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## Effect of pursed lip breathing (PLB) exercises on respiratory rate among patients with pneumonia

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### Abstract

**Background:** Pneumonia is an acute respiratory infection, commonly caused by viruses or bacteria. It can cause mild illness or even be life-threatening. When a person suffers from pneumonia, the alveolus will be filled with pus and fluid, which makes breathing painful and limits oxygen intake so that the patient will feel short of breath. PLB therapy will help develop the alveolus in the lung lobes so that it helps push the secretions in the respiratory tract during expiration and increase alveolus pressure.

**Purpose:** To determine the respiratory rate (RR) using pursed lip breathing.

**Method:** Study with evidence-based practice. The subjects used were 5 patients with pneumonia, data analysis using descriptive analysis.

**Results:** The application carried out for 15 minutes in a span of 3 days, there was a decrease in respiratory rate in pneumonia patients.

**Conclusion:** The Pursed Lips Breathing (PLB) technique is effective in reducing or reducing the rate of respiratory in patients with pneumonia.

**Keywords:** Airway Clearance; Pursed Lips Breathing; Respiratory Rate.

### INTRODUCTION

Pneumonia is an acute respiratory infection, this disease is generally caused by viruses or bacteria. This disease can cause mild illness or can even be life-threatening in people of all ages (Lilik, Wanda, & Nurhaeni, 2019). In 2017 the disease killed more than 808,000 children under the age of 5, accounting for 15% of all deaths of children under 5. Adults are also at risk of developing this disease and people who already have previous health problems (Rahmawati, Effendi, Mutiara, Oktarina, & Andina, 2023). If a person has pneumonia, the alveolus will fill with pus and fluid, which makes breathing painful and limits oxygen intake. Patients with pneumonia generally have symptoms such as coughing up phlegm, shortness of breath, fatigue, persistent cough, limited function, and decreased quality of life, in general

Respiratory disorders are compensation for the body's lack of oxygen because low oxygen concentration will stimulate the central nerve to increase respiratory rate (Gattinoni, Gattarello, Steinberg, Busana, Palermo, Lazzari, & Camporota, 2021). The inflammatory process of pneumonia results in excess secretion production which will cause the problem of ineffective airway clearance, where in this situation the patient will find it difficult to remove secretions to maintain the airway (Muhtadi, Rosyid, Nurcahyanto, Rachmanisa, Firdausi, Wardani, & Mustikasari, 2023). Characteristics that can be found in patients with airway ineffectiveness such as coughing, dyspnea, restlessness, abnormal breathing sounds, ronchi, changes in respiratory rate, use of respiratory muscles, nasal lobe respiratory, and

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excessive amounts of sputum (Rahmawati et al., 2023). If these efforts are not balanced, there will be disruption of oxygenation status from mild to severe, even causing death (Mulasari, 2017).

Provision of nursing care with pneumonia who experience nursing problems, impaired gas exchange or ineffective airway clearance. Ineffective airway clearance is inadequate secretion or obstruction that occurs in the respiratory tract so that airway patentness is disturbed, this can be characterized by dyspnea, changes in respiratory rate, excess sputum, additional respiratory sounds, and ineffective coughing (Muhtadi et al., 2023). This can be risky for patients who cause patients to experience shortness of breath and impaired gas exchange (Mulasari, 2017). Nurses can provide good management by establishing trusting relationships between patients and patients' families in order to create good cooperation (Yang, Wei, Wang, Ke, Zhao, Mao, & Mao, 2022).

The main management that can be done in pneumonia patients is the administration of antibiotics in accordance with the causative microorganisms and other supportive measures. Another therapy that can be recommended in the problem of ineffective airway clearance is PLB (*Pursed Lips Breathing*) therapy. PLB therapy is given to help overcome the problem of ineffective airway clearance in pneumonia patients (Mohamed, 2019). PLB therapy will help develop the alveolus in the lung lobes so that it helps push the secretions in the respiratory tract when expiratory and increase the pressure of the alveolus. PLB has a beneficial effect on patients by reducing respiratory rate at rest, increasing oxygen saturation and tidal volume, and shortening the time needed to recover when short of breath (Yang et al., 2022).

Pursed lips breathing technique is able to reduce

respiratory rate and increase the fulfillment of oxygenation (SpO<sub>2</sub>) of COPD patients (Qamila, Azhar, Risnah, & Irwan, 2019). An increase in oxygen saturation and a decrease in respiratory rate only by using PLB action, that is, before the intervention 93.17% and after the PLB action 96.30% with an average value of 3.2% (Devia, Inayati, & Ayubbana, 2023). In his research investigated that controlled breathing techniques such as pursed lip breathing help reduce respiratory rate, prevent airway collapse, reduce symptoms of anxiety and facilitate ventilation of the alveoli and improvement of shortness of breath can be achieved (Rusminah, Siswanto, & Amalia, 2021).

## RESEARCH METHOD

The method used in this study is to use case reports (case study) with evidence-based practice, implementation approach focused on nursing interventions. Actual or ongoing cases, this study uses case reports. The sample in this case report is 5 patients with pneumonia in the Flamobyan 7 treatment ward of dr. Moewardi Regional Public Hospital, who is willing to take pursed lips breathing intervention. the case report was conducted in August 2023. The instrument used in this case report is an observation sheet that aims to record in order to determine changes in respiratory rate (RR) before and after the intervention. How to collect data using interview techniques and exercises, patients are given an explanation of how to do PLB and also the benefits of doing PLB. This case study was conducted by checking the rate of respiratory before and after the intervention to determine the effect of the intervention given. This therapy is done 30 times in a span of 10-15 minutes within 3 days in the morning interspersed with ordinary respiratory.

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## RESEARCH RESULTS

**Table 1. Bio Data of Participants**

Variables	Patient (1)	Patient (2)	Patient (3)	Patient (4)	Patient (5)
<b>Age (Year)</b>	43	57	49	40	52
<b>Gender</b>	Male	Male	Male	Male	Female
<b>Reasons for Admission to Hospital</b>	Complaining of coughing up phlegm for 3 months and shortness of breath.	Complaints of shortness of breath for 2 weeks, coughing up phlegm difficult to come out, and chest pain.	Complaints of shortness of breath since 5 months ago, coughing up phlegm 1 month ago, chest pain.	Complaints of shortness of breath since 1 month ago, coughing up phlegm 3 weeks ago, and weakness.	Complaints of shortness of breath since 5 months ago, coughing up phlegm 3 weeks ago secretions difficult to come out, and chest pain.
<b>Assessment Results</b>	The respiratory rate was 27x/minute and oxygen saturation were 96%.	The respiratory rate was 28x/minute and oxygen saturation was 96%.	The respiratory rate was 28x/minute and oxygen saturation was 95%.	The respiratory rate was 27x/minute and oxygen saturation was 96%.	The respiratory rate was 29x/minute and oxygen saturation was 95%.
<b>Medical Diagnosis</b>	Pneumonia.	Pneumonia.	Pneumonia.	Pneumonia.	Pneumonia.

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**Table 2. Respiratory Rate Status**

	Pre Test	Post Test
<b>Patient (1)</b>		
First Day	27x/minutes	24x/minutes
Second Day	28x/minutes	26x/minutes
Third Day	27x/minutes	23x/minutes
<b>Patient (2)</b>		
First Day	28x/minutes	25x/minutes
Second Day	28x/minutes	24x/minutes
Third Day	27x/minutes	22x/minutes
<b>Patient (3)</b>		
First Day	28x/minutes	24x/minutes
Second Day	27x/minutes	22x/minutes
Third Day	27x/minutes	23x/minutes
<b>Patient (4)</b>		
First Day	27x/minutes	23x/minutes
Second Day	26x/minutes	24x/minutes
Third Day	26x/minutes	22x/minutes
<b>Patient (5)</b>		
First Day	29x/minutes	25x/minutes
Second Day	26x/minutes	24x/minutes
Third Day	26x/minutes	23x/minutes

Based on Table 2, after PLB intervention, there was a decrease in respiratory rate that varied. On the first day of patient (1) before the PLB intervention the respiratory rate was 27x/minute, after the PLB intervention the respiratory rate decreased by 24x/minute. On the second day, before the intervention, the respiratory rate was calculated at 28x/minute, but after the PLB intervention, the rate of respiratory decreased to 26x/minute. On the third day, respiratory rate was calculated at 27x/minute after the PLB intervention, the respiratory rate dropped to 23x/minute.

On the first day of patient (2) before the PLB intervention the respiratory rate was 28x / minute, after the PLB intervention the respiratory rate decreased by 25x/minute. On the second day, before the intervention the respiratory rate was calculated at 28x/minute but after the PLB intervention there was a decrease in the rate of respiratory to 24x/minute. On

the third day, the respiratory rate was calculated at 27x/minute after the PLB intervention, the respiratory rate dropped to 22x/minute.

On the first day of patient (3) before the PLB intervention, the respiratory rate was 27x/min, after the PLB intervention, the respiratory rate decreased to 23x/minute. On the second day, before the intervention, the respiratory rate was calculated at 26x/minute, but after the PLB intervention, the rate of respiratory decreased to 24x/minute. On the third day, the respiratory rate was calculated at 26x/minute after the PLB intervention, the respiratory rate dropped to 22x/minute.

On the first day of patient (4) before the PLB intervention the respiratory rate was 27x/minute, after the PLB intervention the respiratory rate decreased by 23x/minute. On the second day, before the intervention, the respiratory rate was calculated at 26x/minute, but after the PLB intervention, the rate of

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respiratory decreased to 24x/minute. On the third day, respiratory rate was calculated at 26x/minute after the PLB intervention, the respiratory rate dropped to 22x/minute.

On the first day of patient (5) before the PLB intervention the respiratory rate was 29x/minute, after the PLB intervention the respiratory rate decreased by 25x/minute. On the second day, before the intervention, the respiratory rate was calculated at 26x/minute, but after the PLB intervention, the rate of respiratory decreased to 24x/minute. On the third day, the respiratory rate was calculated at 26x/minute after the PLB intervention, the respiratory rate dropped to 23x/minute.

## DISCUSSION

The results of this case study showed that there was a decrease in respiratory rate in patients before and after pursed lips respiratory intervention, this shows that pursed lips exercise therapy is effective in reducing respiratory rate (Rosyid, Muhtadi, Isa, & Nurcahyanto, 2022). Pursed lip breathing therapy is a non-pharmacological therapy that can reduce shortness of breath (reduce respiratory rate), and can increase oxygen saturation, this technique is also very easy for patients to do so that it can be done anywhere and anytime (Gholamrezaei, Van Diest, Aziz, Vlaeyen, & Van Oudenhove, 2021). Pursed Lip Breathing (PLB) is a type of respiratory exercise by inhaling through the nose while counting to 3, with a bent forward position and exhaling slowly through the lips that are pressed together/like blowing a balloon, while counting to 7. In this pursed lips breathing exercise, there are 2 mechanisms, namely strong inspiration and long expiration (Arisa, & Azizah, 2023). Long expiration will involve the intra-abdominal muscles which will increase the movement of the diaphragm muscle upwards which will make the thoracic cavity smaller (Lalwani, Mishra, Gaidhane, & Quazi, 2020). If there is a reduction of the thoracic cavity, it will cause an increase in intra-alveolar pressure so that it increases atmospheric air pressure, this condition will make air flow out of the lungs into the atmosphere. Expiration that supports will reduce respiratory resistance so that it will facilitate the inhaled or exhaled air so that it will prevent air trapping in the alveolus (Lilik et al., 2019). This breathing exercise can help to induce slow and deep breathing patterns, and help patients to control breathing, even

during periods of physical stress (Wibrata, Putri, Annisa, & Kholifah, 2019).

That patients with pneumonia who exercise the pursed lips breathing technique will produce more expiratory flow rates compared to other respiratory control techniques so that it can reduce respiratory rate (Zuriati, & Surya, 2020). That PLB can help in lowering respiratory rate and dyspnea, increasing saturation levels, patient confidence, self-esteem to manage dyspnea so as to help improve in overall respiratory parameters (Roberts, Schreuder, Watson, & Stern, 2017). Other studies have also stated that when PBL techniques are compared with other spontaneous breathing techniques. PLB can reduce shortness of breath, respiratory rate, carbon dioxide levels in arterial blood and increase oxygen saturation and pulmonary tidal volume in resting conditions (Mayer, Karloh, Dos Santos, de Araujo, & Gulart, 2018).

In research conducted by Dechman and Wilson in their research on patients with Stable Chronic Obstructive Pulmonary Disease showed that PLB exercise was able to reduce RR resistive pressure, constriction during expiration, and dyspnea in asthma patients (Sulistiyawati, & Pendet, 2020). Pursed Lip Breathing (PLB) therapy technique is effective against decreasing respiratory rate in patients with respiratory disorders with a medical diagnosis of pneumonia The use of Pursed Lip Breathing (PLB) can be done anywhere and anytime because it does not require tools and also does not require costs. In addition, pursing the lips can also improve the quality of life of patients, because by doing this exercise regularly, people with COPD will be able to control their shortness of breath so that they can live a normal life (Philip, & Hafizurrachman, 2021).

## CONCLUSION

Based on the exposure of case reports, it was concluded that the Pursed Lips Breathing (PLB) technique is effective in reducing or reducing respiratory rate in patients with pneumonia with nursing problems, ineffective airway clearance and impaired gas exchange.

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