Media Kesehatan Politeknik Kesehatan Makassar

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

Analysis of Risk Factors Affecting the Incidence of ARI in Toddlers in Benteng City, Selayar Islands Regency

Erwinda Alwi Rachman*, Mulyadi, Budirman, Tsarwa Vania

Department of Environmental Health, Poltekkes Kemenkes Makassar
*Corresponding author: windaaa87@gmail.com

Article Information: received in September 2025; approved in Desember 2025; published in December 2025

ABSTRACT

Acute Respiratory Infection is an infectious disease that attacks the respiratory tract caused by the entry of microorganisms in the human body, especially in the respiratory system. Toddlers are one of the risk populations for ARI. This study aims to analyze the risk factors that influence the incidence of ARI in toddlers in Benteng Town, Selayar Islands Regency. The type of research used is analytic with a case control approach. The sampling method used was purposive sampling technique. The total number of samples was 74 samples. The results of data analysis were tested using the Chi Square test and the Logistic Regression test. The results showed that ventilation factors (p = <0.001 <0.05), occupancy density (p = 0.020 <0.05), and smoking habits of family members (p = 0.006 <0.05) were risk factors for the incidence of ARI in toddlers. The use of mosquito coils (p = 0.100 > 0.05), immunization history (p = 1.000 > 0.05), nutritional status (p = 0.563 > 0.05), and family income (p = 0.053 > 0.05) were not risk factors for ARI among children under five. The conclusion of this research is that of the seven variables studied, there are three variables that are risk factors for the incidence of ARI in toddlers, with ventilation being the most influential risk factor for the incidence of ARI in toddlers. Suggestions in this research are to maintain the cleanliness of the environment around the house and behave cleanly and healthily to prevent toddlers and families from ARI disease transmission.
Keywords: ARI; Toddler; Ventilation

INTRODUCTION

Human interaction with the environment has been going on since birth, including human needs for air, water, food, and other necessities. The quality of the environment has an impact on human health. One component of the environment that has a significant impact is air. Air, as a vital resource, is a mixture of several natural gases that surround the earth and consists of 78.1% nitrogen, 20.93% oxygen, 0.03% carbon dioxide (CO2), and other gas components. Health Ministerial Regulation No. 1077 of 2011 concerning Guidelines for Indoor Air Quality in Homes states that air pollution risk factors that can affect health originate from physical, chemical, and biological air pollution. Air pollution has the potential to increase cases of illness and death due to respiratory tract diseases, one of which is ARI. [2]

Acute Respiratory Infections (ARI) remain one of the most common health problems in Indonesia, with a total of four million deaths each year. ARI is an infectious disease that attacks the respiratory tract, caused by the invasion and reproduction of microorganisms in the human body, particularly in the respiratory system. Toddlers are one of the groups at risk of ARI because their immune systems are still vulnerable and weak, making it easy for microorganisms or bacteria to enter the body through the air and multiply, causing ARI symptoms that begin with fever followed by one or more symptoms such as sore throat, dry cough, and cough with phlegm [3]. Ministry of Health shows that the prevalence of ARI among toddlers in Indonesia is 12.8%, with the highest prevalence in East Nusa Tenggara province (18.6%) and the lowest in North Maluku province (6.0%)4. The highest prevalence of ARI in children under five according to age is in the 12-23 month age range, at around 14.4%. Meanwhile, the prevalence of ARI in children under five in South Sulawesi is 8.7%, which is close to the national average of 12.8%. [5]

Selayar Islands Regency is an area located in South Sulawesi and consists of 11 subdistricts, with 5 subdistricts located on the main island and 6 subdistricts outside the main island. Data obtained from the Selayar Islands Regency Health Office shows that the total number of cases among toddlers in 2023 was 1,744. Benteng City, one of the subdistricts in Selayar Islands Regency, had the highest incidence of ARI among toddlers in 2023 with 345 cases (19.8%). In 2024, there were 230 cases of ARI in children up to November. Benteng City has the largest population, reaching 25,000 people, with a population growth rate of around 1.10%. As a densely populated area, Benteng City will increase the risk of infectious diseases, one of which is ARI in children. [6]

Risk factors for ARI in toddlers are caused by three main components, namely agent factors, host factors, and environmental factors. Agent factors include microorganisms that cause ARI, such as bacteria, viruses, and fungi. Host factors, or human factors, also pose a risk of ARI in toddlers and include toddler behaviors such as immunization history, age, gender, and nutritional status. Research conducted by Wibowo & Ginanjar (2020) shows that there is a significant influence between nutritional status (ρ= 0.038) and immunization status (ρ= 0.035) and the incidence of ARI in toddlers. Immunization in infants is related to the role of vaccines in fighting pathogens. Immunization is one way to actively boost immunity in infants against a disease. In addition, children

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

with poor nutritional status are more susceptible to widespread diseases or inflammatory diseases, one of which is ARI.

Environmental factors include the physical environment of the home and behavioral factors of residents that cause the transmission of ARI in toddlers. This study is in line with research conducted by Tarigan and Heryanti, (2021), which also states that there is an influence of housing density and home ventilation on the incidence of ARI. Poor home ventilation can increase the concentration of pathogens in the air, while housing density causes narrow spaces between individuals, making it easier for pathogens to increase and spread to toddlers. In addition, socioeconomic factors also have an influence on the incidence of ARI. Generally, in low- and middle-income countries, the incidence of ARI is still quite high among infants, toddlers, children, and adults. With high incomes, healthy and nutritious food intake is more easily fulfilled. Toddlers who are nutritionally healthy have a stronger immune system and are not easily susceptible to infection. [9]

Based on observations conducted in Benteng City, it was found that the physical environment of people's homes was not suitable, considering the ventilation and housing density conditions that did not meet the requirements. In terms of behavior, the community was found to still have the habit of smoking and using mosquito coils around toddlers. In addition, from a socioeconomic perspective, the families of toddlers in Benteng City are associated with their ability to provide immunizations and nutrition for their toddlers. Based on the above description of the problem and considering the importance of knowing the risk factors that cause ARI in toddlers, the researcher was interested in conducting research related to "Analysis of Risk Factors Affecting the Incidence of ARI in Toddlers in Benteng City, Selayar Islands Regency" with the risk factors studied being ventilation, housing density, family members' smoking habits, use of mosquito coils, immunization history, nutritional status, and family income.

MATERIALS AND METHODS

The type of research used in this study was analytical with a case-control approach. The population in this study were toddlers aged 12-59 months or under 5 years old who were registered in Benteng City based on data from the Benteng Community Health Center in 2024. The data on the number of toddlers affected by ARI in 2024 in Benteng City amounted to 168 toddlers. The required sample size was 37 for the case group and 37 for the control group, with a total sample of 74 toddlers. The sample in this study was determined using the purposive sampling technique, which is sampling based on specific criteria. Data processing and analysis were performed using a computer. Decision making was assessed by comparing the p-value with the alpha value of 0.05 (margin of error 5%) with a confidence level of 95%. If the p-value < alpha value (0.05), it means there is an effect, and if the p-value > alpha value (0.05), it means there is no effect.

RESULT

Based on research that has been carried out in the City of Benteng, Selayar Islands Regency, the following results were obtained:

Distribution of the incidence of ARI in toddlers

Table 1. Distribution of ARI Incidence in Toddlers in Benteng City Selayar Islands Regency in 2025

No	ARI Incidence in Toddlers	Frequency	%
1	ARI	37	50
2	No ARI	37	50
	Total	**74**	**100**

Source : Primary Data

Based on table 1, it shows that out of 74 respondents, 37 respondents (50%) with control (Non-ARI) cases and 37 respondents (50%) with control (Non-ARI).

Distribution of Respondents Based on Ventilation Conditions

Table 2. Distribution of Respondents Based on Ventilation Conditions in Benteng City Selayar Islands Regency in 2025

No	Ventilation Conditions	Frequency	%
1	Not Eligible	42	56,8
2	Qualify	32	43,2
	Total	**74**	**100**

Source : Primary Data

Vol. XX No. 2 Desember 2025
https://doi.org/10.32382/medkes.v20i2

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

Based on table 2, it shows that respondents who have unqualified ventilation are 42 respondents (56.8%) and respondents who have qualified ventilation are 32 respondents (43.2%).

Distribution of Respondents by Occupancy Density

Table 3. Distribution of Respondents Based on Residential Density in Benteng City Selayar Islands Regency in 2025

No	Occupancy Density	Frequency	%
1	Not Eligible	39	52,7
2	Qualify	35	47,3
	Total	**74**	**100**

Source : Primary Data

Based on table 3, it shows that respondents with ineligible occupancy density are 39 respondents (52.7%) and respondents with housing density meet the requirements as many as 33 respondents (47.3%).

Distribution of Respondents Based on Family Members' Smoking Habits

Table 4. Distribution of Respondents Based on Family Members' Smoking Habits in Fort City, Selayar Islands Regency in 2025

No	Family Members' Smoking Habits	Frequency	%
1	Smoke	50	67,6
2	No Smoking	24	32,4
	Total	**74**	**100**

Source : Primary Data

Based on table 4, it shows that respondents with family members smoking as many as 50 respondents (67.6%) and respondents with family members who do not smoke as many as 24 respondents (32.4%).

Distribution of Respondents Based on the Use of Burning Mosquito Repellents

Table 5. Distribution of Respondents Based on the Use of Burning Mosquito Repellents in Fort City, Selayar Islands Regency in 2025

No	Burning Mosquito Repellents	Frequency	%
1	Using	32	43,2
2	Not Using	42	56,8
	Total	**74**	**100**

Source : Primary Data

Based on table 5, it shows that respondents who use burnt mosquito repellent are 32 respondents (43.2%) and respondents who do not use burnt mosquito repellent as many as 42 respondents (56.8%).

Distribution of Toddlers Based on Immunization History

Table 6. Distribution of Toddlers Based on Immunization History in Benteng City Selayar Islands Regency in 2025

No	Toddlers Based on Immunization History	Frequency	%
1	Not Immunized	1	1,4
2	Immunized	73	98,6
	Total	**74**	**100**

Source : Primary Data

Based on table 6, it shows that 1 toddler who has not been immunized is 1 toddler (1.4%) and 73 toddlers who have been immunized (98.6%).

Vol. XX No. 2 Desember 2025
https://doi.org/10.32382/medkes.v20i2

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

Distribution of Toddlers Based on Nutritional Status

Table 7. Distribution of Toddlers Based on Nutritional Status in Benteng City Selayar Islands Regency in 2025

No	Toddlers Based on Nutritional Status	Frequency	%
1	Abnormal Nutrition	15	20,3
2	Normal Nutrition	59	79,7
	Total	**74**	**100**

Source : Primary Data

Based on table 7, it shows that 15 toddlers with abnormal nutrition (20.3%) and 59 toddlers with normal nutrition (79.7%).

Distribution of Respondents Based on Family Income

Table 8. Distribution of Respondents Based on Family Income in Benteng City Selayar Islands Regency in 2025

No	Family Income	Frequency	%
1	Low	47	63,5
2	Tall	27	36,5
	Total	**74**	**100**

Source : Primary Data

Based on table 8, it shows that respondents with low income are 47 respondents (63.5%) and respondents who have high income are 27 respondents (36.5%).

The Effect of Ventilation with the Incidence of ARI in Toddlers

Table 9. Risk Factors for Ventilation with the Incidence of ARI in Toddlers in Benteng City Selayar Islands Regency in 2025

Ventilation	ARI Incident						OR 95% CI	*p-value*
	ARI		No ARI		Total			
	n	%	n	%	n	%		
Not Eligible	29	78,4	13	35,1	42	56,8	6,692 (2,381-18,812)	<0.001
Qualify	8	21,6	24	64,9	32	43,2		
Total	**37**	**100**	**37**	**100**	**74**	**100**		

Source : Primary Data

Based on table 9, the results of *the Chi Square* test show that ventilation is a risk factor for the occurrence of ARI in toddlers in Benteng City, Selayar Islands Regency with *a p-value* of <0.001 < 0.05. Based on statistics, ventilation conditions are said to have an effect on the occurrence of ARI in toddlers with an OR value = 6.692 (95% CI 2.381-18.812) indicating that toddlers who have unqualified ventilation are 6.6 times more at risk of suffering from ARI than toddlers who have qualified ventilation.

The Effect of Housing Density with the Incidence of ARI in Toddlers

Table 10. Risk Factors for Housing Density with the Incidence of ARI in Toddlers in Benteng City Selayar Islands Regency in 2025

Occupancy Density	ARI Incident						OR 95% CI	*p-value*
	ARI		No ARI		Total			
	n	%	n	%	n	%		
Not Eligible	25	67,6	14	37,8	39	52,7	3,423 (1,315-8,909)	0,02
Qualify	12	32,4	23	62,2	35	47,3		
Total	**37**	**100**	**37**	**100**	**74**	**100**		

Source : Primary Data

Vol. XX No. 2 Desember 2025
https://doi.org/10.32382/medkes.v20i2

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

Based on table 10, the results of *the Chi Square* test show that residential density is a risk factor for the occurrence of ARI in toddlers in Benteng City, Selayar Islands Regency with *a p-value* of 0.020 < 0.05. Based on statistics, housing density is said to have an effect on the occurrence of ARI in toddlers with an OR value = 3.423 (95% CI 1.315 - 8.909) indicating that toddlers with ineligible housing density are 3.4 times more at risk of suffering from ARI than toddlers with qualified housing density.

The Effect of Family Members' Smoking Habits with the Incidence of ARI in Toddlers

Table 11. Risk Factors for Family Members with the Incidence of ARI in Toddlers in the City of Benteng, Selayar Islands Regency in 2025

Smoking Habits of Family Members	ARI Incident						OR 95% CI	*p-value*
	ARI		No ARI		Total			
	n	%	n	%	n	%		
Smoke	31	83,8	19	51,4	50	67,6	4,895 (1,652-14,503)	0,006
No Smoking	6	16,2	18	48,6	24	32,4		
Total	**37**	**100**	**37**	**100**	**74**	**100**		

Source : Primary Data

Based on table 11, *the results of the Chi Square* test show that family members' smoking habits are a risk factor for the incidence of ARI in toddlers in Benteng City, Selayar Islands Regency with *a p-value* of 0.006 < 0.05. Based on statistics, the smoking habit of family members is said to have an effect on the occurrence of ARI in toddlers with an OR value = 4.895 (95% CI 1.652-14.503) indicating that toddlers with smoking family members are 4.8 times more at risk of suffering from ARI than toddlers who do not have a smoking family member.

Effect of Burning Mosquito Repellents on the Incidence of ARI in Toddlers

Table 12. Risk Factors for the Use of Burning Mosquito Repellents with the Incidence of ARI in Toddlers in the City of Benteng, Selayar Islands Regency in 2025

Use of Burning Mosquito Repellents	ARI Incident						OR 95% CI	*p-value*
	ARI		No ARI		Total			
	n	%	n	%	n	%		
Using	20	54,1	12	32,4	32	43,2	2,451 (0,953-6,302)	0,100
Not Using	17	45,9	25	67,6	42	56,8		
Total	**37**	**100**	**37**	**100**	**74**	**100**		

Source : Primary Data

Based on table 12, the results of *the Chi Square* test show that the use of burnt mosquito repellent is not a risk factor for the occurrence of ARI in toddlers in Benteng City, Selayar Islands Regency with *a p-value* of 0.100 > 0.05. Based on statistics, the OR value = 2.451 (95% CI 0.953-6.302) showed that toddlers who used mosquito repellent were 2.4 times more likely to suffer from ARI than toddlers who did not use mosquito repellent.

Vol. XX No. 2 Desember 2025
https://doi.org/10.32382/medkes.v20i2

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

The Effect of Immunization History with the Incidence of ARI in Toddlers

Table 13. Risk Factors for Immunization History with the Incidence of ARI in Toddlers in Fort City, Selayar Islands Regency in 2025

History of Immunization	ARI Incident						OR 95% CI	*p-value*
	ARI		No ARI		Total			
	n	%	n	%	n	%		
Not Immunized	0	0	1	2,7	1	1,4	0	1,000
Immunized	37	100	36	97,3	73	98,6		
Total	**37**	**100**	**37**	**100**	**74**	**100**		

Source : Primary Data

Based on table 13, *the Chi Square* test results show that immunization history is not a risk factor for the occurrence of ARI in toddlers in Benteng City, Selayar Islands Regency with *a p-value* of 1,000 > 0.05.

The Effect of Nutritional Status with the Incidence of ARI in Toddlers

Table 14 Risk Factors for Nutritional Status with the Incidence of ARI in Toddlers in Benteng City Selayar Islands Regency in 2025

Nutritional Status	ARI Incident						OR 95% CI	*p-value*
	ARI		No ARI		Total			
	n	%	n	%	n	%		
Abnormal	6	16,2	9	24,3	15	20,3	0,602 (0,190-1,906)	0,563
Normal	31	83,8	28	75,7	59	79,7		
Total	**37**	**100**	**37**	**100**	**74**	**100**		

Source : Primary Data

Based on table 14, the results of *the Chi Square* test show that nutritional status is not a risk factor for the occurrence of ARI in toddlers in Benteng City, Selayar Islands Regency with *a p-value* of 0.563 > 0.05. Based on statistics, the OR value = 0.602 (95% CI 0.190-1.906) showed that toddlers with abnormal nutrition were 0.6 times more at risk of suffering from ARI than toddlers with normal nutrition.

The Effect of Family Income with the Incidence of ARI in Toddlers

Table 15. Family Income Risk Factors with the Incidence of ARI in Toddlers in Benteng City Selayar Islands Regency in 2025

Family Income	ARI Incident						OR 95% CI	*p-value*
	ARI		No ARI		Total			
	n	%	n	%	n	%		
Low	28	75,7	19	51,4	47	63,5	2,947 (1,095-7,930)	0,053
Tall	9	24,3	18	48,6	27	36,5		
Total	**37**	**100**	**37**	**100**	**74**	**100**		

Source : Primary Data

Based on table 15, the results of *the Chi Square* test show that family income is not a risk factor for the occurrence of ARI in toddlers in Benteng City, Selayar Islands Regency with *a p-value* of 0.053 > 0.05. Based on statistics, the OR value = 2.947 (95% CI 1.095-7.930) shows that families with low income are 2.9 times more at risk of having toddlers with ARI than high-income families.

Vol. XX No. 2 Desember 2025
https://doi.org/10.32382/medkes.v20i2

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

Determination of Variables Eligible for Regression Test

Table 16 Determination of Variables Eligible for Regression Test

Variabel	P-value
Ventilation	<0.001
Occupancy Density	0,012
Smoking Habits of Family Members	0,004
Use of Burning Mosquito Repellents	0,163
History of Immunization	1,000
Nutritional Status	0,388
Family Income	0,032

Source : Primary Data

Based on table 16, it shows that there are 3 variables that are declared worthy of the regression analysis test (*p-value* < 0.25), namely ventilation variables, occupancy density, and smoking habits of family members. Meanwhile, variables with *a p-value* result of > 0.25 were declared unsuitable for inclusion in the regression analysis test, namely the variables of mosquito repellent use, immunization history, nutritional status, and family income.

The Most Significant Influence on the Incidence of ARI in Toddlers

Table 17. Logistic Regression Test Results

			95% C.I. for EXP (B)	
	Itself.	OR	Lower	Upper
Ventilation	0,002	8,715	2,203	34,477
Occupancy Density	0,595	1,413	0,395	5,059
Smoking Habits of Family Members	0,002	8,303	2,239	30,791
Constant	<0.001	0,001		

Source : Primary Data

Based on table 17, it shows that there are 2 variables that have a significant effect on the incidence of ARI in toddlers, namely ventilation and smoking habits of family members. Among the two variables, the most influential variable was ventilation with a *p-value* of 0.002 < 0.05 and a strong value of OR influence of 8.715, indicating that the risk of ARI in toddlers was 8.7 times greater in homes with unqualified ventilation.

DISCUSSION

The Effect of Ventilation with the Incidence of ARI in Toddlers in Benteng City, Selayar Islands Regency

Based on the results of the research that has been conducted, it was found that in the ventilation risk factors, as many as 42 respondents (56.8%) had unqualified ventilation and 32 respondents (43.2%) had qualified ventilation. Statistically, a *p-value* of <0.001 was obtained which stated that ventilation had an effect on the incidence of ARI in toddlers in Benteng City, Selayar Islands Regency with an OR value = 6.692 (95% CI 2.381-18.812) indicating that toddlers who had unqualified ventilation were at 6.6 times greater risk of suffering from ARI than toddlers who had qualified ventilation. In addition, through a logistic regression test, it was found that ventilation was the most influential risk factor in the occurrence of ARI in toddlers with *a p-value* of 0.002 < 0.05.

The state of ventilation in the house of toddlers can be said to be risky with a ventilation state of less than 10% of the floor area. It was found that the respondent's house did not have ventilation that was in accordance with the floor area of the house he owned. A total of 10 respondent houses were found in a hallway with narrow land which resulted in the walls of the houses directly adjacent to other houses so that the construction of ventilation could not be done optimally. Meanwhile, other respondents used many windows as ventilation but in their use the windows were rarely opened or closed permanently. The narrow environmental conditions make respondents prefer to close the windows to reduce noise disturbances and prevent dust from entering the house. In addition, the ventilation owned by the respondents was covered by cabinets and items thus inhibiting air

Vol. XX No. 2 Desember 2025
https://doi.org/10.32382/medkes.v20i2

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

circulation. The state of closed ventilation does not allow air exchange to occur, increasing the risk of transmission of diseases in the respondent's home which will then have an impact on the health of toddlers.

This study is in line with the research and by stating that there is an influence between the incidence of ARI and ventilation shown in the Mulyadi & Nugroho (2018) and Lazamidarmi et al. (2021) *p-value* result of 0.002 < 0.05. This study states that the existence of ventilation can help expel air that is at risk of containing microorganisms and pollutants that are harmful to health. Vents, which also function as a place for sunlight to enter, are also useful for controlling indoor humidity. Rooms with little exposure to sunlight cause high humidity and risk becoming a medium for the growth and proliferation of pathogenic microorganisms.

This research is supported by Hendrik L Blum's theory in the book "Fundamentals of Public Health Sciences by stating that the first thing that affects the degree of health is the environment, followed by behavior, health services, and heredity. Ventilation as one of the environmental factors affects the occurrence of ARI in toddlers. Based on the Regulation of the Minister of Health No. 2 of 2023, it states that the room must be equipped with ventilation of at least 10% of the floor area. Ventilation as a means of air circulation to ensure indoor air quality and free the room from pathogenic microorganisms that can interfere with the health of residents [12].

This research is also supported by the theory of Karimuna *et al* in the book "Residential and Urban Environmental Health" which states that ventilation is the key to maintaining indoor air quality and the health of its residents. This is because indoor air has the potential to be contaminated by pollutants such as cigarette smoke and household chemicals. Without adequate ventilation, pollutants and pathogenic microorganisms can accumulate indoors and pose a risk to the health of toddlers.

Control that can be carried out by the community as an effort to reduce the incidence of ARI in toddlers is to routinely clean and open ventilation, arrange the room and avoid the accumulation of items near the vents that can hinder circulation.

The Effect of Residential Density with the Incidence of ARI in Toddlers in Benteng City, Selayar Islands Regency

Based on the results of the study, it was obtained that in the risk factor of occupancy density, as many as 39 respondents (52.7%) with unqualified occupancy density and 35 respondents (47.3%) with qualified occupancy density. Statistically, a *p-value* of 0.020 was obtained which stated that residential density had an effect on the incidence of ARI in toddlers in Benteng City, Selayar Islands Regency with an OR value = 3.423 (95% CI 1.315 – 8.909) which means that toddlers who have houses with unqualified occupancy density are at 3.4 times greater risk of suffering from ARI than toddlers with qualified occupancy density.

The housing density in the house of toddlers can be said to be risky with the situation of most of the respondents' houses still not meeting the specified conditions. Generally, the room in the respondent's house has an area of less than 8 m^2. It was found that some respondents used a room such as a bedroom inhabited by more than 2 people because some parents were still sleeping together with their children. Some respondents admitted that they still did not feel ready to let their children sleep alone in a separate room. Potential risks are also supported by the availability of ventilation conditions in some respondents' houses that are still inadequate with closed or unqualified conditions.

This study is in line with research with and which states that there is an effect of residential density with the incidence of ARI in toddlers with Zairinayati & Putri (2020) and Wisudariani et al. (2022) *a p-value* of 0.012 < 0.05. The theory that supports this finding is put forward by the "Environmental Health Textbook" that housing should be built in a safe and comfortable form for residents to reduce the risk of disease onset. Unqualified housing density can be a means of disease transmission for its residents. Inadequate space space and an unbalanced ratio of occupants allow reduced oxygen levels and lead to the transmission of pathogenic microorganisms. Densely populated living conditions in one room make it easy for droplets (air droplets containing viruses/bacteria) to move from one individual to another. In this case, toddlers whose immune system and respiratory tract size are still vulnerable will be more susceptible to infection. [15]

Control that can be carried out by the community as an effort to reduce the incidence of ARI in toddlers is to arrange the space so that toddlers do not have enough space. In addition, it can be done by providing good and adequate ventilation.

The Effect of Family Members' Smoking Habits with the Incidence of ARI in Toddlers in Benteng City, Selayar Islands Regency

Based on the results, it was obtained that in the risk factors for smoking habit of family members, as many as 50 toddlers (67.6%) with family members smoking and 24 toddlers (32.4%) with non-smoking family members. Statistically, a *p-value* of 0.006 was obtained which stated that the smoking habit of family members had an effect on the incidence of ARI in toddlers in Benteng City, Selayar Islands Regency with an OR value = 4.895 (95% CI 1.652 – 14.503) which means that toddlers with family members who have smoking habits are at 4.8 times greater risk of suffering from ARI than toddlers with non-smoking family members.

Vol. XX No. 2 Desember 2025
https://doi.org/10.32382/medkes.v20i2

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

The smoking habit of family members can be said to be risky because there are still many family members of toddlers who actively smoke around toddlers. The majority of these family members are fathers of toddlers with smoking habits both in and around the home environment. It was found that the average smoker has been smoking for more than 1 year and often does this activity around toddlers. It was also found that family members sometimes directly touch toddlers after smoking. Some respondents said that the father of the toddler did not smoke inside the house. However, the risk of transmission of smoke particles can still be carried through clothing or equipment touched by smokers. A person's smoking habit in the household produces smoke that sticks to furniture, carpets, clothes, and other appliances that can indirectly harm health.

These findings are in line with research conducted by and Seda et al. (2021) and Salamat S (2024) which states that there is an influence of smoking behavior of people closest to the incidence of ARI in toddlers with *a p-value* of 0.004 < 0.05. Smoking habits by parents and other family members significantly increase the risk of respiratory infections due to exposure to toxic substances contained in cigarettes. Cigarette smoke causes air pollution which can further damage the respiratory mechanism where the habit of smoking not only endangers active smokers, but can also cause others to become passive smokers in a state of exposure to cigarette smoke.

Efforts that can be made to reduce the smoking habit of toddler families that are not accompanied by awareness of health risks for children can be in the form of instructions not to touch toddlers before cleaning themselves after smoking. In addition, education and socialization can be carried out about the dangers of smoking around children to foster awareness of toddler families.

The Effect of the Use of Burning Mosquito Repellents with the Incidence of ARI in Toddlers in Benteng City, Selayar Islands Regency

Based on the results of the study, it was obtained that in the risk factors for the use of burning mosquito repellent, as many as 32 respondents (43.2%) used burning mosquito repellent and 42 respondents (56.8%) did not use burning mosquito repellent. Statistically, *a p-value* of 0.100 was obtained which stated that the use of burnt mosquito repellent had no effect on the incidence of ARI in toddlers in Benteng City, Selayar Islands Regency with an OR value = 2.451 (95% CI 0.953 – 6.302), meaning that toddlers who used burnt mosquito repellent had a 4.8 times greater risk of suffering from ARI than toddlers who did not use burning mosquito repellent.

Based on the results of the research that has been conducted, the respondents in this study do not use burning mosquito repellent. This is because respondents choose to use mosquito nets and electric mosquito repellent as mosquito repellents. Respondents chose mosquito nets because they were considered more practical and easy to use. In addition, the use of electric mosquito repellent is also widely used because it is easy to use and does not produce smoke. However, there are still some respondents who use burnt mosquito repellent and are usually used at night. Respondents stated that generally burnt mosquito repellent is sometimes used when gathering with family to protect against mosquito bites. The use of mosquito repellent is widely chosen because it is relatively cheap and easier to get in stores.

This study is in line with previous research by and which stated that there was no effect between the use of mosquito repellent and the incidence of ARI in toddlers with Fajrianti et al. (2022) and Pasaribu et al. (2021) *a p-value* of 0.291 > 0.05. The use of burnt mosquito repellent is used as a method to repel mosquitoes in the house. Burnt mosquito repellent contains active ingredients to kill mosquitoes in the form of DEET, *allethrin* and *permenthrin* as well as other additives such as carbon, fragrance, and binders. The content of these active ingredients will then be burned into smoke that can repel mosquitoes.

Exposure to mosquito repellent smoke at night for a long period of time can increase the potential for respiratory tract disruption. In addition, the use of burning mosquito repellent in a closed space can cause harmful particles due to the burning of mosquito repellent to be trapped in the room which then toddlers and other families will inhale the smoke.

Efforts that can be made to replace the use of burnt mosquito repellent are by installing mosquito nets on beds, installing mosquito nets in open vents, and replacing mosquito repellent with mosquito repellent products that are more environmentally friendly. In addition, early prevention is carried out by maintaining environmental cleanliness through efforts to eradicate mosquito breeding nests.

The Effect of Immunization History with the Incidence of ARI in Toddlers in Benteng City, Selayar Islands Regency

Based on the results of the study, it was obtained that in the risk factors of immunization history, as many as 1 toddler (1.4%) had not been immunized and 73 toddlers (98.6%) had been immunized. Statistically, *a p-value* of 1,000 was obtained which stated that immunization history had no effect on the incidence of ARI in toddlers in Benteng City, Selayar Islands Regency. This shows that both in the case group and the cock group, no striking differences were found regarding immunization history which was dominated by toddlers who had immunized.

The history of immunization of toddlers in Benteng City, Selayar Islands Regency is considered to be good, where almost all toddlers have received complete basic immunizations according to the recommended age.

Vol. XX No. 2 Desember 2025
https://doi.org/10.32382/medkes.v20i2

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

This shows that the level of parental awareness of the importance of immunization is quite high. It is also supported by the role of puskesmas officers who carry out *home visit* for toddlers who do not come to the posyandu during the recommended schedule.

This study is in line with previous research by and which stated that there was no significant effect between immunization status on the incidence of ARI with a Togodly (2022) and Caniago et al. (2022) *p-value* of 0.608 > 0.05. This is due to the awareness and concern of mothers under five for the fulfillment of immunization as an effort to prevent disease. This finding is in line with the situation in Benteng City, Selayar Islands Regency where mothers under five understand the importance of immunization for toddlers.

According to the theory in the book "Introduction to Child Nursing" the form of immunization in the form of vaccination given according to the schedule aims to prevent various infectious diseases that have the potential to harm children. Immunization will increase the immunity of toddlers to pathogenic viruses that can cause disease. Toddlers with incomplete immunizations tend to have less immunity so they are more susceptible to viruses and bacteria that cause disease. An immune system that has not been optimally formed can worsen the response of the toddler's body to disease. [22]

The control that can be carried out for toddlers who have not been immunized is by providing education to parents of toddlers about the importance of immunization. And control for toddlers who have been immunized is by providing a healthy lifestyle for toddlers as an effort to minimize the transmission of disease to toddlers.

The Effect of Nutritional Status with the Incidence of ARI in Toddlers in Benteng City, Selayar Islands Regency

Based on the results of the study, it was obtained that in the risk factors of nutritional status, as many as 15 toddlers (20.3%) had abnormal nutrition and 59 toddlers (79.7%) had normal nutrition. Statistically, *a p-value* of 0.563 was obtained, which stated that nutritional status had no effect on the incidence of ARI in toddlers in Benteng City, Selayar Islands Regency with an OR value = 0.602 (95% CI 0.190 – 1.906), meaning that toddlers with abnormal nutritional status were 0.6 times more at risk of suffering from ARI than toddlers with normal nutrition.

The overall nutritional status of toddlers in Benteng City, Selayar Islands Regency shows the average toddler with normal nutrition. The nutritional status in the toddler group of cases was on average normal and only 6 toddlers with abnormal nutrition. Toddlers with abnormal nutrition were found to tend to have lower body weight than children their age. Toddlers tend to be lazy or have selective habits of food, mainly vegetables and fruits. The lack of fruit and vegetable intake results in the nutritional intake needed by toddlers not being fulfilled properly. In addition, malnutrition in toddlers can also be caused by toddlers who are not given exclusive breastfeeding. This causes the antibodies contained in breast milk to be not possessed by some toddlers who are not breastfed so that the immunity of toddlers will be disturbed and easily affected by infectious diseases.

This study is in line with a study conducted by the University of Pennsylvania that states that there is no influence between nutritional status and the incidence of ARI in toddlers with Jumiyati et al. (2024) *a p-value* of 0.093 > 0.05. Nutritional status is influenced by parental awareness in fulfilling nutritious food for children. Research conducted shows that the average toddler is fulfilled in nutritious foods such as milk, vegetables, fruits, carbohydrates, and protein.

Based on the theory in the book "Nutritional Status with Morbidity of ARI Children of Toddler Age" states that good nutritional status by toddlers will reduce the number of illnesses and deaths of toddlers. Undernourished toddlers will be more susceptible to infections due to decreased immunity. However, nutritional status factors do not have a significant effect on the incidence of ARI in toddlers, so it is said that there are other supporting factors that have the potential to affect the risk of ARI (Acute Respiratory Tract Infection) in toddlers such as environmental factors around toddlers and family behaviors of toddlers such as smoking. In addition, the lack of hygiene of food and cutlery, as well as the lack of parental knowledge about balanced feeding risks causing ARI in toddlers. [24]

Control that can be done to reduce the risk of abnormal nutritional status in toddlers is to provide nutritious food with modifications in shape so that it attracts more attention to toddlers with the aim of increasing the immunity of toddlers.

The Effect of Family Income with the Incidence of ARI in Toddlers in Benteng City, Selayar Islands Regency

Based on the results of the study, it was found that in the family income risk factor, as many as 47 respondents (63.5%) were low-income and 27 respondents (36.5%) were high-income. Statistically, a *p-value* of 0.053 was obtained which stated that family income had no effect on the incidence of ARI in toddlers in Benteng City, Selayar Islands Regency with an OR value = 2.947 (95% CI 1.095 – 7.930), meaning that toddlers who come from low-income families are 2.9 times more at risk of suffering from ARI than toddlers from high-income families.

https://doi.org/10.32382/medkes.v20i2

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

Based on the results of the research that has been conducted, more respondents from the case group in this study come from low-income families. It was found that some low-income respondents lived in modest homes in narrow hallways. This limited income causes some families to live in unhealthy environments such as poor ventilation and lighting, which puts them at risk of exposure to ARI. In addition, the living environment is less suitable because the family's priorities focus on daily needs. Respondents also tend to have limitations in meeting basic needs such as nutritious food due to the lack of information owned by parents in relation to the selection of nutritious food for toddlers.

This study is inversely proportional to the research conducted by the University of Wisconsin, which states that there is an influence between income and the incidence of STIs in toddlers with a Nursella et al. (2024) *p-value* 0.004 < 0.05. Family income is one of the socio-economic determinants that can have an influence on health. These findings state that parents with low incomes cause children's immunity to be poorer due to lack of nutritional intake. Because children's immunity is weak, the potential for children to contract diseases will be greater. The control that can be done is by providing education on the importance of maintaining children's health by fulfilling nutrition and proper housing for the family.

CONCLUSIONS AND RECOMMEDATION

This study concluded: 1) There was an effect of ventilation, occupancy density, and smoking habits of family members with the incidence of ARI in toddlers in Benteng City, Selayar Islands Regency, 2) There was no effect of mosquito repellent use, immunization history, nutritional status, and family income with the incidence of ARI in toddlers in Benteng City, Selayar Islands Regency. Recommended 1) For the community to maintain the cleanliness of the environment around the house, not obstructing ventilation with goods, regularly opening windows, avoiding toddlers from sick family members, reducing the intensity of smoking in the house or around toddlers, replacing burnt mosquito repellent with other mosquito repellent alternatives such as mosquito nets, mosquito rackets, and mosquito repellent lotion, as well as prioritizing and managing income as best as possible to meet the health needs of toddlers, 2) For the Benteng Health Center to provide education and socialization to parents about ARI disease in toddlers, clean and healthy lifestyles in the environment around toddlers, immunization routines and nutritional fulfillment of toddlers, 3) For the next researcher to be able to develop research related to risk factors for the occurrence of ARI in toddlers related to microorganisms in the air, outdoor pollution, the condition of the walls of the house, and other factors to get a more comprehensive picture.

REFERENCES

1. Kementerian Kesehatan. Peraturan Menteri Kesehatan Nomor 1077/menkes/per/v/2011 Tahun 2011 Tentang Pedoman Penyehatan Udara dalam Ruang Rumah [Internet]. 1077 Indonesia; 2011. Available from: https://peraturan.go.id/id/permenkes-no-1077-menkes-per-v-2011-tahun-2011
2. Aly SH, Selintung M, Hustim M, Zakaria R, Harusi NMR, Hanami ZA. Esensi Pencemaran Udara. 1st ed. Yogyakarta: Graha Ilmu; 2023. 1–16 p.
3. Anantasia F, Mulyadi M, Hidayat H. Kondisi Faktor Fisik Rumah Dan Kejadian Ispa Di Desa Alenangka Kecamatan Sinjai Selatan Kabupaten Sinjai. Sulolipu: Media Komunikasi Sivitas Akademika dan Masyarakat. 2021 Dec 8;21(2):258.
4. RI K. Laporan Nasional RISKESDAS 2018. Kementerian Kesehatan Republik Indonesia; 2018. 70–74 p.
5. Kemenkes RI. Laporan Nasional RISKESDAS 2018. Jakarta: Kementerian Kesehatan Republik Indonesia; 2018. 70–74 p.
6. BPS Kabupaten Kepulauan Selayar. Kabupaten Kepulauan Selayar dalam Angka [Internet]. Benteng: BPS Kabupaten Kepulauan Sealayar; 2023 [cited 2024 Dec 22]. Available from: https://selayarkab.bps.go.id/en/publication/2022/02/25/fadbca6cd2dea664760661c8/kabupaten-kepulauan-selayar-dalam-angka-2022.html
7. Wibowo DA, Ginanjar G. Hubungan Faktor Determinan Penyakit Infeksi Saluran Pernapasan Akut (Ispa) Dengan Kejadian Inpeksi Saluran Pernafasan Akut (Ispa) Pneumonia Pada Balita Di Wilayah Kerja Puskesmas Cipaku Kabupaten Ciamis Tahun 2020. Jurnal Keperawatan Galuh. 2020 Dec 1;2(2):43.
8. Tarigan DA, Heryanti E. Perbedaan Kelembaban, Kepadatan Hunian, Ventilasi Rumah terhadap Kejadian Infeksi Saluran Pernafasan Akut pada Balita. Jurnal Health Sains. 2021 Jul 24;2(7):871–6.
9. Anggraeni P, Rahmat NN, Widhiyanto A. Hubungan Berat Badan Lahir Dan Sosial Ekonomi Dengan Kejadian Ispa Pada Balita Di Puskesmas Kasiyan Kabupaten Jember. Jurnal Ilmiah Kesehatan Mandira Cendikia [Internet]. 2023 [cited 2024 Nov 4];2(10):357–67. Available from: https://journal.mandiracendikia.com/index.php/JIK-MC/article/view/625
10. Mulyadi, Nugroho HSW. Risk Factors at Home on Acute Respiratory Infection (ARI) Incidence in Children Under Five in Sapuli Island, South Sulawesi. Indian J Public Health Res Dev. 2018;9(6):210.

https://doi.org/10.32382/medkes.v20i2

ISSN : 1907-8153 (Print)
e-ISSN : 2549-0567 (Online)

11. Lazamidarmi D, Sitorus RJ, Listiono H. Faktor-Faktor yang Berhubungan dengan Kejadian ISPA pada Balita. Jurnal Ilmiah Universitas Batanghari Jambi. 2021 Feb 8;21(1):299.
12. Marpaung DDR, Putri NR, Manurung J, Laga EA, Hairuddin. Dasar-Dasar Ilmu Kesehatan. 1st ed. Medan: Yayasan Kita Menulis; 2022.
13. Zairinayati Z, Putri DH. Hubungan Kepadatan Hunian Dan Luas Ventilasi Dengan Kejadian Ispa Pada Rumah Susun Palembang. Indonesian Journal for Health Sciences. 2020 Sep 1;4(2):121.
14. Wisudariani E, Zusnita S, Butar Butar M. Faktor-Faktor yang Berhubungan dengan Kejadian ISPA pada Balita di Wilayah Kerja Puskesmas Semerap Kerinci, Jambi. JIK JURNAL ILMU KESEHATAN. 2022 Oct 31;6(2):362.
15. Boy E. Buku Ajar Kesehatan Lingkungan. Medan: UMSU Press; 2022.
16. Seda SS, Trihandini B, Ibna Permana L. Hubungan Perilaku Merokok Orang Terdekat Dengan Kejadian Ispa Pada Balita Yang Berobat Di Puskesmas Cempaka Banjarmasin. JURNAL KEPERAWATAN SUAKA INSAN (JKSI). 2021 Dec 19;6(2):105–11.
17. Salamat S. Hubungan Kondisi Lingkungan Rumah, Kebiasaan Merokok dan Pengetahuan Ibu dengan Kejadian ISPA pada Anak 0-5 Tahun. Journal of Public Health Education. 2024;3(3):91–100.
18. Fajrianti AN, Widiarini R, Wibowo PA. Pengaruh Pengetahuan Dan Penggunaan Obat Nyamuk Bakar Dengan Kejadian Ispa Pada Balita Di Desa Rejuno. Jurnal Delima Harapan. 2022 Sep 5;9(2):189–97.
19. Pasaribu RK, Santosa H, Kumala S, Nurmaini N, Hasan D. Faktor-Faktor yang Berhubungan dengan Kejadian Infeksi Saluran Pernafasan Akut (ISPA) pada Balita Di Daerah Pesisir Kota Sibolga Tahun 2020. Syntax Idea. 2021 Jun 20;3(6):1442–54.
20. Togodly A. Faktor-Faktor yang Berpengaruh terhadap Kejadian Infeksi Saluran Pernafasan Akut (ISPA) pada Balita di Puskesmas Karubaga Kabupaten Tolikara. Jurnal Sains dan Kesehatan [Internet]. 2022 [cited 2025 May 4];4(4):407–15. Available from: https://jsk.ff.unmul.ac.id/index.php/JSK/article/view/465
21. Caniago O, Utami TA, Surianto F. Faktor Yang Mempengaruhi Kejadian Ispa Pada Balita. JOMIS (Journal of Midwifery Science). 2022 Aug 6;6(2):175–84.
22. Lestari NE, Purwati NH, Arini D, Rasmita D, Nursasmita R, Wahyuni F, et al. Buku Ajar Pengantar Ilmu Keperawatan Anak. Sonpedia Publishing Indonesia; 2025.
23. Jumiyati J, Yolanda L mayang, Krisnasary A. Hubungan Status Gizi, Konsumsi Vitamin A Dengan Kejadian Ispa Pada Balita Di Wilayah Puskesmas Betungan Kota Bengkulu. Svasta Harena Rafflesia. 2024 Jul 1;3(1):261–9.
24. Pakpahan R, Tarigan SW. Status gizi dengan morbiditas ISPA anak usia balita. Uwais Inspirasi Indonesia; 2024.
25. Nursella A, Sriwahyuni S, Eky Nursia L, Darmawan, Ernawati. Hubungan Domain Perilaku Dan Pendapatan Dengan Risiko Kejadian Ispa Pada Balita Di Wilayah Kerja Puskesmas Meureubo Kabupaten Aceh Barat. Jurnal Kesehatan Ilmiah Indonesia (Indonesian Health Scientific Journal). 2024 Dec 19;9(2).