



Implementation of Chest Physiotherapy in Children with Tuberculosis to Manage Ineffective Airway Clearance

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ABSTRACT

Objective: This case study aims to describe the nursing care process and analyze the administration of chest physiotherapy to treat ineffective airway clearance in children diagnosed with tuberculosis. **Method:** This research is a case study research using random sampling technique for the sampling process. The samples used were children diagnosed with tuberculosis, being hospitalized, and experiencing ineffective airway clearance. The study was conducted in March 2022. Data collection used a nursing assessment format for children, a physical examination format, and an interview guide format. The nursing care process is carried out from the initial stage of assessment to evaluation. **Result:** The main complaint expressed was a fever that went up and down, often felt nauseated, coughed up phlegm that was difficult to expel. The data findings showed wheezing, cyanotic skin color, and an increase in respiratory rate and pulse. The patient experiences ineffective airway clearance. Effective chest and cough physiotherapy interventions were given for 3 days during the treatment period and showed that the results of walking clearance were not effectively resolved. This condition is seen from the phlegm that has come out, there are no additional breath sounds, the respiratory rate and pulse are within normal limits. **Conclusion:** The provision of effective chest physiotherapy and coughing interventions proved to be able to overcome ineffective airway clearance. Research recommendations to be able to combine alternative non-pharmacological techniques in overcoming ineffective airway clearance in children, especially with tuberculosis.

Keywords: airway clearance, children, chest physiotherapy, tuberculosis

Introduction

Tuberculosis (TB) is a type of infectious disease caused by the bacterium *Mycobacterium tuberculosis*, where this bacterium will invade the lower respiratory tract through air that is inhaled into the lungs. The spread of bacteria to other body parts through the circulatory system, lymphatic system, respiratory tract or directly to other body parts (Wijaya, Mantik, & Rampengan, 2021). TB disease will very quickly affect children who have a history of contact with adult TB patients, have poor nutritional status, and have not carried out BCG immunization (Wahid, Nachrawy, & Armaiijn, 2021). This condition will be supported by the presence of densely populated residential areas, ventilation, home lighting, having comorbidities and decreased body resistance (Pramono, 2021). Data from the Global Tuberculosis Report explains that in 2020, Indonesia will become the third country in Southeast Asia that has the largest TB prevalence at 8.4% after India 26% and China 8.5%. Indonesia is among the four highest countries after China, the Democratic Republic of the Congo, and India for MDR/RR-TB cases in 2020. It is recorded that the number of TB cases in children has a percentage of 17% of the total TB cases in Indonesia. There are 845,000 new TB cases every year with a mortality rate of 98,000 or 11 deaths per hour, while the number of TB cases in children has a percentage of 17% of the total TB cases in Indonesia (World Health Organization, 2021).

Children who have TB will show symptoms such as a cough that lasts more than 2 weeks, fever for more than 2 weeks or recurs without a clear cause, and is usually accompanied by night sweats, decreased or absent appetite accompanied by failure to thrive, weight loss or not showing an increase in the previous 2 months even though they have been given nutritional improvements for 1 to 2 months, and look sluggish or become inactive in playing (Kementrian Kesehatan Republik Indonesia, 2020). Cases of TB in children must get treatment immediately so that there is no impact, such as the severity of TB cases becoming more severe with the emergence of TB meningitis, drug-resistant TB or miliary TB to death. However, the process of investigating TB case contacts in children is still minimal, seen from weak planning, not optimal in the investigation process, lack of coordination, lack of monitoring and lack of evaluation from the Health Service or Puskesmas level (Hendri & Yani, 2021). The results showed that children with TB will have problems in terms of growth and development. The child will look thinner and there will be a decrease in appetite. This problem is also supported by several other factors that affect growth and development (Yustina & Indawati, 2020).

Nurses as one of the health workers, have the task of providing both pharmacological and non-pharmacological management to treat TB in children. Pharmacologically, nurses need to collaborate with doctors. Pharmacological management in children is carried out by giving OATs such as isoniazid, rifampin, pyrazinamide, ethambutanol and streptomycin (Ministry of Health of the Republic of Indonesia, 2020), while non-pharmacological management is carried out according to the diagnosis that most often appears, namely ineffective airway clearance. Clearing the ineffective airway can be done by giving chest physiotherapy (FTD). Based on this, researchers are interested in providing non-pharmacological therapy to overcome the problem of ineffective airway clearance in children with tuberculosis. Research conducted by (Widiastuti, Rahmasari, Ermawati, & Sani, 2022) explains that giving FTD to children is useful for removing phlegm so that it can increase the efficiency of respiratory muscles. Giving FTD is one of the therapies that can

remove mucus or secretions that can clog the respiratory tract so that the airway becomes loose (Sitorus et al, 2018).

Objective

The purpose of this case study is to describe the process of nursing care and appropriate interventions in tuberculosis children with ineffective airway clearance.

Method

This research uses a case study design with a nursing care process approach. The sample used children who were diagnosed with TB, were undergoing treatment and showed ineffective airway clearance. The case study was conducted at RSUD X in March 2022. Data collection used interview, observation and physical examination techniques using nursing assessment guidelines for children. The nursing process has been carried out for 3 days of treatment starting from assessment to evaluation. Researchers provide nursing actions in the form of chest physiotherapy actions that refer to Standard Operating Procedures. The action taken is by positioning the patient with postural drainage to help expel sputum with the help of gravity. The next step is to do clapping or clapping of hands that are shaped like a bowl, done slowly on the chest and back from the bottom up. Doing vibrations or giving slow vibrations using your hands and finally by doing an effective cough. This action is done 2 times a day for 15 to 20 minutes.

Results

The assessment process was carried out on the first day of treatment, on March 14, 2022. The results of the study showed that the respondent with the initials An B was 6 years old, had not attended school, had a history of tuberculosis at the age of 2 years and was currently diagnosed with suspected DHF and pulmonary TB. Birth history An B weighs 2600 grams and is 55 cm long, has been exclusively breastfed for up to 24 months. An B was noted to have received complete basic immunizations. When taken to the hospital, An B had complaints of fever that went up and down for 2 weeks, there was a cough with phlegm that was difficult to come out and a runny nose. An B's parents said that the condition of the house that was used as a residence at this time was close to the road and had poor ventilation.

The results of the physical examination found a BMI value of 11.3 or in the thin category, cyanotic lip color, having wheezing lung sounds, breathing rhythm 31 times per minute, temperature 38.7 OC, and pulse 112 times per minute. Before getting sick, An B ate voraciously and finished one serving, but when he was sick he could only finish half the portion given. When he was sick, An B also experienced a lack of drinking where he only spent 400 ml of water orally. The results of the calculation of fluid balance, obtained a value of ± 418.7 cc, while the fluid requirement that must be met is 1150 cc. During his illness, An B said he did not drink enough, it was very difficult to sleep, he often woke up. This happens because you feel very tight and difficult to breathe and often cough. An B also said that he was very bored and scared while in the treatment period. During pain, the frequency of bowel movements from An B is 2 times a day with a solid, soft and yellow-black consistency, however, An B complains of abdominal pain, while when urinating the color of the urine is slightly cloudy.

The results of laboratory examinations revealed that the platelet value decreased from the normal reference value, namely the value of $95 \times 10^3/\mu\text{L}$ (normal reference value 150-521

10³/uL), and the MCH value also decreased with a value of 27.0 Pcg (the normal value was 27.0 Pcg). normal reference 28 – 33 Pcg). Based on the medical record data, it was found that before An B received OAT treatment and while he was in hospital, An B received pharmacological therapy in the form of giving fluids as often as IV 15 drops per minute, PCT infusion via IV 150 mg every 8 hours, injection of vitamin C for 12 hours, injection of ceftriaxone 2 x 500 grams, omeprazole, curcuma syrup 3 x 1, sanmol 4 x 1, ambroxol 3 x 1/2, sucralfate 3 x 1, and getting elkane 1 x 1.

Discussion

Based on the results of grouping the assessment data, there are priority diagnoses that can be concluded, namely ineffective airway clearance. This condition is related to the presence of secret or phlegm that is retained and cannot be removed. Overcoming this, the researchers decided to take action 3 times 24 hours so that the results of ineffective airway clearance were resolved with the criteria of decreased sputum production, decreased cyanosis, improved breathing frequency and breathing patterns as well as an increase in the ability to perform effective coughing (Tim Pokja SLKI DPP PPNI , 2018). The action taken is by airway management. Airway management is carried out by monitoring breathing patterns, monitoring breath sounds, monitoring sputum, positioning semi-Fowler or Fowler, giving warm drinks, doing chest physiotherapy, giving oxygen if necessary, recommending fluid intake of 2000 ml/day if there are no contraindications, teaching techniques effective coughing, as well as collaborating with the provision of bronchodialtor, expectorant mucolytic if needed (Tim Pokja SIKI DPP PPNI Team, 2018).

The implementation of the given actions includes several actions from airway management. The action on the first day, the researchers conducted an assessment of the patient's vital signs, monitored breathing and sputum patterns, positioned the semi-Fowler, performed chest physiotherapy, and taught effective coughing techniques to the family and also An B. This action was also carried out on the second and third days, but on on the second and third days, the researcher added an intervention by collaborating with the administration of an expectorant, namely ambroxol 3 times orally. The patient's response was shown on the first day, it was seen that the lip mucosa was still pale, there was an additional wheezing breath sound, the rhythm of the breath was 31 times per minute, the pulse was 112 times per minute, the temperature was 38.70C. The patient's mother said that her son still coughed a lot and had phlegm that he couldn't expel. Mother said that she began to understand the effective coughing techniques and chest physiotherapy being taught, and she said that she was able to do it independently.

The response seen on the intervention given on the second day, the mother said that the child was able to cough and produce phlegm, and was able to sleep more calmly. The results of the physical examination showed that the child's breathing rhythm was 29 times per minute, pulse was 105 times per minute, temperature was 36.80C, and he seemed not as fussy as the first day. The third day's response found that An B appeared to be sleeping in semi-Fowler's, calm condition, no additional breath sounds, breathing rhythm calculation 20 times per minute, pulse 100 times per minute, temperature 36.70C. Mother said that An B slept better because he coughed less often. The existing phlegm has also been released several times. This indicates that the problem of ineffective airway clearance related to retained secretions has been well resolved.

The incidence of TB in An B is in accordance with the theory where TB will often occur and quickly spread in children aged 0 to 14 years (Hamdan & Septian Wijaya, 2021). The condition of An B's house that lacks ventilation is also one of the risk factors for causing someone to get TB. (Pramono, 2021) explained that age, risky behaviors such as coughing not covering the mouth, lack of ventilation, overcrowding, decreased immunity and lack of lighting at home are very risky for transmission events. Children will be at risk of TB if they have poor nutritional status, weak immune systems and poor environmental sanitation such as dense settlements and lack of ventilation (Yani, Fauzia, & Witdiawati, 2018). Signs experienced by someone who has TB are coughing for more than 2 weeks, phlegm, chest pain, shortness of breath, decreased appetite, fever, accompanied by night sweats (Kementerian Kesehatan Republik Indonesia, 2020). An B has the same symptoms as cough for more than 2 weeks, phlegm, and fever.

One of the nursing diagnoses that can appear in patients with TB is ineffective airway clearance. Ineffective airway clearance is a condition in which a person experiences an inability to clear secretions or airway obstruction to maintain a patent airway (Tim Pokja SDKI DPP PPNI, 2017). This condition is characterized by major symptoms such as an ineffective cough, inability to cough, excessive sputum, wheezing or rhonchi, besides that, it is accompanied by minor symptoms such as dyspnea, difficulty speaking, restlessness, cyanosis, changing breathing frequency, and changing breathing patterns (Tim Pokja SDKI DPP PPNI, 2017). The author puts the diagnosis of ineffective airway clearance in the priority diagnosis because this is theoretically the impact if airway clearance is not treated immediately, it can include symptoms such as cough, tachypnea, shortness of breath, excessive sputum production. Then when there is an infection the body secretes a lot of mucus or sputum. If there is a buildup of sputum, it will cause airway blockage and shortness of breath (Mathis, 2018). This condition can worsen the respiratory condition called respiratory distress syndrome. If this situation is not treated immediately, it will cause inflammation and disorders that cause sepsis (Supriatin & Nurhayani, 2021).

The implementation to improve airway clearance is to perform airway management. Airway management is carried out by means of observation, therapy, education and collaboration. Observations made on airway management are monitoring breathing patterns, breath sounds, and sputum. Therapeutic measures are carried out by giving warm drinks, positioning semi-Fowler or Fowler which aims to reduce shortness of breath, doing chest physiotherapy to remove sputum and giving oxygen if needed. Education is carried out by recommending a fluid intake of 2000 ml a day, as well as teaching effective coughing. Collaborate on giving bronchodilators, expectorants, and analytics if needed (Purnamaningsih, Martini, Adi, & ..., 2018). Chest physiotherapy is a treatment for removing phlegm using postural drainage, vibration and percussion techniques. The benefit of chest physiotherapy is to facilitate the discharge of secretions or sputum (Siregar & Aryayuni, 2019). This is supported by research (Melati et al., 2018), that chest physiotherapy is very effective for removing sputum and can reduce the respiratory rate and can improve ventilation and lung function (Dewi, 2019). In addition, physiotherapy can restore muscle function in the lungs so that it is easy to remove sputum and helps to prevent sputum accumulation (Ernirita, Putri, Giri, Tria, & Ika, 2020).

Conclusion

Nursing care for An B was found to have priority problems for ineffective airway clearance associated with the presence of sputum. Nursing care is carried out for 3 days starting from the

assessment process to conducting an evaluation. Airway management such as teaching effective coughing and performing chest physiotherapy is one of the interventions carried out for 3 days of treatment. This action is proven to be able to overcome the problem of ineffective airway clearance properly. Nurses are expected to modify other non-pharmacological interventions to overcome ineffective airway clearance which can be combined with effective coughing and chest physiotherapy measures.

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