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Original Research

Analysis of Risk Factors for Acute Respiratory Infection in Terms of The Physical Environment in Jatimulya Village

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Abstract

Acute respiratory infection (ARI) is currently a global primary health problem. WHO 2016 data shows that the incidence of ARI and the under-5 mortality rate are estimated at >40/1000 live births, or 15%-20% per year in the under-five group. ARI is an inflammatory reaction in the upper or lower respiratory tract. The risk of ARI occurring depends on three factors: the individual, behaviour, and environmental conditions. Environmental factors include lighting, humidity, area of ventilation or windows, types of walls, floors, roofs, and the distance from the house to the main road. Environmental factors, especially the house's physical condition, are closely related to the magnitude of the community's risk of ARI. This study used a cross-sectional design. It was carried out in October 2022 and involved 148 mothers with toddlers in Jatimulya Village, Bekasi Regency. The instruments used were a rolling meter, a hygrometer, and a questionnaire with univariate and bivariate analysis. A chi-square test was used to determine whether there was a relationship. From the analysis results, it was found that the window width (p = 0.000) and humidity (p = 0.000) were related to the incidence of ARI, and the results were not related to the type of house wall (p = 0.069), the type of floor of the house (p = 0.196), and the distance between the house and the main road (p = 0.144) with the incidence of ARI. There is a significant relationship between window width and humidity and the incidence of ARI in toddlers, but there is no significant relationship between the type of wall, the type of floor, or the distance from the house to the main road.

Keywords: Acute Respiratory Infection, Environmental Factors, Cross-Sectional

INTRODUCTION

Acute Respiratory Infection (ARI) until present continues to be a problem in primary health globally. The morbidity and mortality rates arising from this disease are as many as 18.8 billion events and it is estimated that around a total of 4 million people worldwide die from this disease (Syahidi et al., 2016). According to data available from the World Health Organization (WHO) in 2016, the incidence rate of Acute Respiratory Infection and child mortality >40 per 1000 live births are estimated to reach 15% - 20% per year in children under five years of age. In 2015, the highest number of deaths caused by ARI occurred in Africa, and then in Southeast Asia (Mahendra & Farapti, 2018).

Based on data obtained from basic health research in 2018, the prevalence of ARI in Indonesia was 9.3% with the highest prevalence occurring in the one to four-year age group of 13.7%. In 2018 the prevalence of Acute Respiratory Infection in Bekasi District According to the results of the recapitulation of the ARI control work program report, 10,874 cases of ARI were found in baby boys aged <1 year and 10,397 cases in baby girls. Based on data reported by the Jatimulya Health Center, in 2021 toddlers suffering from Acute Respiratory Infections had as many as 1,143 cases (Dinas Kesehatan Kabupaten Bekasi, 2019).

Acute Respiratory Infection is an inflammatory reaction that exists in the upper respiratory tract and its etiology is the presence of bacteria, viruses, and inflammation of the lung parenchyma which causes several complications (Simanjuntak, 2021). The risk of ARI occurring depends on 3 factors, namely the individual himself, behaviour, and environmental conditions (Arifin et al., 2021; Sari et al., 2021). Previous studies have found that ARI in toddlers is caused by smoking habits in the home, immunization status, and maternal knowledge (Ilmaskal et al., 2023; Nabila et al., 2023). Based on the Indonesian Minister of Health Number. 1077/MENKES/PER/V/2011 concerning Guidelines for Indoor Air Conditioning of the House, with dense occupants, the circulation of the house is also low so disease transmission can occur. This is due to the rapid transmission of disease if there are many people or mass gatherings. Humidity and room temperature are affected by the size of the ventilation that is owned by the house because ventilation measures that do not follow health standards can cause high levels of humidity and unstable room temperature (Fitriyah, 2016). The same thing can happen to the lighting conditions inside the house, sunlight can kill the bacteria that cause Acute Respiratory Infection. The condition of floors, walls, and roofs that are dirty and dusty can be a medium for the spread of ARI in children (Wijayanti & Indarjo, 2018). This study aims to analyze the risk factors for ARI in terms of the physical environment in Jatimulya Village.

METHODS

This research used a cross-sectional design. In this design, the independent variables and the dependent variable are examined at the same time (point time approach) to determine the relationship between the variables (Wang & Cheng, 2020). The location for this research was Jatimulya Village, South Tambun District, Bekasi Regency. The research was carried out within a month, in October 2022. The population of this study consisted of mothers who had toddlers suffering from ARI and those who did not suffer from ARI. The sample for this study was selected according to the inclusion and exclusion criteria which were determined by simple random sampling with a sample size of 148 respondents.

The source of data comes from primary and secondary data. Primary data is data collected in the form of wall type and floor type as well as direct observation of the respondent's house. To measure the area of the windows of the house and the distance between the house and the road, a Roll meter is used and a hygrometer is used to measure humidity.

Secondary data from the Jatimulya Health Center was used to confirm ARI patient data. After data collection is complete, then the data is analyzed to identify risk factors using the chi-square statistical test. This research has received ethical approval with ethical number 98/KER-FK/VII/2022.

RESULTS

The independent variables in this study are window width, humidity, type of house wall, type of house floor, and distance between the house and the main road. While the incidence of Acute Respiratory Infection (ARI) is used as the dependent variable. The number of subjects who participated in this study and met the criteria was 148 subjects.

Table 1. Frequency distribution in terms of the physical environment

Variable	Frequency	Percentage (%)
Window Width		
Eligible (≥1/9 floor area)	63	42.6
Not eligible (<1/9 floor area	85	57.4
Humidity		
Eligible (40-70%)	85	57.4
Not eligible (<40% or >70%)	63	42.6
Types of House Walls		
Eligible (permanent)	114	77.0
Not eligible (not permanent)	34	23.0
Types of House Floors		
Eligible (clean, dry, not damp, and watertight)	135	91.2
Not eligible (not clean, not dry, damp, and not waterproof)	13	8.8
Distance between the house and the main road		
Eligible (>5m)	131	88.5
Not eligible (≤5m)	17	11.5
Acute Respiratory Infection Incident		
Yes	59	39.9
No	89	60.1

Data source: Primer data

In terms of the physical environment, the components assessed are window width, humidity, type of house walls, type of floor of the house, and the distance between the house and the main road. Of the 148 research subjects, more subjects did not have ARI (60.1%) than those who had ARI (39.9%). Based on the table showed that the window width, there were more respondent houses whose window area did not meet the requirements, which was 57.4% compared to those that met the requirements, which was 42.6%. Based on the table showing the humidity, 85 respondent houses met the requirements (57.4%) while those that did not meet the requirements were 63 houses (42.6%). According to respondents' house on the construction of the walls of their houses, 114 (77%) of the houses studied met the criteria, while only 34 (23%) did not. Regarding the type of floor of the house, 135 of the respondent's houses met the requirements (91.2%) which was far greater than the thirteen houses (8.8%) whose floor types did not meet the standards. Regarding the distance between the house and the main road, 131 respondents (88.5%) met the requirements, which means more than 17 (11.5%) did not.

Table 2. The relationship between physical environmental factors and the incidence of ARI

Variable	ARI n (%)	Not ARI n (%)	p-value
Window Width			
Eligible (≥1/9 floor area)	2 (3.4%)	61 (68.5%)	0.000
Not eligible (<1/9 floor area	57 (96.6%)	28 (31.5%)	
Humidity			
Eligible (40-70%)	12 (20.3%)	73(82%)	0.000
Not eligible (<40% or >70%)	47(79.7%)	16(18%)	
Types of House Walls			
Eligible (permanent)	50(84.7%)	64(71.9%)	0.069
Not eligible (not permanent)	9(15.3%)	25(28.1%)	
Types of House Floors			
Eligible (clean, dry, not damp, and watertight)	56(94.9%)	79(88.8%)	0.196
Not eligible (not clean, not dry, damp, and not waterproof)	3(5.1%)	10(11.2%)	
Distance between the house and the main road			
Eligible (>5m)	55(93.2%)	76(85.4%)	0.144
Not eligible (≤5m)	4(6.8%)	13(14.6%)	

Data source: Primer data

Based on Table 2, in the window width that meets the requirements, 3.4% of subjects with ARI and 96.6% of subjects with window width do not meet the requirements and have ARI. It was also found that 68.5% of subjects whose house windows met the requirements and 31.5% of subjects whose house windows did not meet the requirements did not have ARI. The chi-square test was carried out on the data, the resulting p-value = 0.000, where p <0.05, indicating a significant relationship between window width and the incidence of ARI.

In terms of humidity, 23% of participants with humidity met the standards, while 89% of participants who did not meet the requirements suffered from ARI. It was also found that 82% of subjects with humidity met the requirements and 18% of subjects did not meet the requirements who did not have ARI. The chi-square test was carried out on these data, the calculation results were p = 0.000 where p <0.05 indicated that there was a significant relationship between humidity and the incidence of ARI in toddlers.

In terms of wall types, 84.7% of subjects with wall types met the requirements and 15.3% of subjects did not meet the requirements who had ARI. There were also 71.9% of the subjects who met the requirements and 20.1% of the subjects who did not meet the requirements and did not have ARI. Based on the findings of the chi-square test, p = 0.069, where p > 0.05, indicating that there was no significant relationship between the type of house wall and the incidence of ARI in toddlers.

For the type of floor, 94.9% of the subjects with this type of floor met the requirements and 5.1% of the subjects who did not meet the requirements had ARI. There were also 88.8% of subjects who met the requirements and 11.2% of the subjects who did not meet the requirements and did not have ARI. Based on the findings of the chi-square test, p = 0.196, where p > 0.05, which indicates that there was no significant relationship between the type of house floor and the incidence of ARI in toddlers.

In the distance between the house and the main road, 93.2% of the subjects with the distance between the house and the main road met the requirements and 6.8% of the subjects who did not meet the requirements had ARI. It was also found that 85.4% of the subjects with

the distance from their house to the main road met the requirements and 14.6% of the subjects did not meet the requirements who did not have ARI. The chi-square test was carried out on the data, p = 0.144 where p > 0.05, which means that there was no significant relationship between the distance between the house and the road and the incidence of ARI in toddlers.

DISCUSSIONS

Relationship between window width and the incidence of ARI

Based on the research conducted, it was found that there was a significant relationship between window width and the incidence of ARI in toddlers in Jatimulya Village with a p-value <0.05 (p=0.00). Based on the Ministry of Public Works and Housing, the window area is said to have met the requirements if the area is ≥1/9 of the floor area of the house (Presiden RI, 2016). The large number of window areas that do not meet the requirements in Jatimulya Village is probably due to the large number of residents living in window-rented houses, some residents who have the habit of rarely opening windows (67%) causing poor air circulation in the house. With windows that do not meet standards (less than a ninth of the floor area of the house), less light enters the house. Insufficient airflow and little incoming sunlight will cause air humidity to increase and make it easier for bacteria or microorganisms to develop (Rafaditya et al., 2022).

Same with the relationship between ventilation area and the incidence of ARI, which has been widely studied before, based on the Ministry of Health regulation number 829/Menkes/SK/VII/1999 at least 10% of the floor space must be devoted to ventilation (Kementerian Kesehatan RI, 1999). According to a study conducted in Purwokerto, there was a relationship between the ventilation area and the incidence of acute respiratory infections (ARI) in toddlers in Sokanegara Village, Purwokerto with a p-value = 0.019. This is because ventilation functions as a place for air exchange so that the air in the room of the house can be maintained (Rafaditya et al., 2022). The same is the case with one of the functions of windows ventilation.

Relationship between humidity and the incidence of ARI

This study obtained the results that there was a significant relationship between humidity and the incidence of ARI in toddlers in the Jatimulya Village with a p-value <0.05 (p=0.00). With poor air quality value, it will increase the risk of developing bacteria or diseases related to the respiratory tract, one of which is the ARI (Sofia, 2017).

Another factor that causes humidity in residents' homes can be due to the large number of residents who live in rented windows with one window, the habit of some residents who rarely open windows so that little light enters and air circulation in the house becomes poor. Based on the Ministry of Health regulation number 829/Menkes/SK/VII/1999, good air humidity is in the range of 40-70% (Kementerian Kesehatan RI, 1999). Indoor humidity is influenced by several factors, namely the location and size of windows or ventilation and the construction of a house (Pudul et al., 2013).

This study is in line with the conclusions of Dedi Mahyudin and Ronny (p = 0.00)that there was a relationship between air humidity and the incidence of acute respiratory infections (ARI) in toddlers (Syam & Ronny, 2016). This research was also in line with the findings of Selfiana, P., et al., who found a strong correlation between relative humidity and the incidence of acute respiratory infections (ARI) in toddlers in Mapanget District, Manado City with p = 0.00 (Pudul et al., 2013).

The relationship between the type of wall and the incidence of ARI

This study obtained the results that there was no significant relationship between the type of wall and the incidence of ARI in toddlers in the Jatimulya Village with a p>0.05 (p=0.069). Most of the respondent's houses already use this type of adobe wall so many of them meet the requirements. Non-permanent walls such as those made of woven bamboo, plywood, and gypsum can be one of the factors that cause an increase in room humidity (Rafaditya et al., 2022).

This research is in line with the research of Irma et al. who examined children in the work area of the Wawonsa Health Center, Manado City, and found no correlation between the type of wall and the prevalence of ARI in toddlers (p-value = 0.268). However, this is contrary to research conducted by Safrizal who obtained with p-value = 0.00 which showed a significant relationship between the type of house wall and the prevalence of ARI in toddlers. In this study, many house walls in Blang Muko Village still use bamboo, planks, or wood (Safrizal, 2017).

Although the results obtained that there was no relationship, the type of wall is one of the factors that must be considered in building a house so that it becomes a form of prevention of ARI. According to the Minister of Health of the Republic of Indonesia Regulation Number 829/Menkes/SK/VII/1999, any type of wall must use a permanent material (Hasanah et al., n.d.).

The relationship between the type of floor and the incidence of ARI

This study found no relationship between the type of floor and the incidence of acute respiratory infections (ARI) in toddlers in the Jatimulya Village with a p-value > 0.05 (p = 0.196). Most of the respondent's houses already use this type of ceramic floor so many of them meet the requirements. Floors that do not meet the requirements, such as those made of earth or cement are not plastered so that they produce dust during the dry season and the rainy season will be more humid. A lot of dust in the house will cause various diseases related to the respiratory tract, one of which is ARI. A good floor should be clean, dry, and impermeable (Safrizal, 2017).

This study agrees with Merry et al. that there is no significant relationship between the type of floor and the prevalence of ARI in toddlers in Bunaken District, Manado City (p = 0.252) (Husna et al., 2022). In contrast, Vedjia Medhyna's study showed that there was a significant relationship between floor type and the prevalence of acute respiratory infections (ARI) in toddlers in the Pasaman District (p=0.035). In this study, many of the respondent's houses had dirt floors, so the humidity in the room increased because the floors were not tight (Medhyna, 2019).

Although the results obtained that there was no relationship, the type of floor is one of the factors that must be considered in building a house so that it becomes a form of prevention of ARI. According to the Minister of Health of the Republic of Indonesia Regulation Number 829/Menkes/SK/VII/1999, the type of floor must use a waterproof material and be easy to clean and made of tile or ceramic (Bura et al., 2021).

The relationship between the distance between the house and the main road with the incidence of ARI

This study found that there was no significant relationship between the distance between the house and the main road and the frequency of acute respiratory infections (ARI) in toddlers in Jatimulya Village p > 0.05 (p = 0.144). In this study, most of the respondents' houses were >5m (88.5%) because they lived in small streets far from the main road.

This study is in line with the research of Robiah, H. et al., who concluded that there was no relationship between the distance between the house and the main road and the prevalence of ARI among toddlers in the Tabunganen District. In this study, various risk factors for ARI including the physical condition of the house, nutrition, socio-economic variables, and climate were the causes of ARI in toddlers in the District of Tabunganen (Hasanah et al., n.d.).

Although there is no significant relationship between the distance between the house and the main road and the incidence of ARI, the distance between the house and the road is an important factor that must be considered. According to the Minister of Health of the Republic of Indonesia Regulation Number 829/Menkes/SK/VII/1999, the distance between a house and the main road is at least ≤5m, this can be a form of prevention of ARI (Kementerian Kesehatan RI, 1999).

CONCLUSIONS

Based on the results of the research, it can be concluded that there was a significant relationship between window width and humidity with the incidence of ARI. And there was no relationship between the type of wall, the type of floor, and the distance between the house and the main road to the incidence of ARI. For further research, it is possible to examine more comprehensive factors, including host, agent and environmental factors.

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