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The Relationship Between The Physical Environment Of The House And Family Behavior With The Incidence Of Acute Respiratory Disease In Toddlers In The Koeloda Health Center

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Abstract
Introduction: Acute respiratory infection (ARI) is a disease that affects the respiratory tract, including the nose, throat, and lungs. Based on data from the Ngada Regency Health Center, ARI remains a serious problem and continues to increase from 4,92% in 2020 to 5.54% in 2021. This study aimed to determine the relationship between the physical environment of the home and family behavior and the Incidence of ARI in toddlers.
Method: Observational analytical research with a cross-sectional design was used. The population in this study were all toddlers in the Koeloda Health Center area, totaling 357 toddlers and the sample in this study were some of the toddlers totaling 185 toddlers. Random cluster sampling was used in this study. Data collection was conducted through interviews using research instruments in the form of questionnaires, and measurements using research instruments in the form of *roll* meters. This analysis uses the Chi square test
Results :
The results showed that there was a relationship between the type of household fuel (P=0.007), behavior of bringing toddlers to the kitchen (P= 0.002), and Incidence of ARI in toddlers. There was no relationship between room occupancy density (P = 0.078), ventilation area (P =0.235), floor type (P =0.291), and smoking behavior (P =1.000) and the incidence of ARI.
Conclusion :
There is a relationship between the type of household fuel and the behavior of bringing toddlers to the kitchen when cooking, and the Incidence of ARI in toddlers.

Keywords: Toddlers, ARI, Home Physical Environment, and Behavior

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Introduction

Acute respiratory infection (ARI) is a common disease that occurs in communities and is often considered normal or harmless. ARI is a disease of the upper or lower respiratory tract, usually infectious, which can cause a wide spectrum of diseases ranging from

asymptomatic to severe and fatal, depending on the causative pathogen, environmental factors, and host factors.[1]

The WHO data show that the morbidity and mortality rates of this disease are quite high in children and toddlers. The death of children under five is a health problem worldwide. As many as 1,500 children under five in the world die daily. In 2017, the total number of deaths of children under five reached 5.4 million. ARI contribute to 16% of all deaths in children under 5 years of age worldwide, amounting to 920. A total of 136 children under five died, or more than 2,500 children under five died per day.

In Indonesia, based on the Indonesian health profile in 2020, it shows that in 2019, the number of visits by children with coughing or difficulty breathing was 7,047,834; in 2020, it became 4,972,553, a 30% decrease from visits in 2019, which ultimately had an impact on the discovery of toddler pneumonia. Meanwhile, Indonesia's 2021 profile data show a decline in cases to 4,432,177, which ultimately has an impact on the discovery of pneumonia in toddlers.

ARI cases in NTT based on data from the 2019 Provincial Health Profile are still the number 1 disease in the 10 most common diseases in health centers and hospitals among outpatients. NTT has the highest number of ARI cases in Indonesia. In 2019, the incidence were 15.4%, and in 2021, it was 16.08%.[2.]

In the Ngada Regency, ARI is still a serious problem that needs to be addressed. According to data from the Ngada Regency Health Center from 2020 to 2022, it has continued to increase and still dominates the 10 largest diseases from 16 health centers in Ngada Regency. The incidence of ARI in the Ngada Regency in 2021 was 10.72%, and in 2022, it was 6.30%. Based on the data, the Tahat Koeloda Health Center is ranked 4th out of 16 community health centers in the Ngada district as a contributor to the ARI problem, with an incidence of 4.92% and 5.54% in 2021 and 2022, respectively.

In general, the risk factors for ARI are the physical environment, host, agent, and social environment. Agents include bacteria, viruses, and fungi. Physical environmental factors include air pollution in the house and the physical condition of the house, such as residential density, floor type, wall type, and house lighting. Social factors included parents' work, mothers' education, and family members' smoking behavior.[3]

The quality of air in the house is closely related to the physical sanitation of the house and affects the health of the occupants, especially children under five years of age. Unhealthy home environments facilitate the occurrence of various diseases. Acute Respiratory Tract Infection (ARI) is an environment-based disease transmission. Physical sanitation at home that does not meet health requirements can provide the right environment for the growth and proliferation of bacteria that cause ARI in toddlers. Ventilation areas that do not meet these requirements can affect humidity conditions in the room, and residential density in a room can accelerate the transmission of disease. [4]

The initial survey showed that the majority of people in the Koeloda Health Center area have semi-permanent houses rather than permanent houses. In addition, the majority of people in the Koeloda Health Center area still use firewood as a fuel in their households. This is because the temperature in the Golewa sub-district area is cold and the rainfall is quite high; therefore, people in this area use more wood as the main fuel in the household, in addition to the prices of kerosene and gas being quite expensive. This supports people's preference for firewood as the primary household fuel. Therefore, people in the Koeloda Health Center area, especially babies and toddlers, experience many disorders and infections of the respiratory tract or ARI. This is because the condition of the house is inadequate and does not meet the criteria for a healthy house.

Based on the background description above, is there a relationship between house ventilation, residential density, type of house floor, type of household fuel, behavior of bringing

toddlers to the kitchen when cooking, and smoking behavior in the family, with Incidence of ARI in toddlers. The aim of this study was to determine the relationship between the physical environment of the home and family behavior with Acute Respiratory Infections (ARI) in toddlers in the working area of the Keoloda Health Center.

Methods

This type of research is an observational analytic study with a cross-sectional design that studies the relationship/correlation between risk factors and their impacts by approaching, observing, or collecting data at one time. This research was conducted in the working area of the Koeloda Health Center during the research period from February 1 to February 28, 2024. The population in this study was toddlers in the Koeloda Health Center area, totaling 357 toddlers and 185 toddlers. In this research, the method of determining which toddlers suffer from ARI was by using diagnoses from health workers when carrying out toddler posyandu in 10 villages in the working area of the Koeloda Health Center.

Sampling is carried out using techniques *such as* random or random sampling by dividing the population into several sections or groups that will be used as samples in this study. Data collection techniques were carried out through interviews using research instruments in the form of questionnaires, and measurements using research instruments in the form of *a roll* meter. The ventilation variable is said to be not at risk, namely at least 10% of the floor area of the house and risky if it is less than 10% of the floor area of the house. The residential density variable is said to have no risk if the area is at least 8 m^2 per person, and for a bedroom, a minimum of two people are required. The bedroom should not be occupied by more than two people, except for the husband, wife, and children under two years old. The floor-type variable is said to be not risky if smooth ceramic floors, tiles, and cement floors are used, while it is risky if dirt floors are used. The variable type of household fuel is said to have no risk if kerosene or gas stoves are used, whereas it is risky if firewood is used. The behavioral variable of bringing toddlers to the kitchen when cooking is said to be no risk if toddlers are not brought to the kitchen when cooking, whereas it is risky if you bring toddlers to the kitchen when cooking. The smoking behavior variable is said to be not risky if there are no family members in the house who smoke, whereas it is risky if there are family members in the house who smoke. Data were analyzed using the chi-square test with a confidence level of 95% and a significance level of a=0.05, to determine the relationship and closeness of the relationship between independent variables (house ventilation, room occupancy density, floor type, type of household fuel, behavior of bringing toddlers to the kitchen, and smoking behavior of family members) and the dependent variable (incidence of ARI in toddlers).

Results

Table 1 shows that from the six variables studied, there are two variables that have a relationship, namely, the household fuel type variable with a p-value = 0.007 and the behavior variable of bringing toddlers to the kitchen while cooking with a p-value = 0.002. In the household fuel type variable, there were more ARI cases in the risky fuel type, namely firewood, with 101 people (72.1%). Regarding the behavioral variable of bringing toddlers to the kitchen while cooking, it was also found that ARI cases occurred more frequently in risky behavior, namely bringing toddlers to the kitchen while cooking (121 people, 69.5%).

Variables that had no relationship were house ventilation, residential density, floor type, and smoking behavior of family members, with a p-value greater than 0.05.

Tabel 1 Relationship between the independent variable and the dependent variable

No	Variabel independen	Incidence of ARI				*p-value*
		ARI		Not ARI		
		N	%	N	%	
1	Home Ventilation					
	Risk	80	70,2	34	29,8	0,235
	No Risk	43	60,6	28	39,4	
	Residential Density					
2	Risk	64	73,6	23	26,4	0, 078
	No Risk	59	60,2	39	39,8	
3	Types of Floors					
	Risk	51	71,8	20	28,2	0, 291
	No Risk	72	63,2	42	36,8	
4	Types of Household Fuel					
	Risk	101	72,1	39	27,9	0,007
	No Risk	22	48,8	23	51,2	
5	Behaviors for Bringing Toddlers to the Kitchen While Cooking					
	Risk	121	69,5	53	30,5	0,002
	No Risk	2	18,2	9	81,8	
6	Smoking Behavior of Family Member					
	Risk	89	66,4	45	33,6	1.000
	No Risk	34	66,7	17	33,3	

Discussion

The Relationship Between Ventilation and the Incidence of ARI in Toddlers

Ventilation in the house functions as air circulation or air exchange because fresh air is needed in the house. Poor ventilation causes respiratory health problems for the occupants. Good ventilation requirements include ventilation, which has an area of at least 10% of the floor area of the house.

Based on the research results, there was no significant relationship between house ventilation and the incidence of ARI in toddlers in the Koeloda Health Center area. This is because respondents have the habit of opening windows every day so that circulation in the house continues smoothly.

This study is in line with research conducted by Agungnsia (2017) in East Kalinget Village, which stated that the ventilation area did not have a significant relationship with the incidence of ARI in toddlers in East Kalinget Village.

Based on a study conducted in the Koeloda Community Health Center area, there are many house ventilation areas that do not meet the requirements; however, the majority of respondents have the habit of opening windows every day so that air exchange in the room continues to run smoothly, and there is no accumulation of microorganisms in the house, so house ventilation is not related to the Incidence of ARI in toddlers.

The Relationship Between Residential Density and the Incidence of ARI in Toddlers

Healthy home requirements based on Minister of Health Decree No. 829 of 1999 stipulate that the area of the bedroom is 8 $m^{2,}$ and it is not recommended for more than two people to live in, except for children under 2 years old. If the residential density is too high, it will cause a lack of oxygen consumption (O_2) so that the room can become a living medium for disease agents, especially respiratory tract infections (ARI). [5]

This study is in line with the research conducted by Dani (2020) in the work area of the Rasimah Ahmad Bukittinggi Health Center, which found no significant relationship between the density of toddler rooms. This proves that the condition of overcrowding in toddler rooms is not related to the incidence of ARI in the work area of the Rasimah Ahmad Health Center, which is located in Aua Tajungkang Tangah Sawah Village.[6]

This was because the residential density of more than 98 respondents (53%) met the requirements. Another supporting factor is the respondent's habit of always opening the windows every day so that the air circulation in the room remains smooth and the air in the room remains maintained so that there is no buildup of bacteria and germs that cause disease, especially those that cause diseases of the respiratory tract; therefore, even though the room is occupied by two people, it is not a risk factor for ARI.

This study is in line with previous research by Ningrum (2015), who found no relationship between residential density and the incidence of ISPA in toddlers (P=0.281). A large number of people living in the house can increase the room temperature. However, in this study, there was no significant relationship between residential density and ARI incidence in toddlers.

The Relationship Between Floor Type and the Incidence of ARI in Toddlers

A good floor is a floor that is dry and not damp, while a bad type of floor is a floor that is made of dirt or one that is not tiled. In addition, the floor must be waterproof and easy to clean.[7]

The results of the study showed that there was no significant relationship between the type of floor and the incidence of ARI in toddlers at Koeloda Health Center. This is because there are more respondents at the Koeloda Health Center who have floor types that meet the requirements (floor types in the form of smoothed cement floors and tiles/ceramics), and only a portion of respondents have floor types that do not meet the requirements because they still use dirt floors. The floor is made of cement that has not been plastered, so the floor can easily become dusty.

This study is in line with research conducted by Septian (2021) in Pangandaran Regency regarding the relationship between physical sanitation of residential homes and the incidence of ARI in toddlers, which stated that some respondents had floors that were waterproof and made of ceramic and had been plastered, so easy to clean.[8]

This is because of the 185 respondents at the Koeloda Health Center; the number of respondents who had a floor type that met the requirements (floor type in the form of polished cement floor and also tile/ceramic) was 114 (61.6%). In addition, people in the Koeloda Health Center area also have the habit of cleaning their floors every day, so that the floors remain clean and dust-free.

The Relationship Between Types of Household Fuel and the Incidence of ARI

Kitchen smoke can also cause respiratory problems. Burning in the home kitchens is a source of air pollution. Health effects will occur if the levels of pollutants increase, resulting in disease.

The results of this research show that there is a significant relationship between the type of household fuel and the incidence of ARI in toddlers in the Koeloda Health Center. In this study, the fuel that is mostly used by the Koeloda community is firewood. Considering that this area still has many forests and produces wood, people tend to use wood or similar materials as fuel. In addition, this fuel is very cheap and easy to obtain compared to the expensive prices of kerosene and gas, so people prefer to use firewood as a fuel mainstay in the household. Based on direct observations made by researchers, the high incidence of ARI is also caused by the fact that most kitchens are located in the house and are not separated from the main house, where exposure to kitchen smoke using firewood is dangerous if inhaled by toddlers.

This study is in line with the research conducted by Herawati (2018), who stated that there was a relationship between the use of cooking fuel and the incidence of ARI at the Beber Health Center in 2015. After burning, wood fuel produces CO and CO2 gases. These two types of pollutants are not required by humans because they are dangerous to health and can cause poisoning if inhaled in large quantities. A person who inhales CO gas will experience poisoning, changes in heart and lung function, headaches, nausea, and difficulty breathing, which can cause death. .

Other research that is in line with this research is research conducted by Putri & Mantu (2019) in Ciwandan District, Cilegon City for the period July – August 2016, with a cross-sectional design showing that there is a significant relationship between the type of cooking fuel and the Incidence of ARI in toddlers.

Based on the problems above, several things that can be done to reduce or prevent the incidence of ARI, especially in toddlers, are to maintain air circulation in the kitchen smoothly by using good ventilation or smoke exhaust holes so that kitchen smoke resulting from household combustion does not accumulate in the room.

The Relationship Between the Behavior of Taking Toddlers to the Kitchen and the Incidence of ARI in Toddlers

The degree of pollution created by fuel-using wood is much greater than that of fuel-using gas because the smoke produced by firewood is greater than that produced by oil or gas stoves. Several studies have shown that exposure to pollution in rooms increases the risk of acute respiratory infections in children. As a result of the use of biomass fuel, gases such as carbon monoxide, nitrogen oxide, SP2, ammonia, hydrochloric acid, and hydrocarbons such as formal dehide, benzene, and benzo pyrene are potential carcinogens, and particulates (SPM: suspended particulate matter), hydrocarbons, and CO are present at high levels. the big one. Some substances contained in biomass fuel are pollutants that are dangerous to health and can cause various infectious diseases, such as Acute Respiratory Infections (ARI).[9]

The results of the study showed a significant relationship between the behavior of bringing toddlers to the kitchen and the incidence of ISPA in toddlers in the Koeloda Health Center area. Based on the answers to the questionnaire and observations, many respondents brought their toddlers into the kitchen when cooking, because there was no one to look after them. In addition, the air temperature in the area is quite cold, so children and toddlers are always taken to the kitchen, which results in them being exposed to smoke produced from burning firewood. Babies and toddlers who are frequently exposed to smoke will easily develop ARI because the smoke produced contains a large amount of carbon monoxide.

The incidence of ARI is closely related to risk factors such as home environmental conditions and behavior. The condition of the house means that the kitchen is close to the family room, there is smoke in the house when cooking, the kitchen and dining room are combined, and there are no ventilation holes in the kitchen. Meanwhile, behavioral factors include the mother's habit of bringing her child to the kitchen when cooking.

This study is in line with research conducted by Wulandari (2020) in the Panti District, Jember Regency, which stated that one of the factors in the incidence of ISPA was caused by children often being brought into the kitchen when cooking for a long time, these results proved to be diagnosed with ARI.[10]

Based on these factors, to prevent the occurrence of ARI in toddlers, people are advised to pay attention to air circulation in the kitchen during cooking by using good ventilation or smoke exhaust holes with open windows or doors, in addition to reducing the intensity of bringing toddlers into the kitchen when cooking by letting children play in a separate room that is still under parental supervision.

The Relationship Between Smoking Behavior and the Incidence of ARI in Toddlers

Cigarette smoke from parents or residents living on the same roof as toddlers is a serious source of pollution in living spaces and increases the risk of illness from toxic substances in children. Continuous exposure causes respiratory problems, especially acute respiratory infections and lung disorders in adulthood. The more cigarettes a family smokes, the greater the risk of ARI, especially if smoking is performed by the baby's mother.[11]

Based on the study results, it is stated that there is no significant relationship between family smoking behavior and the incidence of ISPA in toddlers in the Koeloda Health Center area, because when parents of toddlers smoke, they will not smoke around or close to the toddler, and when they smoke, they will smoke outside the house or with the window open.

This study is in line with research conducted by Fillacano (2019) on the relationship between the environment in the home and ISPA in toddlers in the Ciputat sub-district, Tangerang City in 2013, which showed that there was no relationship between the smoking habits of householders and ISPA in toddlers in the Ciputat sub-district.

Another study that supports this research is research conducted by Rahma Anisa (2022), which shows that there is a tendency for family members to increase their potential and make them worse for toddlers who suffer from ARI. The habit of the head of the family smoking in the house can have a negative impact on family members, especially toddlers. If one or more smokers smoke in the house, it increases the risk of family members suffering from respiratory problems and can increase the risk of getting an ARI attack, especially in toddlers.

Cigarette smoke from parents or residents living on the same roof as toddlers is a serious source of pollution in living spaces and increases the risk of illness from toxic substances in children. Continuous exposure causes respiratory problems, especially acute respiratory infections and lung disorders in adulthood. The more cigarettes a family smokes, the greater the risk of ARI, especially if smoking is performed by the baby's mother.[11]

Based on this, parents who have toddlers are advised not to smoke near or around toddlers, especially while carrying toddlers, and are not advised to smoke in the house with the windows closed, because this can be a risk factor for the occurrence of ARI in toddlers, even though in this study, there was no relationship between family smoking behavior and the Incidence of ARI in toddlers.

Conclusion

In this research, there was a relationship between the type of household fuel and the behavior of bringing toddlers to the kitchen with the incidence of ARI in toddlers in the work area of the Koeloda Health Center. There was no relationship between house ventilation, residential density, floor type, and smoking behavior of family members and the Incidence of ARI in toddlers. For the Koeloda Health Center, it is hoped that it can become input in carrying out the ARI control program for toddlers, such as health promotion department health center officers to further improve promotive programs such as education on the prevention of risk factors that cause ARI and education on parenting patterns and

The habit of bringing toddlers into the kitchen when cooking and using household fuel.

Ethics approval

This study was approved by the Health Research Ethics Commission, Faculty of Public Health, Nusa Cendana University, 2023400 - KEPK, 2023.

Availability of data and materials

Available

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Author Contribution

The FKB collected and processed data using a questionnaire to analyze the relationship between the physical environment of the home and family behavior, and the incidence of ARI in toddlers in the Koeloda Health Center area. The authors have read and approved the final manuscript.

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