


Characteristics of Bronchopneumonia in Children at Dr. Abdul Rivai Regency Hospital, Berau District, East Kalimantan Province in 2022-2023

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Article Info	ABSTRACT
<p>Keywords: Bronchopneumonia, Children, Risk Factors.</p>	<p>Bronchopneumonia is an inflammation that occurs in the bronchi and alveoli of the lungs and is also the most common clinical symptom of pneumonia in children. This is an infectious disease of the lower respiratory tract, often occurring in infants under 2 years of age or toddlers up to 5 years of age. The purpose of this study was to evaluate the factors that influence the incidence of bronchopneumonia in children, with a focus on risk factors, management, and the effectiveness of treatment applied in hospitals. The method used was a literature study and secondary data analysis from various journals and medical reports related to bronchopneumonia in children. The results showed that the main risk factors contributing to the incidence of bronchopneumonia in children include viral infections, incomplete immunization status, and environmental factors such as exposure to cigarette smoke. Treatment given generally includes antibiotics, fluid therapy, and supportive care, with an emphasis on early detection to prevent further complications. This study also found the importance of a holistic approach in the management of bronchopneumonia to achieve optimal outcomes in pediatric patients.</p>
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INTRODUCTION

Pneumonia is an inflammation that occurs in the part parenchyma lungs. In general, pneumonia in childhood called as bronchopneumonia which is a combination from spread of lobular pneumonia or Because existence infiltration that occurs in the area second field lungs or field lungs Good lungs left or lungs part right and around bronchi. Bronchopneumonia is inflammation that occurs in the area bronchi and alveoli in the lungs and are also symptom the most common clinical pneumonia that occurs in children. This is a disease transmitted to the channel breathing part down, many occurs in babies under 2 years or toddler until 5 years old. Incident bronchopneumonia highest in children is age 5-9 years¹⁻⁴.

Worldwide, as many as 900,000 children are aged not enough from 5 years die because of pneumonia that occurs each year. In 2015 and 2016, pneumonia became reason from infant mortality in the world is as much as 15-16%. In 2016 too, pneumonia had result in death around 2,400 children per day (16%) of the 5.6 million death in toddlers or as many as 880,000 toddlers and years 2015, number death due to pneumonia as many as 920,136 toddlers. In 2019, the number incident bronchopneumonia in the world, becoming reason death in children under 5 years old namely 740,180 (14%). Child mortality rate consequence bronchopneumonia age 1-5 years as much as 22%. Each annually, worldwide as many as 156 million case caught bronchopneumonia in children. According to the World Health Organization (WHO) in 2020, bronchopneumonia cause deaths in 740,180 children under age 5 years in 2019, which is approximately 14% of total deaths in the group age said. More furthermore, bronchopneumonia also recorded number about 22% of overall death in children ages 1 to 5 years. In 2016, bronchopneumonia cause approximately 850,000 deaths toddlers, which is equivalent with around 16% of the total 5.5 million death at age. With this data, it can be concluded that around 2,400 children toddler die every the day or estimated 2 children toddler die every minute consequence bronchopneumonia. With thus, bronchopneumonia is reason death primary in children under 5 years of age worldwide.⁵⁻⁷

The incidence of pneumonia in Indonesia in 2015, age toddler as many as 557,016 in the meantime age more from 5 years as many as 173,593. In 2016, the age of toddler or age not enough from 5 years as many as 582,489, while at the age of more from 5 years namely 201,821. In 2017, the number incidence of pneumonia in age toddler namely 513,638, while at the age of more from 5 years as many as 160,400. As many as 505,331 ages toddlers and older from 5 years. As many as 134,930 children were affected by pneumonia in 2018. In 2019, the number incidence of pneumonia at age toddler namely 426,066 children and children age more from 5 years namely 157,710 children. Indonesia entered in 7th place with number death as many as 808,694 children at the age of under 5 years.^{8,9}

In 2019 in East Kalimantan province, the cause death. The largest incidence of Post Neonatal is caused by pneumonia. In the Indonesian Health profile in 2018, the prevalence in East Kalimantan province was 29.09%. The presence of the disease inflammation lungs at age toddlers in 2016 were 6,780, then happen a decrease in 2018 of 5,860 cases.⁹

The incidence of pneumonia, especially in the Regency Berau in 2016 there were 167 cases (9.91%) out of 1,686 (Berau District Health Office) 2016). Based on the top 10 data disease take care stay group patient children at dr. Abdul Rivai Regional Hospital Regency Berau, numbers incident bronchopneumonia that is treated hospitalization at dr. Abdul Rivai Regional Hospital Regency Berau in 2021 as many as 159 children, in 2022 patients child take care stay bronchopneumonia increase to 914 children. From these data, inpatient pediatric patients diagnosed with bronchopneumonia in 2023 increased to 960 children.

My purpose of researching bronchopneumonia disease is, the high incidence of the disease is caused by Berau Regency being an area that has many mines, especially coal. This factor can increase dust exposure due to coal mining. As well as the amount of pollution produced by mining vehicles entering and leaving the main road or highway which can affect

respiratory conditions, especially in children. Bronchopneumonia is the highest disease along with the weather and areas that support it.

This study aims to determine the characteristics of pediatric bronchopneumonia patients at Dr. Abdul Rivai Regional Hospital, Berau Regency, East Kalimantan Province during 2022-2023. The focus of the study includes patient characteristics based on gender, age, symptoms, and risk factors that can affect the incidence of this disease. The general objective of this study is to obtain an overview of the characteristics of pediatric bronchopneumonia patients, while the specific objectives include determining patient characteristics based on gender, age, symptoms, and risk factors. This study is expected to provide a deeper understanding of pediatric bronchopneumonia, as well as present useful data for the community and medical personnel in efforts to prevent and treat this disease.

The benefits of this study for researchers are to increase knowledge, insight, and experience in research related to bronchopneumonia in children, especially in Berau Regency. In addition, this study is also expected to provide additional information that is useful in maintaining health and preventing risk factors that can cause complications. For the community, the results of this study are expected to increase awareness, especially for parents, about the importance of a healthy lifestyle and an understanding of risk factors that increase the occurrence of infectious diseases. Thus, the community can be more proactive in preventing bronchopneumonia and maintaining the health of their children.

RESEARCH METHODS

This study uses an observational research design with a descriptive method and a cross-sectional approach, which aims to describe the incidence of bronchopneumonia in children found at the dr. Abdul Rivai Regional Hospital, Berau Regency during the period 2022-2023. The data used are secondary data taken from medical records of pediatric bronchopneumonia patients. This study focuses on the characteristics of pediatric bronchopneumonia sufferers based on variables such as gender, age, clinical symptoms, and risk factors. This study will be conducted at the dr. Abdul Rivai Regional Hospital, Berau Regency and will begin in October 2024.

The variables in this study are divided into two types, namely independent and dependent variables. Independent variables include the characteristics of bronchopneumonia in children, including age, gender, clinical symptoms, and risk factors, while the dependent variable is the characteristics of bronchopneumonia in children themselves. Operational definitions of each variable are made to facilitate data collection and processing. Variables such as gender, age, clinical symptoms, and risk factors will be measured using medical records with a categorical scale that includes categories that have been determined based on operational standards.

The population in this study were all pediatric patients with a diagnosis of bronchopneumonia recorded at the dr. Abdul Rivai Regional Hospital, Berau Regency during 2022-2023. The research sample was taken using the Slovin formula to determine the number of representative samples. Based on the calculation, a sample of 100 patients was obtained who met the inclusion criteria, namely children with a diagnosis of

bronchopneumonia and had complete data on the variables to be studied. Exclusion criteria included patients with unreadable or incomplete medical record data, as well as patients who had comorbidities that could affect the results of the study.

This study used materials and tools in the form of medical records, laptops, and SPSS software for data analysis. Data analysis was carried out using the univariate analysis method to describe the characteristics of each research variable, such as gender, age, clinical symptoms, and risk factors. The results of this analysis are expected to provide an overview of the characteristics of pediatric bronchopneumonia patients at the dr. Abdul Rivai Regional Hospital, Berau Regency. The data obtained will be used to compile recommendations for the prevention and treatment of pediatric bronchopneumonia, as well as provide useful information for the community and medical personnel.

Research ethics is an important aspect in this study. Before starting the study, the researcher will obtain ethical permission from the Muslim University of Indonesia to gain access to patient medical records at the dr. Abdul Rivai Regional Hospital, Berau Regency. This ethical permission process is important to ensure that the research is conducted in accordance with applicable ethical standards, maintain the confidentiality of patient data, and avoid violations of individual rights. By following strict ethical procedures, this study is expected to produce valid and useful data in understanding the characteristics of bronchopneumonia in children.

RESULTS AND DISCUSSION

Results

Characteristics of Bronchopneumonia Patients in Children at Dr. Abdul Rivai Regional Hospital, Berau Regency, East Kalimantan Province in 2022-2023 Based on Gender

Table 1. Characteristics of Bronchopneumonia Patients in Children Based on Gender

Gender	Frequency (people)	Percentage (%)
Man	63	63.0
Woman	37	37.0
Total	100	100

Source : secondary data (2022-2023)

Based on the table above can known that out of 100 patients child with acquired bronchopneumonia with record medical at dr. Abdul Rivai Regional Hospital Berau In 2022-2023, the majority own type sex man that is as many as 63 people (63.0%), while the rest own type Female gender (37.0%) as many as 37 people (37.0%), while the rest own type Female gender (37.0%).

Characteristics of Bronchopneumonia Patients in Children at Dr. Abdul Rivai Regional Hospital Regency Berau East Kalimantan Province 2022-2023 Based on Age

Table 2. Characteristics of Bronchopneumonia Patients in Children Based on Age

Age	Frequency (people)	Percentage (%)
0-1 years	27	27.0
1-5 years	53	53.0

Age	Frequency (people)	Percentage (%)
5-9 years	19	19.0
10-18 years	1	1.0
Total	100	100

Source : secondary data (2022-2023)

Based on the table above can known that out of 100 patients child with acquired bronchopneumonia with record medical at dr. Abdul Rivai Regional Hospital Berau In 2022-2023, the majority aged between 12-59 months that is as many as 53 people (53.0%) while the rest aged 0-11 months as many as 27 people (27.0%), aged 5-9 years as many as 19 people (19.0%), and aged 10-18 years as many as 1 person (1.0%).

Characteristics of Bronchopneumonia Patients in Children at Dr. Abdul Rivai Regional Hospital, Berau Regency, East Kalimantan Province in 2022-2023 Based on Symptoms

Table 3. Characteristics of Bronchopneumonia Patients in Children Based on Main Complaints

Main Complaint	Frequency (people)	Percentage (%)
Cough	31	31.0
Fever	25	25.0
Have a cold	1	1.0
Congested	25	25.0
Seizures	12	12.0
Vomit	1	1.0
Liquid Stool	5	5.0
Total	100	100

Source : secondary data (2022-2023)

Based on the table above can known that out of 100 patients child with acquired bronchopneumonia with record medical at dr. Abdul Rivai Regional Hospital Berau In 2022-2023, the majority own complaint main cough that is as many as 31 people (31.0%) while the rest own complaint main fever as many as 25 people (25.0%), had colds as many as 1 person (1.0%), shortness of breath as many as 25 people (25.0%), seizures as many as 12 people (12.0 %), vomited as many as 1 person (1.0%), and loose stools as many as 5 people (5.0%)

Characteristics of Bronchopneumonia Patients in Children at Dr. Abdul Rivai Regional Hospital, Berau Regency, East Kalimantan Province in 2022-2023 Based on Risk Factors

Table 4. Characteristics of Bronchopneumonia Patients in Children Based on Risk Factors

Risk Factors	Frequency (people)	Percentage (%)
Exclusive Breastfeeding	28	28.0
No immunization base complete	22	22.0
Exposure to cigarette smoke	21	21.0
Exposed pollution consequence pollution air	29	29.0

Risk Factors	Frequency (people)	Percentage (%)
Total	100	100

Source: secondary data (2022-2023)

Based on the table above, it can be seen that of the 100 pediatric patients with bronchopneumonia obtained from medical records at the dr. Abdul Rivai Berau Regional Hospital in 2022-2023, the majority had risk factors, the majority of respondents had risk factors for pollution due to air pollution, namely 29 people (29%), while the rest had risk factors for no exclusive breastfeeding as many as 28 people (28%), incomplete basic immunization as many as 22 people (22%), and exposure to cigarette smoke as many as 21 people (21%).

Discussion

Characteristics of Bronchopneumonia Patients in Children at Dr. Abdul Rivai Regional Hospital, Berau Regency, East Kalimantan Province in 2022-2023 Based on Gender

Based on results research obtained at Dr. Abdul Rivai Regional Hospital Berau Regency In 2022-2023 that obtained that 63 people (63.0%) among patient diagnosed child bronchopneumonia is type sex male and the remaining 37 people (37.0%) were female sex female. These results are in line with research conducted by Alaydrus, S (2018) regarding gender in pediatric patients with bronchopneumonia. The results of his study showed that as many as 66.67% of bronchopneumonia sufferers in children were male. Male children are more susceptible to lower respiratory tract infections including bronchopneumonia compared to female children. This is due to physical differences in the anatomy of the respiratory tract between male and female toddlers and differences in immunity between the two, which can increase the frequency of respiratory tract diseases. In general, the respiratory tract of boys is larger than that of girls. This can contribute to the improvement frequency disease channel breathing. Research also shows that difference hormone sex and response immune can contribute to the improvement incident infections in men. For example, men show response more inflammation big to infection, which can to worsen condition they. This is also related to response immune to type sex women, response their innate and adaptive immunity more strong compared to type male^{10,11}genital.

This is also in line with research by Zr Ganda (2010) in Sinaga, FTY (2015) which states that risk caught bronchopneumonia more high in patients children of the same sex sex man with percentage 64.28%. Patients child with type sex man more Lots caused by hormonal factors and environmental factors descendants. Boys tend own system immunity body that has not develop completely, and also the response more immune weak so that more prone to to infection respiratory tract.¹²

Characteristics of Bronchopneumonia Patients in Children at Dr. Abdul Rivai Regional Hospital Regency Berau East Kalimantan Province 2022-2023 Based on Age

Based on results research obtained at Dr. Abdul Rivai Regional Hospital Berau Regency In 2022-2023 that age patient child the most suffering bronchopneumonia that is age 12-59 months range as many as 53 people (53.0%). Findings This in line with data from Dr. M. Djamil Padang General Hospital which was studied by Putri, YY (2023) where in period 11-

16 September 2023, case bronchopneumonia in children age 0-5 years increase by 22% in three last month.¹³

Group age toddlers (1-5 years) are the most vulnerable population to bronchopneumonia. This is because of age the Power stand body toddler Still low and system the respiratory tract is not yet functioning perfect so that prone to For infected disease including bronchopneumonia.^{14,15}

Bronchopneumonia in children age toddler can happen through various road come in, especially through infection channel breathing consequence microorganisms, aspiration fluid or object foreign, as well as transmission from contact direct with individual infected. Unsanitary environment healthy and condition underlying health also contributes to improvement risk disease This. Prevention through vaccination, maintaining cleanliness environment, and strengthen system immunity is very important For protect children from bronchopneumonia.¹⁶

Characteristics of Bronchopneumonia Patients in Children at Dr. Abdul Rivai Regional Hospital, Berau Regency, East Kalimantan Province in 2022-2023 Based on Symptoms

Based on the research results obtained at the dr. Abdul Rivai Regional Hospital, Berau Regency in 2022-2023, the symptoms of patients with the main complaint of coughing were 31 people (31%). This result is not in line with the research conducted by Kaunang, CT, Runtunuwu, AL, & Wahani, AM (2016) which found that the highest frequency of symptoms in pediatric bronchopneumonia patients was shortness of breath with a total of 148 patients (93.7%). In alloanamnesis, the patient's main complaint is usually shortness of breath. Symptoms of shortness of breath can be characterized by chest wall retraction also accompanied by fever, weakness, and diarrhea. In toddlers diagnosed with bronchopneumonia, coughing occurs due to inflammation that occurs in the lower respiratory tract, especially in the bronchi and alveoli. This inflammation increases the production of mucus or phlegm, which encourages the body to expel it through coughing. Coughing functions as a protective mechanism for the body to clear the respiratory tract of secretions accumulated due to infection, which can block airflow and cause difficulty breathing. In toddlers, because their immune systems are not fully mature, they are more susceptible to infections and have difficulty in expelling secretions effectively, so coughing becomes the dominant symptom.^{15,17,18}

Bronchopneumonia generally started with infection in the tract breathing part on during a number of day. Body temperature can suddenly increase to 39–40°C and can be accompanied by seizures due to high fever. The child will appear very restless, experience dyspnea, and rapid and shallow breathing, accompanied by the use of accessory respiratory muscles and cyanosis around the nose and mouth. Cough usually does not appear in the early stages of the disease, but will appear after a few days, starting with a dry cough which then develops into a phlegmy cough. The entry of fungi, viruses, and bacteria into the lungs that cause bronchopneumonia in toddlers will increase phlegm production. This is a major problem in children because of their inability to expel secretions, resulting in ineffective airway clearance. Airway clearance problems that are not treated immediately can cause hypoxia,

loss of consciousness, seizures, permanent brain damage, respiratory arrest, and even death.^{16,17,19}

The diagnosis of bronchopneumonia is based on the clinical symptoms that exist, these clinical symptoms include retraction in the epigastric, intercostal, and suprasternal regions. Then, rapid breathing and the use of the nostrils when breathing. It usually starts with an infection in the upper respiratory tract for several days. There is fever, dyspnea, which is sometimes accompanied by vomiting and diarrhea. Bronchopneumonia can affect the digestive system and cause diarrhea, especially in children. Studies show that about 20% of pediatric patients with bronchopneumonia experience diarrhea. This condition occurs because microorganisms that infect the intestines can damage the intestinal mucosal lining, disrupt normal intestinal function, and increase fluid and electrolyte secretion. In addition, bronchopneumonia caused by viruses can trigger symptoms such as nausea, vomiting, and diarrhea, with rotavirus being the most common cause of diarrhea in children. Cough that does not appear at the beginning of the disease, but can appear after a few days, starts with a dry cough and then becomes productive. On auscultation examination, fine, loud wet rales are heard. Peripheral blood examination shows leukocytosis with PMN dominance. Chest X-ray examination showed interstitial and alveolar infiltrates and bronchopneumonia.²⁰⁻²²

From the results of alloanamnesis, the patient complained of cough and fever, which indicated the possibility of infection. In addition, physical examination showed additional breath sounds in the form of loud fine wet rhonchi which are typical for bronchopneumonia. The diagnosis of bronchopneumonia was established based on the WHO clinical diagnosis guidelines, with symptoms appearing in this patient including shortness of breath accompanied by nasal flaring, a history of fever, cough, runny nose, cyanosis, and additional breath sounds in the form of loud fine wet rhonchi during auscultation.²³

Characteristics Patient Bronchopneumonia in Children at Dr. Abdul Rivai Regional Hospital Regency Berau East Kalimantan Province 2022-2023 Based on Risk Factors

Exclusive Breastfeeding

Breast milk contains immunoglobulins which can prevent baby from disease infection and contains series unsaturated fatty acids very important saturation for growth and development children. In addition to being practical, breast milk is also easy digestible, clean and safe for baby. Colostrum contained in breast milk contains anti- infective substances. In colostrum, there is secretory IgA which can to disable Escherichia coli bacteria and various viruses in digestion. In addition, breast milk contains lactoferrin (a type of protein) that can bind iron in digestion. Breast milk also contains the enzyme lysosi which can also protect babies from the dangers of bacteria (*E. coli* and *Salmonella* sp) and viruses. Babies who always consume breast milk rarely experience upper respiratory tract infections in the first year of birth, when compared to babies who do not consume exclusive breast milk, or full breastfeeding, meaning babies are only given breast milk without additional fluids such as formula milk, juice, honey, tea, water, and without solid foods such as bananas, papaya, milk porridge, biscuits, rice porridge, or tim. Exclusive breastfeeding is recommended for at least 6 months, after which babies begin to be introduced to solid foods. The baby's immune system tries to fight or defend the body from foreign objects that enter, and the best immune

system is obtained from breast milk. This is understandable because breast milk contains immunoglobulins and other substances that provide protection against bacterial and viral infections. Babies who are breastfed have been shown to have better immunity against various infectious diseases, such as diarrhea, pneumonia, Acute Respiratory Tract Infections (ARI), and ear infections.^{24,25}

Incomplete Basic Immunization

A child is considered to have incomplete immunization status if he/she has not received at least one dose of the recommended vaccinations, including BCG, three doses of pentavalent vaccine, three doses of PCV vaccine, two doses of Rotavirus vaccine, and three doses of polio and measles vaccines by the age of 12 months. Immunization can prevent various infectious diseases, including bronchopneumonia. This is in line with the opinion of Hamidin (2014) who stated that immunization, especially DPT, can protect against respiratory tract infections, whooping cough, and tetanus, as well as Hib immunization which functions to prevent infection by *Haemophilus influenzae* type B. This organism can cause meningitis, pneumonia, and severe throat infections that can cause children to choke. Given the high mortality rate of toddlers due to bronchopneumonia, it is hoped that with complete immunization, the development of the disease will not become more severe. When children do not receive complete immunization, they lose the opportunity to develop the antibodies needed to fight the pathogens that cause bronchopneumonia. Children who do not receive complete immunization, they lose the opportunity to develop the antibodies needed to fight the pathogens that cause bronchopneumonia. Complete basic immunization is very important to prevent bronchopneumonia in children because it can increase immunity, reduce the risk of lower respiratory tract infections, prevent complications of other diseases, and reduce morbidity and mortality. Therefore, providing immunization according to schedule should be a priority for parents and the community to protect the health of their children.^{22,26,27}

Exposure to Cigarette Smoke

Cigarette smoke contains various dangerous chemicals that can damage lung tissue and disrupt the function of the respiratory tract. This includes disruption of cilia (fine hairs in the respiratory tract) and alveolar macrophage cells, which function to capture and clean microorganisms and foreign particles from the lungs. This damage makes it easier for microorganisms to enter the respiratory tract and cause infection. Research conducted by experts provides clear evidence of the dangers of cigarettes to the health of smokers and those around them. In addition to wives, children are also at risk of becoming passive smokers. The results of the study showed that respiratory complaints, such as coughs and colds, occurred 20% to 80% more often in children whose parents smoked compared to children of non-smoking parents. In addition, the possibility of children whose parents smoked to experience bronchitis and other lung infections was also twice as high compared to children whose parents did not smoke. Cigarette smoke can suppress the immune system, making children more susceptible to respiratory infections. Research shows that children exposed to cigarette smoke have a higher risk of developing bacterial and viral infections, which can cause bronchopneumonia. Toddlers exposed to cigarette smoke have a higher risk because their lungs are still small and their breathing frequency is higher compared to adults, so that

chemicals from cigarette smoke can more easily enter the body. Cigarette smoke residue and hazardous chemicals can stick to dust, be released back into the air, and react with oxidant gases in the indoor environment, such as ozone and nitric acid, to form nitrosamines which are toxic and carcinogenic. The oxidation process in the environment further increases the toxic properties of these substances. In addition, exposure to cigarette smoke through breathing can trigger excessive mucosal secretion, cause inflammation, and disrupt the function of the respiratory tract due to the chemical properties of cigarettes. This condition weakens the respiratory tract's defense against pathogenic agents, including those that cause pneumonia.^{26,28-30}

Exposed to pollution due to air pollution

Based on the research results obtained at the dr. Abdul Rivai Regional Hospital, Berau Regency in 2022-2023, it was found that the majority had risk factors for pollution due to air pollution, as many as 32 people (32%). This is in line with research conducted by Wardani, AC, Kalsum, U., & Andraimi, R. (2023) which found risk factors for air pollution from patients diagnosed with bronchopneumonia, namely (46.9%). Infants and toddlers are considered more susceptible to air pollution because their organs are not fully developed, and their cough reflex is also not optimal. More serious impacts can occur in children, such as respiratory disorders, and children who have allergies, such as asthma. A healthy home must be able to provide comfort, security, and support the safety and health of its occupants. Basic health needs in housing include three main aspects, namely adequate lighting, good ventilation, and normal air temperature and humidity.^{31,32}

According to the Berau Regency Environmental and Sanitation Service, the quality of the environment in Berau Regency is still in the good category, as evidenced by the Environmental Quality Index (IKLH), but factors that can affect the risk of increasing respiratory diseases include high rainfall, increasing temperatures, long dry seasons resulting in dust, and an increase in the number of vehicles. The increase in the number of motorized vehicles also contributes to the decline in air quality. This is exacerbated by high rainfall and increasing temperatures, which cause dust and other pollutants to accumulate in the air. Based on valid data from the East Kalimantan Central Statistics Agency (BPS), the number of motorized vehicles in Berau Regency in 2022 was recorded at 12,101 units, consisting of various types of vehicles such as motorbikes and cars. Until December 2024, the number of motorized vehicles in Berau increased drastically to 198.7 thousand units, dominated by motorbikes at 171.78 thousand units, followed by passenger cars at 14.16 thousand units, and loaded cars at 11.98 thousand units.

In addition, Berau Regency is one of the gateways for development in the northern part of East Kalimantan province which has the potential for non-renewable natural resources, such as mining, namely coal. Air pollution due to mining operations does not only occur at mining sites, but also in residential areas passed by coal trucks. Dust particle fine coal and vehicle exhaust fumes motorized is one of the example pollution that occurs.^{28,33}

Coughing and respiratory problems are related to air pollution from mining companies. Open pit mining operations release SO₂, N₂O, CO, and coal dust particles into the air. Coal mining activities produce dust and hazardous gas emissions that have the potential to pollute

the air. Dust produced from the mining, processing, and transportation stages of coal contains small particles that can be inhaled and cause health problems, especially in the respiratory system. Research indicates that respirable dust (particles measuring 1-3 μm) is the most dangerous because it can enter the lungs.³⁴

Factors that can increase the risk of developing bronchopneumonia include conditions that affect the immune system and exposure to vulnerable environments. Children under 2 years of age are at higher risk because their immune systems are not yet fully developed. In addition, people who work in hospitals or frequently visit hospitals are more susceptible to exposure to pathogens that can cause infection. A history of previous respiratory infections, such as flu and colds, can also increase susceptibility to bronchopneumonia. Conditions that weaken the immune system, such as HIV infection or autoimmune disorders, are also risk factors. Likewise, the presence of chronic diseases such as diabetes, heart disease, asthma, cancer, or chronic lung disease can worsen the body's vulnerability. Malnutrition also plays an important role because a body that is lacking nutrients tends to have a harder time fighting off infections. The combination of these factors can significantly increase a person's chances of developing bronchopneumonia.³⁵

CONCLUSION

Most of the bronchopneumonia patients at RSUD dr. Abdul Rivai Berau Regency are boys (63%) and mostly occur in children aged 12-59 months (53%). The main symptoms experienced by patients are coughing (31%), and the biggest risk factor found is exposure to pollution due to air pollution (29%). These findings indicate that the characteristics of bronchopneumonia patients at this hospital tend to be related to environmental factors and the age of children who are susceptible to respiratory diseases. Based on the results of the study, it is recommended to increase public awareness, especially parents, about the importance of exclusive breastfeeding, immunization, and creating a clean environment to prevent bronchopneumonia in children. In addition, it is necessary to develop more specific health programs for vulnerable children. Homes and schools should be designed to minimize the risk of respiratory tract infection transmission, and local governments need to evaluate and formulate data-based policies to reduce the incidence of bronchopneumonia, including restrictions on smoking habits at home. Further research is also needed to better understand the factors that contribute to the prevalence of bronchopneumonia, especially those related to the environment.

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