# Analysis Of Factors Related To The Incidence Of Acute Respiratory Infection In Toddlers In The Area Of Tuntungan Community Health Center, Deli Serdang Regency 2024

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#### Abstract.

According to the WHO (World Health Organization), acute respiratory infection (ARI) is an infectious disease of the upper or lower respiratory tract that can cause various types of diseases, from asymptomatic diseases or mild infections to severe and fatal diseases, depending on the causative pathogen, environmental factors, and host factors. Acute respiratory infection (ARI) is caused by more than 300 bacteria, viruses, and rickettsia types. The incidence, distribution, and consequences of acute respiratory infections vary based on several factors, namely environmental conditions, such as air pollution, household density, humidity, cleanliness, season and temperature; availability and effectiveness of medical care; infection prevention and control (IPC) measures to contain the spread, such as vaccines, access to health care facilities, and isolation capacity; individual factors, such as age, smoking, the ability of personal factors to transmit infection, immune status, nutritional status, previous or concurrent infections with other pathogens, and underlying medical conditions; pathogen characteristics, such as mode of transmission, transmissibility, virulence factors and microbial load (WHO, 2020). This study aims to analyze several factors related to the incidence of ARI in toddlers in the Tuntungan Health Center area, Deli Serdang Regency, in 2024. This research method uses a questionnaire containing questions to obtain primary data from respondents. The questionnaire is processed using validity, reliability, normality, and logistic regression tests. This study concludes that environmental factors, such as maternal education history, individual children, nutrition, socioeconomics, and family smoking behavior, have a relationship with the incidence of ARI in toddlers. In contrast, the results for immunization factors show no relationship with the incidence of ARI in toddlers.

Keywords: ARI; toddlers; factors related to the incidence of ARI; infection prevention and control.

#### I. INTRODUCTION

The World Health Organization defines acute respiratory infection (ARI) as a virus that can infect either the upper or lower respiratory tract and cause a wide range of symptoms or severity of infection (ranging from mild to deadly) depending on the pathogen responsible, the host's immune system, and other environmental and anthropogenic factors. Another possible definition of ARI is an infectious disease that causes acute respiratory illness and is spread from person to person [1]. Over 300 bacteria, viruses, and rickettsia are responsible for ARI. Many bacterial genera, including Streptococcus, Staphylococcus, Haemophilus, Bordetella, Corynebacterium, and Pneumococcus, are responsible for ARI [2]. Contrarily, ARI can be caused by viruses from Mycoplasma, Picornavirus, Herpesvirus, and Myxovirus. Symptoms such as a high temperature, coughing, sore throat, nasal discharge, and difficulty breathing often manifest rapidly, anywhere from a few hours to a few days [3]. Worldwide, ARI kills up to thirteen million people per year, according to the World Health Organization. Approximately 4 million out of 13 million persons experience a disease burden yearly, although this varies greatly. In 2020, ARI cases were most prevalent in Southeast Asia, with the highest concentration in Nepal (0.3%), followed by India (48%), Ethiopia (4.4%), Pakistan (4.3%), Sudan (1.5%), and Ethiopia (1.4%). Indonesia was one of the 30 countries that contributed to approximately two-thirds of ARI cases [3]. Health office statistics show that as of the end of December 2020, with 705,659 cases (or 39.2% of the total) reported from all provinces in Indonesia, the country ranked first among ASEAN countries regarding the number of deaths caused by ARI.

Globally, ARI is anticipated to impact 10 million individuals in 2021 and result in the annual loss of 1.4 million lives. According to Zahrani (2023), Indonesia ranks at the top for infectious diseases and is one of the countries that suffer from ARI. In North Sumatra, 6.80% of the population has ARI. North Nias has the highest rate of ARI at 20.40%, followed by West Nias at 15.88% and Tanjung Balai City at 11.95%.

Compared to other provinces, the Deli Serdang area has a high frequency of 8.09% [4].In 2013, the world's toddler mortality rate was 45.6 per 1,000 live births, with ARI accounting for 15% of those deaths, according to data obtained by WHO. According to the WHO, in 2012, 78% of children who sought medical attention had acute respiratory illness (ARI), also known as pneumonia. Twelve million toddlers are hospitalized annually due to acute respiratory infections (ARI) [5]. People in the toddler years (about 1–5) have a highly malleable brain, making them receptive to new information and experiences. When we talk about kids, we usually mean toddlers (those aged 1-3 years) or preschoolers (those aged 3-5 years). They continue to rely on their parents for assistance with basic needs like eating, toileting, and bathing when they are toddlers. Progress has been made in the areas of speech and walking.

Nonetheless, there are still limitations in other talents [6].Environmental factors like air pollution, household density, humidity, cleanliness, season, and temperature; medical care availability and effectiveness; infection prevention and control measures like vaccines, health care facility accessibility, and isolation capacity; individual factors like age, smoking, immune status, nutritional status, past or current infections with other pathogens, and underlying medical conditions; and and pathogen characteristics like mode of transmission, transmissibility, virulence factors, and microbial load. These factors all play a role in determining the incidence, distribution, and consequences of acute respiratory infections [7]. Toddler ARI risk factors include family smoking, socioeconomic level, diet, vaccination, age, gender, and birth weight, as well as environmental factors [6].In 2017, the National Socioeconomic Survey found that of all the sick residents who sought treatment, around 33% went to the Health Center PUSKESMAS. The remaining 67% went to private hospitals, polyclinics, or doctors' offices. Age, knowledge, educational level, economic situation, distance, travel time, health worker conduct, health requirements, stigma, and external factors affecting service all play a role in the underutilization of health centre services.Based on the background above, the researcher wants to research "Analysis of Factors Related to the Incidence of ARI in Toddlers in the Tuntungan Health Center Area, Deli Serdang Regency in 2024".

#### II. METHODS

This research intends to examine the influence of factors associated with acute respiratory infection (ARI) incidence in toddlers in the Tuntungan PUSKESMAS Area, Deli Serdang Regency, from April to July 2024. It is quantitative and will use a case study technique. In quantitative research, variables are crucial for describing and assessing ideas to draw reliable findings. Using variables can also be seen as testing hypotheses [8]. The data is subsequently categorized according to requirements using an interactive subject approach to facilitate further analysis. The interactive approach is a comprehensive research method that utilizes direct data collection approaches from people in their natural environments. A sample of moms with toddlers meeting the inclusion and exclusion criteria will be needed for this study. These criteria help ascertain the sample's usability. Similarly, this study used a sampling technique—specifically, selecting samples from all groups.

# III. RESULT AND DISCUSSION

#### **Univariate Analysis**

Respondents in this study were mothers who had toddlers who had ARI and were treated at the Tuntungan PUSKESMAS from April 2024 to July 2024, with a total of 100 toddlers. From the results of data collection, the following demographic characteristics information was obtained:

Characteristics	Category	Frequency (n)	%
	17-25 years	18	18.0
Mother's Age	26-45 years	77	77.0
	>45 years	5	5.0
Condor	Man	55	55.0
Genuer	Woman	45	45.0
Child Ago	0-24 months	22	22.0
Cinid Age	25-48 months	49	49.0

Table 1. Demogr	aphic Chai	acteristics
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	>48 months	29.0	
	Elementary school	9	9.0
	Junior High School	11	11.0
<b>Mother's Education</b>	Senior High School	55	55.0
	Diploma 3	9	9.0
	Bachelor 1 - Bachelor 2	16	16.0
	Laborer	1	1.0
	Housewife	76	76.0
	Trader	3	3.0
Mother's Job	Farmer	7	7.0
	Breeder	1	1.0
	Government Employees	4	4.0
	Self-employed	8	8.0

Source: 2024 research data

Based on demographic characteristics, it is known that mothers who have toddlers are predominantly aged 26-45 years (77%), while the dominant age of toddlers is 25-48 months, or around 2-4 years (45%). The number of male toddlers is more significant (55%) than that of females (45%). Based on education, it is known that respondents are predominantly high school graduates (55%), and most are housewives (76%).

Factor	Category	Frequency (n)	%
Environmont	Good	77	77.0
Environment	Bad	23	23.0
Individual	Good	79	79.0
Individual	Bad	21	21.0
Nutrition	Good	51	51.0
Nutrition	Bad	49	49.0
Immunication	Good	83	83.0
Immunization	Bad	17	17.0
Sacia Economia	Good	37	37.0
Socio-Economic	Bad	63	63.0
Parental Smoking	Good	41	41.0
Behavior	Bad	59	59.0
ICDA	Non ISPA	63	63.0
ISPA	ISPA	37	37.0

Table 2. Univariate Analysis of Factors

# Source: 2024 research data

From the results of univariate analysis of factors related to the incidence of ARI in toddlers in the Tuntungan PUSKESMAS area, Deli Serdang Regency, in 2024, it is known that in environmental factors, out of 100 respondents, 77 respondents have a good category (77%), while 33 respondents have a bad category (33%). In individual factors, out of 100 respondents, 79 respondents have a good category (79%), while 21 respondents have a bad category (21%). In nutritional factors, out of 100 respondents, 51 have a good category (51%), while 49 have a bad category (49%). In terms of immunization factors, out of 100 respondents, 83 respondents were in the good category (83%), while 17 respondents were in the bad category (17%). In the smoking behavior factor of parents, out of 100 respondents, 41 respondents have a good category (41%), while 59 respondents have a bad category (59%). The results of the ISPA incident were that 63 children did not experience ISPA (63%) and 37 children experienced ISPA (37%).

#### **Bivariate Analysis**

Bivariate analysis is a statistical test to analyze the relationship between independent and dependent variables. In this bivariate analysis, a chi-square statistical test was carried out to conclude that there was a relationship between the two variables with the criterion of sig <0.05. Analysis of factors related to the incidence of ISPA in toddlers in the Tuntungan PUSKESMAS area, Deli Serdang Regency in 2024 was processed using IBM SPSS version 27.

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	ISPA incident							p-Value	
No	Variable Factor	Status	ISPA		Non ISPA		Amount		
110.		Status	F	%	F	%	F	%	
	Environmental	Good	22	59,5	55	87,3	77	77,0	
1		Bad	15	40,5	8	12,7	23	23,0	0,001
		Total	37	100	63	100	100	100	
		Good	18	48,6	61	96,8	79	79,0	
2	Individual	Bad	19	51,4	2	3,2	21	21,0	0,000
		Total	37	100	63	100	100	100	
		Good	13	35,1	38	60,3	51	51,0	
3	Nutritional	Bad	24	64,9	25	39,7	49	49,0	0,015
		Total	37	100	63	100	100	100	
	Immunization	Good	32	86,5	51	81,0	83	83,0	0,477
4		Bad	5	13,5	12	19,0	17	17,0	
		Total	37	100	63	100	100	100	
		Good	8	21,6	29	46,0	37	37,0	
5	Socio-Economic	Bad	29	78,4	34	54,0	63	63,0	0,015
		Total	37	100	63	100	100	100	
6		Baik	10	27,0	31	49,2	41	41,0	
	Smoking Behavior Parents	Buruk	27	73,0	32	50,8	59	59,0	0,029
		Total	37	100	63	100	100	100	

Table 3. Bivariate Test of the Relationship

Table 3 shows that of the 63 toddlers who did not experience ARI, most of them lived in a good environment (87.3%), and those who lived in a bad environment were 12.7%. Meanwhile, of the 37 toddlers who experienced ARI, it was known that 59.5% lived in a good environment and 40.5% lived in a bad environment. The chi-square test results obtained a sig value of 0.001 (sig < 0.05), indicating a relationship between environmental factors and the incidence of ARI in the Tuntungan PUSKESMAS Area, Deli Serdang Regency. Table 3 shows that of the 63 toddlers who did not experience ARI, most had good individual factors (96.8%), and those with bad individual factors were 3.2%. Meanwhile, of the 37 toddlers who experienced ARI, it was known that 48.6% had good individual factors and 51.4% had bad individual factors. The results of the chi-square test obtained a sig value of 0.000 (sig < 0.05), which indicates that there is a relationship between individual characteristics and the incidence of ARI in the Tuntungan PUSKESMAS Area, Deli Serdang Regency. Table 3 shows that of the 63 toddlers who did not experience ARI, most had good nutritional factors (60.3%), and those with poor nutritional factors were 39.7%. Meanwhile, of the 37 toddlers who experienced ARI, 35.1% were known to have good individual factors, and 64.9% had poor nutritional factors. The results of the chi-square test obtained a sig value of 0.015 (sig < 0.05), which indicates that there is a relationship between nutritional factors and the incidence of ARI in the Tuntungan PUSKESDMAS Area, Deli Serdang Regency. Table 3 shows that of the 63 toddlers who did not experience ARI, most had good immunization factors (81.0%), and those who had poor immunization factors were 19.0%.

Meanwhile, of the 32 toddlers who experienced ARI, it was known that 86.5% had good immunization factors and 13.5% had poor immunization factors. The results of the chi-square test obtained a sig value of 0.477 (sig > 0.05), which indicated that there was no relationship between immunization factors and the incidence of ARI in the Tuntungan PUSKESMAS Area, Deli Serdang Regency. Table 3 shows that of the 63 toddlers who did not experience ARI, 46% had good socio-economic factors and 54% had poor socio-economic factors. Meanwhile, of the 32 toddlers who experienced ARI, 21.6% had good socio-economic factors and 78.4% had poor socio-economic factors. The results of the chi-square test obtained a sig value of

0.015 (sig < 0.05), which indicates that there is a relationship between socio-economic factors and the incidence of ARI in the Tuntungan PUSKESMAS Area, Deli Serdang Regency. Based on Table 3, it is known that of the 63 toddlers who did not experience ARI, 49.2% had parents with good smoking behavior and 50.8% had parents with bad smoking behavior. Meanwhile, of the 32 toddlers who experienced ARI, 27% had parents with good smoking behavior and 73% had parents with bad smoking behavior. The results of the chi-square test obtained a sig value = 0.029 (sig < 0.05), which indicates that there is a relationship between parental smoking behavior factors and the incidence of ARI in the Tuntungan PUSKESMAS Area, Deli Serdang Regency.

# Multivariate Analysis

This study uses the backward method and obtains the results of multiple logistic regression tests. The bivariate results found that environmental factors, individuals, nutrition, socio-economic factors, and parental smoking behavior were significantly related to the incidence of ARI in the Tuntungan Health Center Area, Deli Serdang Regency. Multivariate analysis with logistic regression to determine how each variable influences the incidence of ARI. The results obtained are as follows:

Variable Factor	в	SE	Wald	df	Sig	Exp(B)	95% C.I.for EXP(B)		
variable i actor	Ъ	D.L.	wald	ui	Sig.	LXP(D)	Lower	Upper	
X1	1,975	0,753	6,877	1	0,009	7,205	1,647	31,522	
X2	4,425	1,069	17,131	1	0,000	83,518	10,274	678,915	
X3	1,822	0,655	7,745	1	0,005	6,184	1,714	22,311	
X4	2,344	0,774	9,172	1	0,002	10,423	2,287	47,514	
X5	1,446	0,696	4,320	1	0,038	4,245	1,086	16,593	
Constant	-5,293	1,137	21,678	1	0,000	0,005			

Note: X1 (Environment), X2 (Individual), X3 (Nutrition), X4 (Socio-economic), X5 (Smoking Behavior\_Parents)

Multivariate analysis shows the results that:

- 1. Environmental factors have sig = 0.009 (sig < 0.05) which shows that environmental factors have a significant effect on the incidence of ARI (OR = 7.205; CI 95% 1.647 31.522). This means that respondents who live in a bad environment are 7.205 times more at risk of experiencing ARI
- 2. Individual factors have sig = 0.000 (sig < 0.05) which shows that individual factors have a significant effect on the incidence of ARI (OR = 83.518; CI 95% 10.274 678.915). This means that respondents who have poor individual factors are 83.518 times more at risk of experiencing ARI
- 3. Nutritional factors have a sig = 0.005 (sig < 0.05) which shows that nutritional factors have a significant effect on the incidence of ARI (OR = 6.184; 95% CI 1.714 22.311). This means that respondents who have poor individual factors are 6.184 times more at risk of experiencing ARI
- 4. Socioeconomic factors have a sig = 0.002 (sig < 0.05) which shows that nutritional factors have a significant effect on the incidence of ARI (OR = 10.423; 95% CI 2.287 47.514). This means that respondents who have poor nutritional factors are 10.423 times more at risk of experiencing ARI
- Parental Smoking Behavior Factor has sig = 0.038 (sig < 0.05) which shows that nutritional factors have a significant effect on the incidence of ARI (OR = 4.245; CI 95% 1.086 16.593). This means that respondents who have poor nutritional factors are 4.245 times more at risk of experiencing ARI Discussion</li>

According to the WHO (World Health Organization), acute respiratory infection (ARI) is a contagious disease in the upper or lower respiratory tract that can cause various types of diseases, from asymptomatic or mild infections to severe and fatal diseases, depending on the causative pathogen, environmental factors, and host factors. Acute respiratory infection (ARI) is caused by more than 300 bacteria, viruses, and rickettsia types. The incidence, distribution, and consequences of acute respiratory infections vary based on several factors, namely environmental conditions, such as air pollution, household density, humidity, cleanliness, season and temperature; availability and effectiveness of medical care; infection prevention and control (IPC) measures to contain the spread, such as vaccines, access to health care facilities, and isolation capacity; individual factors, such as age, smoking, the ability of personal factors to

transmit infection, immune status, nutritional status, previous or concurrent infections with other pathogens, and underlying medical conditions; characteristics of pathogens, such as transmission mode, transmissibility, virulence factors and microbial load [9]. Several factors related to ARI in toddlers include environmental factors, individual children (age, gender, and birth weight), nutrition, immunization, socioeconomic status, and parental smoking behavior [6].

The research findings indicate a correlation between environmental conditions and toddler acute respiratory infections. The examined environmental elements encompass air quality, residential ventilation, housing density, and the cleanliness of the dwelling near the toddler's residence. A poor home environment fosters germ proliferation, leading to several ailments, including acute respiratory infections (ARI) [10]. The research findings indicate that individual child variables correlate with ARI in toddlers. The factors affecting an individual child include age, gender, and birth weight. As in Fathmawati's research on the relationship between water quality and the incidence of ARI in toddlers, it is necessary to follow up on these findings. The exclusion criteria were toddlers with pulmonary tuberculosis in the past year [11]. The Merera study also found that the incidence of ARI varied significantly between and within regions in Ethiopia [12]. Similar to this study, other predictive variables should also be considered. The research findings indicate a correlation between nutritional variables and the occurrence of ARI in toddlers. The nutritional condition of toddlers significantly influences a child's nutrition, as imbalanced nutrition leads to malnutrition, which can result in diseases, particularly diarrhea and acute respiratory infections (ARI). Azad's study indicates maternal age, malnutrition, education, and family socioeconomic level are associated with acute respiratory infections [13]. This study necessitates the implementation of community initiatives that offer health education, vitamin A supplementation, and home counseling. This will diminish low birth weight and acute respiratory infections in these children.

Attention must be given to the correlation between breast milk provision and the incidence of acute respiratory infections (ARI) in children aged 24 to 59 months, as evidenced by the Rengganis study conducted in the Imogiri II Health Center region in 2024 [14].Complete immunization of children can increase their immune system compared to children whose immunization status is incomplete. However, the results of the research that has been conducted show that immunization factors have no relationship with the incidence of ARI in toddlers. This can be studied further to obtain more accurate data on immunization for each toddler. Adedokun's study indicated that the likelihood of children in Nigeria receiving incomplete immunization is affected by individual and community-level factors within a region [15]. This study suggests that interventions to enhance child immunization acceptance must consider the regional features. Mugada's research showed that immunization knowledge and status were not substantially correlated. Consistent with this study, no correlation was identified between children's immunization status and their location of residence, birth order, or maternal education. Mugda's research indicated a correlation between the area of living and maternal education with knowledge regarding immunization [16]. A family's socioeconomic status can influence it because a family with a high economic status is likely to be more responsive to ARI and seek treatment immediately to obtain information and appropriate treatment. Research has shown that immunization factors have no relationship with the incidence of ARI in toddlers. Similar to what Rokhman and Nana discovered, there is a correlation between people's socioeconomic position and the prevalence of stunting and infectious diseases [17]. he findings of this study are consistent with those of Anggraeni and Pratiwi, who also found that socio-economic characteristics influence ARI [18].

Maternal education, maternal awareness, and family income are socioeconomic factors that can impact the prevalence of ARI in toddlers. The smoking habits of a child's parents significantly elevate the incidence of acute respiratory infections (ARI), as a household environment characterized by smoking and the use of mosquito coils at night increases exposure to airborne chemicals that other family members, particularly toddlers, can inhale. The research findings indicate a correlation between this characteristic and the occurrence of ARI in toddlers. Many studies have found that the behavior of smoking parents influences the level of ARI sufferers in the family. Acute lower respiratory disease in infants is highly likely to have a causal association with parental smoking [19]. Due to the elevated risk associated with smoking by other household members, it can be inferred that exposure to environmental tobacco smoke after birth causes acute

chest illness in young children, even though it is impossible to separate the separate contributions of prenatal and postnatal maternal smoking [20], [21]. There is hope for a future generation of children by implementing more effective measures to discourage smoking among young people before they have children. Household sanitation, overcrowding, and smoking all play a role in the development of ARIs in children . Birth sequence and premature delivery also have significant impacts [22]. There is a correlation between encouraging exclusive breastfeeding and a decreased incidence of ARI in children younger than five. These results can help direct efforts to lower ARI rates in low-income areas. Toddlers are more likely to have respiratory problems and develop bronchopneumonia if they observe smoking behavior in their families, and this is due to inadequate socialization and the obstruction of residents' access to health facility services [23]. So the role of PUSKESMAS is very much needed in health education in the Tuntungan community.

#### **IV. CONCLUSION**

Factors such as environmental conditions, individual child variables, nutrition, immunization, socioeconomic status, and parental smoking behavior contribute to the incidence of ARI in toddlers. Poor home environments foster germ proliferation, leading to various ailments, including ARI. Nutritional variables such as maternal age, malnutrition, education, and family socioeconomic level influence ARI. Immunization factors have no significant relationship with ARI incidence in toddlers. Socioeconomic status can influence ARI, with high-income families being more responsive to treatment. Smoking habits of parents significantly elevate the incidence of ARI in toddlers, as exposure to airborne chemicals increases the risk of infection for other family members. Household sanitation, overcrowding, smoking, birth sequence, and premature delivery also have significant roles. Encouraging exclusive breastfeeding can help lower ARI rates in low-income areas.

#### V. ACKNOWLEDGMENTS

This research would not have been possible without the invaluable assistance of the author's supervisors, colleagues, and everyone else who offered words of wisdom, encouragement, and moral support. The success and efficiency of this study would not have been possible without their help and input. Additionally, we would want to express our gratitude to all the families of the toddlers in Tuntungan area who selflessly served as respondents for this study.

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