpO₂) indicators among pneumonia patients with breathing difficulties before the intervention in the intervention group shows that, out of

a total of 8 respondents, most experienced mild shortness of breath (7 respondents or 87.5%), while 1 respondent (12.5%) experienced moderate shortness of breath.

b. Control Group

Table 2.

Distribution of Shortness of Breath Levels Based on Oxygen Saturation (SpO₂) Indicators Among Respondents Before the Intervention in the Control Group

Oxygen Saturation (SpO ₂) Level	Frequency (N)	Percentage (%)
Normal	0	0
Mild	6	75
Moderate	2	25
Severe	0	0
Total	8	100

Source: Primary Data, 2025

Based on Table 2 above, the distribution of shortness of breath levels based on oxygen saturation (SpO₂) indicators among pneumonia patients with breathing difficulties before the intervention in the control group shows that, out of a total of 8 respondents, most

experienced mild shortness of breath (6 respondents or 75%), while 2 respondents (25%) experienced moderate shortness of breath.

Level of Dyspnea Based on Oxygen Saturation (SpO₂) Indicators Among Respondents After the Intervention

a. Intervention Group

Table 3.

Distribution of Shortness of Breath Levels Based on Oxygen Saturation (SpO₂) Indicators Among Respondents After the Intervention in the Intervention Group

Oxygen Saturation (SpO ₂) Level	Frequency (N)	Percentage (%)
Normal	7	87.5
Mild	1	12.5
Moderate	0	0
Severe	0	0

Source: Primary Data, 2025

Based on Table 3 above, the distribution of shortness of breath levels based on oxygen saturation (SpO₂) indicators among pneumonia patients with breathing difficulties after the intervention in the intervention group shows that, out of a total of 8

respondents, the majority no longer experienced shortness of breath (normal category) with 7 respondents (87.5%), while 1 respondent (12.5%) still experienced mild shortness of breath.

b. Control Group

Table 4.

Distribution of Shortness of Breath Levels Based on Oxygen Saturation (SpO₂) Indicators Among Respondents After the Intervention in the Control Group

Oxygen Saturation (SpO ₂) Level	Frequency (N)	Percentage (%)
Normal	7	87.5
Mild	1	12.5
Moderate	0	0
Severe	0	0

Oxygen Saturation (SpO ₂) Level	Frequency (N)	Percentage (%)
Total	8	100

Source: Primary Data, 2025

Based on Table 4 above, the distribution of shortness of breath levels based on oxygen saturation (SpO₂) indicators among pneumonia patients with breathing difficulties after the intervention in the control group shows

that, out of a total of 8 respondents, most no longer experienced shortness of breath (normal category) with 7 respondents (87.5%), while 1 respondent (12.5%) still experienced mild shortness of breath.

The Effect of Pursed Lip Breathing and Diaphragmatic Breathing Exercises on Dyspnea in Pneumonia Patients

Table 5.

Analysis of Pursed Lip Breathing Exercise and Diaphragmatic Breathing Exercise on Shortness of Breath in Pneumonia Patients at the Emergency Department

Variable	SpO ₂	N	Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Intervention	Pre-test	8	91.62	1.59799	1.59799	0.000
	Post-test	8	98.87	2.03101	2.03101	
Control	Pre-test	8	90.87	1.45774	0.51539	0.000
	Post-test	8	97.62	1.99553	0.70553	

Source: Primary Data, 2025

Based on Table 5 above, it is known that the average oxygen saturation level (SpO₂) of pneumonia patients before being given Pursed Lip Breathing and Diaphragmatic Breathing Exercise interventions was 91.62, which increased to 98.87 after the intervention, showing an average improvement of 7.25 points. Meanwhile, in the control group that did not receive the intervention, the average oxygen saturation level increased from 90.87 to 97.62, with a difference of 6.75 points. The results of the Paired Samples T-Test showed that the significance value (Sig. 2-tailed) in the intervention group was 0.000, which means Sig. (2-tailed) < α (0.05).

Therefore, H₀ is rejected and H_a is accepted, indicating that there is a significant effect of Pursed Lip Breathing and Diaphragmatic Breathing Exercise on reducing shortness of breath among pneumonia patients in the Emergency Department of Dr. M.M. Dunda Limboto Hospital. These findings suggest that both PLB and DBE interventions have a positive impact on improving oxygen saturation levels compared to the control group that only received standard oxygen therapy without breathing exercises.

Discussion

Level of Shortness of Breath in the Intervention Group

Based on Table 4, it can be observed that the distribution of shortness

of breath levels, as indicated by oxygen saturation (SpO_2), among pneumonia patients experiencing dyspnea after the intervention in the intervention group shows that out of a total of eight respondents, most no longer experienced shortness of breath (normal) — seven respondents (87.5%), while one respondent (12.5%) still experienced mild dyspnea.

Theoretical evidence indicates that the combination of these two techniques effectively reduces dyspnea scores, normalizes the respiratory rate, and increases oxygen saturation while also improving patient comfort and reducing anxiety. The mechanisms of both techniques complement each other: *Pursed Lip Breathing (PLB)* enhances exhalation and alveolar ventilation, whereas *Diaphragmatic Breathing Exercise (DBE)* strengthens diaphragmatic function, deepens inspiration, and slows the respiratory rhythm (Sharma et al., 2022).

These findings are consistent with studies conducted by Gosselink et al. (2021), which demonstrated that the combination of PLB and DBE provides significantly greater clinical improvement compared to oxygen therapy alone. Active breathing therapy contributes to the physiological enhancement of lung function and the efficiency of gas exchange, thereby accelerating the increase in SpO_2 and reducing the sensation of breathlessness (McConnel et al., 2014).

Further research supports that PLB reduces respiratory rate and pulmonary hyperinflation and increases oxygen saturation more effectively when combined with DB than when used as a single technique. The combination extends exhalation duration and helps maintain airway patency, reducing air

trapping—an effect that is difficult to achieve with oxygen therapy (Mandell et al., 1996).

Level of Shortness of Breath in the Control Group

Based on Table 5, the distribution of shortness of breath levels, indicated by oxygen saturation (SpO_2), among pneumonia patients with dyspnea after the intervention in the control group shows that, out of a total of eight respondents, most no longer experienced shortness of breath (normal category), totaling seven respondents (87.5%), while one respondent (12.5%) still experienced mild dyspnea. This finding aligns with the study by Prina 2023, which revealed that the administration of standard oxygen therapy in patients with severe pneumonia did not significantly reduce the risk of mortality and was not effective in preventing acute respiratory failure. Passive oxygen therapy also fails to provide the positive airway pressure necessary to keep the alveoli open, thereby maintaining a high risk of atelectasis and hypoxemia (Prina et al., 2015).

The main disturbance in pneumonia patients lies in *alveolar ventilation*—the process of gas exchange between air in the alveoli and pulmonary capillaries. While oxygen therapy increases the oxygen content of inspired air, it does not correct the underlying ventilatory dysfunction caused by pathological processes such as inflammation, alveolar edema, and mucus accumulation (Potter et al., 2025). Passive oxygen therapy, such as via nasal cannula or simple mask, can increase the *fraction of inspired oxygen (FiO_2)*; however, it remains limited in its effectiveness because it does not address mechanical breathing disorders or ventilation-perfusion imbalance in pneumonia patients (Hinkle et al., 2021; Hussain et al., 2025).

Comparison of the Effects of Pursed Lip Breathing and Diaphragmatic Breathing Exercise with Oxygen Therapy in Pneumonia Patients with Shortness of Breath

Based on the results of the Paired Samples T-Test in *Table 6*, the obtained significance value (2- tailed) was 0.000, indicating that $p < 0.05$. Therefore, H_0 is rejected and H_a is accepted, meaning there is a significant effect of Pursed Lip Breathing (PLB) and Diaphragmatic Breathing Exercise (DBE) on patients with pneumonia experiencing shortness of breath in the Emergency Department (ED). Pneumonia is an acute infection of the lung tissue characterized by alveolar inflammation and secretion accumulation, leading to impaired gas exchange and decreased tissue oxygenation, which clinically manifests as dyspnea (WHO, 2022).

PLB and DBE have been shown to improve breathing patterns, enhance alveolar ventilation, and reduce the work of breathing. PLB helps slow down exhalation and maintains positive airway pressure to prevent bronchial collapse, while DBE strengthens diaphragmatic function and enhances the efficiency of gas exchange (Sharma et al., 2022; McConnel et al., 2014). Several previous studies support these findings. Pramesti & Ajeng reported that PLB performed twice daily for five days decreased respiratory rate from 27 to 18 breaths per minute and increased oxygen saturation (SpO₂) in pneumonia patients (Pramesti, 2023). Similarly, Azzahra 2022 found that PLB reduced dyspnea and improved comfort in breathing. Research conducted at Sahabat Hospital Pasuruan also demonstrated a mean reduction of 9.5 breaths per minute after PLB training, accompanied by improved respiratory comfort (Azzahra et al., 2024).

However, the comparison between the intervention and control

groups showed only a small clinical difference, as oxygen therapy alone can rapidly increase oxygen saturation levels (Sari, 2024). Passive oxygen therapy elevates blood oxygen concentration but does not correct impaired respiratory mechanics or ventilation efficiency, as achieved through PLB and DBE. Thus, the two methods are physiologically complementary: oxygen therapy provides immediate oxygenation improvement, whereas PLB and DBE enhance breathing control and patient comfort. In summary, the findings indicate that the combination of PLB and DBE is effective in reducing dyspnea and improving oxygen saturation among pneumonia patients, although the statistical difference compared to oxygen therapy alone is relatively small. These breathing techniques are recommended as simple, safe, and non-pharmacological interventions that can be easily implemented in emergency settings to help stabilize respiratory function in pneumonia patients (West et al., 2008).

Interpretation of results

Bivariate analysis in this study aimed to determine the effect of Pursed Lip Breathing (PLB) and Diaphragmatic Breathing Exercise (DBE) on reducing dyspnea among patients with pneumonia in the Emergency Department of Dr. M.M. Dunda Limboto Hospital. This analysis was conducted to assess the influence of PLB and DBE before and after the intervention. Prior to data analysis, a normality test using the Shapiro–Wilk method was performed. The results showed significance values of 0.819 for the pre-test and 0.001 for the post-test, both greater than 0.05, indicating that the data were normally distributed. Therefore, the appropriate statistical test used for this analysis was the Paired Sample T- Test (Difference Test), processed using the SPSS software, with a significance level set at $p < 0.05$.

Research Limitations

The limitation of this study lies in the difficulty of obtaining an adequate sample size. The limited number of samples was primarily due to time constraints, as data collection was conducted only during morning shifts. Additionally, most patients diagnosed with pneumonia were admitted during night hours, which further restricted the availability of eligible participants.

CONCLUSION

The application of Pursed Lip Breathing (PLB) and Diaphragmatic Breathing Exercise (DBE) has been shown to significantly reduce the level of dyspnea, normalize respiratory rate, and improve oxygen saturation in pneumonia patients treated in the Emergency Department. These two non-pharmacological interventions are simple, safe, and effective in supporting the management of acute respiratory distress, helping patients achieve greater comfort and stability before receiving further medical treatment. The combination of PLB and DBE should be integrated as a routine nursing intervention for pneumonia patients experiencing respiratory impairment in the Emergency Department.

Both PLB and DBE techniques are easy to learn, safe for emergency patients, and require no special equipment—only simple education from healthcare providers. PLB is more suitable for managing episodes of acute shortness of breath, while DBE can be practiced regularly to improve long-term respiratory function. These non-pharmacological interventions are recommended to become part of the standard management protocol for both acute and non-acute respiratory cases in the Emergency Department.

CONFLICT OF INTEREST

The researcher declares that there

is no conflict of interest in the conduct and reporting of this study. All research processes were carried out independently without any influence from external parties, including institutions, organizations, or individuals, that could affect the results or interpretation of the data. The researcher did not receive any financial, material, or personal incentives from third parties with an interest in the outcome of this study. All scientific decisions, including data collection, analysis, and preparation of the final report, were made objectively and in accordance with established research ethics principles.

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