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PRACTICAL COUGH EXERCISES IN CHILDREN WITH INEFFECTIVE AIRWAY CLEARANCE PROBLEMS DUE TO BRONCHPNEUMONIA AT DUSTIRA TK II CIMAHI HOSPITAL: CASE REPORT

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ABSTRACT

Background*: Babies and children are susceptible to bronchopneumonia due to infection caused by Streptococcus pneumonia and Haemophilus influenzae. Nursing problems that often arise due to bronchopneumonia are ineffective airway clearance due to airway hypersecretion and the child's inability to expel secretions. One of the non-pharmacological therapies to overcome this problem is effective cough training.* ***Objective****: Effective cough training aims to train children who cannot yet cough effectively to be able to clear the larynx, trachea, and bronchioles of secretions or foreign objects in the airway.* ***Method:*** *This case report describes the application of effective cough training in a child aged 7 years 11 months with ineffective airway clearance problems. Sampling was based on the criteria of the child's age being over 5 years, rapid breathing frequency, and the presence of additional breath sounds on lung auscultation.* ***Results:*** *The results of applying effective coughing training for 3 days showed changes in the child's general conditions, phlegm was able to come out, there wasn't additional breath sound (rhonchi), and respiratory frequency and oxygen saturation improved.* ***Conclusion:*** *The conclusion is that this intervention can help children expel phlegm, improve respiratory frequency, and increase oxygen saturation. Suggestions for pediatric nurses, that effective cough training can be an independent intervention in overcoming problems with respiratory system disorders.*

Keywords: *Brochopneumonia, Effective Cough Training, Ineffective Airway Clearance*

INTRODUCTION

Bronchopneumonia is a type of pneumonia that occurs in the walls of the bronchioles and the surrounding lung tissue. Bronchopneumonia or lobular pneumonia is caused by the inflammation in the lung parenchyma localized to the bronchioles and the surrounding alveoli. According to Coutts (2019), Bronchopneumonia is an infection of the airways that leads to the lungs through the bronchi; this Bronchopneumonia, also known as lobular pneumonia, is a type of pneumonia that affects the bronchioles and the surrounding lung tissue. It is caused by inflammation in the lung tissue localized to the bronchioles and alveoli. Coutts (2019) describes Bronchopneumonia as an infection of the airways that leads to the lungs through the bronchi, and bacteria, viruses, and fungi can cause it. Babies and children are particularly susceptible to Bronchopneumonia due to their underdeveloped immune systems. The most common causes of Bronchopneumonia in infants and children are bacteria such as Streptococcus pneumoniae and Haemophilus influenzae. Children with compromised immune systems are at risk of experiencing recurrent Bronchopneumonia or facing challenges in completely overcoming the disease.is caused by various infectious agents, such as bacteria, viruses, and fungi. Babies and children are especially susceptible to Bronchopneumonia because their immune response is not yet fully developed. Bacteria such as Streptococcus pneumonia and Haemophilus influenza are the most common causes of Bronchopneumonia in infants and children. Children with a compromised immune system are at risk of experiencing recurrent Bronchopneumonia or even facing difficulty in overcoming the disease completely.

The World Health Organization WHO (2022) said that pneumonia contributed to the death rate of 740,180 children (14%) in 2019. Based on Riskesdas Basic Health Research (2018), the prevalence of pneumonia has increased from 1.6% to 2%. Meanwhile, the results of a review of cases in 2017 of pneumonia sufferers in

children were classified based on gender; the number of pneumonia sufferers in women (46%) was less than cases of pneumonia in men (54%) (Ministry of Health of the Republic of Indonesia, 2022).

Bronchopneumonia can be transmitted through saliva splashes when someone coughs or sneezes, which can then be inhaled and enter the respiratory tract. The inhalation process triggers the body's immunological reaction and causes inflammation. This inflammation results in secretions buildup, narrowing the respiratory tract (Handayani et al., 2022). If there is a narrowing of the respiratory tract, the patient will experience an obstruction in the airway, resulting in ineffective airway clearance (Rahmawati, 2017). Children with bronchopneumonia experience obstruction of the airway because of excess secretion. Those obstructions narrow the airway and can cause the child difficulty breathing correctly. Bronchopneumonia can show symptoms such as high fever, cough with phlegm that is sometimes yellow or green, headache, rapid and shortness of breath, weakness, chest wall retraction, and the potential for severe breathing problems including lack of oxygen (Aryani & Argarini, 2023). Lack of oxygen makes the body's cells unable to work optimally, so bronchopneumonia sufferers can die due to lack of oxygen (Wulandari & Iskandar, 2021).

Based on the symptoms described above, the primary nursing diagnosis in bronchopneumonia sufferers can be established: ineffective airway clearance related to retained secretions (Safitri & Suryani, 2022). In order to maintain airway patency, nursing intervention is carried out, namely practical coughing exercises. Effective coughing exercises can help patients who have difficulty expelling sputum or foreign objects from the throat, trachea, and bronchioles. Therefore, it is important to train to overcome respiratory problems caused by sputum buildup (Sartiwi et al., 2019). Cough is the earliest symptom and is the disorder most often complained of in patients suffering from bronchopneumonia. The most straightforward process to cause secretions to collect is when the patient sleeps and is released when the patient wakes up in the morning. To remove secretions properly and not make the patient tired in removing blocked secretions, the patient must cough correctly, namely coughing effectively (Aryani & Argarini, 2023).

According to research (Safitri & Suryani, 2022) on "Effective coughing to reduce shortness of breath and secretions in children diagnosed with bronchopneumonia," shows that the results of the intervention given to An. The patient was unable to expel secretions and was short of breath, but after the intervention, the patient was able to expel secretions, and there was a reduction in shortness of breath. Before the intervention, RR was 27x/min, Spo2 was 85x/minute, and after intervention for 3 x 24 hours, RR became 22x/min and Spo2 95x/minute. Coping can effectively reduce shortness of breath and secretions in bronchopneumonia. According to Aryani & Argarini (2023), cough training nursing actions were practical for three days for client An. A and An. N there were significant changes before the action was carried out and after the action was carried out with the result that the client was able to do practical coughing exercises, the phlegm was able to come out, there were no additional breath sounds, and the respiratory frequency was within the normal range.

The aim of providing practical coughing exercises is to help the patient expel secretions or sputum to help the patient regulate breathing. Before performing practical coughing exercises, the nurse will suggest that the patient drink warm water to soften the secretions. Providing practical coughing exercises is one of the nurses' efforts to reduce secretions, speed up the removal of mucus from the airways, and keep the lungs clean if done properly and correctly. Based on the description above, researchers are interested in conducting further studies by reviewing the importance of implementing practical coughing exercises as an effective way to expel sputum that blocks the respiratory tract in bronchopneumonia patients.

METHOD

The research design used was a case report of a pediatric patient with problems with ineffective airway clearance. Data collection methods include observation of patients, interviews with patient families, nurses, people in charge, and other health workers in the Melati Room at Tk II Dustira Hospital, Cimahi City, patient medical records, and nursing care results.

The steps for effective cough training begin with the equipment preparation stage, the patient and environment preparation stage, and the work stage. Prepare the patient and environment to ensure the patient and family understand the purpose of the procedure and agree to carry out effective cough exercises. For the environment, ensure privacy is maintained, and the client is in a comfortable position.

After assessing the patient's vital signs, guide the patient to place the hand on the upper abdomen and bring the tips of the right and left middle fingers together above the xiphoid process. Instruct the patient to inhale through the nose for 4 seconds, hold for 2 seconds, then exhale through the mouth with pursed lip breathing for 8 seconds. Ask the patient to repeat this action 3 – 4 times. On the last inhalation, after holding the patient's breath, ask him to lift his shoulders, loosen his chest, and cough vigorously. This exercise can be done four times in 1 session or according to the patient's needs. The procedure's success is assessed by comparing the patient's respiratory frequency, breath sounds, and oxygen saturation before and after the procedure.

RESULT

The patient is An. R, male, seven years 11 months old. The patient's mother said that her child had a fever before entering the hospital, accompanied by a cold, cough, shortness of breath, and difficulty in expelling secretions. The patient vomited twice in 1 day, and his appetite had decreased since he was sick. The patient has a history of asthma from his mother, and his father is an active smoker. The results of the physical assessment are as follows:

Table.1
Physical Assessment Result

Consciousness: Compos Mentis	
Vital Sign	
HR	110 x/menit
RR	28 x/menit
Temperature	38,6℃
SpO2	98%
Head & face examination	
Head	The hair is clean, no headaches.
Eye	Complete eye structure, symmetrical right & left, pupil reaction (+), anemic conjunctiva.
Nose	Symmetrical nose shape, clean, no tenderness.
Mouth	Lip mucosa is dry; the lip color looks dark and pale; there are no lesions, lousy breath (+), and no pain in swallowing.
Chest & back examination	
Lungs	Normal thorax shape, symmetrical chest shape, no retraction of accessory muscles for breathing, additional breath sounds (rhonchi) are heard. Normal spinal alignment.
Skin/integument examination	
Integument/Skin	No lesions, brown skin color, smooth texture, normal turgor, wrinkled structure, subcutaneous fat (thin), no pain when pressed, no abnormalities in the skin.
Supporting examinations/diagnostics/drug therapy	
Iv Ringer Laktat	Ivfd 45cc/hour
Ceftriaxone	Intra vena 1x2 gr
Ondancentron	Intra vena 2x2 mg
Paracetamol	Intra vena 259 mg every 4-6 hour if body temperature: 38ºC
Ambroxol syirup	Per-oral 3x1
Eflin syirup	Per-oral 3x5 ml
Inhlalation	NaCl 3 % 4cc every 8 hour

Based on the above study, nursing care can be formulated as follows:

1. Data analysis shows that subject An. R has the problem of ineffective airway clearance (D.0002), namely as follows:
   DS: The client's mother complained that her child had a cough and runny nose, was short of breath, had difficulty expelling phlegm, and when he was sleeping, his breathing sounded "grok-grok"
   DO: compos mentis consciousness
   Coughing is ineffective
   There are additional breath sounds, rhonchi
   R: 28 x/minute
   HR: 110 x/minute
   S: 38,6 ^{0}C
   SPO2: 98%
2. Nursing diagnoses that appear in subject An. R is ineffective airway clearance related to airway hypersecretion, characterized by the client having difficulty expelling secretions.
3. Nursing action plan
   Dx: ineffective airway clearance (D.0001)
   With nursing action planning, as follows:
   Objective: After 3x24 hours of nursing care to clear the airway, each with the outcome criteria, namely increased ineffective cough, decreased sputum production, decreased rhonchi, decreased dyspnea, improved respiratory frequency, and improved breathing pattern.
   Intervention: Implementation of evidence-based practice in nursing, including effective cough exercises. Apart from that,

An. R was also given antibiotic therapy and inhalation therapy.

4. Implementation of practical coughing exercises for An. R is done three times. Results on January 13, 2024 are as follows:
   a. Identifying coughing ability, An. R The client can cough
   b. Monitor for sputum retention, rhonchi, "grok grok" sounds when breathing
   c. Semi-Fowler position
   d. Explain the procedure and purpose of effective coughing.
   e. Practice coughing effectively.
   f. Collaborate on purchasing drugs and inhalation therapy.

   Next, the second and third will be on January 15 and 16, 2024, as follows:
   a. Monitor for sputum
   b. Set the semi-Fowler position
   c. Give warm drinks
   d. Practice effective coughing
   e. Collaborate on drug administration and inhalation therapy
5. After taking action, an evaluation was also carried out for three consecutive days with the following results:

Table.2
Nursing Evaluation

Date & Time	Evaluation
Sunday, 14th January 2024 06.00 a.m	**S (Subjective)**: The client's mother said An. R coughs up phlegm; there is shortness of breath, nausea, and vomiting when expelling phlegm **O (Objective)**: - The client appears weak and breathless - Warm acral - N: 110x/minute - R: 28x/minute - S: 38.3oC - SPO2: 98% - Ronchi was heard **A (Assessment)**: Ineffective airway clearance has not been resolved **P (Planning)**: The intervention continued - Monitor for sputum retention - Practice coughing effectively - Collaborate on medication and therapy administration
Monday, 15th January 2024 11.00 p.m	**S (Subjective)**: The client's mother said, coughing to An. R is still there, but a little phlegm has come out, and there is still vomiting when An. R coughs **O (Objective)**: - The client appears weak and breathless - Warm acral - N: 98x/minute - R: 26x/minute - S: 37.8o C - SPO2: 98% - Ronchi reduced **A (Assessment)**: Ineffective airway clearance partially resolved **P (Planning)**: The intervention continued - Monitor for sputum retention - Practice coughing effectively - Collaborate on medication and therapy administration
Tuesday, 16th January 2024 02.00 p.m.	**S (Subjective):** The client's mother said her child felt more comfortable and able to cough and expel phlegm. **O (Objective)**: - The client no longer looks cramped - Acral feels warm - N: 98x/minute - R: 23x/minute - S: 37.4o C - SPO2: 99% - No rhonchi **A (Assessment)**: Ineffective airway clearance is resolved **P (Planning)**: Intervention stopped

Practical coughing exercises are carried out for three consecutive days. The results of the oxygen saturation and frequency examination on subject An. R before effective coughing exercises and after effective coughing exercises can be seen in the table below:

Table.3
Respiratory frequency and oxygen saturation before and after practical coughing exercises

Time	Subject (An. R)			
	Before		After	
	RR	Spo_2	RR	Spo_2
Day 1	28x/m	98%	28x/m	98%
Day 2	28x/m	98%	26x/m	98%
Day 3	25x/m	98%	23x/m	99%

Table 3 shows the results of practical cough training for three consecutive days. Subject An. R showed a decrease in respiratory frequency. R from 28 x/minute to 23 x/minute with the oxygen saturation value in subject An. R from 98% to 99%. Practical coughing exercises can reduce respiratory frequency and improve oxygen saturation in patients with ineffective airway clearance problems.

DISCUSSION

Practical cough training is a method of coughing correctly, where the client can save energy so that he does not get tired quickly and can expel sputum wholly and optimally. *Coughing* is a natural movement that the body makes, mainly to protect the lungs. This exercise

can be utilized by medical personnel as a method to remove secretions that have accumulated in the respiratory tract. An indication of an effective cough is a patient with respiratory problems, the patient cannot expel secretions, and the patient has additional sounds when breathing; this is based on the results of the fundamental nursing assessment analysis in this case (Utami et al., 2023). Understanding the concept and technique of practical cough training will provide many benefits, namely improving breathing and helping deal with mucus in the form of sputum and nasal mucus that appears due to respiratory tract infections or other diseases.

The results of this application are relevant to previous research on practical coughing exercises conducted by Safitri & Suryani (2022) regarding practical coughing exercises to expel sputum, reduce respiratory frequency, and increase oxygen saturation in bronchopneumonia patients, showing that the results of the 3-day evaluation had an effect in the ability to expel sputum and decrease shortness of breath. Initially, the patient was unable to expel secretions and was short of breath, but after intervention, the patient was able to expel secretions, and shortness of breath was reduced. Research conducted by Wartini et al. (2021) states that coughing can effectively mobilize secretions and prevent side effects due to accumulated secretions. Secretions can be removed so that the airway becomes patent again. Practical cough training is one of the nursing actions to remove secretions from the airway, which aims to prevent a high risk of increased secretions and to help expel phlegm from the airway so that it remains patent if done correctly. Implementing an effective cough correctly and adequately can speed up phlegm expulsion (Novitasari & Putri, 2022). In another study, they provided an effective cough training intervention over three days, reducing shortness of breath and coughing effectively (Sinaga et al., 2022).

Research by Utami et al. (2023) shows that after practical coughing exercises, the patient could expel retained sputum with a respiratory frequency of 20 x/minute and oxygen saturation of 100%. *Practical cough training* is a nurse's independent action to complete a nursing diagnosis of ineffective airway clearance related to sputum buildup. Implementing practical coughing exercises can increase patient and family knowledge and the ability to expel sputum in bronchopneumonia patients.

Subsequent research conducted by Kusumawati et al. (2020) on managing ineffective airway clearance in patients with bronchopneumonia in the Dahlia Room at Ungaran Regional Hospital can conclude that practical coughing exercises help patients expel secretions. As evidenced by the results of the nursing evaluation, it was found that the ineffectiveness of airway clearance had been resolved, which was supported by subjective data and objective data; the patient was able to cough effectively, RR: 20x/minute, the sound of rhonchi was no longer heard, and the patient was able to produce secretions. Moreover, practical cough exercises can be optimal if preceded by chest physiotherapy and warm water intake.

This is also in line with research conducted by Handayani et al. (2022), showing that giving effective cough therapy for 3x24 hours can be seen from the main achievement, namely the results of oxygen saturation before the intervention, namely SpO2 85 x/minute and the patient could not excreting secretions. Hence, he was still short of breath; after the intervention, the oxygen saturation changed to SpO2 94x/minute, and the patient could expel phlegm, so the shortness of breath was slightly reduced. The effective coughing reduces shortness of breath and makes it easier to expel secretions. Effective coughing is an effective method to help expel secretions and facilitate breathing, with the result that the patient can expel the secretions and is not short of breath.

The next research conducted by Novitasari & Putri (2022), the results showed that as many as 17 respondents released sputum after effective coughing for 3x24 hours which was greater than the amount of sputum released before effective coughing techniques were used. This underscores the crucial role of healthcare practitioners in guiding patients through effective coughing exercises. Providing effective coughing exercises for 3 x 24 hours has been

proven to show changes in the patient's ability to expel phlegm. Therefore, repeated effective coughing can help expel phlegm in patients diagnosed with bronchopneumonia and a buildup of secretions. Patients can do effective coughing exercises independently, save energy, increase lung ventilation, and normalize respiratory frequency in patients with bronchopneumonia.

Based on the results of the application and previous research, the author can conclude that the application of coughing exercises effectively removes sputum, improves respiratory frequency, and increases oxygen saturation in bronchopneumonia patients. The Ministry of Health (2022) stated that the signs and symptoms in children with bronchopneumonia are fussiness, breathing sounds (rhonchi, wheezing, wheezing, etc.), fever, the chest appears sunken in when breathing, blocked nose, difficulty sleeping, decreased appetite, rapid pulse, and blue lips. Based on the results of subjective physical assessments and supporting examinations. The data supports the problem of ineffective airway clearance because the assessment data found that the pulse was 110x/minute, temperature 38.6oC, respiratory frequency 28x/minute, SPO2 98%, dry lip mucosa, dark and pale lip color, rapid breathing, and audible auscultation: additional breath sounds, rhonchi. During illness, patients experience a decrease in appetite; patients are more often given to drink warm water when sick.

This patient showed symptoms similar to findings from previous studies regarding the application of effective cough techniques in bronchopneumonia patients with impaired oxygenation problems. The importance of early intervention in bronchopneumonia is underscored by the patient's symptoms. Subjective data showed that the patient experienced shortness of breath, cough for about 4 days, and sleep disturbances. Meanwhile, objective data includes blood pressure 110/82mmHg, body temperature 36.6°C, pulse 88 times/minute, and respiratory rate 24 times/minute. On physical examination, rapid breathing was found, sonor percussion, and wheezing and bronchovesicular sounds were heard on respiratory auscultation. Researchers also identified the problem of ineffective airway clearance (Novitasari & Putri, 2022). Ineffective airway clearance occurs when secretions or obstructions in the airway cannot be cleared properly, resulting in airway obstruction. This can be caused by a foreign body or mucus buildup. Signs include an ineffective cough, difficulty coughing, large amounts of mucus, rhonchi, wheezing, pain when breathing or dyspnea, difficulty speaking, chest compressions during sleep, restlessness, cyanosis, decreased breath sounds, changes in breathing frequency, and irregular breathing patterns. abnormal.

Researchers chose practical coughing exercises to expel sputum in bronchopneumonia patients with a buildup of secretions in the airways because practical coughing exercises are easy to do and the equipment needed is easy to obtain, can be done at any time according to the patient's needs, and does not require much money. Practical coughing exercises can also be done for children aged over four years to adults, and effective coughing can also be done repeatedly and independently. Although practical cough exercises can be performed on children with indications of an effective cough, namely patients with respiratory problems, patients who cannot expel secretions, and patients who have additional sounds when breathing, there are also contraindications for practical cough exercises, including clients who experience cardiovascular disorders such as severe hypertension, aneurysms. , heart failure, myocardial infarction, clients who experience increased intracranial pressure (ICP), impaired brain function, and client emphysema because it can cause alveolar wall rupture.

Research by Novitasari & Putri (2022) suggests that if nurses find patients with airway clearance problems, they can apply practical cough exercises as an independent nursing intervention to maintain the patient's airway adequacy and educate the patient's family to collaborate with nurses in carrying out practical cough exercises independently. During the treatment period, after being provided with education and proper effective coughing procedures, practical coughing exercises can help reduce the patient's respiratory frequency within the normal range, improve SPO2, and increase sputum output.

CONCLUSION

Based on the implementation results and discussion above, the author concludes that effective coughing exercises can be a beneficial

intervention for children with respiratory problems. These exercises can help expel sputum, improve respiratory frequency, and increase oxygen saturation, thereby resolving the issue of ineffective airway clearance. Nurses, especially those caring for children who can communicate and interact well, can confidently apply this effective cough exercise as an independent intervention for nursing care.

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