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Factors Related to The Incidence of Pneumonia in Toddlers at Karangrejo Metro Utara Community Health Center

Faktor-Faktor yang Berhubungan dengan Kejadian Pneumonia pada Balita di Puskesmas Karangrejo Metro Utara

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Abstract
Introduction: According to the World Health Organization (WHO), pneumonia accounted for 16% of deaths among children under five worldwide, with a total of 920,136 deaths in 2021. The Metro City Health Office (2021) recorded the highest prevalence was found at Karangrejo Public Health Center, with 288 out of 677 children affected (65.1%). **Objective**: This study aims to identify the factors associated with the incidence of pneumonia in children under five at Karangrejo Public Health Center, North Metro. **Method**: The type of research used is analytical with a case-control approach. The dependent variable is pneumonia, and the independent variables in this study are low birth weight, age of the child, and immunization status. The research sample consists of 36 pneumonia cases and 36 control respondents among children under five at Karangrejo Public Health Center, selected using systematic random sampling. Data collection was carried out using questionnaires, and statistical analysis was performed using the chi-square test. **Results**: Based on the study, it was found that 45.8% of children under five with low birth weight were at risk, 48.6% of children were at risk due to age, and 54.2% were at risk due to immunization status. The bivariate analysis showed a significant relationship between low birth weight and the incidence of pneumonia (p-value = 0.000), a significant relationship between the age of the child and the incidence of pneumonia (p-value = 0.000), and a significant relationship between immunization status and the incidence of pneumonia (p-value = 0.000). **Conclusion**: Low birth weight, age of the child, and immunization status are associated with the incidence of pneumonia in children under five. The researcher provided counseling regarding the various factors that can contribute to the occurrence of pneumonia in young children.

Kata kunci:
Berat badan lahir**,** Umur balita, Imunisasi, Pneumonia

Abstrak
Pendahuluan: Menurut WHO kematian pneumonia pada anak balita di dunia sebesar 16% dengan kasus kematian sebanyak 920.136 tahun 2021. Dinas Kesehatan Kota Metro (2021) mencatat pravelensi pneumonia yang tertinggi berada di Puskesmas Karangrejo diantaranya balita 288 diantara 677 balita (65,1%). **Tujuan:** Penelitian ini bertujuan untuk mengetahui faktor-faktor yang berhubungan dengan kejadian pneumonia pada balita di Puskesmas Karangrejo Metro Utara. **Metode:** Jenis penelitian bersifat analitik menggunakan pendekatan *case control.* Variabel dependen pneumonia dan variabel independen penelitian ini adalah berat badan lahir rendah, umur balita, status imunisasi. Sampel penelitian ini adalah pneumonia pada balita di Puskesmas Karangrejo sebanyak 36 kasus dan 36 kontrol responden dengan teknik *systematic random sampling*. Pengumpulan data menggunakan kuesioner dan uji statistik *chi-square*. **Hasil:** Berdasarkan penelitian didapatkan balita berat badan lahir rendah beresiko sebanyak 45,8%, umur balita beresiko sebanyak 48,6%, status imunisasi beresiko sebnyak 54,2%. Hasil analisis bivariat didapatkan terdapat hubungan antara berat badan lahir rendah dengan kejadian pneumonia (*p value* = 0,000), terdapat hubungan antara umur balita dengan kejadian pneumonia (*p value* = 0,000) dan terdapat hubungan status imunisasi dengan kejadian pneumonia (*p value* = 0,000). **Simpulan:** Berat badan lahir rendah, umur balita, dan status imunisasi berhubungan dengan kejadian pneumonia pada balita. Peneliti memberikan konseling terkait faktor-faktor apa saja yang dapat menyebabkan pneumonia pada balita.

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Introduction

Pneumonia is an illness characterized by a cold and cough accompanied by shortness of breath or rapid breathing. This disease primarily affects children under five but can also be found in adults and the elderly. Pneumonia is an infection that causes inflammation of the lungs, reducing their ability to absorb oxygen. A lack of oxygen impairs the body's functioning, and if the infection spreads throughout the body, it can lead to death (Misnadiarly, 2018).

According to UNICEF (2022), pneumonia accounted for 16% of the 5.6 million under-five deaths and killed approximately 880,000 children in 2021 (Astuti et al., 2022). Pneumonia occurs in many countries, including the Philippines, with 53,101 (10.0%) cases, and Malaysia, with 9,250 (12.0%) cases (Department of Statistics Malaysia, 2022). According to WHO, as stated by the Directorate General of Disease Prevention and Control, out of 6.6 million children under five worldwide, 1.1 million died from pneumonia in 2016. In 2020, WHO reported that pneumonia caused 16% of deaths among children under five, totaling 920,136 deaths in 2020.

Based on the 2021 Indonesian Health Profile, the pneumonia incidence rate in Indonesia was 20.54 per 1,000 children under five (Sari and Cahyati, 2019). The Metro City Health Office (2021) reported 7,024 cases of pneumonia in children under five. The highest prevalence was recorded at Karangrejo Public Health Center, with 288 out of 677 children (65.1%) affected. The second highest was at Yosodadi Public Health Center, with 424 out of 1,331 children (53.4%) affected. The lowest prevalence was found at Margorejo, Tejoagung, and Purwosari Public Health Centers, each with 0.0% cases.

Pneumonia is primarily caused by pneumococcal bacteria. Serotypes 1 to 8 cause more than 80% of pneumonia cases in adults, while in children, the common types are 14, 1, 6, and 9. Pneumonia in children under five is most often caused by respiratory viruses, with a peak incidence between the ages of 2 and 3 years. In school-aged children, it is commonly caused by *Mycoplasma pneumoniae* (Misnadiarly, 2018).

Risk factors for pneumonia in children under five include low birth weight, young age, and immunization status. These are influenced by poor nutrition during pregnancy, lack of exclusive breastfeeding, being under two years old, and exposure to unhealthy air (Misnadiarly, 2018). Pneumonia can also be linked to parental respiratory infections, alcohol consumption, smoking, low educational levels, and inadequate healthcare access (Misnadiarly, 2020). Pneumonia can lead to death in children due to coughing or difficulty breathing, as the lungs may have insufficient space for oxygen. It can also hinder growth in malnourished children, as proper growth depends on balanced nutrition and healthy eating patterns (Chomari, 2021).

Management of pneumonia in children with mild symptoms includes outpatient care, administration of antibiotics such as cotrimoxazole or amoxicillin twice daily for three days, and ensuring the child receives nutritious food. If the child is breastfeeding, it is recommended to continue exclusive breastfeeding until the age of two (Misnadiarly, 2018).

According to research by Rasyid (2013), there is a relationship between maternal education, child's gender, maternal occupation, exclusive breastfeeding, and immunization status with the incidence of pneumonia in hospitalized children under five (p=0.25). A study by Rigustia et al. (2021) showed a relationship between measles and DPT immunization and pneumonia incidence in children under five (p=0.00). Research by Aldirana (2019) found a significant relationship between the child's age and the incidence of pneumonia (p=0.002).

Based on a preliminary survey at Karangrejo Public Health Center in North Metro, 288 children under five (65.1%) were diagnosed with pneumonia. Based on this background, the researcher is interested in conducting a study titled: **"Factors Associated with the Incidence of Pneumonia in Children Under Five at Karangrejo Public Health Center, Metro City."**

Method

This research is a quantitative study using a case-control design with a retrospective approach. The study population consisted of children under six years old in Karangrejo Utara Village, totaling 288

children. The sample size was determined using the Dahlan formula (2016), resulting in 36 case samples and 36 control samples. Sampling was conducted using systematic random sampling, where samples were selected systematically at certain intervals from an ordered sampling frame. The total population was divided by the desired number of samples to determine the interval (x), and respondents were selected at multiples of that interval.

Inclusion criteria for the research sample were as follows:

1. Children under five years old living in Karangrejo
2. Children diagnosed with pneumonia
3. Children whose parents/guardians agreed to participate as respondents

Exclusion criteria were as follows:

1. Children no longer residing in Karangrejo
2. Children with comorbid diseases such as tuberculosis or heart disease

Data were collected using questionnaires distributed to the control group respondents (children without pneumonia), and risk factors were identified based on prior occurrences. The data were analyzed using univariate and bivariate analysis. The statistical test used was the Chi-square test to determine the relationship between birth weight, age of the child, and immunization status with the incidence of pneumonia in children under five.

Results

Description of Research Subjects

Table 1.
Characteristics of Respondents / Demographics of Research Subjects

Characteristics	Total	Percentage (%)
Birth Weight		
Risk	33	45,8
Less risk	39	19,3
Toddler age		
Risk	35	48,6
Less risk	37	51,4
Immunization status		
Risk	39	54,2
Less risk	33	45,8

This study was conducted on 72 respondents. The characteristics of the respondents were categorized based on birth weight, age of the child, and immunization status. Based on Table 1, out of the 72 respondents, 33 children (45.8%) had a history of low birth weight, 35 children (48.6%) were categorized as at-risk based on age, and 39 children (54.2%) had incomplete immunization status.

Analysis Results

Table 2.
The Relationship between Birth Weight and the Incidence of Pneumonia in Toddlers

Birth Weight	Pneumonia		No Pneumonia		Total		P *value*	OR CI 95%
	n	%	n	%	n	%		
Risk	6	16,7	27	75,0	33	100	0,000	0,067 (0,021-0,212)
Less risk	30	83,3	9	25,0	39	100		
Total	36	100	36	100	78	100		

Based on Table 2, the statistical results showed that among the 33 respondents categorized as at-risk due to low birth weight, 6 respondents (16.7%) experienced pneumonia. Among the 36 respondents who did not experience pneumonia, 39 respondents (75.0%) were classified as less at risk. The chi-square test analysis conducted using statistical software at a 95% confidence level yielded a p-value of 0.000 ($p < 0.05$), indicating that the null hypothesis (Ho) is rejected and the alternative hypothesis (Ha) is accepted. Therefore, there is a significant relationship between low birth weight and the incidence of pneumonia in children under five at Karangrejo Public Health Center.

Table 3.
The Relationship between Toddler Age and the Incidence of Pneumonia in Toddlers

Toddler Age	Pneumonia		No Pneumonia		Total		P *value*	OR
	n	%	n	%	n	%		CI 95%
Risk	31	86,1	4	11,1	35	100	0,000	49.600 (12.176-202.046)
Less Risk	5	13,9	32	88,9	37	100		
Total	36	100	36	100	72	100		

Based on Table 3, it was found that of the 35 respondents who experienced pneumonia, 31 respondents (86.1%) were classified as at risk based on age. Among the 37 respondents who did not experience pneumonia, 4 respondents (11.1%) were categorized as less at risk. The chi-square test analysis using statistical software at a 95% confidence level produced a p-value of 0.000 ($p < 0.05$), indicating that Ho is rejected and Ha is accepted. Thus, there is a significant relationship between the age of the child and the incidence of pneumonia in children under five at Karangrejo Public Health Center.

Table 4.
The Relationship between Immunization Status and the Incidence of Pneumonia in Toddlers

Immunization	Pneumonia		No Pneumonia		Total		P *value*	OR
	n	%	n	%	n	%		CI 95%
Risk	30	83,3	9	20,5	39	100	0,000	15.000 (4.719-47.68)
Less Risk	6	16,7	27	75,0	37	100		
Total	36	100	36	100	72	100		

Based on Table 4, the results showed that among the 39 respondents who experienced pneumonia, 30 respondents (83.3%) had an incomplete immunization status. Meanwhile, among the 37 respondents who did not experience pneumonia, 9 respondents (20.5%) were considered less at risk. The chi-square statistical test conducted with 95% confidence level showed a p-value of 0.000 ($p < 0.05$), which means Ho is rejected and Ha is accepted. Therefore, there is a significant relationship between immunization status and the incidence of pneumonia in children under five at Karangrejo Public Health Center.

Discussion

The Relationship between Low Birth Weight and the Incidence of Pneumonia in Toddlers

The results of the study showed that toddlers who experienced pneumonia with a history of low birth weight were at risk of 6 respondents 16.7% with OR=0.067 and CI=95% (0.021-0.212) based on a statistical test using *chi-square* and a confidence level of 95%, a p value of 0.000 was obtained, which means that there is a significant relationship between pneumonia and birth weight in toddlers. OR>1 then birth weight is a risk factor for pneumonia. The results of this study are in line with previous research conducted by Aldriana (2014) in the work area, it was found that there is a relationship between low birth weight and the incidence of pneumonia in toddlers *p value = 0.005. The results of* Kartika's (2019) research in the DKI Jakarta area that there is a relationship between low birth weight and pneumonia were obtained with *a p=value* of 0.001. Toddlers who experienced pneumonia with a history of low birth weight as many as 6 respondents (16.7%) parents did not know that toddlers with a history of low birth weight were very susceptible to pneumonia.

Toddlers with a history of BBLR will be more susceptible to infection, infectious disease itself is one of the direct causes of nutritional events in mothers starting during pregnancy and it is expected that pregnant women carry out pregnancy examinations in accordance with standards to monitor the growth and development of the fetus during pregnancy. Babies with low birth weight (BBLR), the formation of imperfect anti-immune substances, are at risk of infectious diseases, especially pneumonia, so that the risk of death is greater than normal birth weight.

Toddlers with a history of normal birth weight of 75.0% do not mean that normal birth weight will not experience pneumonia because pneumonia is very susceptible to the body of toddlers, it can be from other factors such as an environment with polluted air, parents who smoke, and even houses are

around landfills, therefore health awareness is very beneficial for all families researchers suggest to maintain health and maintain immunity because it is very means for the health of yourself or others.

The researcher provides counseling to the public using brochure media related to a clean and healthy lifestyle, especially to consume very nutritious foods to prevent and maintain pregnancy from an early age, to avoid unwanted things. Pregnancy is very vulnerable if not taken care of early affection, support and attention are very important for pregnant mothers are very necessary, researchers provide counseling to the community about health in babies and toddlers to avoid various health problems, especially from environmental health problems such as unhealthy air problems and a nutritious diet and what are good foods for toddlers. Toddlers with low birth weight are very susceptible to diseases such as pneumonia, so researchers provide knowledge about what factors are factors that cause pneumonia itself from an early age and what must be avoided and implemented to keep toddlers from pneumonia itself.

The Relationship between Toddler Age and the Incidence of Pneumonia in Toddlers

The results showed that of the 72 respondents under five with a risk age, 35 respondents (48.6%) and there were 37 respondents (51.4%) under five with a less risk age. The results of this study show that it is higher than that of the study of Regustia, et al. (2021) in the Palembang area from 58 respondents aged under five who experienced pneumonia (29.6%).

Toddlers have a weak body defense mechanism compared to adults. So that toddlers are prone to influenza and pneumonia, this is caused by imperfect immunity and relatively narrow respiratory tract. Severe pneumonia is characterized by coughing or difficulty coughing, shortness of breath, or *severe chest inward withdrawal* in children aged 2 months to less than 5 years. In the age group of toddlers, it is also known as very severe pneumonia with symptoms of coughing, difficulty breathing accompanied by symptoms of central cyanosis and not being able to drink. Meanwhile, for children under 2 months, severe pneumonia is characterized by a respiratory frequency of 60 times per minute or more there is a strong pull on the chest wall.

Toddlers are a very vulnerable age to various diseases, especially diseases derived from food bacteria that they consume from the environment where they live. The age of toddlers who are still vulnerable due to weak immunity, parental assistance is very meaningful for children so that parents know the development and growth of their children. Growth and development during the age of toddlers is the age when children begin to actively carry out daily activities and children's curiosity is getting higher, therefore parents are very important in taking care of their children.

The researcher provides counseling to the community about health in babies and toddlers to avoid various health problems, especially from environmental health problems such as unhealthy air problems and a nutritious diet and what foods are good for toddlers.

The Relationship between Immunization and the Incidence of Pneumonia in Toddlers

The results of the study showed that 30 respondents (83.3%) were toddlers who experienced pneumonia with a history of not being immunized against measles and DPT at risk. The results of the statistical test using *chi-square* obtained a p value of 0.000 which means that there is a relationship between immunization status and the incidence of pneumonia in toddlers with results of OR=15,000 and CI=95% (4,719-47,680), meaning that immunization status is very likely to experience pneumonia. OR>1 immunization status is a risk factor for toddlers to develop pneumonia. The results of another study showed a difference, namely there was no relationship between immunization, and differences based on statistical tests by Yushananta (2017) in Bandar Lampung. However, the same as the results of research conducted by the United States for 10 years which showed that measles vaccination plays a role in reducing the mortality rate due to pneumonia and research conducted by Kartika (2019) which stated that toddlers who did not get measles immunization had a 2.3 times greater risk of suffering from pneumonia compared to toddlers who did measles immunization.

Toddlers with an incomplete history of immunization will be more susceptible to influenza, influenza and pneumonia itself are one of the direct causes of the incidence in toddlers and it is

expected that health workers provide counseling about the benefits of immunization for infants and toddlers and what are the impacts that occur if they do not immunize. Immunization status affects a person's immune system or immunity. The more complete the immunization, the more the immune system will increase. Immunization greatly affects the health condition of the baby, because immunizations that are given in full will work more optimally in protecting the baby's body against various types of infectious diseases than incomplete greatly affecting the health of the toddler itself.

Immunization is very important to maintain children's immunity or immunity because immunization can prevent and protect children from various diseases. Toddlers are one of the most vulnerable to viruses or bacteria, immunization can prevent the bacterial disease itself. But there is still a lack of parental knowledge about the importance of immunization, because there are still many parents who do not do check-ups or do not follow the posyandu in their villages, there are still many toddlers who are not fully immunized according to the schedule that has been given on the grounds that their children are fine and there have been no health problems so far without knowing the impact.

Researchers advise all parents to immunize toddlers according to the age or schedule determined because immunization is very beneficial to maintain the immunity of toddlers themselves. Counseling is very good to add insight to families, especially families who do not know the importance of immunization. Measles and DPT immunization is one of the risk factors for pneumonia in toddlers, so researchers provide advice to immunize on time and according to schedule.

Conclusion

Based on the results of analysis and discussion of factors related to the incidence of pneumonia in toddlers at the Karangrejo Health Center in 2020, it can be concluded that the proportion of toddlers with a history of low birth weight is 45.8%, the proportion based on the age history of toddlers is 48.6%, and the proportion based on a history of immunization status is 54.2%.

The results of bivariate analysis showed a significant relationship between birth weight history and the incidence of pneumonia in toddlers with a p-value of 0.000. In addition, there was a significant relationship between the age of toddlers and the incidence of pneumonia with a p-value of 0.000, as well as a significant relationship between immunization status and the incidence of pneumonia in toddlers, also with a p-value of 0.000.

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