

ARTICLE INFORMATION

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Risk factors for acute respiratory infection (ARI) in children under five years of age

M. Nabil Azkia Mastera*, M. Naswir, Hendra Dhermawan Sitanggang, Dwi Noerjoedianto

Universitas Jambi

Corresponding author: *Email: mnabilazkiamastera@gmail.com

Abstract

Background: Acute Respiratory Infection (ARI) remains one of the major health problems among children under five in Indonesia. The high incidence of ARI is influenced by various factors, including nutritional status, housing conditions, and previous history of ARI.

Purpose: to determine the risk factors associated with ARI among children under five years of age.

Method: This research used a quantitative method with a cross-sectional design. The sample consisted of 81 children under five selected using purposive sampling technique. Data were collected through questionnaires, observations, and medical records, then analyzed using the Chi-Square test with a 95% confidence level.

Results: The results showed that there was a significant relationship between nutritional status and the incidence of ARI among children under five (p -value = 0.004; PR = 2.297; 95% CI = 1.287–4.098). In addition, a history of ARI was also significantly associated with the incidence of ARI (p -value = 0.000; PR = 13.000; 95% CI = 5.048–33.476). Meanwhile, residential density was not significantly associated with ARI incidence among children under five (p -value = 0.474).

Conclusion: In conclusion, nutritional status and history of ARI are risk factors associated with ARI incidence among children under five.

Suggestion: Therefore, efforts are needed to improve nutritional status, implement clean and healthy living behaviors, and conduct regular health monitoring to prevent recurrent ARI among children under five.

Keywords: ARI; Children Under Five; History Of ARI; Nutritional Status; Residential Density.

INTRODUCTION

Acute Respiratory Infections (ARI) remain a significant global health problem, particularly among children and vulnerable groups. The WHO reports that respiratory infections such as influenza and Respiratory Syncytial Virus (RSV) still cause hundreds of thousands of deaths annually in children under five, with the burden of disease higher in developing countries than in developed countries (World Health Organization, 2024).

In Indonesia, ARI remains a major health problem among toddlers. The 2023 Indonesian Health Survey recorded 877,531 cases of ARI nationally, indicating a high burden of disease in the childhood age group (Ministry of Health of the Republic of Indonesia,

2023). Furthermore, the 2018 Basic Health Research (Riskesdas) reported a prevalence of ARI of 4.4% based on health worker diagnoses, rising to 9.3% based on symptoms and diagnoses, indicating that ARI remains prevalent in the community (Ministry of Health of the Republic of Indonesia, 2023). This situation indicates that toddlers are the most vulnerable group due to their underdeveloped immune systems.

Acute Respiratory Tract Infection (ARI) remains a significant public health issue, requiring attention because it is an acute illness and can even cause death in infants in various developing countries, including Indonesia. In general, there are three risk

factors for ARI: environmental factors, individual child factors, and behavioral factors (Sofia, 2017). Behavioral factors, in particular, relate to the prevention and management of ARI in infants and toddlers, including family practices for ARI management, whether by the mother or other family members (Ministry of Health of the Republic of Indonesia, 2011). Environmental factors can also be caused by indoor air pollution, such as cigarette smoke, kitchen smoke from cooking with firewood, and the habit of using mosquito coils indoors (Wahyono, Hapsari, & Astuti, 2008).

The incidence of ARI is influenced by various factors described in the epidemiological triangle theory, namely host, agent, and environment. Host factors include age, nutritional status, and medical history, while environmental factors such as residential density, home ventilation, sanitation, and exposure to air pollution play a role in increasing the risk of transmission (Suhada, Novianus, & Wilti, 2023). Several studies also show that nutritional status, residential density, and a history of ARI are associated with the incidence of ARI in toddlers, although there is variation in results across several factors (Rita, Yundelfa, & Novianti, 2025).

ARI is a disease caused by an infection caused by a contagious agent. The spectrum of ARI symptoms can vary, usually including fever, cough, sore throat, shortness of breath, wheezing, or difficulty breathing (Fadila & Siyam, 2022). ARI is a major cause of morbidity and mortality in children under 5 years of age worldwide. Children are at high risk of ARI because they can experience decreased immunity. Complications of ARI can become more severe when the infection reaches the lungs (Mardiah, 2017). ARI is divided into two groups: upper respiratory tract infections and lower respiratory tract infections. Upper respiratory tract infections can cause sufferers to experience a variety of symptoms, including runny nose, nasal congestion, itchy eyes and nose, red eyes, earache, blurred or reduced hearing, dizziness, sore throat, difficulty swallowing, sinusitis, toothache, cough, excessive phlegm production, fever, fatigue, shortness of breath, hoarseness, myalgia, and malaise (Pelzman & Tung, 2021). The lower respiratory tract includes the continuation of the respiratory tract from the trachea and bronchi to the bronchioles and alveoli, which can result in

pneumonia, bronchitis, and other lower respiratory tract infections (Bruce, Bressler, Apostolou, & Singleton, 2021).

RESEARCH METHOD

This study was a quantitative cross-sectional study. This design was used to analyze the relationship between nutritional status, residential density, and history of acute respiratory infections (ARI) with the incidence of acute respiratory infections (ARI) in toddlers during the simultaneous observation period. The study was conducted in the Sarolangun Community Health Center area, Sarolangun Regency, Jambi Province, in 2025. The study location was selected based on the high number of cases of acute respiratory infections (ARI) in toddlers in the area compared to other community health centers in Sarolangun Regency.

The population in this study was all toddlers recorded as having ARI in the Sarolangun Community Health Center's area, a total of 429 toddlers, based on 2025 data. The sample size was determined using the Slovin formula with a 10% margin of error, resulting in a sample size of 81 respondents. The sampling technique used purposive sampling with inclusion criteria: toddlers residing in the Sarolangun Community Health Center's area, having complete data, and parents/guardians agreeing to participate by signing an informed consent. Exclusion criteria included respondents who could not communicate well, refused to be interviewed, and had incomplete data.

The data used consisted of primary and secondary data. Primary data were obtained through structured interviews using a questionnaire regarding nutritional status, housing density, and history of acute respiratory infections (ARI). Secondary data were obtained from medical records from the Sarolangun Community Health Center regarding the incidence of acute respiratory infections (ARI) in toddlers. The dependent variable in this study was the incidence of acute respiratory infections (ARI), while the independent variables included nutritional status, housing density, and history of acute respiratory infections (ARI).

Data processing was carried out through editing, coding, entry, cleaning, and tabulation using SPSS. Data analysis consisted of univariate and bivariate

M. Nabil Azkia Mastera*, M. Naswir, Hendra Dhermawan Sitanggang, Dwi Noerjoedianto

Universitas Jambi

Corresponding author: *Email: mnabilazkiamastera@gmail.com

analyses. Univariate analysis was used to describe the frequency distribution and percentage of each study variable. Bivariate analysis was conducted using the Chi-Square test to determine the relationship between the independent variables and the incidence of acute respiratory infections (ARI) in toddlers. The relationship between variables was considered significant if the p-value was <0.05 , presented as prevalence ratio (PR) and 95%

confidence interval (CI). This study applied ethical research principles, including respect for persons, beneficence, non-maleficence, justice, and confidentiality. All respondents were given an explanation of the research objectives and signed informed consent prior to the study. Respondents' identities were kept confidential, and data were used solely for research purposes.

M. Nabil Azkia Mastera*, M. Naswir, Hendra Dhermawan Sitanggang, Dwi Noerjoedianto

Universitas Jambi

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RESEARCH RESULTS

Table 1. Characteristics of respondents (N=81)

Variable	Results	PR (95% CI)	P-value
ARI incident (n/%)			
Yes	42/52.0		
No	39/48.0		
Nutritional Status (n/%)		2.29(1.28-4.09)	0.004
At Risk	32/39.5		
Not at Risk	49/60.5		
Residential Density (n/%)		1.23 (0.69-2.17)	0.474
Does not meet requirements	39/48.0		
Meets requirements	42/52.0		
History of ARI (n/%)		13.00 (5.04-33.47)	0.000
Yes	27/33.3		
No	54/66.7		

Based on table, it is known that of the 81 toddlers who responded to the study, the majority (42 toddlers (51.9%)) experienced acute respiratory infections (ARI), while 39 toddlers (44%) did not experience acute respiratory infections (ARI). These results indicate that the proportion of toddlers with symptoms of acute respiratory infections (ARI) is higher than that of toddlers without symptoms. Regarding nutritional status, the majority of toddlers (49 toddlers) were categorized as not at risk, while 32 toddlers (39.5%) were at risk. This distribution indicates that the majority of respondents had relatively good nutritional status. Regarding residential density, 42 toddlers (51.9%) lived in houses with adequate housing density, while 39 toddlers (48.1%) lived in houses with inadequate housing density. This indicates that the proportion of adequate housing density between the adequate and inadequate housing categories is relatively balanced, although the adequate category is more dominant. Regarding the history of ARI variable, the majority of toddlers (54 toddlers (66.7%)) had no history of ARI, while 27 toddlers (33.3%) had a history of ARI. This finding indicates that the majority of respondents had no prior history of ARI.

The bivariate analysis showed a p-value of 0.004 ($p < 0.05$), concluding that there is a significant relationship between nutritional status and the

incidence of ARI. The PR value of 2.29 (95% CI: 1.28–4.09) indicates that toddlers with a nutritional status at risk have a 2.29 times higher risk of experiencing ARI than toddlers with a nutritional status not at risk. The bivariate analysis showed a p-value of 0.474 ($p > 0.05$), concluding that there is no significant relationship between residential density and the incidence of ARI in toddlers. A PR value of 1.23 (95% CI: 0.69–2.17) indicates that toddlers living in homes with inadequate housing density have a 1.23-fold increased risk of developing ARI compared to toddlers living in homes with adequate housing density. However, because the confidence interval spans 1 and the p-value is greater than 0.05, the relationship is not statistically significant. The statistical test results show a p-value of 0.000. Since the p-value is < 0.05 , it can be concluded that there is a statistically significant relationship between a history of ARI and the incidence of ARI. Furthermore, the risk analysis results estimate a Prevalence Ratio (PR) of 13.00, with a 95% Confidence Interval (CI) ranging from 5.04 to 33.47. Because the CI spans 1 and the lower limit is greater than 1, this statistically significant finding indicates that a history of ARI is a strong risk factor. It can be concluded that toddlers who have a history of ARI have a 13 times greater risk

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Universitas Jambi

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of experiencing ARI again compared to toddlers who do not have a history of this disease.

DISCUSSION

Bivariate analysis results showed a significant association between nutritional status and the incidence of acute respiratory infections (ARI) in toddlers ($p = 0.004$). Toddlers with a nutritionally at-risk status were 2.297 times more likely to experience an ARI than toddlers with a nutritionally non-risk status (PR = 2.297; 95% CI: 1.287–4.098). This suggests that poor nutritional status can reduce immunity, increasing susceptibility to acute respiratory infections.

These results align with those of Abainpah et al. (2025), who also found a relationship between nutritional status and the incidence of ARI in toddlers ($p = 0.000$), with toddlers with malnutrition experiencing a higher incidence of ARI. However, these results differ from previous research, which found no significant association between the two variables ($p = 0.143$), which is thought to be influenced by other factors such as environmental conditions and respondent characteristics (Khadijah, Sari, Sari, & Amalia, 2025).

The chi-square test results showed no significant association between residential density and the incidence of acute respiratory infections (ARI) in toddlers ($p = 0.474$). Although a higher proportion of toddlers living in homes with inadequate housing density (56.3%) experienced acute respiratory infections (ARI) compared to those living in adequate housing density (33.3%), the relationship was not statistically significant. A PR value of 1.231 (95% CI: 0.696–2.176) indicates that residential density is not a significant risk factor, as the confidence interval still encompasses 1. This indicates that the incidence of acute respiratory infections in toddlers is likely more influenced by other factors such as ventilation, home humidity, exposure to cigarette smoke, and immune system health.

These results align with previous research that also found no significant association between residential density and acute respiratory infections (ARI) in toddlers ($p = 1.00$), presumably because most respondents' homes met health standards (Apriyan, Adawiyah, Agustin, & Calista, 2025). However, these results differ from those of other

researchers who found a significant association ($p = 0.003$), where inadequate housing density can increase the risk of ARI transmission due to poor air circulation and high contact between residents (Hermadita, 2025).

The analysis showed a significant association between a history of ARI and the incidence of ARI in toddlers ($p = 0.000$). Toddlers with a history of ARI had a higher proportion of ARI cases (74.1%) than toddlers without a history of ARI (40.7%). The PR value of 13.000 (95% CI: 5.048–33.476) indicates that toddlers with a history of ARI have a 13-fold greater risk of developing ARI than toddlers without such a history. This indicates that a history of ARI is a strong risk factor for recurrent ARI, which may be due to a more vulnerable respiratory tract and a child's suboptimal immunity.

The results of this study are in line with previous studies showing that the majority of toddlers experience ARI (70.40%) and there is a tendency for increased risk in toddlers with a history of previous respiratory tract disorders, which makes them more susceptible to recurrent ARI due to increased sensitivity of the respiratory tract to environmental factors such as dust, cigarette smoke, weather changes, and microorganisms that cause infection (Suhada et al., 2023). However, the results of this study are not in line with studies by other researchers who showed that several toddler characteristics such as age (p -value = 0.418) and gender (p -value = 0.815) did not have a significant relationship with the incidence of ARI, even though the prevalence of ARI in that study was also quite high (74.4%) (Rita et al., 2025).

CONCLUSION

There is a significant association between nutritional status and a history of acute respiratory infections (ARI) and the incidence of ARI in toddlers. Toddlers with high-risk nutritional status and a history of ARI are more likely to experience ARI. Meanwhile, housing density did not show a significant association with the incidence of ARI in toddlers.

SUGGESTION

It is recommended that the Sarolangun Community Health Center increase promotive and preventive efforts through regular monitoring of

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Universitas Jambi

Corresponding author: *Email: mnabilazkiamastera@gmail.com

toddlers' nutritional status, educating parents about ARI prevention, and strengthening Clean and Healthy Living Behaviors to prevent recurrent ARI incidents, especially in toddlers with a history of ARI. In addition, future researchers are expected to examine other risk factors such as home ventilation, cigarette smoke exposure, immunization status, and socioeconomic factors with a more comprehensive research design.

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