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## **Factors related to the physical home environment on the incidence of acute respiratory tract infections in toddlers in the working area of the Nusa Bakti Public Health Center, East Ogan Komering Ulu Regency**

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**Abstract**---Acute Respiratory Tract Infection (ARI) is a disease of the upper and lower respiratory tract, this disease often affects infants, children, the elderly, and/or people with existing health problems. Complications that can arise if ARI is not immediately treated can result in lung infections, infections of the meninges, decreased consciousness, and can even cause death. The purpose of this study was to determine the relationship between parental environmental knowledge and acute respiratory infections in toddlers. This research method used a quantitative research type with a cross-sectional approach. The results of the study showed a relationship between the environment and parental knowledge about acute respiratory infections. It is hoped that this study will improve parental knowledge and environmental cleanliness regarding the dangers of acute respiratory infections (ARI).

**Keywords**---Toddlers, ISPA, Environment, Knowledge

## Introduction

The World Health Organization (WHO, 2019) in its World Health Statistics (2019) data, toddler deaths due to ISPA in the world rank first. The Under Five Mortality Rate (UMFR) ISPA is 41 per 1,000 children while the Infant Mortality Rate (IFR) ISPA is 45 per 1,000 children (Yuriah & Zahra, 2024). The incidence of ISPA in developed countries is caused by viruses while in developing countries it is caused by bacteria. In a year, deaths due to ISPA in children are 2,200 children every day, 100 children every hour, and 1 child every second (Yuriah et al., 2024). This is the highest number of causes of child death compared to other infections worldwide (United Nations Emergency Children's Fund (UNICEF, 2018).

Acute Respiratory Tract Infection (ARI) is a disease of the upper and lower respiratory tract, this disease is often suffered by infants, children, the elderly and/or people who have health problems (Malang Health Office, 2018). ARI occurs in the respiratory tract starting from the nose, middle ear, pharynx (throat), voice box (larynx), bronchi, bronchioles and lungs (Muthoharoh et al., 2022). Types of upper respiratory tract infections are coughs, colds, earaches (otitis media) and sore throats (pharyngitis), while types of diseases that include lower respiratory tract infections are bronchitis, bronchiolitis and pneumonia (POM, 2019).

ARI is defined as an infectious disease transmitted from person to person. ARI mostly affects toddlers because their immune systems are still vulnerable. One of the causes of ARI in toddlers is environmental factors (Sepriani et al., 2024).

Environmental factors indirectly impact toddler health because the environment significantly influences health, particularly the home environment. As we know, environmental factors significantly impact health. Several factors that the public should consider include ventilation, humidity, lighting, and temperature (Health Care and Development Agency, 2021).

Three factors influence the occurrence of a disease: host, disease agent, and environment (Yuriah et al., 2022). Therefore, parents must maintain their toddler's immune system to prevent illness, especially acute respiratory infections (ARI), by providing a balanced, nutritious diet (Yuriah & Kartini, 2022). Furthermore, parents must also pay attention to the condition of the home environment, especially physical sanitation, to ensure it remains safe and healthy for toddlers (Agungnisa, 2020). Prevention efforts are reinforced through education by showing videos about acute respiratory infections and posters on environmental maintenance efforts at community health centers (Puskesmas) and other strategic locations (Depisa, 2022).

Preventing the occurrence of ARI in toddlers can be done by maintaining the cleanliness of the home environment, maintaining cleanliness of the outside environment and maintaining clean air in the house so that it can prevent germs (Maryunani, 2020).

Acute Respiratory Infections (ARIs) are a leading cause of morbidity and mortality from infectious diseases worldwide. Nearly 4 million people die from ARIs each year, 98% of which are caused by lower respiratory tract infections. Mortality rates for infants, children, and the elderly are high, particularly in low- and

middle-income countries. Consequently, ARIs are a leading reason for consultation or hospitalization in healthcare institutions, particularly in childcare settings (WHO, 2018).

Risk factors for ARI include external and internal factors. External factors include residential density, floor type, window area, kitchen location, fuel use, and smoke ventilation (Hasan, 2017). In addition to these external factors, internal factors include age, gender, nutritional status, immune status, and vitamin A consumption during childbirth and breastfeeding (Hasan, 2017). Santoso (2018) argues that a mother's low level of education, limited knowledge, and lack of expertise can lead to ARI in children (Yuriah, 2024).

This ARI disease is often found in toddlers, because toddlers are people whose immune systems are still vulnerable to disease. (Firnada, Junaid, & Jafriati, 2017). Toddlers are more susceptible to acute respiratory infections because their immune systems are not yet fully developed, and they are very easy to spread or transmit acute respiratory diseases through coughing and sneezing. This infectious disease can form infectious particles in the air and from a sick person is transferred to someone at risk of infection or through direct contact. (Agrina, Suyatno, & Arneliwati, 2014).

If not properly treated, ARI can result in a number of disabilities, such as otitis media, which can cause deafness and developmental disorders, among others. Complications that can arise if ARI is not promptly treated can result in lung infections, infections of the meninges, decreased consciousness, and even death (Widoyono, 2017). To reduce the likelihood that a child will contract ARI, preventative measures are necessary.

A mother is the closest person in a child's life. Her extensive knowledge should enable her to play an active role in early detection and prevention of ARI and to take preventative measures independently at home (Ngastiyah, 2017).

Knowledge is a crucial factor in shaping a person's behavior. According to Lawrence Green (2018), a person's behavior is determined by three factors. First, predisposing factors, manifested in knowledge, attitudes, and perceptions. Second, enabling factors, such as the physical environment, information media and health facilities (Haryanti & Yuriah, 2025). Third, reinforcing factors, manifested in the attitudes and behaviors of health workers, family, and peers (Lawrence Green, 2018).

One way to improve mothers' knowledge about managing ARI is through health education. This increased knowledge is essential for mothers to understand the management and prevention of ARI. Health education is a key component of health promotion and disease prevention efforts (Fitriani, 2017).

Health education about ISPA is an effort or activity to help individuals, groups, or communities, especially parents, improve their knowledge and skills in caring for toddlers with ISPA so that optimal health quality is achieved (Ministry of Health, 2019). Health education media is a means or effort to display the information message that the communicator wants to convey so that the target can increase

their knowledge, which is ultimately expected and change their behavior in a positive direction towards health (Notoatmodjo, 2018).

Of the various educational media or aids, leaflets are the most widely used by health workers to convey information during health education sessions. This is because leaflets are folded and easy to carry, so if someone forgets what was taught, they can simply read it (Notoatmodjo, 2018).

According to the Indonesian Health Profile (2019), there were 511,434 cases of acute respiratory infections (ARI) in Indonesia (Ministry of Health, 2019). ARI ranks first as a cause of infant morbidity. Based on diagnoses by health workers, the prevalence is 9.3 per 1,000 population (Basic Health Research, 2019).

According to the 2018 report from the Sub-Directorate of Mortality, Indonesia has seen a decline. The five provinces with the highest prevalence of ARI per 1,000 residents are East Nusa Tenggara (15.4%), Papua (13.1%), West Papua (12.3%), Banten (11.9%), and Bengkulu (11.8%). North Sumatra Province ranks 30th with a prevalence of ARI per 1,000 residents of 6.8%. Jambi, meanwhile, has the fewest ARI sufferers, at 5.5%. Compared to 2014, there were 0.3326 infants and 0.6674 toddlers (Ministry of Health, 2019).

The prevalence of ARI among toddlers in South Sumatra is 3.7% (Ministry of Health, 2019). This prevalence has increased compared to the previous Basic Health Research, which was only 1.0% (Ministry of Health, 2018). This indicates that ARI requires greater attention.

Data from the East OKU Regency Health Office shows that in 2020, the number of toddlers was 432, with 221 boys and 211 girls. In 2021, this number increased to 492, with 255 boys and 237 girls. (2021 Nusa Bakti Health Center Profile Data). Research conducted by Novrianda (2019) entitled "comparison of the effectiveness of health education on the knowledge and ability of mothers to care for toddlers at Padang Pasir and Pauh Health Centers found that there was a difference in knowledge and ability to care for toddlers before and after health education with ( $p= 0.002$ ).

Sari's research results (2020), Researchers concluded that the results of this study indicate that there is a significant relationship between health education and maternal knowledge regarding ISPA in toddlers at the Limo Village Integrated Health Post. The results of this study are in accordance with the theory that maternal knowledge can be influenced by health education carried out, namely from statistical tests showing an average difference of -1.019 with a standard deviation of 1.770. The results of the statistical test obtained a  $p$ -Value = 0.000.

A preliminary survey conducted by researchers at the Nusa Bakti Community Health Center (Puskesmas Nusa Bakti) revealed an increase in the incidence of ARI in toddlers from 2020 to 2021. In 2020, there were 39 cases of ARI in toddlers, while in 2021 the number increased to 47 toddlers suffering from ARI. Based on interviews with 9 mothers with toddlers who visited the Puskesmas, 6 mothers were completely unaware of ARI due to a lack of information and knowledge about it. 2 of them knew what ARI was but still had little knowledge of

how to prevent and treat ARI. One mother knew how to prevent ARI because her toddler had been treated for ARI.

Based on this description, the researcher is interested in examining the relationship between the environment and mothers' knowledge of acute respiratory infections in the Nusa Bakti Community Health Center work area.

## **Method**

This study employed quantitative research methods. The design employed an analytical cross-sectional approach. The sample consisted of 35 toddlers in the Nusa Bakti Community Health Center working area.

The research location was within the Nusa Bakti Community Health Center (Puskesmas) working area. The study was conducted from June to July 2024. The research instrument was a questionnaire containing several questions.

**Data Collection Method** This research was conducted after obtaining a letter of assignment from the Al-Ma'arif Health Sciences College and data collection was carried out after the researcher obtained permission to conduct research in the Nusa Bakti Community Health Center Work Area. The data collection procedure was carried out by distributing questionnaires to respondents. The stages carried out by the researcher were: 1) The researcher delivered a letter requesting research permission to the Nusa Bakti Community Health Center. After being granted permission, the researcher conducted research on toddlers in the Nusa Bakti Community Health Center work area. 2) After obtaining potential respondents, the researcher approached the potential respondents to provide an explanation regarding the purpose, benefits, and procedures of the research. 3) If the respondents were willing to participate in the research activities, then the respondents were asked to sign a statement of consent to become respondents. 4) Before filling out the questionnaire, the researcher provided an explanation regarding the research to be carried out and how to fill out the questionnaire. Respondents were given the opportunity to ask questions if there were any questions on the questionnaire that were unclear or not understood. 5) After the respondents understood how to fill out the questionnaire, the researcher distributed the research questionnaire to the respondents selected as the research sample. 6) During the questionnaire filling activity, the researcher was near the respondents so that if there were any difficulties, the respondents could ask the researcher directly. However, for respondents who chose to be left, the researcher returned at the specified time to collect the questionnaires again. 7) After all questions in the questionnaire had been completed by the respondents, the researcher collected the research questionnaires again and conducted a termination with the respondents.

Data collection techniques include editing, coding, data entry, and tabulation. Data analysis consists of univariate analysis to explain or describe the characteristics of environmental factor variables. Bivariate analysis uses the Chi-Square statistical test.

## Results and Discussion

### Results

A univariate analysis was conducted to determine whether physical sanitation at home could influence the incidence of ARI in toddlers. This analysis used frequency distribution analysis. The desired results were the frequency of ventilation and humidity conditions, and the incidence of ARI.

#### *Ventilation*

Table 1. Frequency distribution of ventilation conditions in houses in the Nusa Bakti Health Center work area

<b>Variables</b>	<b>n</b>	<b>%</b>
Good	15	42.9
Not good	20	57.1
<b>Amount</b>	<b>35</b>	<b>100</b>

Source: Primary Data, 2020

The results obtained from Table 1 show that of the 35 houses studied, the majority, namely 20 houses (57.1%), had house ventilation that met the requirements.

#### *Humidity*

Table 2. Distribution of Humidity Frequency in Houses in the Nusa Bakti Health Center Area

<b>Humidity</b>	<b>n</b>	<b>%</b>
Not eligible	3	8.6
Qualify	32	91.4
<b>Amount</b>	<b>35</b>	<b>100</b>

The results obtained from Table 2 show that of the 35 respondent houses studied, almost all, namely 32 houses (91.4%), had house humidity that met the requirements.

#### *ISPA incident*

Table 3. Distribution of Frequency of ISPA Incidents in the Nusa Bakti Community Health Center Area

<b>ISPA incident</b>	<b>n</b>	<b>%</b>
No	19	54.3
Yes	16	45.7
<b>Amount</b>	<b>35</b>	<b>100</b>

The results obtained from Table 3 show that of the 35 houses studied, less than half, namely 16 toddlers (45.7%), experienced ISPA and half of the toddlers did not experience ISPA, namely 19 toddlers (54.3%). Bivariate analysis aims to determine the relationship between independent variables and dependent variables.

***The relationship between home ventilation and the incidence of ARI***

Table 4. Relationship between Home Ventilation and the Incidence of ARI in the Nusa Bakti Community Health Center Area

Ventilation	Incident acute respiratory infection		ISPA ARI		Total		P Value
	F	%	F	%	F	%	
1. No fulfil condition	11	31.4%	4	17.1%	15	42.9%	0.41
2. Fulfil	8	22.9%	12	28.5%	20	57.1%	
Total	19	54.3%	16	45.6%	35	100%	
PValue	0.41						

The results obtained from table 4 show that of the 15 houses whose ventilation does not meet the requirements, less than half (31.4%) did not experience ISPA, as well as toddlers who experienced ISPA less than half (17.1%) and it can be seen that there are 20 houses whose ventilation meets the requirements, less than half (22.9%) did not experience ISPA, as well as toddlers who experienced ISPA less than half (28.5%).

The chi-square test results show that the significant value of the probability of ventilation conditions is  $p\text{-value} = 0.41 > \alpha \text{ value} = 0.05$ . This proves that ventilation conditions have no relationship with the incidence of ARI in the Nusa Bakti Community Health Center area.

### ***The relationship between humidity and the occurrence of ISPA***

Table 5. Relationship between Home Humidity and the Incidence of ARI in the Nusa Bakti Community Health Center Area

Humidity	Tid F	IncidentI <u>acute</u> <u>respiratory</u> <u>infection</u> %	SPA F	ARI %	Total F	%	P Value
1. No fulfil condition	1	2.9%	1	2.9%	2	5.71%	1.00
2. Fulfil	18	48.6%	15	42.8%	33	94.2%	
Total	19	51.4%	16	45.5%	35	100%	

The results of table 5 show that in 2 houses the humidity in the house did not meet the requirements, a small portion (2.9%) did not experience ISPA, as did a small portion of toddlers who experienced ISPA (2.9%) and it can be seen that there were 35 houses with humidity that met the requirements, almost half (48.6%) did not experience ISPA, as did almost half of toddlers who experienced ISPA (42.8%).

The chi-square test results show that the significant value of the probability of humidity conditions is  $p\text{-value} = 1.00 > \alpha \text{ value} = 0.05$ . This proves that humidity conditions have no relationship with the occurrence of ISPA in the work area of the Nusa Bakti Community Health Center.

## **Discussion**

### ***Univariate Analysis Ventilation***

The study found that 20 respondents, or 57.1% of the 35 respondents, met the requirements for ventilation. In Tinumpuk and Kaliombo sub-districts, less than 10% of the residents' ventilation was inadequate due to a lack of understanding of ventilation size and a preference for shape or design. Furthermore, residents only cared about adequate ventilation for sleeping, with the doors always open during the day.

This is similar to previous research conducted by Dani (2022) in Aua Tanjungkang Tengah Sawah, which found that 19 respondents (51.4%) had adequate ventilation, while 18 respondents (48.6%) did not meet the requirements. This study found that the percentage of adequate ventilation was greater than that of inadequate ventilation. This is because the ventilation is always open every day, allowing for proper air exchange between the outside and inside of the house.

Researchers argue that inadequate ventilation, which is less than ten percent, will have an impact on the occupants. Respondents did not care about ventilation but cared about them being enough to rest. One of the uses of ventilation is to maintain the indoor air system so that it circulates. Toddlers with ventilation that does not meet the requirements but the toddler does not experience ARI, this is because most mothers are aware of the importance of protecting their children from ARI.

### ***Humidity***

The study found that 32 homes, representing 91.4% of the 35 respondents, met the required indoor humidity levels. In Tinumpuk and Kaliombo sub-districts, most homes experienced reduced indoor humidity levels due to sufficient natural lighting.

This research aligns with Rahma's (2022) study at the Rasimah Ahmad Community Health Center in Bukittinggi. The humidity levels of the 37 respondents studied were found to be below the minimum humidity levels of 2 (5.4%) and below the maximum humidity levels of 35 (94.6%). This study found that the percentage of homes with adequate humidity levels was higher than the percentage of homes with inadequate humidity levels.

Researchers believe that humidity is caused by suboptimal or inadequate ventilation, which reduces the amount of sunlight needed to kill pathogens, which can lead to respiratory infections. People often overlook humidity levels in their homes, instead focusing on how comfortable they sleep.

### ***ISPA incident***

This study involved 35 toddlers aged 1 to 5 years. The results found that the toddlers experienced mild ARI, with symptoms of cough, runny nose, and fever. Sixteen households (45.7%) experienced mild ARI, while 19 households (54.3%) did not experience ARI.

Lutfiah's research found that 53 toddlers (60.9%) did not experience ARI, while 34 toddlers (39.1%) did. This study found that the number of toddlers without ARI was greater than the number of toddlers with ARI.

The epidemiological triangle theory explains that there are three factors that influence the occurrence of a disease, namely host factors, disease agents, and the environment. Therefore, parents must maintain the immunity of toddlers so that they are not easily affected by ARI by providing food with balanced nutrition, in addition, parents must also maintain the condition of the home environment, especially physical sanitation of the house such as ventilation and humidity to keep it safe and healthy for toddlers (Juniarti et al., 2024). According to the researcher's assumption, this is in accordance with the theory that children under 5 years old have an immune system that is not yet perfect so that all children in this study experienced ARI as toddlers.

### ***Bivariate Analysis***

#### ***The Relationship Between Ventilation and the Incidence of ISPA in Toddlers in the Nusa Bakti Community Health Center Area***

The results of the research on ventilation in houses in Timumpuk and Kaliombo sub-districts found that 15 houses did not meet the requirements with a percentage of 48.6% and the ventilation in houses that met the requirements was 20 houses with a percentage of 51.1% were taken from 35 respondents. The results of the chi-square statistical test obtained a p value = 0.41 >  $\alpha$  = 0.05 based on the data, there is no relationship between ventilation and the incidence of ISPA in the Nusa Bakti Health Center area.

This is in accordance with Ningrum's (2015) research in Banjar which stated that there is a relationship between the existing ventilation area, so that the ventilation area that should be the area of the ventilation that is opened is not obtained. Marhamah et al. (2017) showed the same results, that home ventilation has no relationship with the incidence of ISPA in toddlers in Botongan village because most of the respondents' houses have wooden walls so that the gaps between the wooden boards can function as air holes.

Researchers believe that mothers who have well-ventilated homes but their toddlers experience ARI, this is because adequate ventilation is not able to prevent ARI in toddlers. Similarly, mothers who have inadequate ventilation but do not experience ARI. This is because most mothers have good awareness in keeping their children from getting sick. Ventilation functions to maintain fresh air flow in the house. Most houses in villages have adequate ventilation because they are made of wood and have many holes that can allow for air exchange inside the house.

#### ***The Relationship Between Humidity and the Incidence of ISPA in the Work Area of the Nusa Bakti Health Center in Sukanegara Village***

The results of the study for indoor humidity in Tinumpuk and Kaliombo sub-districts are that there are 2 houses that do not meet the requirements with a percentage of 5.71% and indoor humidity that meets the requirements is 33 houses with a percentage of 94.2%, out of 35 houses studied. The results of the chi-square test show that the significant value of the probability of humidity conditions is p value = 1.00 >  $\alpha$  = 0.05. This proves that humidity conditions have no relationship with the incidence of ISPA in Sukanegara village.

This is consistent with research conducted by Rahma (2022) in Bukittinggi Regency, which found no correlation between humidity and the incidence of ARI. Although there was no correlation, both high and low humidity levels could support the growth of microorganisms that cause ARI.

Researchers argue that excessive humidity can dry out mucous membranes, making them less effective at blocking microbes, making them susceptible to acute respiratory infections. Humidity in the home can be affected by increased indoor airflow due to evaporation. Most rural homes are made of wood, so they

have holes that can control humidity levels by allowing sufficient air and light to enter the room, reducing indoor humidity.

## **Conclusion**

The conclusion of this study on the Relationship of Environmental Factors with the Incidence of ISPA in Toddlers in Sukanegara Village is that: Home ventilation in the Nusa Bhakti Health Center working area based on the majority of toddler mothers' houses using adequate ventilation, the humidity of the majority of toddler mothers' houses has met the requirements. The majority of Acute Respiratory Tract Infections (ISPA) incidents do not experience ISPA. There is no relationship between ventilation and humidity with the incidence of ISPA in toddlers in the Nusa Bhakti Health Center area.

### *Conflict of interest statement*

The authors declared that they have no competing interests.

### *Statement of authorship*

The authors have a responsibility for the conception and design of the study. The authors have approved the final article.

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