



Physical House Sanitation and the Acute Respiratory Infections (ARI) in Children

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ABSTRACT

The sanitation conditions of residential houses in the Indramayu Regency are mostly categorized as low, which can potentially trigger Acute Respiratory Infections (ARI). This research aims to determine the relationship between the physical sanitation of homes and ARI in toddlers within the working area of the Cantigi Community Health Center in the Indramayu Regency. The research method employed a cross-sectional approach, with a sample taken from a total population of 95 houses in the Cantigi Community Health Center area. Data collection methods included semi-structured interviews, observations, and measurements covering ventilation, natural lighting, humidity, and flooring.

Statistical tests were conducted using ordinal scale data, and the Chi-Square statistical test was chosen due to its suitability for the data used. The confidence level was set at 95% with a significance level of 5%. To determine the strength of the relationship between independent and dependent variables, the contingency coefficient (CC) was used, scored from 0 (lowest) to 1 (highest), and data processing was performed using SPSS version 24.

Based on the research results, the Chi-Square test yielded the following values: ventilation $p = 0.000$ and $CC = 0.455$, lighting $p = 0.000$ and $CC = 0.358$, humidity $p = 0.000$ and $CC = 0.538$, flooring $p = 0.002$ and $CC = 0.323$. Thus, the hypothesis stating 'The relationship between ventilation, lighting, humidity, and flooring is associated with ARI in toddlers in the working area of the Cantigi Community Health Center, Indramayu Regency' is accepted, indicating a fairly strong relationship.

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1. INTRODUCTION

According to data from the World Health Organization (2021), Acute Respiratory Infections (ARI) are the leading cause of death in children under five years old worldwide. The United Nations Children's Fund (UNICEF) report indicates that ARI is the primary cause of death in toddlers in developing countries². The Global Burden of Disease Study 2020, conducted by GBD 2019 Diseases and Injuries Collaborators, presents a systematic analysis of the global disease burden, including ARI in toddlers³.

One aspect contributing to the occurrence of ARI is the physical environment of the home. Environmental disease transmission risk factors may be related to the physical home environment. Since toddlers spend more time indoors and have weaker immune systems compared to adults, they are the most at risk of contracting ARI⁴.

Based on the Indramayu Health Department profile (2021), there are 166,372 homes that do not meet the criteria for a healthy home. According to this data, many houses in the Indramayu Regency are still categorized as low, which can trigger the onset of ARI⁵.

According to the preliminary survey results, mothers' behavior and knowledge about ARI are divided into three categories using the Hanlon quantitative method, including good categories between 60-100%, less good categories between 30-50%, and not good categories less than 30%. Maternal knowledge about ARI is 73.1%, and maternal behavior is 86%, indicating good knowledge and behavior of mothers about ARI in the Cantigi

Community Health Center's working area. The community's disease pattern seeking treatment at the Cantigi Community Health Center and its subordinate health posts, including Pustu Panyingkiran Lor, Pustu Cemara, Poskesdes Lamarin Tarung, Poskesdes Cemara, and Poskesdes Cangkring, is still dominated by ARI (25.55%), followed by Gastritis (16.88%), Myalgia (16.17%), Hypertension (10.27%), Migraine (9.60%), Rheumatoid (9.48%), Neuralgia (3.56%), Dermatitis (3.16%), Diarrhea (2.34%), and Dental Caries (2.21%). In 2021, ARI cases from January to July were still high, totaling 203 cases⁶.

2. METHODOLOGY

This research is an observational study with a cross-sectional approach. Cross-sectional design is an epidemiological study that examines the relationship between disease and exposure (research factor) by observing the exposure and disease status simultaneously in individuals from a single population at a specific point in time or period⁷.

The sampling technique to be used is cluster random sampling, a sampling method where the sampling unit is a group (such as a hamlet or household) rather than individuals, and clusters are randomly selected from the population.⁶ The population in this study consists of 1926 households with toddlers. The sample size determined is 95 households with toddlers. Data analysis will be conducted using univariate and bivariate analysis with the Chi-square test at a 95% confidence level (0.05).

3. RESULTS

3.1 Analysis Univariate

3.1.1 Sanitation Home Physical

Table 1. Distribution Frequency Home Sanitation

No.	Variable	Amount	Percentage
1	Ventilation		
	Good	61	64.2%
	Not good	34	35.8%
	Total	95	100%
2	Lighting		
	Good	64	67.4%
	Not good	31	32.6%
	Total	95	100%
3	Humidity		
	Not damp	63	66.3%
	Moist	32	33.7%
	Total	95	100%
4	House floor		
	Water proof	49	51.6%
	Not waterproof	46	48.4%
	Total	95	100%

From table 1 you can see that , ventilation House good responder are 61 houses (64.2%) and those that are not good 34 houses (35.8%), on lighting House good responder are 64 houses (67.4%) and those that are not good 31 houses (32.6%). From the table it can also be seen that fre ku ensi humidity House respondents who did not moist were 63 houses (66.3%) and 32 houses (33.7%) were damp. Whereas For type floor house, which is airtight water is 49 houses (51.6%) and those without 46 houses (48.4%) were waterproof.

3.1.2 ARI

Table 2. Distribution of Acute Respiratory Infections (ARI) cases

No.	ARI	Amount	Percent ase
1	Never	68	71.6%
2	Yes	27	28.4%
	Total	95	100%

From table 2 you can see that, family respondents who did not hit ARI cases were 68 home (71.6%) and those who have hit ARI cases in 27 houses (28.4%).

3.2 Analysis Bivariate

Table 3. Testing the Relationship between Research Variables and the Incidence of Acute Respiratory Infections (ARI).

No	Variable	ARI case			p-Value	CC
		No	Yes	Total		
1	Ventilation					
	Good	53 (55.8%)	8 (8.4%)	61 (64.2%)	0,000	0.414
	Not good	15 (15.8%)	19 (20%)	34 (35.8%)		
Total	68 (71.6%)	27 (28.4%)	95 (100%)			
2	Lighting					
	Good	53 (55.8%)	11 (11.6%)	64 (67.4%)	0,000	0.337
	Not good	15 (15.8%)	16 (16.8%)	31 (32.6%)		
Total	68 (71.6%)	27 (28.4%)	95 (100%)			
3	Humidity					
	Not damp	56 (58.9%)	7 (7.4%)	63 (66.3%)	0,000	0.474
	Moist	12 (12.6%)	20 (21.1%)	32 (33.7%)		
Total	68 (71.6%)	27 (28.4%)	95 (100%)			
4	Floor Type					
	Water proof	56 (58.9%)	7 (7.4%)	63 (66.3%)	0.002	0.308
	Not waterproof	12 (12.6%)	20 (21.1%)	32 (33.7%)		
Total	68 (71.6%)	27 (28.4%)	95 (100%)			

Based on table 3 typed a hui that ventilation a house that doesn't Good cause toddler respondents affected ARI more Lots i.e. 20% in comparison with ventilation good house only 8.4%. Results test *Chi square* m shows There is connection between ventilation House with ARI incidence in working area Public health center Cantigi (value *p* of 0.000 and CC 0.414).

Based on table 3 can is known that lighting a house that doesn't Good cause toddler respondents affected ARI more Lots i.e. 16.8% in comparison with lighting good house only 11.6%. Results test *Chi square* m shows There is connection between lighting House with ARI incidence in working area Public health center Cantigi (value *p* of 0.000 and CC 0.337). And can is known that humidity a house that doesn't good / moist cause toddler respondents affected ARI more Lots i.e. 21.1% in comparison with humidity good house/ not moist only 7.4%. Results test *Chi square* m shows There is connection between humidity House with ARI incidence in working area Public health center Cantigi (value *p* of 0.000).

And table 3 can is known that type floor a house that doesn't waterproof causes n toddler respondents affected ARI more Lots i.e. 21.1% in comparison with type floor the house is only 7.4% waterproof . Results test *Chi square* m shows There is connection between type floor House with ARI incidence in working area Public health center Cantigi (value *p* of 0.002 and CC 0.308).

4. DISCUSSION

4.1 Ventilation

According to Dinata, the general assessment of home ventilation can be done by comparing the ventilation area to the floor area of the house, using a rollmeter. Based on home ventilation indicators, the ventilation area that meets health criteria is equal to or greater than 10% of the floor area, while the ventilation area that does not meet health criteria is less than 10% of the floor area.⁸ From the research results, it can be depicted that the floor area meeting health criteria/good (> 10% of the floor area) is 61 houses (64.2%), while those not meeting health criteria/not good are 34 houses (35.8%).

During the data analysis phase, it was found that home ventilation has a significant correlation with the occurrence of Acute Respiratory Infections (ARI) in children. This result is consistent with previous research indicating that good air circulation can reduce the risk of ARI. Poor ventilation can lead to the accumulation

of germs and indoor pollution, increasing the likelihood of children being exposed to agents causing ARI⁹.

4.2 Lighting

Sunlight is crucial as it can kill pathogenic bacteria inside the house, such as bacteria causing acute respiratory infections (ARI) and tuberculosis (TBC). Therefore, a healthy home should have sufficient access to light. Adequate light entry (windows) should be at least 15% to 20% of the floor area inside the house¹⁰. From the research results, it can be observed that the lighting in the respondents' homes mostly meets the criteria/good in 64 houses (67.4%).

In the data analysis phase, the research results indicate that home lighting is significantly correlated with the occurrence of Acute Respiratory Tract Infections (ARI). These findings are consistent with previous studies that emphasize the importance of good natural lighting as a crucial factor in reducing the risk of ARI in children. Dimly lit homes can create an environment conducive to the growth and spread of ARI-causing agents. From this perspective, improving home lighting can be considered an effective preventive measure to reduce ARI incidents in children. Therefore, it is important to provide education to the community about the importance of natural sunlight and efforts to enhance home lighting⁹.

4.3 Humidity

High home humidity can affect a person's immune system and increase vulnerability to diseases, especially infectious diseases. Humidity can also enhance the survival of bacteria. According to Suryanto, humidity is considered good if it falls within 40-70% and bad if it is less than 40% or more than 70%.⁹ From the research results, 63 houses (66.3%) of the respondents have humidity that meets health criteria/good, while 32 houses (33.7%) do not meet the criteria/are humid.

The results of the data analysis indicate a significant relationship between home humidity and the occurrence of Acute Respiratory Tract Infections (ARI) in children. High humidity can create conditions that support the growth of microorganisms and the spread of ARI-causing agents. This research is consistent with previous findings that show a humid environment can be a crucial risk factor in ARI cases. The importance of maintaining a healthy level of humidity inside the home becomes evident in efforts to prevent ARI in children. Educating the public on how to manage home humidity, such as using dehumidifiers and ensuring good ventilation, can be an effective strategy in reducing ARI incidents¹¹.

4.4 Floor Type

The type of floor in a house can influence the occurrence of ARI because a floor that does not meet standards is a good medium for the proliferation of bacteria or viruses causing ARI. A good floor is one that is dry and not damp. The floor material should be waterproof and easy to clean, so at the very least, the floor needs to be plastered, and it would be even better if it is covered with tiles or ceramic that is easy to clean¹². From the research results, 49 houses (51.6%) of the respondents have a floor type that meets health criteria/waterproof, while 46 houses (48.4%) do not meet the criteria/are damp.

The results of the data analysis indicate that the type of flooring in a home has a significant correlation with the occurrence of Acute Respiratory Tract Infections (ARI) in children. This finding is consistent with previous research stating that non-waterproof flooring can increase the risk of ARI. Flooring that doesn't meet the necessary standards can become a breeding ground for microorganisms and contribute to increased exposure of children to ARI-causing agents. Improving the type of flooring in homes can be considered an effective preventive measure to reduce ARI incidents in children. Public education about the importance of selecting flooring that meets health standards can be a key strategy in lowering the risk of ARI¹³.

4.5 Relationship between Home Ventilation and Acute Respiratory Infections (ARI) Incidence

The results of statistical analysis using the Chi-square test for the relationship between home ventilation and ARI incidence in toddlers in the working area of Cantigi Health Center showed a p-value (0.000) smaller than the α -value (0.05). Therefore, there is a significant relationship between home ventilation and ARI incidence. The Contingency Coefficient (CC) value of 0.414 indicates a fairly strong relationship between respondents' home ventilation and ARI incidence.

These findings are consistent with a study conducted in Penjaringan Sari Village, which concluded that on average, homes in Penjaringan Sari Village do not open their windows during the day. Respondents who suffered from ARI had good home ventilation in 10 houses (16.1%) and poor ventilation in 27 houses (43.5%), while respondents who did not suffer from ARI had good home ventilation in 13 houses (21%) and poor ventilation in 12 houses (19.4%). This is attributed to the fact that the windows in respondents' homes are generally not opened, and many windows are made of glass that cannot be opened, resulting in poor air exchange in the houses.

The results of the data analysis indicate a significant relationship between home ventilation and the occurrence of Acute Respiratory Tract Infections (ARI) in children. This finding is consistent with previous research showing that good ventilation can play a crucial role in reducing the risk of ARI. Poor home ventilation

can lead to the accumulation of germs and indoor pollution, increasing the likelihood of children being exposed to ARI-causing agents. Improving home ventilation can be considered an effective preventive measure to reduce ARI incidents in children⁹.

4.6 Relationship between Home Lighting and Acute Respiratory Infections (ARI) Incidence

The statistical analysis using the Chi-square test for the relationship between natural lighting in homes and ARI incidence in toddlers in the Cantigi Health Center area yielded a p-value (0.000) smaller than the α -value (0.05). Thus, there is a significant relationship between natural lighting in homes and ARI incidence. The CC value of 0.337 indicates a weak relationship between lighting and ARI incidence.

This study is supported by the findings of Nindya and Sulistyorini (2005) in Sidomulyo Sidoarjo Village, which concluded that natural lighting in homes is influenced by ventilation or windows that are not opened during the day. Respondents who suffered from ARI had good natural lighting in 10 houses (16.1%) and poor natural lighting in 27 houses (43.5%), while respondents who did not suffer from ARI had good natural lighting in 17 houses (27.4%) and poor natural lighting in 8 houses (12.9%).

The results of the data analysis indicate a significant relationship between home lighting and the occurrence of Acute Respiratory Tract Infections (ARI) in children. Adequate home lighting has been proven to play a role in reducing the risk of ARI, consistent with previous research findings. Dimly lit homes can create an environment conducive to the growth and spread of ARI-causing agents. Improving home lighting can be considered an effective preventive effort in reducing ARI incidents in children¹⁴.

4.7 Relationship between Humidity and Acute Respiratory Infections (ARI)

The statistical analysis using the Chi-square test for the relationship between home humidity and ARI incidence in toddlers in the Cantigi Health Center area yielded a p-value (0.000) smaller than the α -value (0.05). Thus, there is a significant relationship between home humidity and ARI incidence. The CC value of 0.474 indicates a fairly strong relationship between humidity and ARI in toddlers.

The results of interviews, observations, and humidity measurements in the Cantigi District area suggest that the windows and ventilation in those houses meet the physical requirements to be considered good, but some of them are not opened during the day, causing poor lighting and inadequate air circulation. This leads to humidity. Respondents who suffered from ARI had good humidity in 7 houses (11.11%) out of 63 houses with good humidity, while respondents who suffered from ARI did not have good humidity in 20 houses (62.5%) out of 32 houses without good humidity.

Home humidity plays a crucial role in the respiratory health of children, and research indicates a correlation between home humidity and the occurrence of Acute Respiratory Tract Infections (ARI). High humidity inside the home can create an environment that supports the growth of microorganisms, including bacteria, viruses, and fungi. The presence of these microorganisms can be a risk factor for ARI in vulnerable children. Additionally, high humidity can trigger the growth of dust mites, which can act as allergens and contribute to allergies and asthma in children. Chronic allergies and asthma can increase vulnerability to respiratory infections. High humidity can also support the survival of viruses and bacteria in the air, increasing the risk of ARI transmission to children, especially through the air. Prevention measures, such as maintaining optimal home humidity levels, can be considered essential in preventing ARI in children. The use of humidity control devices, good ventilation, and environmental cleanliness practices can help create conditions less conducive to the transmission of respiratory diseases^{9,10}.

4.8 Relationship between House Flooring and Acute Respiratory Infections (ARI) Incidence

The results of statistical analysis using the Chi-square test for the relationship between house flooring and ARI incidence in toddlers in the Cantigi Health Center area revealed a p-value (0.002) smaller than the α -value (0.05). Thus, there is a significant relationship between house flooring and ARI incidence.

These findings are supported by the research conducted by Nindya in Tual Village, Kei Kecil Subdistrict, Southeast Maluku Regency. The research showed that the average house flooring in Tual Village includes cement and soil floors. Respondents who suffered from ARI had house flooring that met the criteria in 13 houses (21%) and house flooring that did not meet the criteria in 24 houses (38.7%). On the other hand, respondents who did not suffer from ARI had house flooring that met the criteria in 16 houses (25.8%) and house flooring that did not meet the criteria in 9 houses (14.5%).

The existence of a relationship between the type of flooring in a home and the occurrence of Acute Respiratory Tract Infections (ARI) is an important aspect to be considered in the context of children's respiratory health. The flooring material and the type of flooring in a home can influence the rate of microbial growth. Non-waterproof or moisture-prone floors can create an environment that supports the growth of bacteria, fungi, and dust mites, which can act as triggers for ARI. Non-waterproof flooring can be a source of moisture in the home, especially in the case of leaks or water exposure. High humidity can be a risk factor for ARI. Poor ventilation can also lead to moisture accumulation and contribute to the growth of microorganisms¹⁵.

Home repair activities involving the manipulation of flooring materials can increase the risk of exposure

to dust and particles that can be detrimental to respiratory health. Understanding safety measures during repair work can be part of a prevention strategy¹⁶.

5. CONCLUSION

This study concludes that :

- a. The majority of ARI cases are found in homes with poor or inadequate ventilation (20%).
- b. The majority of ARI cases are found in homes with poor or inadequate lighting (16.8%).
- c. The majority of ARI cases are found in homes with poor or inadequate humidity (21.1%).
- d. The majority of ARI cases are found in homes with non-waterproof or inadequate flooring (21.1%).
- e. There is a significant relationship between ventilation and ARI incidence in the Cantigi Health Center working area with a p-value of 0.000 and CC of 0.414.
- f. There is a significant relationship between lighting and ARI incidence in the Cantigi Health Center working area with a p-value of 0.000 and CC of 0.337.
- g. There is a significant relationship between humidity and ARI incidence in the Cantigi Health Center working area with a p-value of 0.000 and CC of 0.474.
- h. There is a significant relationship between flooring type and ARI incidence in the Cantigi Health Center working area with a p-value of 0.002 and CC of 0.308.

6. RECOMMENDATION

For the Community:

- a. It is advisable for the community to develop a habit of opening windows every day to ensure smooth air circulation and allow sunlight to enter the house, thus reducing humidity.
- b. The community should maintain cleanliness in their homes by sweeping and mopping the floors and cleaning dust that accumulates on walls and floors to prevent the breeding of bacteria.

For Relevant Institutions, Especially Cantigi Health Center:

- a. Institutions should enhance early warning systems for ARI incidents by improving mothers' knowledge, attitudes, and behaviors regarding the importance of a healthy physical environment in homes.
- b. Health professionals should provide education on ARI during events such as integrated health posts (posyandu) meetings.

For Other Researchers:

- a. Other researchers could expand on this study by adding variables such as household density, house temperature, and indoor air pollution (cigarette smoke or kitchen smoke) and investigating their impact on ARI incidence.

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