

Section: Paediatric Nursing

Implementation of simple inhalation therapy to improve airway clearance in children with bronchopneumonia

Andita Novtiana Sari , Dwi Sulistyono, Reni Mareta, Septi Wardani

Authors information

Department of Nursing, Universitas Muhammadiyah Magelang, Indonesia

 **Contactable email:** andita.nov27@gmail.com / Article DOI: *On process*

Abstract

Bronchopneumonia in children is a type of pneumonia that requires careful attention because it can lead to complications and even death. According to UNICEF data from 2024, pneumonia claims the lives of more than 700,000 children under five each year. Children tend to be unable to cough up phlegm effectively, resulting in phlegm accumulating in the bronchi over time, narrowing the airways and causing shortness of breath. Inhaling hot steam increases the humidity of the inhaled air, thus softening the thick mucus that accumulates in the airways and facilitating expectoration through coughing. Eucalyptus oil (*Eucalyptus globulus*) contains active compounds such as eucalyptol (1.8-cineole), which has anti-inflammatory, mucolytic, and antimicrobial effects. The case study aimed at understanding the concept of nursing care for children with bronchopneumonia, focusing on the inhalation of warm steam and eucalyptus oil in improving airway clearance in paediatric patients with bronchopneumonia. The case study uses a descriptive case study approach that aims to comprehensively and thoroughly describe the nursing care for paediatric patients with bronchopneumonia by implementing simple inhalation therapy using hot steam and eucalyptus oil. The problem of airway clearance was resolved on the 3rd day, the cough was reduced, rhonchi were minimal, shortness of breath was absent, oxygen saturation increased to 97-98%, respiratory rate decreased to 25x/minute, the child was no longer fussy and cooperative and was allowed to go home by the doctor. This simple inhalation therapy can be an alternative supporting intervention in an effort to improve the respiratory condition of paediatric patients with bronchopneumonia.

Keywords: Bronchopneumonia, child care, eucalyptus oil, Ronchi, simple inhalation

Introduction

Oxygen is a life-sustaining gas distributed to cells through the respiratory and cardiovascular systems (blood circulation). Oxygenation is a basic human need to meet the oxygen needed for cellular metabolism, maintaining life, and the activity of various organs and cells (Santiago-González et al., 2024). Without oxygen for a certain period of time, body cells will suffer permanent damage and lead to death. In healthy individuals, the respiratory system can provide sufficient oxygen to meet the body's needs. However, in certain illnesses, this oxygenation process can be hampered, disrupting the body's oxygen requirements (Shukla et al., 2020). These conditions include disorders of the respiratory and cardiovascular systems. Bronchopneumonia is an inflammation of the lung parenchyma caused by bacteria, viruses, fungi, or foreign objects (Zade et al., 2023). Bronchopneumonia begins with lung inflammation in the lung tissue or alveoli, usually preceded by an upper respiratory tract infection lasting several days (McCracken, 2000). The germs that cause bronchopneumonia enter the lung tissue through the upper respiratory tract to the bronchi, then the germs enter the other alveoli through the Kohn's pore, causing inflammation of the bronchial walls and surrounding alveoli (Ilham et al., 2024). In children, bronchopneumonia often has symptoms similar to other respiratory illnesses, such as cough, runny nose, fever, and shortness of breath (Ling et al., 2023). However, in the case of bronchopneumonia, these symptoms can be more severe and more localized to certain areas of the lungs. People with bronchopneumonia can experience vomiting mucus, shortness of breath, and additional sounds due to ineffective airway clearance (Grief & Loza, 2018). More serious problems can arise if the airway is not properly opened, such as severe difficulty breathing and possibly death.

Data from UNICEF in 2024 shows that pneumonia kills more children than any other infectious disease, claiming the lives of more than 700,000 children under 5 years old each year, or about 2,000 every day. This includes approximately 190,000 newborns. Almost all of these deaths are preventable. Globally, there are more than 1,400 cases of pneumonia per 100,000 children, or 1 case per 71 children each year, with the highest incidence occurring in South Asia (2,500 cases per 100,000 children) and West and Central Africa (1,620 cases per 100,000 children) (UNICEF, 2025). WHO stated that Indonesia ranked 8th in the world out of 15 countries in terms of infant and child

mortality rates due to bronchopneumonia. In 2021, bronchopneumonia was the third most common cause of death in Indonesia, after cardiovascular disease and tuberculosis. Bronchopneumonia cases in young children increased from 94.12% to 97.30%. Data on the number of toddlers suffering from bronchopneumonia by gender in 2022 in Central Java Province, particularly in the Semarang region, showed that 863 cases (24.04%) were male, consisting of 35,899 males and 3,590 patients (Anggraeni, 2024). At Tidar Regional Hospital in Magelang City, there were 397 cases of bronchopneumonia in children in the past six months, ranking number one in the top 10 diagnoses among inpatients in the paediatric area in the first semester of 2025, accounting for 17%.

The entry of fungi, viruses, and bacteria into the lungs results in lung parenchymal infection. One reaction to infection is increased sputum production. Increased sputum production is a major problem in patients with bronchopneumonia, leading to ineffective airway clearance in children (Nowicki & Murray, 2020). Ineffective airway clearance is a condition in which a person is unable to clear secretions or obstructions to maintain a patent airway (Dillon et al., 2023). Ineffective airway clearance in children requires immediate and appropriate treatment (Dantas et al., 2023). Airway obstruction can cause a decrease in oxygen concentration to the tissues, leading to oxygen saturation disorders and respiratory emergencies (Belli et al., 2021). Treatment options for ineffective airway clearance include chest physiotherapy, nebulization, effective coughing, adopting a semi-Fowler's or Fowler's position, providing warm fluids, suctioning mucus, and maintaining a patent airway. Inhalation therapy is the administration of medication by inhalation into the respiratory tract (Borghardt et al., 2018). The basic principle of inhalation therapy is to create small aerosol particles (respirable aerosol) that can reach their target, depending on the purpose of therapy through the inhalation process (Sorino et al., 2020). Medical inhalation therapy usually uses bronchodilator drugs, but in the community, this complementary therapy can be a more effective companion therapy with simple inhalation therapy using eucalyptus oil. Eucalyptus oil is produced from the leaves of the *Melaleuca leucadendra* plant with the largest content being eucalyptol (cineole). The simple inhalation therapy used utilizes simple, inexpensive, and easily found ingredients in the surrounding environment, such as warm water vapor and eucalyptus oil. Research on the efficacy of cineole shows that it has mucolytic (thinning phlegm), bronchodilation (relieving breathing), anti-inflammatory effects, anti-infection agent and significantly reduces the rate of exacerbations in chronic obstructive pulmonary disease (COPD) cases, particularly in patients with asthma and rhinosinusitis (Mieres-Castro et al., 2021; Horváth & Ács, 2015). The case study aimed at understanding the concept of nursing care for children with bronchopneumonia, focusing on the inhalation of warm steam and eucalyptus oil in improving airway clearance in paediatric patients with bronchopneumonia.

Case Description

The case study involves one paediatric patient with bronchopneumonia. The assessment, conducted on November 15, 2024, at 2:00 PM, revealed a persistent cough, runny nose, and inability to produce phlegm. The patient's breathing rhythm was regular, and rhonchi were heard in the right and left lower lungs. The patient's mother reported no previous medical history, but the patient's father smoked at home. The patient is currently receiving paracetamol 100 mg injections every 6 hours, ceftriaxone 400 mg injections every 12 hours, ondansetron 1 mg injections every 8 hours, Lasal expectorant syrup 1.5 cc three times a day, and Rhinos Neo drops 0.4 cc three times a day. A chest X-ray revealed bronchopneumonia. Based on the assessment, the primary nursing diagnosis was ineffective airway clearance. The author developed airway management interventions, including simple inhalation therapy. Simple inhalation therapy was performed once daily for 10 minutes for three consecutive days. On the third day, evaluation revealed that the patient was still coughing, but only occasionally, and rhonchi were only found in the right lung.

Discussion

Data obtained from the assessment of the patients on November 15, 2024, at 2:00 PM, showed a respiratory rate of 30 beats/minute, a temperature of 37.2°C, and an SpO₂ of 96%. The patient continued to have a persistent cough, a runny nose, and was unable to produce phlegm. His breathing was regular, and rhonchi were heard in both lung fields. The entry of fungi, viruses, and bacteria into the lungs results in a parenchymal infection. One reaction to infection is increased sputum production. Increased sputum production is a major problem in patients with bronchopneumonia, leading to ineffective airway clearance in children. In children, the cough reflex is still weak, so they tend to be unable to effectively expel phlegm. This results in the phlegm accumulating in the bronchi, narrowing the airways and causing shortness of breath. This accumulation of phlegm in the airways produces rhonchi. From the data that emerged, the author concluded that the problem that emerged in the patient was ineffective airway clearance (D.0001). Based on the SDKI (Standar Diagnosa Keperawatan Indonesia) book, the major symptoms and signs that appeared were ineffective cough or inability to cough, excessive sputum, and the presence of additional breath sounds. The minor symptoms and signs were dyspnoea, difficulty speaking, restlessness, cyanosis, decreased breath sounds, altered breath frequency, and altered breathing patterns. From the results of the assessment, major and minor signs and symptoms were found in the client, namely a groggy cough, phlegm that could not be expelled, and the presence of rhonchi sounds in the right and left lower lungs. The nursing intervention that the author will carry out on the patient is airway management.

Airway patency and adequate respiratory effort are very important for normal oxygenation and ventilation, ensuring that normal physiological processes continue without metabolic disorders. The action plan prepared by the author on November 15, 2025 at 14.30 included monitoring breathing patterns, additional breath sounds (e.g. gurgling, wheezing, wheezing, dry rhonchi), and sputum (amount, colour, aroma). Other measures include positioning the patient in a semi-Fowler's or Fowler's position, providing warm fluids, performing chest physiotherapy, administering oxygen if necessary, encouraging fluid intake of 2000 ml/day, teaching effective coughing techniques, and collaborating with bronchodilators, expectorants, and mucolytics. The authors chose simple inhalation therapy with eucalyptus oil as one of the complementary measures used to address the problem of ineffective airway clearance in patients. Inhalation of hot steam increases the humidity of the inhaled air, thereby helping to soften thick mucus that accumulates in the airways. Hot steam stimulates the secretion of mucous fluids to become thinner, thus facilitating the expulsion of phlegm through the coughing mechanism. Eucalyptus oil contains active compounds such as eucalyptol (1.8-cineole) which have anti-inflammatory, mucolytic, and antimicrobial effects. These compounds work by stimulating receptors in the airway epithelium to increase ciliary activity and accelerate mucus clearance (Sundara & Kulsum, 2024). The aim of compiling the nursing interventions above is that after nursing interventions are carried out for 3 x 24 hours, airway clearance will increase, with the following outcome criteria: decreased sputum production, decreased rhonchi sounds.

The nursing interventions were carried out from November 15, 2024, to November 18, 2025. The implementation was carried out in accordance with the interventions made and adjusted to the nursing problems found in the patient. From the first to the third day, all actions were carried out by the author, including the provision of simple inhalation therapy using warm water vapor and eucalyptus oil. The action was carried out by administering simple inhalation therapy using hot water vapor and eucalyptus oil for 10-15 minutes, once a day for three days. The purpose of administering inhalation therapy was to thin secretions so that they could easily come out, loosen the airways, overcome/treat airway inflammation, prevent dryness of the upper respiratory mucous membranes. When children inhale warm steam, the moist air enters the respiratory tract and helps increase the moisture content of the bronchial mucosa. This moisture is crucial because it thins thick phlegm caused by inflammation. With thinner phlegm, the cilia (fine hairs in the airways) work more effectively to push mucus toward the pharynx to be expelled through coughing. The main components of eucalyptus oil, namely eucalyptol, cineole, and terpinol, have mucolytic (thinning secretions), bronchodilator (relieving breath), anti-inflammatory, and cough-suppressing effects. Cineole works by breaking down bonds in the mucus structure, making it more fluid and easier to expel. Furthermore, its anti-inflammatory effects help reduce swelling of the airway mucosa, which indirectly widens the bronchial lumen and improves airflow. Cineole also has a mild bronchodilator effect, contributing to a feeling of relief in breathing. Clinically visible results include: decreased respiratory rate, reduced additional breath sounds (rhonchi), improved breathing patterns, and the expulsion of mucus or phlegm when the child coughs. Thus, through the combined mechanism of warm, humidifying steam and the pharmacologically active ingredients of eucalyptus oil, this simple inhalation therapy helps address the problem of ineffective airway clearance in children with bronchopneumonia.

Evaluation results obtained after 3 days of treatment showed that the airway clearance problem resolved; the cough was reduced, rhonchi were minimal, shortness of breath was absent, oxygen saturation increased to 98%, the respiratory rate decreased to 25 breaths per minute, the child was no longer fussy and cooperative, and the doctor allowed him to go home. These results align with research conducted by Pujiningsih and Musniati (2018), who found that children who received steam inhalation with eucalyptus oil droplets had easier expulsion of secretions, no sore throats when coughing, less nasal congestion, and easier breathing. In line with research conducted by Sembiring & Hasibuan (2025) on 37 respondents, the results showed that 72% of respondents experienced a positive effect from administering this simple inhalation therapy. This case study provides a significant contribution to the implementation of simple, inexpensive, and easy-to-administer non-pharmacological therapy, specifically for improving airway clearance in children with bronchopneumonia. The simple inhalation therapy utilized readily available materials, such as warm water vapor and eucalyptus oil, making it potentially suitable for use by the patient's family at home as a complementary therapy. The approach used is practical and supports holistic nursing practice, which considers the patient's physical well-being and comfort. This paper also provides an alternative intervention that can support the effectiveness of medical therapy, particularly in improving airway clearance in children. In implementing this complementary therapy, the authors did not objectively measure the water temperature, thus ensuring temperature consistency throughout the therapy. The patients in the study also received pharmacological therapy in the form of medication from a doctor, so the effect of improving airway clearance cannot be entirely attributed to the inhalation therapy alone. The authors were only able to provide assistance with inhalation therapy once daily. This is a limitation, as optimal results are likely to be achieved if the therapy is administered two to three times daily on a regular basis.

Conclusion

Based on the description above, it can be concluded that comprehensive nursing care was provided, starting from the time the patient was admitted to the hospital until discharge. One intervention implemented during treatment was simple inhalation therapy utilizing steam and eucalyptus oil as a complementary therapy. This therapy was given to a

child with bronchopneumonia and showed positive results. Post-therapy evaluations showed improved airway clearance, with coughing and a reduction in rhonchi, indicating that this simple inhalation therapy could be an alternative supportive intervention to improve the respiratory condition of paediatric patients with bronchopneumonia. The author's recommendation regarding this case study is that inhalation therapy with eucalyptus oil can be repeated at home if the child experiences coughing, difficulty expectorating sputum, or shortness of breath. Further research should consider using hot water at a consistent temperature to achieve optimal results

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