



**HUBUNGAN KEBERADAAN PEROKOK DAN BAHAN BAKAR MEMASAK
DENGAN KEJADIAN INFEKSI SALURAN PERNAPASAN AKUT (ISPA)
PADA BALITA DI KECAMATAN KELEKAR, GELUMBANG, DAN LEMBAK**

*The Relationship between Smoking and Cooking Fuel with Acute Respiratory
Infections (ARI) in Toddlers in Kelekar, Gelumbang, and Lembak Districts*

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Abstract

Acute Respiratory Infection (ARI) remains a leading cause of morbidity among children under five in Indonesia. Household environmental factors, such as the presence of smokers and the type of cooking fuel used are often associated with an increased risk of ARI. This study aimed to analyze the association between these factors and ARI incidence among children under five in Kelekar, Gelumbang, and Lembak Subdistricts, Muara Enim Regency. A cross-sectional design was applied with a total sample of 1,276 households with children under five, obtained through total sampling. Data were collected using the 2024 PBL FKM Unsri questionnaire and analyzed with the Chi-Square test. Results showed an ARI prevalence of 5.9%; 75.2% of children lived with smokers, and 97.9% of households used clean fuels (gas/electricity). Bivariate analysis indicated no significant association between the presence of smokers and ARI incidence ($p=0.981$) nor between the type of cooking fuel and ARI incidence ($p=1.000$). In conclusion, these two factors were not associated with ARI incidence. Other factors, such as household ventilation, low smoking frequency, outdoor smoking habits, as well as nutritional and environmental conditions, may play a more dominant role in influencing ARI among children under five.

Keywords: *toddlers, cooking fuel, the presence of smokers, ARI*

Abstrak

Infeksi Saluran Pernapasan Akut (ISPA) masih menjadi penyebab utama kesakitan pada balita di Indonesia. Faktor lingkungan rumah tangga, seperti keberadaan perokok dan jenis bahan bakar memasak sering dikaitkan dengan peningkatan risiko ISPA. Penelitian ini bertujuan menganalisis hubungan kedua faktor tersebut dengan kejadian ISPA pada balita di Kecamatan Kelekar, Gelumbang, dan Lembak, Kabupaten Muara Enim. Desain penelitian adalah cross-sectional dengan total sampel 1.276 rumah tangga yang memiliki balita, diperoleh melalui total sampling. Data dikumpulkan menggunakan kuesioner PBL FKM Unsri tahun 2024 dan dianalisis dengan uji Chi-Square. Hasil menunjukkan prevalensi ISPA sebesar 5,9%; 75,2% balita tinggal bersama perokok, dan 97,9% rumah tangga menggunakan bahan bakar bersih (gas/listrik). Analisis bivariat menunjukkan tidak ada hubungan

signifikan antara keberadaan perokok dengan kejadian ISPA ($p=0,981$) maupun antara jenis bahan bakar memasak dengan kejadian ISPA ($p=1,000$). Disimpulkan bahwa kedua faktor tersebut tidak berhubungan dengan kejadian ISPA. Faktor lain, seperti ventilasi rumah, intensitas merokok yang rendah, aktivitas merokok di luar rumah, serta kondisi gizi dan lingkungan kemungkinan lebih berpengaruh terhadap kejadian ISPA pada balita.

Kata Kunci: *balita, bahan bakar memasak, keberadaan perokok, ISPA*

1. INTRODUCTION

Acute Respiratory Infection (ARI) is one of the most common diseases affecting toddlers and is a major cause of morbidity and mortality of children in developing countries (Ali et al., 2024). According to the World Health Organization (WHO) (2018) the number of under-five deaths caused by ARIs worldwide is the highest. At the Under Five Mortality Rate (UMFR) level, ARI disease ranges from 41/1000 children while according to the Infant Mortality Rate (IFR) level ARI is 45/1000 children (WHO, 2018 in Suhada et al., 2023). In Indonesia, ARI is ranked first as the most common disease suffered by the community, especially children. It is recorded that the average toddler in Indonesia experiences cough and cold at least three to six times per year (Fitriasih et al., 2024). Data from the Ministry of Health of the Republic of Indonesia states that ARI ranks first in diseases suffered by infants and toddlers in Indonesia. The prevalence of ARI in Indonesia is 25.5% with pneumonia morbidity in infants 2.2% and in toddlers 3.0%, while mortality in infants 23.8% and toddlers 15.5% (Rane et al., 2024).

The incidence of ARI in South Sumatra in 2021 reached 32,336 cases and ranked as the third highest number of cases. The prevalence of ARI in South Sumatra province is 6.92%, where the prevalence of ARI in urban areas is higher than rural areas, namely 6.35%, while the prevalence of ARI for the age group 1-4 years reaches 5.77% (Riskesdas, 2019), while according to the South Sumatra Provincial Health Profile Data in 2023, the coverage of pneumonia case finding in children under five in the province reached 20.6%. This figure has decreased compared to the previous year which was recorded at 21.9%. Muara Enim District recorded a pneumonia case-finding coverage of 43.9% with a total of 969 cases in 2023, making it the region with the second highest case-finding coverage in South Sumatra Province after Palembang City.

This condition is very concerning because toddlers have an imperfect immune system so they are more vulnerable to various infections, including those from the surrounding environment (Sari & Yansyah, 2023). As a

result of an imperfect immune system, the clinical incidence of ARI in children under five can develop more severely. Apart from the immune system, environmental factors also play a role in triggering ARI cases. Although it seems that toddlers are predominantly active at home and are not exposed to much pollution on the street, they are not necessarily fully protected. Their home environment is not guaranteed to be safe (Setiawan et al., 2025). Previous studies have found that home environmental factors associated with the incidence of ARI in children under five include wall materials from natural materials (AOR = 2.10, 95% CI = 1.56-2.84), floor materials from natural materials (AOR = 4.30, 95% CI = 3.19-5.79), overcrowding (AOR 2.66, 95% CI 1.52-4.71), exposure to cigarette smoke (AOR = 1.74, 95% CI = 1.01-3.05), and the use of solid fuel for cooking ((OR: 1.69, 95% CI: 1.05-2.72) ((Azanaw et al., 2024); (Islam et al., 2024).

One significant source of exposure to ARI is air pollution in the home, especially from cigarette smoke and cooking fuels (Azzahra et al., 2024). Smoking is an activity that is harmful to the health of the body because according to the World Health Organization (WHO), cigarettes are addictive substances that contain approximately 4000 elements, of which 200 elements are harmful to the health of the body. Cigarette smoke contains various harmful chemicals such as nicotine, carbon monoxide, and fine particles that can damage children's respiratory tract (Nabil et al., 2024). These substances will then endanger the health of the smoker. The impact of smoking not only threatens the smoker but also the people around him or passive smokers. WHO analysis shows that the adverse effects of cigarette smoke are greater for passive smokers than active smokers (Rane et al., 2024).

In addition, the use of solid fuels such as firewood, charcoal, straw, and dried animal manure used in most rural households also produces harmful emissions that worsen indoor air quality. Combustion of such materials can produce carbon dioxide, methane, carbon monoxide, sulfur dioxide, hydrocarbons, and particulate matter (Setiawan et al., 2025). Although these gases are not infectious because

they are not biological agents, they can irritate through both physical and chemical mechanisms. As a result, the respiratory tract is increasingly susceptible to microbiological infections. Repeated exposure to these pollutants has been shown to increase the risk of ARI, especially in toddlers who are often in the home environment (Oktarisia et al., 2025).

In the Kelekar, Gelumbang and Lembak sub-districts of Muara Enim Regency, the use of traditional fuels for cooking is still the norm, accompanied by a high prevalence of household smoking. This condition is exacerbated by the lack of adequate ventilation in most houses, increasing the concentration of pollutants indoors. However, local research specifically examining the relationship between the presence of smokers, type of cooking fuel, and the incidence of ARI among children under five in this region is limited. Emission and pollution hazards from the use of certain cooking fuels are of concern for the respiratory health of children under five (Singga & Maran, 2017). This study aims to analyze the relationship between the presence of smokers in the house and the use of cooking fuel in the household with the incidence of ARI, especially in children under five.

This study is important to determine the extent of the influence of the presence of smokers and the type of cooking fuel on the incidence of ARI in children under five years of age in the three sub-districts. The results of this study are expected to provide a scientific basis for public health intervention efforts and policy making at the local level to reduce the incidence of ARI in children under five years of age.

2. METHODS

The method used in this study was a quantitative method with a cross-sectional design. This study aimed to analyze the relationship between the presence of smokers in the household and the type of fuel used for cooking with the incidence of ARI in toddlers. The type of data used in this study is secondary data. The data was sourced from Pengalaman Belajar Lapangan (PBL) conducted by students of the Faculty of Public Health, Sriwijaya University in 2024 in Kelekar, Gelumbang and Lembak Districts, Muara Enim Regency, South Sumatra Province.

The population in this study were all households in the three sub-districts while the sample in this study were 1276 households with sampling using total sampling. Data for dependent and independent variables were collected using questionnaire that has been

determined by the PBL Team from Faculty of Public Health Sriwijaya University. The dependent variable of this study was the incidence of ARI in toddlers with the category of ARI and not ARI while the independent variables of this study were the presence of smokers in the household with the category of presence and absence of smokers, the type of cooking fuel with clean fuel (gas and electric fuel) and dirty fuel (wood, charcoal, kerosene, others consisting of briquettes, coir and coconut shells).

Data processing with a computerized system includes editing, coding, processing data that has been inputted, and checking again. Data were analyzed through univariate analysis to analyze the frequency distribution of each research variable and bivariate analysis using the Chi-Square test to determine the relationship between the independent variable, namely the presence of smokers in the household and the type of cooking fuel with the dependent variable, namely the incidence of ARI in toddlers using statistical software SPSS version 20. Presentation of data in the form of univariate tables and bivariate tables accompanied by explanations. The data analyzed has passed the ethical test with number 174/UN9.FKM/TU.KKE/2024.

3. RESULTS AND DISCUSSION

3.1 Result

Univariate Analysis of Variables

Univariate analysis was conducted to illustrate the data presentation of several variables in the form of frequency distribution tables covering the distribution of respondents per subdistrict, cases of acute respiratory infections, the presence of smokers in the home, the number of smokers in the home, and the type of fuel used for cooking. The following is an overview of the frequency distribution from this study:

Table 1: Variable Frequency Distribution

No.	Characteristics	Frequency	Percentage (%)
1.	Sub-district		
	Kelekar	241	19%
	Gelumbang	623	49,2%
	Lembak	402	31,8%
2.	Incidence of ARI		
	ARI	75	5,9%
	No ARI	1192	94,1%
3.	Existence of smokers		
	Exist	953	75,2 %
	None	314	24,8%
4.	Number of smokers		
	>1	134	10,6%
	≤1	1133	89,4%
5.	Type of cooking fuel		
	Wood/charcoal	17	1,3%
	Kerosene	1	0,1%
	Gas/electricity	1240	97,9%

[Source: PBL FKM Unsri data, 2024]

The results of the frequency distribution analysis of the variables shown in Table 1 show that respondents in Gelumbang District were 623 toddlers (49.2%), while respondents in Lembak District were 402 toddlers (31.8%) and respondents in Kelekar District were 241 toddlers (19%). There were 75 toddlers who had a history of ARI (5.9%) while there were 1192 toddlers who did not have a history of ARI (94.1%). For the variable presence of smokers in the house, as many as 953 toddlers (75.2%) lived with family members who smoked, while as many as 314 toddlers (24.8%) had no family members who smoked. The number of family members who smoke >1 person is 134 respondents, while ≤1 people are 1133 respondents (89.4%). The use of cooking fuel such as wood and charcoal were 17 respondents (1.3%), kerosene was 1 person (0.1%), gas/electricity was 1240 respondents (97.9%), and others such as briquettes, coir and coconut shells were 9 respondents (0.7%).

Bivariate Analysis

Bivariate analysis aimed to determine the significance of the relationship between independent and dependent variables. This analysis was detected using the Chi-Square test for one-sided hypotheses at a 95% confidence level ($\alpha=0.05$). The following is the relationship between the presence of smokers and the type of fuel used for cooking with the incidence of malaria in the subdistricts of Kelekar, Gelumbang, and Lembak.

Relationship between the Presence of Smokers and the Incidence of Acute Respiratory Infections (ARI)

Table 2: Relationship between the Presence of Smokers and the Incidence of ARI

No.	Variable	Incidence of ARI				Total	%	P-value	PR (95% CI)
		ARI		No ARI					
		n	%	n	%				
	Existence of smokers								
1.	Exist	57	6	896	94	953	100	0,981	1,043 (0,624-1,745)
2.	None	18	5,7	296	94,3	314	100		
	Total	56	77,8	16	22,2	72	100		

[Source: PBL FKM Unsri data, 2024]

Table 2 shows the analysis of the relationship between the presence of smokers in the household with the incidence of ARI obtained that toddlers who live with family members who smoke and experience ARI are 57 people (6%) and toddlers who live with family members who smoke and do not experience ARI are 896 people (94%), while toddlers who do not live with family members who smoke and experience ARI are 18 people (5.7%) and toddlers who do not live with family members who smoke and do not experience ARI are 296 people (94.3%). The results of statistical analysis of Chi Square Test showed that the p-value (0.981) > 0.05, so it can be concluded that there is no significant relationship between the presence of smokers in the household the incidence of ARI in toddlers in Kelekar, Gelumbang and Lembak Districts.

Relationship between Cooking Fuel Types and the Incidence of Acute Respiratory Infections (ARI)

Table 3: Cooking Fuel and the Incidence of ARI

No.	Variable	Incidence of ARI				Total	%	p-value	PR (95% CI)
		ARI		No ARI					
		n	%	n	%				
	Type of cooking fuel								
1.	Dirty fuel	1	5,6	17	94,4	18	100	1,000	0,938 (0,138-6,380)
2.	Clean fuel	74	5,9	1175	94,1	1249	100		
	Total	75	5,9	1192	94,1	1267	100		

[Source: PBL FKM Unsri data, 2024]

Table 3 shows analysis about the relationship between the type of fuel used for cooking and the incidence of ARI, which obtained that households using dirty fuel (wood, charcoal, kerosene, and others such as briquettes, coir and coconut shells) experienced ARI as many as 1 toddler (5.6%) and households using dirty fuel and did not experience ARI as many as 17 toddlers (94.4%). In addition, households using clean fuel (gas and electricity) experienced ARI as many as 74 children under five (5.9%), while households using clean fuel and did not experience ARI were 1175 people (94.1%). The results of statistical analysis of Chi Square Test showed that the p-value (1,000) > 0.05, so it can be concluded that there is no significant relationship between the type of fuel used for daily cooking with the incidence of ARI in

children under five years old in Kelekar, Gelumbang and Lembak sub-districts.

3.2 Discussion

Relationship between the Presence of Smokers and the Incidence of Acute Respiratory Infections (ARI)

Smoking is an activity in which a person burns and inhales tobacco, producing smoke that can be inhaled by people around them (Suhada et al., 2023). Cigarette smoke contains more than 4,000 chemicals, including carbon monoxide and fine particles that can damage the respiratory tract (Aftab et al., 2022). The results of this study show that the $p\text{-value } (0.981) > 0.05$, so it can be concluded that there is no significant relationship between the presence of smokers in households and the incidence of ARI in toddlers in the subdistricts of Kelekar, Gelumbang, and Lembak. This condition can be explained by several factors, including low intensity and frequency of exposure to cigarette smoke, the habit of some smokers to smoke outdoors, and adequate ventilation in the house so that smoke does not accumulate inside. Based on the data, it was found that the majority of smokers living with toddlers only consumed no more than one cigarette per day. According to research conducted by Seda et al., (2021), the more frequent smoking behavior in the home, the greater the likelihood of exposure to harmful substances from cigarette smoke to toddlers in the vicinity. Continuous exposure will cause respiratory disorders, especially aggravating the onset of acute respiratory infections and lung disorders in adulthood. The more cigarettes smoked by family members, the greater the risk of ARI. In addition, family members who smoke are generally the head of the family or older brothers who spend more time outside the home or at work, so the intensity of exposure to cigarette smoke for toddlers is minimal. Other factors such as the nutritional status of toddlers, previous health history, environmental hygiene, and housing density are likely to have a more dominant influence on the incidence of ARI. Thus, although in theory cigarette smoke poses a risk of causing ARI in infants, in this study the effect was not proven to be significant.

In line with the results of research conducted by Irianto et al., (2021), the results of the study show that there is no relationship between family members' smoking habits and the incidence of ARI in children aged 1-5 years in the Talangpadang Community Health Center working area. The study states that the absence of a relationship between family members'

smoking habits and the incidence of mild or moderate ARI in children aged 1-5 years may be due to children being kept away when family members are smoking. In addition, ARI can be caused by other environmental factors such as dust, smoke from burning garbage, home ventilation, etc., or it can also be caused by individual factors such as nutritional status, immunization status, or behavioral factors, for example, when a person coughs near a toddler without covering their mouth, droplets enter the toddler's respiratory system and cause the toddler to become infected.

The results of this study contradict those of a study conducted by Marta et al., (2023), which states that there is a link between parental smoking and the incidence of respiratory tract infections in toddlers at the Yonif 131 Payakumbuh dormitory in 2022. Children whose parents smoke are more susceptible to respiratory tract diseases such as flu, asthma, pneumonia, and other respiratory tract diseases. Harmful gases in cigarette smoke stimulate mucus production, and accumulated dust and bacteria cannot be expelled, leading to chronic bronchitis. The breakdown of elastic fibers in lung tissue reduces lung pumping capacity, causing air to become trapped in the lungs and resulting in the rupture of air sacs. Parents who smoke increase the risk of ARI by 4.364 times (Susanti et al., 2025).

According to research by concluded that ISPA cases were caused by exposure to cigarette smoke, which can cause respiratory problems in toddlers, and that smoking by family members had become a habit, with families admitting that they could not stop smoking even though there were toddlers in the family. Meanwhile, Marisa & Nurfitriani (2024) found that the heavier the smoking habit in the home, the greater the potential for children to suffer from ARI. Children's exposure to cigarette smoke is very high when they are at home. This is because family members usually smoke at home while relaxing together, for example, while watching TV or chatting with other family members, so that toddlers in these households are at high risk of exposure to cigarette smoke. Similarly, the study " in the working area of the Sukamerindu Community Health Center in Bengkulu City states that the role of the family is very important and influential, especially the role of parents. The family has a significant influence on the health status of its own members. The worse the smoking behavior, the higher the incidence of ARI in toddlers, and the better the smoking behavior, the lower the incidence of ARI.

Smoking can be a risk factor for ARI in toddlers through exposure to cigarette smoke. The more a family member smokes, the greater the potential for toddlers to develop ARI, especially if more than one family member smokes. Similar to the number of active smokers in the family, the number of cigarettes smoked each day also affects the amount of smoke exposure to toddlers. The more cigarettes smoked by family members, the greater the likelihood of toddlers suffering from ARI (Oktarisia et al., 2025). One of the risks that increase the incidence of ARI is air pollution, namely air pollution caused by cigarettes. Infants are susceptible to ARI. Smoking behavior is one of the factors that cause ARI (Aryanti, 2021).

Relationship between Cooking Fuel Types and the Incidence of Acute Respiratory Infections (ARI)

The incidence of ARI is closely related to risk factors, namely the home environment and behavior. The home environment refers to the proximity of the kitchen to the family gathering room and the presence of smoke when cooking indoors (Asfa et al., 2025). Meanwhile, behavioral factors refer to the cultural practice of mothers bringing their toddlers into the kitchen when cooking (Wulandari et al., 2020).

Based on Indonesian Minister of Health Regulation No. 1077/MENKES/PER/V/2011 concerning indoor air quality monitoring, cooking fuels that cause pollution, such as firewood, charcoal, husks, and coal briquettes, are classified as not meeting indoor air quality standards. Meanwhile, cooking fuels that do not cause pollution, such as electricity and Liquefied Petroleum Gas (LPG) are classified as meeting indoor air quality standards.

The degree of pollution created by wood-based fuels is much greater than that of gas-based fuels. Several studies have proven that exposure to pollution in a room increases the risk of acute respiratory infections in children. The use of biomass fuel produces carbon monoxide, nitrogen oxide, SP_2 , ammonia, hydrochloric acid, and hydrocarbons such as formaldehyde, benzene, and benzo(a)pyrene, which are potential carcinogens, as well as particulate matter (SPM: Suspended Particulate Matter), hydrocarbons, and CO in high concentrations (Amadu et al., 2023). Some substances produced from the use of biomass fuel are harmful pollutants to health and can cause various infectious diseases such as Acute

Respiratory Infections (ARI) (Nurhayati et al., 2025).

Based on the results of the Chi Square test ($p\text{-value} = 1.000$) and PR of 0.938 (95% CI: 0.138-6.380), there is no relationship between the incidence of ARI in toddlers in Kelekar, Gelumbang, and Lembak subdistricts and the type of fuel used daily. This may be due to other more dominant factors, such as good home ventilation so that smoke from combustion does not accumulate in the house, the relatively short duration of solid fuel use, and the influence of individual characteristics such as nutritional status and previous health conditions, which have a more dominant effect on ARI incidence than the type of fuel itself and environmental factors (e.g., housing density, humidity, and house cleanliness) that play a greater role in triggering ARI in toddlers. In addition, the presence of confounding factors such as family members' smoking habits or socioeconomic status also has the potential to mask the influence of fuel on the incidence of ARI, so that even though in theory solid fuel smoke increases the risk of ARI, in this study the effect was not proven to be significant.

The findings in this study are in line with research conducted by Setiawan et al., (2025), which examined the relationship between cooking fuel types and the incidence of ARI in toddlers using a cross-sectional study design. The results of the study stated that there was no relationship between the use of polluting fuels such as wood and the incidence of ARI in toddlers because the odds ratio was less than one (0.429 CI: 95%). Furthermore, this is reinforced by research conducted by Husna et al., (2022), which obtained a $p\text{-value}$ of 0.291, indicating that there is no relationship between cooking fuel and the incidence of ARI in toddlers. The majority of respondents did not use firewood as household fuel but used gas stoves. According to research by Husna et al., (2022), the reason the majority of respondents preferred gas stoves over firewood was because it was easier to access LPG gas as a safe fuel at the household level. Using LPG gas is more economical than using kerosene, and LPG gas is more efficient and has a more complete combustion.

This study is inconsistent with previous studies (Saputri et al., 2023) with a cross-sectional study design showing that out of 77 toddlers who were research respondents and underwent a Chi-square test- Square test, yielding a $p\text{-value} = 0.004$ ($p\text{-value} < 0.05$), it was concluded that there is a relationship between the type of cooking fuel and the

incidence of ARI in infants in Pulau Rambai Village, Kampa Health Center Work Area, in 2023. Respiratory tract infections, commonly referred to as ARI, are essentially triggered by various factors, including air pollution from combustion that produces particles such as PM_{2.5} and PM₁₀. These particles can irritate the respiratory tract and reduce local immunity, thereby increasing the risk of infection, one of which is ARI (Setiawan et al., 2025). Health workers have been paying attention to infectious diseases for several years because they are the most common cause of death and illness in toddlers. The weak immune and defense systems of toddlers and the tropical climate of the country make toddlers very vulnerable to infectious diseases. As a result, other respiratory tract infections, including acute respiratory infections (ARI), are still prevalent today. To address air pollution as one of the main causes of ARI, the government has issued air quality control policies, including the use of clean fuels in households, such as Liquefied Petroleum Gas (LPG) and electricity (Aryanti, 2021) to reduce the burden of ARI as a cause of morbidity and mortality in infants. The use of solid fuels such as firewood for cooking contributes to more than 25% of ARI cases in developing countries. The program to convert solid fuels to LPG in Indonesia has helped reduce the risk of ARI in infants, especially in rural areas (Nurhayati et al., 2025).

Based on the results of the study, there are several limitations to the study, namely that there are many other factors such as nutritional status and sociodemographics that can influence the incidence of ARI in toddlers, so there are many independent variables that can influence the incidence of ARI in toddlers. However, the researchers only studied and discussed the variables of the presence of smokers and the type of fuel used for daily cooking. In addition, another limitation is that this study used secondary data with data collection using questionnaires based on questionnaire results. Data measurement using questionnaires has several weaknesses, including that respondents cannot provide further information because their answers are limited to the questions asked. In addition, respondents may answer statements that do not correspond to the actual situation.

4. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

This study shows that the prevalence of ARI among toddlers in Kelekar, Gelumbang, and Lembak subdistricts is 5.9%. The results of

bivariate analysis using the Chi-Square test show that there is no significant relationship between the presence of smokers in the home and the incidence of ARI in toddlers ($p=0.981$), nor between the type of cooking fuel and the incidence of ARI in toddlers ($p=1.000$). These findings indicate that other factors such as the quality of home ventilation, the habit of smokers who smoke outside the home with low intensity, the nutritional status of toddlers, and environmental conditions (cleanliness, housing density, and humidity) are more dominant in influencing the incidence of ARI.

4.2 Recommendations

Further research is recommended to examine other factors that are more dominant in the incidence of ARI in toddlers, such as sanitation conditions, housing density, and exposure to outdoor pollution, using a more comprehensive research design.

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