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Application of Chest Physiotherapy to Improve Airway Clearance in Nursing Care for Children with Bronchopneumonia in Seruni Ward, Dr. M. Djamil Central Hospital Padang

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ABSTRACT

Bronchopneumonia is a lower respiratory tract infection that is the leading cause of morbidity and mortality in pediatric intensive care units. This condition is a medical emergency that causes impaired gas exchange, secretion accumulation, and lung collapse, leading to respiratory muscle fatigue and decreased consciousness. One effective non-pharmacological intervention for managing this condition is chest physiotherapy. This study aims to evaluate the application of chest physiotherapy to improve airway clearance in children with bronchopneumonia in the Seruni Ward of RSUP Dr. M. Djamil Padang. This research uses a descriptive design in the form of a case report with the application of Evidence-Based Nursing (EBN). The population includes all children with bronchopneumonia, with a sample of two children selected through purposive sampling. The study was conducted in March–April 2025 in the Seruni Ward of RSUP Dr. M. Djamil Padang. Chest physiotherapy interventions were performed once daily for 10–15 minutes over 4–5 days. Evaluation was conducted by monitoring respiratory status, including respiratory rate, oxygen saturation, breath sounds, and sputum characteristics. The study results showed that both patients had the primary nursing issue of ineffective airway clearance. Assessment revealed tachypnea, rhonchi, and increased sputum production

INTRODUCTION

Bronchopneumonia is one form of pneumonia, also known as bronchial pneumonia or lobular pneumonia, which is characterized by infection of the respiratory tract, particularly the bronchi, and extends to the alveoli or air sacs in the lungs, leading to inflammation and impaired respiratory function (Sakila Evrsa Putri Hts & Dika Amalia, 2023). In addition, exposure to infectious agents from the environment, including viruses and bacteria, easily triggers inflammation that can develop into bronchopneumonia. This condition is most frequently found in children, especially within the age range of under 15 years (Puspa Priyasti et al., 2023).

The United Nations Children's Fund (UNICEF) reported in 2022 that bronchopneumonia was the leading cause of death in children under five years of age compared to other diseases such as measles, malaria, and AIDS. Globally, there is one case of pneumonia for every 71 children, or more than 1,400 cases per 100,000 children. Most pneumonia cases occur in developing countries such as Central and West Africa (1,620 cases per 100,000 children) and South Asia (2,500 cases per 100,000 children) (UNICEF Data, 2022).

The World Health Organization (WHO) stated that in 2021, pneumonia remained one of the main causes of morbidity and mortality due to infections in infants and children worldwide. In 2019, pneumonia accounted for 740,180 (14%) deaths in children under 5 years old. Approximately 2,200 children died every day from pneumonia (Kemenkes RI, 2023). Meanwhile, in Indonesia, bronchopneumonia ranked 6th globally among tropical diseases with the highest incidence rate (Alfarizi et al., 2024).

The Ministry of Health of the Republic of Indonesia (Kemenkes RI, 2023) stated that bronchopneumonia in children and toddlers is one of the ten most significant diseases, with a prevalence rate of 36.95%, or around 1.1 million pneumonia cases among children under five. In 2023, the mortality rate from pneumonia among toddlers in Indonesia was 0.13%. Furthermore, provinces with the highest pneumonia detection coverage among toddlers were West Papua (75%), Jakarta (72.4%), and Bali (71.6%).

The estimated number of pneumonia cases among toddlers in West Sumatra in 2023 was 21,409 cases, ranking 14th out of 38 provinces in Indonesia. Pneumonia cases in West Sumatra also increased from 3,546 in 2021 to 5,591 cases in 2022 (Nia Watri Wahyuni & Makful, 2024).

The Padang City Health Office (2022) reported that the number of toddlers in Padang in 2021 was 77,624, with a pneumonia prevalence of 3.91%. Meanwhile, 2,148 cases (70.8%) were diagnosed out of an estimated 3,035. Based on gender, more boys (1,247) than girls (901) were affected by pneumonia.

The main referral hospital in West Sumatra Province and Central Sumatra region is Dr. M. Djamil Central Hospital, Padang, which plays an important role in handling pediatric bronchopneumonia cases. With complete facilities and competent medical personnel in pediatrics and pulmonology, Dr. M. Djamil Hospital serves as the primary referral center for patients with severe respiratory disorders, including bronchopneumonia. In 2020, bronchopneumonia was among the top 10 most common inpatient diseases, with 620 cases, and from 2020

to 2022, a total of 1,537 bronchopneumonia cases were reported (RSUP Dr. M. Djamil, 2020).

Bronchopneumonia is usually preceded by an upper respiratory tract infection lasting several days. The patient may experience a sudden rise in temperature up to 39–40°C, sometimes accompanied by seizures due to high fever. The child appears restless, has difficulty breathing, rapid shallow breathing with nasal flaring, and cyanosis around the nose and mouth. Cough is not usually present in the early stages but develops after several days, initially as a dry cough and later becoming productive (Sakila Evrsa Putri Hts & Dika Amalia, 2023).

Bronchopneumonia can also weaken a child's immune system because it often causes secondary respiratory infections (Ari Sukma et al., 2020a). This indicates that bronchopneumonia is not only an acute medical problem but also poses long-term risks to children's nutrition and overall development (Alfarizi et al., 2024).

Bronchopneumonia not only affects the respiratory system but also influences the child's metabolic system. This condition causes decreased appetite, leading to inadequate nutritional intake. Furthermore, the inflammatory process caused by bronchopneumonia can disrupt metabolism and body regulation. Proinflammatory cytokines produced during inflammation affect chondrocytes (cartilage cells), inhibit bone formation, and negatively impact children's growth and development (Alfarizi et al., 2024).

Bronchopneumonia can cause the accumulation of secretions in the alveolar walls due to infection. Over time, this secretion buildup increases mucus production in the respiratory tract, leading to impaired airway clearance and resulting in the primary nursing problem of ineffective airway clearance related to airway hypersecretion (Salsabila, 2024). Ineffective airway clearance is the inability to remove secretions or obstructions from the airway to maintain airway patency. If left untreated, this problem can lead to more severe complications, such as severe dyspnea and even death (PPNI, 2017a).

The incidence of bronchopneumonia is influenced by several factors, such as socioeconomic status, incomplete immunization, lack of exclusive breastfeeding, environmental pollution, overcrowded housing, and mothers' low knowledge about child health (Wardani et al., 2023).

Severe bronchopneumonia can cause impaired gas exchange, secretion accumulation, and partial lung collapse (atelectasis), which subsequently lead to hypoxemia and respiratory failure. This occurs because the lungs cannot function properly, reducing oxygen levels in the body and increasing carbon dioxide levels. If not treated promptly and appropriately, children may experience respiratory muscle fatigue, decreased consciousness, and ultimately require invasive respiratory support in the form of mechanical ventilation (Tsitsiklis et al., 2022).

More than 20% of children in Pediatric Intensive Care Units (PICU) require invasive mechanical ventilation, mainly due to severe respiratory disorders such as bronchopneumonia. The use of mechanical ventilators in children with bronchopneumonia is an important indication when standard

oxygen therapy is no longer effective in maintaining adequate oxygen saturation. However, mechanical ventilation significantly increases the risk of complications, including atelectasis, secretion retention, and lower respiratory tract infections (Zakaria et al., 2024).

Management of bronchopneumonia requires appropriate treatment to prevent serious complications and accelerate recovery. Pharmacological therapy such as antipyretics, antibiotics, mucolytics, inhaled bronchodilators, and analgesics may be given, along with non-pharmacological therapy as supportive treatment, such as chest physiotherapy (Salsabila, 2024). However, according to Agesta et al. (2024), the application of chest physiotherapy by nurses in improving airway clearance in children with bronchopneumonia is not yet optimal.

Chest physiotherapy is a technique to clear the airways and lungs. The techniques applied in children are similar to those in adults and include postural drainage, clapping, and vibration, with the aim of clearing sputum or mucus (Istiqomah Fi Laella, 2024).

Postural drainage is a technique of positioning patients so that gravity assists in draining excess secretions or mucus from the bronchi, which cannot be removed by cilia or normal coughing. Clapping or chest percussion involves tapping the anterior and posterior chest wall with cupped hands to loosen secretions from the bronchial walls and maintain respiratory muscle function (Alfajri Amin, 2018). After clapping, vibration is performed, where the nurse places their hands on the patient's chest wall and applies rapid shaking during exhalation (expiration), repeated five to eight times per second, to increase airflow turbulence and help loosen thick mucus (Rumata et al., 2025).

Chest physiotherapy helps reduce airway resistance and facilitates the breathing process, applicable across all ages such as infants, children, and adults, especially in children under 5 years with respiratory diseases to assist secretion clearance (Istiqomah Fi Laella, 2024). Moreover, according to Manurung et al. (2021), chest physiotherapy also facilitates ventilation, increases hemoglobin levels, improves oxygen saturation, and reduces dyspnea in children.

Children in critical condition admitted to PICU generally require invasive mechanical ventilation, making suction procedures necessary after chest physiotherapy interventions to help evacuate secretions from the respiratory tract (Zakaria et al., 2024). Suction is indicated only when patients cannot expel secretions independently, such as infants and toddlers who cannot cough effectively (Stevin & Holleyn, 2021).

A case study by Azahra & Yuliani (2022) in the Indonesian Journal of Health and Medical was conducted on two pediatric patients aged 8 months and 21 months with bronchopneumonia at RSUD Arjawinangun. The intervention lasted 6–7 days and included postural drainage, percussion, vibration, and effective coughing techniques. The results showed significant improvement in vital signs and respiratory symptoms, including decreased body temperature and respiratory rate, increased oxygen saturation (SaO_2), reduced rhonchi, cough, tachypnea, and secretions. In infants, improvement occurred faster (day 2), while in toddlers improvement occurred on day 3. This difference was influenced by age, medical history, child cooperation, and parental support. The

study also noted that regular and collaborative therapy with families significantly affects the success of interventions.

A study by Zakaria et al. (2024) in The Egyptian Journal of Hospital Medicine was conducted on critically ill children aged 2–7 years with bronchopneumonia admitted to PICU at Abo El-Reesh Hospital, Cairo University, Egypt, who were mechanically ventilated but clinically stable. The intervention combined conventional chest physiotherapy with chest mobilization, including lateral chest wall flexion, chest rotation, extension, rib mobilization, and pectoralis major stretching. The procedures were performed in supine, lateral, or sitting positions, either passively or actively depending on the child's cooperation. The intervention was carried out once daily for two weeks, before meals or two hours after meals, and after nebulization sessions. Each session lasted 20–30 minutes depending on the child's fatigue and comfort, with rest time allocated for suction. The results showed that after chest physiotherapy intervention, tidal volume significantly increased ($p = 0.041$), and respiratory rate (RR), heart rate (HR), and FiO_2 decreased.

Research by Achirulah Sari Dewi et al. (2024) in Jurnal Cakrawala Ilmiah examined the effect of chest physiotherapy on airway clearance in children aged 1–5 years with bronchopneumonia at RSUD Tamada Bontang, involving 16 toddlers. The intervention included postural drainage, percussion (clapping), and vibration for 20 minutes per session. The findings revealed that before the intervention, 100% of respondents experienced ineffective airway clearance, whereas after intervention, 100% demonstrated effective airway clearance. The paired t-test showed a p-value of 0.001 (< 0.05), indicating a significant effect of chest physiotherapy on the effectiveness of airway clearance.

A case study by Alfarizi et al. (2024) applied combined chest physiotherapy and postural drainage in a 9-month-old child with bronchopneumonia. The intervention was conducted once daily for three consecutive days, lasting 10–15 minutes per session. Techniques included clapping, vibration during expiration, and positioning for secretion drainage. Clinical evaluation showed increased sputum production initially, then gradually decreased, rhonchi reduced from day 1 to day 3, dyspnea improved, breathing pattern normalized, respiratory rate decreased from 58 to 44 breaths/min, and oxygen saturation increased to 96%. This indicated that chest physiotherapy and postural drainage effectively improved clinical conditions, particularly in enhancing airway clearance and overall respiratory status.

LITERATURE REVIEW

Another case study by Agesta et al. (2024) at RSUD Tidar Magelang involved nursing care for a 3-year-old child with bronchopneumonia, with chest physiotherapy as the primary intervention for three consecutive days. The intervention included chest percussion for 1–2 minutes, postural drainage, and vibration during exhalation. Evaluation showed significant improvements in respiratory function, including reduced respiratory rate from 40 to 25 breaths/min, disappearance of rhonchi, improved comfort, reduced secretions, increased ability to expel sputum, improved appetite, and normalized body temperature. This study reinforces findings from other studies that chest physiotherapy is an effective non-pharmacological intervention in managing airway clearance problems in children with bronchopneumonia.

Observations were also carried out on 10 pediatric patients with bronchopneumonia admitted to the Seruni Ward (PICU) diagnosed with ineffective airway clearance. These patients had airway secretions and underwent suction procedures. However, chest physiotherapy interventions were not optimally performed and were not well-documented in nursing records.

Based on the above description, the author prepared a final paper entitled: "Application of Chest Physiotherapy to Improve Airway Clearance in Nursing Care for Children with Bronchopneumonia in Seruni Ward, Dr. M. Djamil Central Hospital Padang."

METHODOLOGY

The research design used in this study was a descriptive design with a case study approach. Descriptive research aims to provide a factual, systematic, and accurate description of a particular situation or phenomenon that becomes the object of the study. A case study is research conducted on an individual and/or social unit in depth, by identifying all important variables related to the development of the unit under study (Fauzy, 2019).

This study was conducted from March to June 2025. Case selection and the implementation process of evidence-based nursing (EBN) chest physiotherapy interventions were carried out in the Seruni Ward, Dr. M. Djamil Central Hospital Padang, from April 21 to May 10, 2025.

The population is defined as the object of the study, either partially or entirely, depending on the scope of the research (Notoatmodjo, 2018). The population in this study consisted of all pediatric patients with bronchopneumonia admitted to the Seruni Ward, Dr. M. Djamil Central Hospital Padang. On April 21–22, 2025, there were 10 children diagnosed with bronchopneumonia.

The sample is a subset of the population that possesses the same characteristics, and from which findings can be generalized to the entire population. Therefore, the sample must be representative (Syapitri et al., 2021). Sampling in this study employed purposive sampling, a technique in which participants are deliberately selected based on specific characteristics considered relevant and able to provide in-depth information regarding the research focus,

or based on particular criteria established by the researcher in line with the research objectives (Notoatmodjo, 2018).

The sample in this final paper consisted of two pediatric patients aged 1–5 years with bronchopneumonia in the Seruni Ward, Dr. M. Djamil Central Hospital Padang. Samples were selected based on inclusion and exclusion criteria as follows:

A. Inclusion Criteria

Inclusion criteria refer to general characteristics that must be met by subjects to be eligible as research participants. The inclusion criteria in this study were:

1. Children aged 1–5 years diagnosed with bronchopneumonia and hospitalized in the Seruni Ward, Dr. M. Djamil Central Hospital Padang.
2. Parents who consented for their children to receive chest physiotherapy interventions.
3. Patients with a nursing diagnosis of ineffective airway clearance and SpO_2 > 90%.

B. Exclusion Criteria

Exclusion criteria refer to specific characteristics that disqualify subjects who initially meet the inclusion criteria. The exclusion criteria in this study were:

1. Patients with chest wall abnormalities such as rib fractures, infections, neoplasms, rickets, or tension pneumothorax.
2. Patients with blood-related disorders, including coagulation abnormalities, hemoptysis, or massive intrabronchial bleeding.
3. Patients with cardiac arrhythmias.

The instrument used for data collection in this study was a pediatric nursing assessment format to obtain information including biodata, chief complaints, past medical history, family medical history, maternal pregnancy and delivery history, immunization history, growth and development history, daily needs fulfillment patterns, physical examination results, vital signs, and measurements before and after the implementation of chest physiotherapy interventions.

RESULTS AND DISCUSSION

This case study was conducted in the Seruni Ward of Dr. M. Djamil Central Hospital Padang for approximately one week, from April 25, 2025, to May 2, 2025. The subjects in this case study were two children aged 1–5 years who were hospitalized with a medical diagnosis of bronchopneumonia and experienced the nursing problem of ineffective airway clearance.

The intervention carried out was the application of chest physiotherapy as part of Evidence-Based Nursing (EBN) to improve airway clearance. Chest physiotherapy was performed regularly according to the standard operating procedure (SOP), including techniques such as postural drainage, percussion (clapping), and vibration, which were adjusted to the clinical condition of each child.

The implementation of nursing care included assessment, data analysis, formulation of nursing diagnoses, nursing interventions, implementation, and evaluation. Nursing assessment was carried out through alloanamnesis (interviews with the patients' parents), direct observation, physical examination, review of medical records, and nursing documentation.

Table 1. Nursing Problems Analysis of Managed Patients

No	Managed Patient I	Managed Patient II
1	**Subjective Data :** Patient's mother stated that the child had difficulty breathing and mucus coming out of the mouth/nose causing shortness of breath. **Objective Data :** 1) Ineffective cough 2) Dyspnea (RR: 42 x/min) 3) Restless 4) Thick secretions in the mouth and nose 5) Breath sounds: fine wet rhonchi in both lung fields Etiology: Retained secretions Problem: Ineffective airway clearance	**Subjective Data :** Patient's mother stated that the child often coughed but was unable to expel sputum, leading to shortness of breath. **Objective Data :** 1) Ineffective cough 2) Dyspnea (RR: 46 x/min) 3) Restless 4) Thick mucus in the mouth and nose 5) Breath sounds: stridor, fine wet rhonchi in both lung fields Etiology: Retained secretions Problem: Ineffective airway clearance
2	**Subjective Data :** Patient's mother stated that the child had recurrent seizures, especially during fever. **Objective Data :** 1) Seizures ±1 time/day lasting 1–2 minutes (general symptomatic seizure) 2) Restless	**Subjective Data : -** **Objective Data :** 1) Warm skin 2) Body temperature: 39.2°C 3) RR: 46 x/min (tachypnea) 4) HR: 163 x/min (tachycardia) 5) Restless with abnormal/extensor spastic posture (muscle spasticity) Etiology: Disease process

	3) Decreased consciousness, GCS 10 (E4M4V2/delirium) 4) BP: 93/54 mmHg 5) MAP: 67 mmHg (ideal ≥ 70 mmHg) 6) Positive Babinski reflex bilaterally 7) Decreased cognitive function (failed KPSP screening) Etiology: Brain tissue damage (cerebral palsy) Problem: Risk of ineffective cerebral perfusion	Problem: Hyperthermia
3	**Subjective Data :** Patient's mother stated that the child had difficulty performing activities due to abnormal stiffness of hands and feet, causing pain when forced to move **Objective Data :** 1) Upper extremities stiff with abnormal flexion posture (decorticate) at elbows and wrists 2) Lower extremities extended and adducted, toes flexed 3) Asymmetrical body posture/scoliosis 4) Limited ROM at knees and elbows 5) Muscle strength: - Upper extremities: 3333/3333 - Lower extremities: 3333/3333 Etiology: Neuromuscular disorder, joint stiffness Problem: Impaired physical mobility	**Subjective Data :** Patient's mother stated that the child had recurrent seizures with high fever. **Objective Data :** 1) Seizures ±1 time/day <1 minute with extremity spasticity 2) Restless 3) Decreased consciousness, GCS 7 (E4M1V2/somnolence 4) BP: 88/54 mmHg5) MAP: 65 mmHg (ideal ≥ 70 mmHg) 5) Positive Babinski reflex bilaterally 6) Decreased cognitive function (failed KPSP screening) Etiology: Brain tissue damage (cerebral palsy) Problem: Risk of ineffective cerebral perfusion
4	–	**Subjective Data :** Patient's mother stated that the child lost ~2 kg over the last 5 months. **Objective Data :** 1) Appears thin 2) Short stature for age

		3) Inability to swallow (weak swallowing/chewing muscles) 4) Nutritional status: - H/A: -3 SD to -2 SD (Stunted) - W/H: -3 SD to -2 SD (Undernourished) - HC/A: < -2 SD (Microcephaly) 5) MUAC: 12.5 cm (Undernourished) 6) Serum albumin: 3.3 g/dL (normal 3.8–4.7) Etiology: Inability to swallow food Problem: Nutritional deficit

1. Ineffective Airway Clearance related to Retained Secretions

In Patient I (An. S), the identified nursing problem was ineffective airway clearance related to retained secretions, as evidenced by the accumulation of thick secretions in the mouth and nose, nasal flaring, chest wall retraction, and the presence of fine wet rhonchi in both lung fields. This condition resulted in an increased respiratory rate (RR) and fluctuating oxygen saturation (SpO_2), indicating a risk of hypoxia if left untreated. During four days of care (April 26–29, 2025), interventions focused on airway management, which included positioning the patient in a semi-Fowler's position to facilitate lung expansion and secretion mobilization, administering oxygen via HFNC (15 L/min, FiO_2 30–40% on the first two days, followed by nasal cannula 2 L/min as the condition improved), and routine chest physiotherapy for 10–15 minutes followed by suctioning. Initially, secretions were thick, cloudy, and abundant, but gradually became thinner, clearer, and reduced in volume. Although coughing was elicited, it remained ineffective, necessitating suction for airway clearance. On the fourth day, parents received education on chest physiotherapy, correct techniques, and preparation for independent care after transfer to the HCU. Daily evaluations showed progressive improvement. On Day 1, RR was 49/min, SpO_2 95%, with marked respiratory distress and thick secretions. On Day 2, RR decreased to 41/min, SpO_2 improved to 96–99%, though secretions were still thick. On Day 3, the patient transitioned to a nasal cannula with SpO_2 stable at 98% and thinner secretions. By Day 4, RR decreased to 36/min, SpO_2 remained stable at 98%, rhonchi were reduced, and respiratory distress was minimal. Thus, the nursing problem of ineffective airway clearance was partially resolved, with improved vital signs, reduced secretions, and family readiness, though ineffective coughing persisted. Continued education for parents regarding airway care and chest physiotherapy was planned.

In Patient II (An. H), ineffective airway clearance was also identified, characterized by increased RR, chest retractions, fine wet rhonchi predominantly in the right lung, nasal flaring, and thick yellowish-white secretions. Care was

provided for five days (April 28–May 2, 2025), including semi-Fowler positioning, oxygen via HFNC (adjusted per clinical status), routine chest physiotherapy, and suctioning. Daily evaluations showed gradual improvement from RR 44/min with abundant secretions and ineffective cough on Day 1, to reduced secretions, improved oxygen saturation (96–99%), and decreased retractions by Day 3. By Day 5, the patient transitioned to a nasal cannula 3 L/min, RR decreased to 27/min, SpO_2 was stable at 97%, with minimal retractions and fewer secretions. Although coughing remained ineffective, consistent interventions effectively improved airway clearance. Education was also provided to parents for continued chest physiotherapy at home. These results align with Fi Laella (2024), who found that chest physiotherapy reduces airway resistance and eases breathing across age groups, and Manurung et al. (2021), who reported that chest physiotherapy improves ventilation, oxygenation, and reduces dyspnea in children.

2. **Risk of Ineffective Cerebral Perfusion evidenced by Brain Tissue Damage (Cerebral Palsy)**

Patient I (An. S) with cerebral palsy was treated April 26–29, 2025. On Day 1, oxygen via HFNC (15 L/min, FiO_2 40%) maintained SpO_2 at 96%, but tonic-clonic seizures and decreased consciousness (GCS 10) were observed, with MAP 71 mmHg. On Day 2, FiO_2 was reduced to 30%, but MAP dropped to 66 mmHg; valproic acid was added. On Day 3, therapy was switched to nasal cannula 2 L/min, MAP improved to 75 mmHg, seizures reduced to once daily with Topamax added. By Day 4, vital signs were stable, seizures absent, though the patient remained delirious (GCS 10). Family was educated on seizure management before transfer to the HCU.

Patient II (An. H) with cerebral palsy experienced daily tonic-clonic seizures over five days. Despite HFNC (6–8 L/min, FiO_2 30–50%) and later nasal cannula 3 L/min, MAP often remained below 70 mmHg. GCS was 7, with frequent seizures and neurologic deficits. Anticonvulsants (valproic acid, clonazepam) were given regularly. By Day 5, MAP improved slightly (71 mmHg), but risk of ineffective cerebral perfusion persisted. Patient was transferred to the HCU with family education on home seizure management.

These findings are consistent with Gibson et al. (2021), highlighting the importance of seizure management in cerebral palsy to prevent cerebral perfusion deficits and respiratory complications.

3. **Hyperthermia related to Disease Process (Bronchopneumonia)**

Patient An. H developed hyperthermia due to bronchopneumonia during April 28–May 2, 2025. Initial temperature was 38.4°C, with tachycardia and tachypnea. Interventions included cooling environment, warm compresses, antipyretics (Paracetamol), and antibiotics (Meropenem). Evaluations showed fluctuations in temperature (37.1–38.6°C), but overall improvement with reduced fever, stabilized vital signs, and improved comfort. Parents were educated on warm compress techniques for home care.

According to Azahra et al. (2022) and Raharjoe et al. (2018), hyperthermia results from thermoregulatory failure, often triggered by pyrogens in

bronchopneumonia. Pro-inflammatory mediators (e.g., IL-1, prostaglandin E2) stimulate hypothalamic temperature set-point, leading to fever (Guyton, 2021).

4. **Imbalanced Nutrition less than Body Requirements related to Inability to Swallow**

Patient An. H required NGT feeding due to swallowing difficulties. Initial weight was 9 kg, height 83 cm (short stature), with low albumin (3.3 g/dL). Nutritional therapy (Pepti Junior 125 cc × 6/day via NGT, oral hygiene, Curcuma syrup) and collaboration with a dietitian were implemented. By May 1–2, albumin increased to 3.6 g/dL, weight rose to 9.6 kg, but patient remained undernourished. Parents were educated on NGT care and feeding at home.

Bronchopneumonia worsened nutritional status due to recurrent infections (Ari Sukma et al., 2020a; Alfarizi et al., 2024). In cerebral palsy, feeding difficulties exacerbate malnutrition risk (Indriasari et al., 2018; Bell & Samson-Fang, 2013). Protein intake of 2 g/kg/day is recommended to improve nutritional outcomes (Aggarwal et al., 2015).

5. **Impaired Physical Mobility related to Neuromuscular Dysfunction, Joint Stiffness, and Cognitive Impairment**

Patient An. S experienced impaired mobility due to cerebral palsy. Four days of passive ROM exercises were performed, with no signs of acute pain, but spasticity persisted. Muscle strength remained 3/3/3/3. Parents were educated on continuing exercises at home.

Cerebral palsy, a non-progressive neurological disorder, disrupts motor control and gait patterns (Patel et al., 2020; Korzeniewski et al., 2018). Spastic hemiplegia and spastic diplegia/quadriplegia are common, resulting in abnormal mobility requiring long-term therapy.

CONCLUSION AND RECOMMENDATION

Overall, the application of chest physiotherapy proved effective in facilitating secretion mobilization and elimination in children with bronchopneumonia. This intervention improved airway clearance effectiveness even when the patient's cough was suboptimal, as evidenced by the gradual improvement in respiratory function. The combination with suctioning was also essential to achieve optimal outcomes. These findings support the implementation of chest physiotherapy as part of Evidence-Based Nursing (EBN) practice in pediatric intensive care units (PICU).

FUTHER STUDY

This research still has delays, so it is necessary to conduct further research related to the topic Application of Chest Physiotherapy to Improve Airway Clearance in Nursing Care for Children with Bronchopneumonia in Seruni Ward, Dr. M. Djamil Central Hospital Padang in order to improve this research and add insight for readers.

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