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THE EFFECT OF EUCALYPTUS OIL INHALATION THERAPY ON CHILDREN WITH BRONCHOPNEUMONIA IN THE PEDIATRIC WARD OF GRAHA HERMINE HOSPITAL BATAM CITY

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Abstract
Bronchopneumonia is one of the leading causes of lower respiratory tract infections in children and is commonly associated with ineffective airway clearance resulting from excessive accumulation of thick airway secretions. Complementary nursing interventions, such as warm steam inhalation with eucalyptus oil, have been proposed to facilitate mucus clearance and improve respiratory function.
Objective: To describe the nursing care of a child with bronchopneumonia through the implementation of complementary warm steam inhalation with eucalyptus oil to improve airway clearance.
Methods: This study employed a descriptive case study design using a comprehensive nursing care approach. The participant was a 2-year-6-month-old child diagnosed with suspected bronchopneumonia and hospitalized in the pediatric ward of Graha Hermine Hospital, Batam City. Nursing interventions were developed according to the Indonesian Nursing Intervention Standards (SIKI). Complementary warm steam inhalation with three drops of eucalyptus oil added to warm, non-boiling water was administered once daily for three consecutive days (7–9 August 2024) for 15–20 minutes before routine pharmacological treatment. Clinical outcomes were evaluated using the Indonesian Nursing Outcomes Standards (SLKI) based on respiratory rate, sputum production, and adventitious breath sounds.
Results: At baseline, the patient presented with shortness of breath, productive cough with thick yellow sputum, a respiratory rate of 32 breaths/min, and bilateral rhonchi on auscultation. Progressive clinical improvement was observed throughout the intervention period. By the third day, sputum production had markedly decreased, rhonchi were minimal to absent, cough effectiveness had improved, and respiratory rate decreased from 33 to 30 breaths/min after the intervention, indicating improved airway clearance.
Conclusion: In this case, complementary warm steam inhalation with eucalyptus oil, administered alongside standard medical treatment, was associated with improved airway clearance, as demonstrated by reduced sputum production, diminished adventitious breath sounds, and gradual normalization of respiratory rate. Further studies with larger sample sizes and controlled study designs are needed to confirm the effectiveness and safety of this complementary nursing intervention in pediatric patients with bronchopneumonia.

Keywords: Bronchopneumonia; Eucalyptus oil; Steam inhalation; Ineffective airway clearance; Pediatric nursing

Children are the future generation whose growth and health must be optimally maintained to ensure a healthy and productive future. During the growth period, children are particularly vulnerable to various infectious agents, including bacteria, viruses, fungi, and other microorganisms. One of the most common acute respiratory diseases affecting the pediatric population is bronchopneumonia (Aslinda, 2019).

According to recent estimates by the United Nations Children's Fund (UNICEF), bronchopneumonia remains one of the leading causes of mortality among children under five worldwide, accounting for more than 800,000 deaths annually, or approximately 39 child deaths every minute. In Indonesia, data from the Basic Health Research (K. Kesehatan & Indonesia, 2021) indicate that approximately 45 out of every 100 children under five experience pneumonia. In the Riau Islands Province, the prevalence of pneumonia has shown an increasing trend over recent years. Furthermore, medical record data from Graha Hermine Hospital, Batam City, covering the period from June 2023 to May 2024, revealed that bronchopneumonia accounted for 2.46% of pediatric inpatient cases.

Clinically, one of the primary nursing problems encountered in children with bronchopneumonia is ineffective airway clearance resulting from acute inflammation of the bronchial and alveolar mucosa. Excessive accumulation of thick airway secretions obstructs airway patency, leading to ineffective coughing, dyspnea, tachypnea, and adventitious breath sounds such as rhonchi (Anjani et al., 2022). Without appropriate management, persistent airway obstruction may progress to serious complications, including acute respiratory distress, hypoxemia, respiratory acidosis, respiratory failure, and even death (Rohma, 2024) .

Management of ineffective airway clearance includes both pharmacological and non-pharmacological approaches.Pharmacological interventions commonly involve bronchodilator nebulization (e.g., salbutamol/Ventolin) and airway suctioning to remove excessive secretions (Puspitaningsih et al., 2019). Among non-pharmacological interventions, steam inhalation therapy is considered a safe and practical complementary approach for loosening airway mucus. The addition of eucalyptus oil, which contains the active compound 1,8-cineole (eucalyptol), has been reported to exhibit mucolytic, bronchodilatory, and anti-inflammatory properties that facilitate mucus liquefaction and promote sputum expectoration in pediatric patients (Oktiawati & Nisa, 2021).

Warm steam inhalation combined with eucalyptus oil was selected because it is inexpensive, easy to administer, non-invasive, and can be performed safely under nursing supervision. Compared with chest physiotherapy or airway suctioning, warm steam inhalation is more comfortable for young children and may increase treatment acceptance. Furthermore, eucalyptus oil contains 1,8-cineole (eucalyptol), which has demonstrated mucolytic, anti-inflammatory, and mild bronchodilatory properties, making it a promising complementary nursing intervention to facilitate airway clearance in pediatric bronchopneumonia while supporting standard pharmacological management.

Methods

This study employed a descriptive case study design using a comprehensive nursing care process approach, encompassing nursing assessment, nursing diagnosis, intervention planning, implementation, and evaluation. The case report was prepared in accordance with the CARE (CAse REport) Guidelines to ensure transparent and systematic reporting of clinical findings.

The study focused on a single pediatric patient, An. R, a 2-year-6-month-old boy who was admitted to the Kalimaya Pediatric Ward of Graha Hermine Hospital, Batam City, Indonesia, with a medical diagnosis of suspected bronchopneumonia. The patient presented with ineffective airway clearance characterized by productive cough, rhonchi on auscultation, tachypnea, and difficulty expectorating sputum.

Clinical data were collected through direct observation, in-depth interviews with the patient's mother, comprehensive head-to-toe physical examination, and review of medical records, including laboratory and chest radiographic findings. Baseline assessment included respiratory rate, oxygen saturation, body temperature, breath sounds, sputum characteristics, and other relevant clinical indicators.

The primary nursing intervention consisted of simple warm steam inhalation with eucalyptus oil as a complementary therapy, administered alongside the hospital's standard medical treatment. The inhalation solution was prepared by adding three drops of eucalyptus oil to warm, non-boiling water (Morrow, 2019). The inhalation solution consisted of approximately 500 mL of warm water maintained at 40–45°C with three drops (approximately 0.15 mL) of pharmaceutical-grade eucalyptus oil. The temperature was measured using a digital thermometer before each session to minimize the risk of thermal injury. The child inhaled the warm vapor at a safe distance of approximately 30–40 cm under continuous parental and nurse supervision for 15–20 minutes. The child inhaled the steam under continuous supervision while maintaining a safe distance from the water. Each inhalation session lasted approximately 15–20 minutes and was administered once daily for three consecutive days (7–9 August 2024) before routine. The intervention was administered approximately 30 minutes before routine nebulizer therapy and pharmacological treatment to facilitate loosening of airway secretions prior to medication administration.

The effectiveness of the intervention was evaluated by comparing the patient's clinical condition before and after each inhalation session. Outcome indicators included respiratory rate, sputum production, cough effectiveness, the presence of rhonchi on auscultation, and overall airway clearance. Nursing outcomes were assessed using the Indonesian Nursing Outcomes Standards (Standar Luaran Keperawatan Indonesia/SLKI), particularly the outcome Airway Clearance (Bersihan Jalan Napas), which includes indicators such as respiratory rate, additional breath sounds, sputum production, cough effectiveness, and respiratory comfort. Clinical progress was documented using the Subjective–Objective–Assessment–Plan (SOAP) format and analyzed descriptively throughout the three-day intervention period.

This case study adhered to the ethical principles of nursing research, including respect for autonomy, beneficence, non-maleficence, and confidentiality. Written informed consent was obtained from the patient's parent after a detailed explanation of the study objectives, intervention procedures, potential benefits, and possible risks. Participation was entirely voluntary, and the parent retained the right to withdraw from the study at any time without affecting the child's medical care (Sulistyono et al., 2025). Patient confidentiality was maintained by anonymizing all personal identifiers throughout the study.

Results

The patient was observed for three consecutive days (7–9 August 2024) following the implementation of complementary warm steam inhalation with eucalyptus oil. Clinical evaluation was performed before and after each intervention using the Indonesian Nursing Outcomes Standards (Standar Luaran Keperawatan Indonesia/SLKI) indicators for airway clearance (Kamin et al., 2025).

On the first day of intervention, the respiratory rate decreased from 32 breaths/min before therapy to 29 breaths/min after therapy. Fine rhonchi remained audible in both lung fields, although the patient showed slight improvement in sputum expectoration. Thick yellow sputum was still present immediately after the intervention (J. Kesehatan et al., 2022).

On the second day, the respiratory rate decreased from 34 breaths/min before therapy to 28 breaths/min after therapy. Auscultation demonstrated a reduction in rhonchi, accompanied by a noticeable decrease in sputum production. The patient also exhibited more effective coughing, indicating gradual improvement in airway clearance .

On the third day, the respiratory rate decreased from eucalyptus oil breaths/min before therapy to 30 breaths/min after therapy. Adventitious breath sounds were minimal to absent on auscultation, while sputum production had markedly decreased. Overall, the patient demonstrated progressive improvement in airway clearance throughout the three-day intervention period. During hospitalization, warm steam inhalation with eucalyptus oil was consistently administered approximately 30 minutes before the scheduled nebulizer therapy. This sequence was chosen to promote airway humidification and loosen thick secretions before bronchodilator administration, thereby potentially enhancing mucus clearance.

Overall, complementary warm steam inhalation with eucalyptus oil administered alongside standard hospital treatment, was associated with improvements in several airway clearance indicators, including reduced respiratory rate, diminished rhonchi, decreased sputum production, and improved cough effectiveness. These findings indicate that the intervention

contributed to the achievement of the nursing outcome Airway Clearance based on the **Indonesian Nursing Outcomes Standards (SLKI)**.

Table 1. Changes in Airway Clearance Indicators Before and After Complementary Warm Steam Inhalation with Eucalyptus Oil During Three Consecutive Days of Nursing Care

Observation Day	Assessment Time	Respiratory Rate (breaths/min)	Adventitious Breath sounds	Sputum Production
Day I (07 Agust 2024)	Before treatment	32 breaths/min	Present	Thick Yellow
	After Treatment	29 breaths/min		
Day II (08 Agust 2024)	Before treatment	34 breaths/min	Reduced	Decreased
	After Treatment	28 breaths/min		
Day III (09 Agust 2024)	Before treatment	33 breaths/min	Minimal	Minimal
	After Treatment	30 breaths/min		

Based on the findings presented in **Table 1**, dynamic fluctuations in respiratory rate were observed following the intervention, which may reflect normal physiological responses in young children, such as crying, agitation, or temporary stimulation caused by warm steam inhalation. Nevertheless, marked improvements were observed in airway clearance. Sputum became less viscous and was more easily expectorated or swallowed safely, accompanied by a gradual reduction in adventitious breath sounds. These improvements may be attributed to the pharmacological properties of 1,8-cineole (eucalyptol)**,** the principal bioactive constituent of eucalyptus oil, which has been reported to exhibit mucolytic, expectorant, anti-inflammatory, and mild bronchodilatory effects, thereby facilitating mucus clearance and improving airway patency (Liu et al., 2024).

The final nursing evaluation on 9 August 2024 demonstrated notable clinical improvement. The patient's parent reported that the child's cough had decreased, shortness of breath had resolved, and nighttime restlessness had significantly improved. Clinical examination also revealed markedly reduced sputum production and minimal to absent rhonchi on lung auscultation. These findings indicate that the integration of complementary warm steam inhalation with eucalyptus oil, in conjunction with standard medical treatment, contributed to improved airway clearance and supported the achievement of the nursing outcome Airway Clearance according to the Indonesian Nursing Outcomes Standards (Standar Luaran Keperawatan Indonesia/SLKI)**.**

In this case, warm steam inhalation with eucalyptus oil was administered before nebulizer therapy. Pre-nebulization steam inhalation may help humidify the airway and reduce

mucus viscosity, allowing bronchodilator therapy to act more effectively after secretions become less tenacious. Although nebulizer therapy remains the standard treatment for improving airway patency through medication delivery, warm steam inhalation functions as a complementary nursing intervention aimed at increasing airway humidity and facilitating mucus mobilization without administering additional pharmacological agents.

Compared with chest physiotherapy and airway suctioning, warm steam inhalation offers several practical advantages. Chest physiotherapy requires specific techniques and may cause discomfort in young children, while suctioning is invasive and generally reserved for patients unable to clear secretions independently. In contrast, warm steam inhalation is simple, inexpensive, non-invasive, and well accepted by pediatric patients when performed under appropriate supervision. Therefore, this intervention may serve as a supportive nursing strategy rather than a replacement for standard medical treatment.

Discussion

The nursing diagnosis of Ineffective Airway Clearance in this patient was associated with acute inflammation of the bronchial airways, resulting in excessive mucus production, increased sputum viscosity, and impaired airway patency. These pathological changes reduced the effectiveness of the cough reflex and contributed to the presence of rhonchi, productive cough, and respiratory distress. Effective airway management is therefore a primary goal of nursing care for pediatric patients with bronchopneumonia to prevent respiratory complications and improve oxygenation.

The findings of this case study suggest that complementary warm steam inhalation with eucalyptus oil**,** administered in conjunction with standard medical treatment, was associated with gradual improvement in airway clearance. Over the three-day intervention period, sputum production became less viscous and easier to expectorate, rhonchi progressively diminished, and the patient's overall respiratory condition improved. These clinical changes were consistent with the nursing outcome Airway Clearance based on the Indonesian Nursing Outcomes Standards (Standar Luaran Keperawatan Indonesia/SLKI)**.**

The beneficial effects of eucalyptus oil oil may be explained by the pharmacological activity of its principal constituent, 1,8-cineole (eucalyptol)**.** Experimental and clinical studies have demonstrated that 1,8-cineole possesses mucolytic, expectorant, anti-inflammatory, and mild bronchodilatory properties (Thomson, 2025). These effects reduce mucus viscosity by disrupting mucopolysaccharide structures within airway secretions, facilitating mucociliary clearance and promoting more effective sputum expectoration. In addition, inhalation of warm,

non-boiling steam increases airway humidity, helping to loosen thick secretions while providing a soothing effect on the respiratory mucosa. The combined action of warm steam and eucalyptus oil may therefore contribute to improved airway patency and respiratory comfort.

The present findings are consistent with previous studies. (Mustofa & Cahyaningrum, 2024) reported that steam inhalation combined with eucalyptus oil oil reduced respiratory symptoms and improved airway clearance in children with bronchopneumonia. (Kurniawan et al., 2025) found that complementary steam inhalation therapy was associated with reductions in respiratory rate, sputum retention, and adventitious breath sounds in pediatric patients with lower respiratory tract infections. Collectively, these studies support the potential role of warm steam inhalation with eucalyptus oil as a safe and practical adjunctive nursing intervention for managing ineffective airway clearance in children.

Another important observation in this case was the active involvement of the patient's parent throughout the intervention. Continuous parental presence appeared to reduce the child's anxiety and improve cooperation during each inhalation session. Family-centered care is a fundamental principle of pediatric nursing, as parental participation enhances the child's sense of security, promotes treatment adherence, and improves the overall effectiveness of nursing interventions. Emotional support from parents may also reduce procedural distress and contribute to better clinical outcomes (P. Kesehatan & Kesehatan, n.d.).

Despite the encouraging clinical improvement observed in this case, several limitations should be acknowledged. This report describes only a single patient, limiting the generalizability of the findings. Furthermore, the intervention was implemented concurrently with standard pharmacological treatment, making it impossible to determine the independent therapeutic effect of eucalyptus oil oil steam inhalation. Future studies employing larger sample sizes, controlled study designs, and objective respiratory outcome measures are needed to further evaluate the effectiveness and safety of this complementary therapy in pediatric patients with bronchopneumonia.

Another limitation is that the optimal dosage of eucalyptus oil and water temperature have not yet been standardized across studies. Although the present intervention used three drops of eucalyptus oil diluted in approximately 500 mL of warm water (40–45°C), further clinical trials are required to determine the safest and most effective dosage protocol for pediatric patients.

Conclusion

This case study demonstrated that the implementation of comprehensive nursing care incorporating complementary warm steam inhalation with eucalyptus oil) over three

consecutive days was associated with improvements in airway clearance in a pediatric patient with bronchopneumonia. Clinical improvements were reflected by reduced sputum production, diminished adventitious breath sounds (rhonchi), and a gradual normalization of respiratory rate, indicating achievement of the nursing outcome Airway Clearance based on the Indonesian Nursing Outcomes Standards (SLKI)**.**

As a complementary nursing intervention, warm steam inhalation with eucalyptus oil oil may be considered as an adjunct to standard medical management for children with bronchopneumonia. However, because this report describes only a single case, the findings should be interpreted with caution and cannot be generalized to a broader population. Further studies involving larger sample sizes and controlled research designs are required to establish the effectiveness and safety of this intervention.

Healthcare professionals may consider integrating this complementary therapy into evidence-based pediatric nursing practice when clinically appropriate and under professional supervision. In addition, parents and caregivers may be educated on the safe use of warm steam inhalation with eucalyptus oil oil as a supportive home-care measure, provided that it complements rather than replaces prescribed medical treatment.

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