
The Effect of Residential Characteristics and Use of Firewood on the Incidence of Acute Respiratory Infections in Children Under Five (Study in The Area of Ndao Islands, Rote Ndao Regency)

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Abstract

The Ndao Islands are remote islands in the Rote Ndao Regency area. The people of the Ndao and Nuse Islands have a distinctive culture in cooking, where most people still live simply by living in houses with roofs of leaves or thatched, houses that are also built with boards or coconut fronds, and also the house that still uses earthen floors and cement floors. Acute respiratory infection (ARI) is still a major health problem in the world. This disease is the main cause of infectious disease morbidity and mortality worldwide with an incidence of 18.8 billion cases and the number of deaths of 4 million people each year. This research was conducted to determine the determinant factors for the incidence of acute respiratory infection in children under five in the Ndao Islands region of Rote Ndao Regency. This type of research is an analytic survey research with a cross sectional design. This research was conducted in the area of the Ndao Islands, Ndao Nuse sub-district, Rote Ndao regency.

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A total of 118 children under five and their mothers who have met the inclusion and exclusion criteria were determined proportionally to the random sampling. The independent variables studied were the characteristics of the dwelling including the type of floor, the type of wall, the type of roof, and the use of firewood. Data analysis used simple logistic regression test. The results of the analysis showed that there was a significant relationship between the use of firewood ($p = 0.011$; OR = 9.18) and the type of floor ($p = 0.009$; OR = 10.44) with the incidence of acute respiratory infection, while there was no significant relationship between types of roofs. ($p = 0.898$; OR = 0.898), and the type of wall ($p = 0.307$; OR = 3.116) with the incidence of acute respiratory infection. From this study it can be concluded that the use of firewood and the type of floor has an effect on the incidence of acute respiratory infection among children under five in the Ndao Islands area.

Keywords: Acute Respiratory Infection; Children under five; Occupancy Characteristics.

1. Introduction

The Ndao Islands are remote islands in the Rote Ndao Regency area. These islands are included in the Ndao Nuse sub-district which consists of three islands, namely Ndao Island, Nuse Island, and Do, o Island. The people of the Ndao and Nuse Islands have a unique culture in cooking, where until now the people of the Ndao and Nuse Islands still believe that fossil fuels such as wood (coconut shells) can make food delicious and fragrant and this has become a culture until now. Most of the people of Ndao and Nuse islands still live simply by living in houses with roofs of leaves or thatched, houses that are also built with boards or coconut fronds, with the house that still uses earthen floors and cement floors. This is due to the location of the islands which are far from the regency so that the people live in accordance with the existing regional conditions[1]. The physical factors of the house include the type of floor, the type of roof, the type of wall where the type of floor, roof, and wall is related to the cleanliness conditions of a house. The walls of the house that are not good, such as there are holes and cracks or made of materials that allow microorganisms to live and reproduce, will allow the increase of various acute respiratory infection (ARI) disease agents such as air pollutants and bacteria in the house[2]. [3]said that children under five who live in houses with poor wall conditions have a 1.13 times greater risk of contracting acute respiratory infection compared to the children who live in houses with plastered walls. Socio-economic factors can also influence the incidence of acute respiratory infection in a region. People who have low economic status or are categorized as poor people tend to have a place to live or house that does not meet health requirements, besides that the inability to meet the need for nutritious food can also occur so that the community will be more susceptible to disease including acute respiratory infection[4]. One of the causes of acute respiratory infection is air pollutants. These air pollutants can come from various human activities in the house, such as cooking. Houses that still use fossil fuels for cooking such as firewood or kerosene will produce higher air pollutants, so this has a major contribution to the occurrence of acute respiratory infection in children under five[5]. Acute respiratory infection (ARI) is still a major health problem in the world. This disease is the main cause of infectious disease morbidity and mortality worldwide with an incidence of 18.8 billion cases and the number of deaths of 4 million people each year[6]. Globally, Acute respiratory infection is the 7th largest cause of environmental-related deaths[7]. Acute respiratory infection is a disease that often occurs in children, because the child's immune system is still low. The incidence of colds in children under five years old in Indonesia is estimated to be 3 to 6 times per year, which means a child under five on average gets bouts of colds

3 to 6 times a year[8]. Reference [7] estimates that the incidence of acute respiratory infections in developing countries with under-five mortality rates above 40 per 1000 live births is 15% -20% per year in Indonesia. Acute respiratory infections always rank as the first cause of death in infants and toddlers. Data from District/City Health profiles in NTT shows that acute respiratory infections coverage in 2014 was 3,714 cases (13%), while in 2015 there were 3,079 cases (4.94%), in 2016 3,683 cases (5.87%) , and in 2017 of 6,059 cases (9.99%), means that there has been a decrease in 2015 compared to 2014 and slightly increased again in 2016 and 2017 [9].The fluctuating increase in acute respiratory infection cases in Rote Ndao Regency from 2014-2017 where in 2014 there were 751 cases (10%), in 2015 there were 1,953 cases (10%), in 2016 there were 2,014 cases (10%) and in 2017 as many as 1,407 cases (10%) [9]. On the other hand, research conducted in the archipelagic region is still limited in relation to the incidence of acute respiratory infections, especially in children under five, so the focus of this study is to determine the factors causing the incidence of acute respiratory infections in children under five in the archipelago.

2. Materials and Methods

This type of research is cross sectional. The research was carried out in the Ndao Islands, Ndao Nuse district, Rote Ndao regency, with the research location focused on the Ndao Puskesmas. This research was conducted in March 2020. The sample of the study was all mothers who had children under five and then met the inclusion and exclusion criteria, which amounted to 118. The factors in the research studied were the type of floor, the type of roof, the type of walls, and the habit of using firewood which were the causes of acute respiratory infections disease. The partial relationship between acute respiratory infections incidence in children under five was analyzed using simple logistic regression.

3. Results

3.1. Characteristic of Samples

Characteristic of the respondents based on mother's age and babies' sex.

Table 1: Characteristic of the respondents

Characteristic	Criteria	n	%
Mother's age	18-20 y.o	6	5,1
	21-30 y.o	41	34,7
	31-40 y.o	51	43,2
	> 40 y.o	20	16,9
Gender of Toddler	Male	53	44,9
	Female	65	55,1

Table 1. showed that most of the respondent's mothers were 31-40 years old with a total of 51 respondents (43.2%). In addition, the majority of respondents who suffered from acute respiratory infections were females with a total of 65 respondents (55.1%).

3.2. The relationship of factors causing the incidence of acute respiratory infections in children under five

The factors causing the incidence of acute respiratory infections in children under five studied in this study include the use of firewood, type of floor, type of roof, and type of wall. The relationship of each of the factors causing the incidence of acute respiratory infections in children under five can be seen in table 2.

Table 2: The relationship between independent variables and the incidence of acute respiratory infections in children under five

Independent Variables	Criteria	n	%	<i>p</i>
Use of Firewood	Use Firewood	104	88,1	0,011
	Do not Use Firewood	14	11,9	
Type of Floor	Semen/Earthen	96	81,4	0,009
	Ceramic/Tile	22	18,6	
Type of Roof	Leaf/ Thatched	56	47,5	0,898
	Metal/Tile	62	52,5	
Type of Walls	Board/Coconut Fronds	44	37,3	0,307
	Wall	74	62,7	
Dependent Variable	Criteria	n	%	
The Incidence of Acute Respiratory Infections	Yes	112	94,9	
	No	6	5,1	

Table 2. showed that most of the respondents who suffered from acute respiratory infections and used wood as cooking fuel as much as of 88,1%, houses that used cement / earthen floors as much as of 8,4%, houses with metal / tiles roof as much as 52,5%, and houses with walls with a total of 62,7%. Most of all respondents suffered from acute respiratory infections with a total of 94.9%. The results of the statistical test for the variable use of firewood obtained p value = 0,011, the variable type of floor obtained p value = 0,009, the variable type of roof obtained p value = 0,898, and for the variable type of walls obtained p value = 0,307. Statistical analysis showed that the use of firewood ($p = 0,011$), floor type ($p = 0,009$), had a significant relationship with the incidence of acute respiratory infections in children under five, while the type of roof ($p = 0,898$), and the type of walls ($p = 0,307$) had no relationship with the incidence of acute respiratory infections in children under five.

4. Conclusion

4.1. Relationship between the use of firewood and the incidence of acute respiratory infections in Toddlers

One of the causes of acute respiratory infections is air pollutants. These air pollutants can come from various human activities in the home, such as cooking, using mosquito coils, and smoking. Houses that still use fossil fuels for cooking such as firewood or kerosene will produce higher air pollutants. The results of the analysis conducted showed that there was a significant relationship between the use of firewood and the incidence of acute respiratory infections in children under five in the Ndao Islands, Rote Ndao Regency, which means that the children under five who lived at home using fossil fuels such as coconut shells or wood had a risk of 9,18

times and had 97% a chance of having acute respiratory infections. This is in line with research conducted by [10] which showed that the incidence of acute respiratory infections was 4,312 times riskier for children under five whose homes used firewood for cooking compared to ones whose homes used gas or kerosene fuel. Reference [11] in their study showed that there was a 1,27 times greater risk for children to suffer pneumonia if they lived in a house that used polluting fuels compared to those using electricity or gas. Of all the respondents studied, it was seen that most of the respondents (88,1%) used fossil fuels such as coconut shells or wood as cooking fuel at home with the assumption that cooking using coconut shells or wood made the dish fragrant and much tastier than use electronic cooking utensils or use electricity and gas. From the results above, it can be concluded that the use of firewood has a significant effect on the incidence of acute respiratory infections.

4.2. Relationship Between Floor Types and the Incidence of acute respiratory infections in Toddlers

The type of floor relates to the cleanliness conditions of a house. Based on the criteria for a simple healthy house applied in Indonesia, a house must have a dry floor and be easy to clean. These requirements can be met if the floor of the house is made of ceramic tiles. The results of the analysis showed the effect of the type of residential floor with the incidence of acute respiratory infections in children under five ($p = 0,009$) in the Ndao Islands area, Rote Ndao Regency, which means that children who lived in houses with cement or earthen floors had 10,44 times risk and 97% chances of experiencing acute respiratory infections. This is in line with research conducted by [12] which showed that the type of floor in the house was significantly associated with the incidence of acute respiratory infections in children under five. The same research conducted by [13] also showed that the condition of the floor was one of the environmental factors of the house that was related to the incidence of pneumonia. This is reinforced by the results of research by [14] which stated that there was a significant relationship between the type of floor of the house and the incidence of acute respiratory infections, where children who lived in a house with this type of floor that did not meet these requirements had a 3,538 times greater risk of suffering from acute respiratory infection than those who live in houses with this type of floor qualify. From the results of observations made by researchers, 61.9% of the houses inhabited are in the category of soil and semen floors that do not meet the criteria for a simple healthy house and this is a source of triggers for carrying out acute respiratory infections. This reflects a significant relationship between floor types and the incidence of acute respiratory infections disease.

4.3. Relationship between types of roof and the incidence of acute respiratory infections in Toddlers

The type of roof relates to the cleanliness conditions of a house. Based on the criteria for a simple healthy house applied in Indonesia, a house must have a roof made of tile or metal and not leak, equipped with a ceiling. A house that is roofed using leaves or grass is very likely for microorganisms to reproduce and become a source of disease transmission. This is in line with research conducted by [15] which showed that there was a significant relationship between types of roofs and the incidence of acute respiratory infections. The results of the analysis did not have a significant relationship between the type of roof and the incidence of acute respiratory infections in children under five ($p = 0,898$). This means that the children under five who live in the area of the Ndao Islands and live in houses with metal or tiles roof have a 0,898 times risk of experiencing acute respiratory infections compared to houses with leaf or thatched roof that have a 94% chance of experiencing acute

respiratory infections. This is different from research conducted by [3] which showed that there was a significant relationship between the type of roof and the incidence of acute respiratory infections in Gampong Blang Muko, Kuala District, Nagan Raya Regency. From the results of observations from researchers, it showed that more respondents owned houses with metal/tiles roof than respondents who owned houses with leaf/thatched roof types. This does not rule out that the type of roof also has a relationship with the incidence of acute respiratory infections in children under five, seen from the number or condition of the roof. From this, the variable type of roof does not have a significant relationship to the incidence of acute respiratory infections.

4.4. Relationship Between Types of Walls and the incidence of acute respiratory infections in Toddlers

The type of wall in the house will determine the quality of the air in the house. The walls of the house that are not good, such as there are holes and crevices or are made of materials that allow microorganisms to live and reproduce, will allow the increase of various agents of acute respiratory infections pneumonia such as air pollutants and bacteria in the house. The results of the analysis carried out showed that there was no significant relationship between the type of wall and the incidence of acute respiratory infections in children under five in the Ndao archipelago, Rote Ndao Regency, meaning that children who lived in houses with wall made from concrete had a 3,11 times risk of experiencing acute respiratory infections compared to houses with clapboard or coconut fronds walls that had a 97% chance of experiencing acute respiratory infections compared. This is different from the research conducted by [16] which showed that the type of house walls has an effect on the incidence of acute respiratory infections in children under five, where under-five who live in a house with poor wall conditions have a 1,13 times greater risk of developing the disease compared to those who live in houses with plastered walls. The results of this observation found that most of the respondents' houses already had permanent walls, plastered, and painted according to the healthy house category when the researchers observed. Thus, the type of wall has no relationship or influence on the incidence of acute respiratory infections.

5. Conclusion

The incidence of acute respiratory infections among children under five in the Ndao Islands region is influenced by the use of firewood for cooking and the type of floor in the house with the risk magnitude is 9,18 and 10,44 times, respectively. This means that children under five whose families often use firewood for cooking have 9,18 times risk of contracting acute respiratory infections compared to those whose families rarely use firewood for cooking. The children under five years old who live in houses with earthen floors have 10,44 times risk of getting acute respiratory infections compared to toddlers who live in houses with cement floors. This problem can be prevented gradually on the basis of health education and services that are more effective and understand the public about acute respiratory infections disease.

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