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Submission date: 03-Nov-2022 09:29PM (UTC-0700)

Submission ID: 1944155254

File name: 009.235-474-1-SM.pdf (498.7K)

Word count: 2311

Character count: 12273

Determinants of Acute Respiratory Infection in Children Under Five in Simalingkar, Medan, North Sumatera

Lasma Maria¹⁾, Maestro Simanjuntak²⁾, Thomas Silangit³⁾,
Jekson Martiar Siahaan⁴⁾

¹⁾Faculty of Medicine, Universitas Methodist Indonesia, Medan

²⁾Department of Public Health, Faculty of Medicine, Universitas Methodist Indonesia, Medan

³⁾Department of Clinical Pathology, Faculty of Medicine, Universitas Methodist Indonesia, Medan

⁴⁾Department of Physiology, Faculty of Medicine, Universitas Methodist Indonesia, Medan

ABSTRACT

Background: Acute Respiratory Infection (ARI) is still one of the health problems in developed and developing countries including Indonesia. ARI is the most common disease in outpatients in North Sumatera, especially in Medan. This study aims to find out about the factors that influence ARI in toddlers in Simalingkar Health Center Medan, including nutritional status, birth weight, history of immunization, exclusive breastfeeding, and parental smoking status.

Subjects and Method: This was a cross sectional study. The sample used was all toddlers who came to the Simalingkar health center, amounting to 100 people. Data collection was carried out using interviews and analysis was carried out using bivariate and multivariate with multiple logistic regression.

Results: The results showed that there was a significant influence between nutritional status, exclusive breastfeeding and parental smoking status with the incidence of ARI in infants.

Conclusion: The results showed that there was a significant influence between nutritional status, exclusive breastfeeding and parental smoking status with the incidence of ARI in infants.

Keywords: acute respiratory infection, children under five

Correspondence:

Lasma Maria. Faculty of Medicine, Universitas Methodist Indonesia, Medan Email: lasma-maria12@gmail.com.

Cite this as:

Maria L, Simanjuntak Maestro, Silangit, Siahaan JM (2020). Determinants of Acute Respiratory Infection in Children under Five in Simalingkar, Medan, North Sumatera. J Epidemiol Public Health, 5(1): 26-30. <https://doi.org/10.26911/jepublichealth.2020.05.01.03>



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BACKGROUND

Acute Respiratory Infection (ARI) is still one of the health problems in developed and developing countries including Indonesia. This is because there are still many morbidity and mortality rates due to ARI, especially those that occur in infants. ARI is the main cause of infant mortality (Ministry of Health, 2011).

According to the World Health Organization (WHO), in 2011, ARI sufferers numbered 48,325 children and estimates that in developing countries are around 30-70 times

higher than in developed countries and it is estimated that 20% of babies born in developing countries fail to reach the age of 5 years and 25- 30% of child deaths are caused by ARI (Ministry of Health, 2010).

ARI ranks first among the illnesses suffered in the group of infants and toddlers in Indonesia (MoH, 2011). The five provinces in Indonesia with the highest ARI are East Nusa Tenggara, Papua, Aceh, West Nusa Tenggara and East Java (Ministry of Health, 2010). The pattern of outpatient disease in North

Sumatra Community Health Center (Puskesmas) especially Medan in 2016, ARI was ranked top of 40.23% (North Sumatra Department of Health, 2017).

ARI can be caused by three factors, namely individual child factors, behavioral factors and environmental factors. Individual child factors include: child's age, sex, birth weight, nutritional status, vitamin A, exclusive breastfeeding and immunization status. Behavioral factors include the level of knowledge, economic status, behavioral prevention and prevention of ARI in infants or the active role of family/ community in dealing with ARI. Environmental factors include: air pollution in the home (cigarette smoke and smoke from burning fuel for cooking with high concentrations), house ventilation and occupancy density (Wahyono et al., 2008).

The number of risk factors for increased ARI in an area becomes the basis of study to find out the factors that influence ARI in children under five in Simalingkar Health Center Medan in 2019. This study aims to find out about the factors that influence the factors that influence ARI in toddlers in Pusalang Simalingkar Medan.

SUBJECTS AND METHOD

1. Study Design

This was a cross-sectional study conducted at the Simalingkar health center, Medan, North Sumatra, in April 2019.

2. Population and Sample

The sample is 100 toddlers, consisting of 63 toddlers with ISPA and 37 toddlers without ISPA, selected by purposive sampling.

3. Study Variables

The dependent variable is the ARI event. The independent variables are toddler nutritional status, exclusive breastfeeding, and parental smoking status.

4. Data Analysis

The data were analyzed with multiple logistic regression.

RESULTS

1. Bivariate analysis

Table 1 shows the results of cross tabulation of factors related to ARI events. Table 1 shows that toddlers with underweight (81.25%) had a higher percentage of ARI than toddlers with sufficient nutritional status (23.08%). Table 1 shows that toddlers who did not receive exclusive breastfeeding had a higher percentage of experiencing ARI (72.60%) than toddlers who did not receive exclusive breastfeeding (37.04%).

Table 2 shows the results of multiple logistic regression factors related to ARI events. Table 2 shows that poor nutritional status ($b = 1.20$; 95% CI= 1.68 to 6.51; $p < 0.001$), not exclusive breastfeeding ($b = 1.68$; 95% CI= 1.53 to 18.92; $p = 0.002$), and parents smoke ($b = 2.29$; 95% CI= 3.10 to 31.20; $p < 0.001$) increases the risk of ARI.

Table 1. Cross tabulation of factors related to ARI events

Independent Variable	ARI event				Total		p
	ISPA		Not ISPA				
	n	%	n	%	n	%	
Nutritional Status							
Poor	39	81.25	9	18.75	48	100	<0.001
Over	18	69.23	8	30.77	26	100	
Adequate	6	23.08	20	76.92	26	100	
Birth Weight							
<2500 g	14	66.67	7	33.33	21	100	0.891
≥2500 g	49	62.03	30	37.97	79	100	
Immunization History							
Incomplete	5	62.50	3	37.50	8	100	1.000

Independent Variable	ARI event				Total		p
	ISPA		Not ISPA				
	n	%	n	%	n	%	
Nutritional Status							
Complete Exclusive Breastfeeding	58	63.04	34	36.96	92	100	0.002
No	53	72.60	20	27.40	73	100	
Yes	10	37.04	17	62.96	27	100	
Parental Smoking Status							
Yes	54	79.41	14	20.59	68	100	<0.001
No	9	28.13	23	71.87	32	100	

Table 2. Results of multiple logistic regression factors related to ARI events

Independent Variable	b	95% CI		p
		Lower limit	Upper limit	
Constant	-2.83			<0.001
Nutritional Status (poor)	1.20	1.68	6.51	<0.001
Not exclusive breastfeeding	1.68	1.53	18.92	0.002
Smoking parents	2.29	3.10	31.20	<0.001

DISCUSSION

1. The effect of nutrition status and the risk of ARI

The results of this study indicate that there is a positive and statistically significant relationship between poor nutritional status and the incidence of ARI. The results of this study are consistent with Pajeriatty (2018), at Makassar District Hospital which states that there is a relationship between nutritional status and ARI events. Similar results were also shown by Alemayehu et al. (2019).

Malnutrition causes abnormalities in the airways so that it disrupts the physiological processes of the airways in terms of protection against disease agents. In children with abnormal nutritional status, the physiological process will not run properly, so that the disease agent that should be released by the body into the airways to the lungs (Bates, 2013).

2. The effect of birth weight and the risk of ARI

The results of bivariate analysis showed that birth weight <2,500 g and ≥2,500 g had the same risk for experiencing ARI (p= 0.891).

Toddlers born with low birth weight have a greater risk for suffering from ARI. Toddlers with low birth weight have immature respiratory organs which cause inadequate lung development, respiratory muscles are still weak, and the respiratory center is not yet developed. Lack of surfactant substances can reduce tension on the lung surface (Ibrahim, 2011).

3. The effect of exclusive breastfeeding and the risk of ARI

The results of this study indicate that more toddlers suffering from ARI in Simalingkar Health Center in Medan are not given exclusive breastfeeding compared to those given exclusive breastfeeding. The results of this study are in accordance with Rahman et al. (2015) which states that the proportion of toddlers who are not given exclusive breastfeeding is greater in the proportion of toddlers who experience ISPA. Tallo et al. (2012) and Tromp et al. (2017) showed that exclusive breastfeeding decreases the risk of ARI exposure to infants.

Breast milk contains a variety of anti-infectious substances that can protect child-

ren against infection. The best breast milk is obtained in the first week of lactation where ASI contains many protective cells such as leukocytes consisting of macrophages, T lymphocytes and B lymphocytes. Lymphocytes themselves have the function to synthesize IgA antibodies. IgA can protect the respiratory tract membranes from infection because IgA contains antibodies against respiratory and digestive virus (Medhyna, 2017).

4. The effect of parental smoking status and the risk of ARI

The results of this study indicate that toddlers whose parents have more smoking status experience ARI than those who do not smoke. Exposure to parental cigarette smoke to ARI in infants due to exposure to cigarette smoke for ≥ 30 minutes can cause damage to endothelial cells and blood clotting cells and cause constriction and stiffness of blood vessels (Aryani et al., 2016).

Smoke released by active smokers contains carbon monoxide 5 times greater, tar and nicotine 3 times, ammonia 46 times, nickel 3 times, nitrosamine as a cause of cancer levels reaches 50 times greater than the smoke inhaled by these active smokers (WHO, 2008).

Trisnawati et al. (2012) states that if infants continue to be exposed to cigarette smoke, it can cause respiratory problems, especially facilitating the emergence of acute respiratory infections and lung disorders in the long term as adults.

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