Original Research

Determinants of Acute Respiratory Infection (ARI) among Children aged 6-35 months in Indonesia

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ABSTRACT

Introduction: LARC. Acute respiratory infection is a major cause of morbidity and mortality in Indonesia's children aged 6-35 months. Therefore, research on the determinants of acute respiratory infection in children aged 6-35 months needs to be explored to prevent the incidence of acute respiratory infection. This study aimed to analyze the determinants of the incidence of acute respiratory infection in children aged 6-35 months in Indonesia.

Methods: This study used the 2017 Indonesian Demographic and Health Survey data with a cross-sectional analytic design. The inclusion criteria were women between the ages of 15 and 49 who had children between the ages of 6 and 35 months and who lived with study participants having symptoms of coughing, rapid breathing, shortness of breath, and chest pain. The sample was 7378 respondents. Data were collected using a questionnaire for women in the 2017 Indonesian Demographic and Health Survey. The data were analyzed using bivariate analysis with a chi-square test and continued with multivariate analysis with binary logistic regression using the STATA application version 14.0 (p-value < 0.05).

Results: The incidence of acute respiratory infection in children aged 6-35 months in Indonesia is caused by several factors with significant results including maternal age [AOR=1.33: 95% CI=1.12-1.58], maternal education [AOR=1.35: 95% CI=1.11-1.63], wealth quintile [AOR=1.27: 95% CI=1.06-1.53], and exclusive breastfeeding [AOR=1.28: 95% CI=1.04-1.57].

Conculsion: Maternal age, maternal education, wealth quintile, and exclusive breastfeeding contributed to acute respiratory infection among Indonesian children aged 6-35 months in which maternal age is the dominant factor. This study recommends health education on ARI prevention, such as exclusive breastfeeding, ARI prevention, and aid to children, which must be given especially to young, uneducated women.

Cite this as:

1. INTRODUCTION

Acute respiratory infections (ARI) are a major cause of morbidity and mortality in children under the age of five worldwide (Tekle, 2015). According to data from the United Nations Emergency Children's Fund (UNICEF), in 2016, there were 878,829 cases of under-five mortality due to ARI, with an average death rate of six people per 1000 live births, or about 16 percent of mortality. Around the world, ARI is thought to be responsible for 3.9 million child deaths, with bacterial pneumonia accounting for 90% of all fatalities (Sharma et al., 2013). In developing countries, seven out of 10 deaths occur due to ARI under the age group of five years (Sharma, 2013).

Similarly, in Indonesia, ARI is the highest cause of death in children under five (Aprilla et al., 2019). Nine out of ten (92%) children with ARI symptoms are taken to a medical institution or a health professional for treatment (IDHS, 2017). In this case, the government has prevented ARI in children under the age of five, but these efforts are not optimal because the government concentrates its prevention efforts on children under the age of two months and children between the ages of two and five years, even though children between the ages of six and 35 months are most likely to experience ARI, leading to less-than-optimal prevention outcome.

Indonesian survey conducted by the 2018 ARI Sub Directorate found that the incidence of ARI under five (per 1000 children under five) amounted to 20.06%, which is almost the same as the previous year's data reaching 20.56% (Kemenkes RI, 2019). Additionally, data from the Indonesian Demographic and Health Survey (IDHS) 1991, 1994, 1997, 2002-2003, and 2007 showed that the prevalence of ARI was highest at 6-35 months in Indonesia. Comparing the 2017 and the 2012 IDHS data, the percentage of ARI aged 24-35 months decreased from 6.5% to 5.1% and was followed by a decrease of 5.9% to 3.5% in children aged 6-11 months, then 5.1% to 4.7% in children aged 12-23 months. The prevalence of ARI incidence commonly occurs in children under five; however, research on the causes of ARI incidence in children aged 6-35 months is still limited. Therefore, this study aims to examine the factors that influence the incidence of ARI in children aged 6 to 35 months in Indonesia using IDHS data, including individual-level factors, household factors, and biological factors of mother and child. Individual-level factors include the child's sex, mother's age, education, occupation, and father's education and occupation. Household factors include an area of residence, wealth quintile, mother's smoking status, cooking fuel, sources of drinking water, and latrine facilities). Biological factors of mother and child include exclusive breastfeeding status.

2. METHOD

This study used a cross-sectional analytic research design. The study was conducted in 34 provinces in Indonesia from February to March 2021. The population in this study amounted to 49627 women of reproductive age-aged 15-49 years with the criteria of having children aged 6-35 months. Their child had symptoms, including coughing, rapid breathing, shortness of breath, and chest problems. This study used two-stage stratified random sampling that were the first stage of this procedure involved choosing several census blocks, and the second stange involved updating and mapping the household list (SDKI, 2017). The number of samples in this study was 7378 people. This study used secondary data from the 2017 IDHS. Data were collected using questionnaires from the Demographic Health Survey (DHS) phase 7 of 2015. The data collection procedure was initially carried out by downloading the 2017 IDHS dataset, then cleaning the data to select the appropriate data to be used, and then ending by identifying the variables used in this study. This study acquired the 2017 IDS dataset from the dhsprogram.com page. After signing up for access, the data set was downloaded. The data set has been downloaded with code IDKR71FL.ZIP in .sav file form.

The 2017 IDHS has obtained an ethical license from the National Health Research and Development Agency, Ministry of Health of the Republic of Indonesia (Kemenkes RI). In addition, permission to use data in this study was obtained from the International Classification of Functioning, Disability, and

Health (ICF), which is part of the DHS program. The data were analyzed using STATA version 14 MP.

3. RESULT

Table 1. individual level characteristics show that ARI commonly occurs in boys at about 3699 (50.13%) in which a range of mother's age was 25-34 years old (n= 3880, 52.59%), the level of mother and father education was secondary education (n=4315, 58.49 % vs. 4323, 58.59%, representatively), and most of the mothers did not work (n=3893, 2.77%).

Table 2 household factors show that the majority of the mother having children with ARI live in rural areas (n= 3764, 51.02%) of respondents live in rural areas, and 3614 (48.98%) live in urban areas. The wealth quintile variable with the largest number of respondents is the lower middle, namely 1535 (20.80%). The mother's smoking status variable contained only 107 (1.45%) mothers who smoked. The cooking fuel variable states that 6016 (81.54%) use clean cooking fuel. Finally, the variable of drinking water sources shows that the respondents who have had a good source of drinking water are 6609 (89.57%), and respondents who have had the proper type of toilet are 6044 (81.91%).

Table 3 shows the biological factors of the mother and child. For example, the variable of exclusive breastfeeding shows that children who receive exclusive breastfeeding are 630 children (8.54%), and children who do not receive exclusive breastfeeding are 6748 children (91.46%). Regarding breastfeeding status, the total of mothers who had breastfed was 3908 (52.96%), while 3470 (47.04%) mothers had never breastfed.

Table 4 shows that based on the bivariate analysis results, five independent variables show significant results on the incidence of ARI in children aged 6-35 months in Indonesia (p-value <0.05). These variables include maternal age (p-value = 0.0016), maternal education (p-value = 0.0013), father's education (p-value = 0.0033), wealth quintile (p-value = 0.0002), and exclusive breastfeeding (p-value = 0.0379), while there are 9 independent variables that do not show significant results on the incidence of ARI in children aged 6-35 months in Indonesia. These variables are gender (p-value = 0.1828), mother's occupation (p-value = 0.3445), father's job (p-value = 0.3745), area of residence (p-value = 0.3609), mother's smoking status (p-value = 0.7114), cooking fuel (p-value = 0.7772), drinking water source (p-value = 0.8792), type of toilet (p-value = 0.1246), and breastfeeding status (p-value = 0.4313).

The study results in table 5 show that four independent variables influence the incidence of ARI in children aged 6-35 months in Indonesia. These variables include maternal age, maternal education, wealth quintile, and exclusive breastfeeding. The individual level, age, and mother's education were proven to influence the incidence of ARI in children aged 6-35 months. Children whose mothers aged 15-24 years have [AOR = 1.33, 95% CI = 1.12-1.58] are more at risk of developing ARI than children whose mothers are 35-49 years old. Children whose mothers with primary education have [AOR = 1.35, 95% CI = 1.11-1.63] are at risk of developing ARI more than those with mothers with high education. The results obtained for household factors, only the wealth quintile influences the incidence of ARI. In contrast, the lower middle wealth quintile is associated with the incidence of ARI [AOR = 1.27, 95% CI = 1.06-1.53] in children aged 6-35 months in Indonesia. The results are based on mother and child biological factors; exclusive breastfeeding is associated with the incidence of ARI in children aged 6-35 months in Indonesia. Children who are not exclusively breastfed have [AOR = 1.28, 95% CI = 1.04-1.57] more at risk of developing ARI than solely breastfed children.

Table 1. Individual Level Characteristics (n=7378)

Chararteristics	N	%
Child's Sex		
Male	3699	50.13
Famale	3679	49.87
Mother's Age		
15-24 Years	1491	20.20
25-34 Years	3880	52.59
35-49 Years	2007	27.21
Mother's Education		
No Education	69	0.94
Primary Education	1784	24.18
Secondary Education	4315	58.49
Higher Education	1210	16.39
Mother's Job		
Work	3485	47.23
Doesn't Work	3893	52.77
Father's Education		
No Education	58	0.79
Primary Education	1971	26.72
Secondary Education	4323	58.59
Higher Education	1026	13.90

Table 2. Household Characteristics (n=7378)

Characteristics	N	%
Residence		
Rural	3764	51.02
Urban	3614	48.98
Wealth Index		
Poorest	1420	19.25
Poorer	1535	20.80
Middle	1472	19.95
Richer	1517	20.56
Richest	1434	19.44
Mother's Smoking Status		
Smoke	107	1.45
Doesn't Smoke	7271	98.55
Cooking Fuel		
Cleaner Fuel	6016	81.54
Polluting Fuel	1362	18.64
Cooking Fuel		
Improved	6609	89.57
Not Improved	769	10.43
Type of Toilet Facility		
Improved	6044	81.91
Not Improved	1334	18.09

Table 3. Biological Characteristics of Mother and Child (n=7378)

Characteristics	N	%
Exclusive Breastfeeding		
Yes	3764	51.02
No	3614	48.98
Breastfeeding Status		
Ever breastfeeding	3908	52.96
Never breastfeeding	3470	47.04

Table 4. Bivariate Analysis of The Determinants of ARI among Children 6-35 months in Indonesia.

Variables	ARI Yes n	ARI Yes %	No n	No %	p-value	X²
Individual level characteristics						
Child's Sex						
Male	1558	21.12	2141	29.01	0.1828	2.80
Female	1480	20.06	2199	29.81		
Mother's Age						
15-24 Years	668	9.05	822	11.15	0.0016	19.17**
25-35 Years	1614	21.88	2266	30..71		
35-49 Years	756	10.24	1252	16.97		
Mother's Education						
No Education	31	0.42	38	0.51		
Primary Education	792	10.73	992	13.45	0.0013	21.18**
Secondary Educatio	1779	24.11	2537	34.38		
Higher Education	436	5.92	773	10.48		
Mother's Job						
Work	1459	19.78	2026	27.46	0.3445	1.31
Doesn't Work	1579	21.40	2314	31.36		
Father's Education						
No Education	20	0.2	38	0.51		
Primary Education	838	11.36	1133	15.35	0.0033	19.39**
Secondary Educatio	1819	24.65	2504	33.94		
Higher Education	361	4.89	665	9.1		
Child's Sex						
Male	3023	40.97	29	0.39	0.3609	1.40
Female	15	0.21	4311	58.43		
Household Characteristics						
Residence						
Rural	1575	21.35	2190	29.67	0.3609	1.40
Urban	1463	19.83	2150	29.15		
Wealth Index						
Poorest	580	7.86	840	11.39		
Poorer	703	9.53	832	11.27	0.0002	34.20***
Middle	623	8.44	849	11.51		
Richer	623	8.45	894	12.11		
Richest	509	6.90	925	12.54		
Mother's Smooking Status						
Smoke	46	0.63	4279	58.00	0.7114	0.20
Doesn't Smoke	2992	40.55	61	0.82		
Cooking Fuel						
Cleaner Fuel	2471	33.50	796	10.78	0.7772	0.13
Polluting Fuel	567	7.68	3544	48.04		
Cooking Fuel						
Improved	2724	36.92	38854	52.66	0.8792	0.03
Not Improved	315	4.26	54	6.16		
Type of Toilet Facility						
Improved	2459	33.33	3585	48.59	0.1246	3.41
Not Improved	579	7.85	755	10.23		
Biological Characteristics of Mother and Child						
Exclusive Breastfeeding						
Yes	230	3.12	400	5.42	0.0379	6.16*
No	2808	38.06	3940	53.40		
Breastfeeding Status						
Ever Breastfeeding	1589	21.53	2319	31.43	0.4313	0.95
Never Breastfeeding	1449	19.65	2021	27.39		

*p<0.05;**p<0.01;***p<0.001

Table 5. Multivariate Analysis of The Determinants of ARI Among Children 6-35 Months in Indonesia.

Variables	AOR	% Lower	% Upper
Mother's Age			
15-24 Years	1.33**	1.12	1.58

	AOR	CI	
25-35 Years	1.21**	1.05	1.38
35-49 Years	Ref		
Mother's Education			
No Education	1.46**	0.96	2.50
Primary Education	1.35**	1.11	1.63
Secondary Educatio	1.13	0.85	1.33
Higher Education	Ref		
Wealth Index			
Poorest	Ref		
Poorer	1.27**	1.06	1.53
Middle	1.13	0.93	1.37
Richer	1.11	0.91	1.35
Richest	0.93	0.76	1.14
Exclusive Breastfeeding			
Yes	Ref		
No	1.28*	1.04	1.57

*p<0.05;**p<0.01;***p<0.001, CI (Confidence Interval), AOR

4. DISCUSSION

The factors that influence the occurrence of ARI in children in Indonesia between the ages of 6 and 35 months are discussed in this study. The fourteen variables that made up the study's determinants were the child's sex, the mother's age, her education, her occupation, her father's education, his occupation, their location, their wealth quintile, whether or not the mother smoked, the type of toilet they used, whether they were exclusively breastfeeding, and their breastfeeding status. The 14 variables are divided into three categories: individual-level, household, and biological factors affecting mothers and children.

Ages 6-35 months are the group most at risk for developing ARI cases in Indonesia. Due to the developing process and lowered innate immunity, the age range of 6 to 35 months is particularly prone to illness. This is because throughout the growth and development stages between the ages of 6 and 35 months, children are more likely to be exposed to bacteria that cause ARI. Children start to learn how to sit, crawl, and walk, increasing their risk of exposure to environmental microbes (Sembiring, 2017).

Individual-level factors, namely maternal age, and education have been shown to have a significant relationship with the incidence of ARI in Indonesian children aged 6-35 months. According to the study's findings, the younger the mother's age, the higher the likelihood that her children may get ARI. Children whose moms were between the ages of 15 and 24 had a higher chance of getting ARI than children whose mothers

were between the ages of 35 and 49. This is consistent with the findings of Astale and Chenault (2015), who discovered that children with young moms are more likely to acquire ARI. Younger women frequently lack experience in caring for their children. It requires a great deal of skill and understanding to cultivate good parents for children. According to the findings of the study, the likelihood that a mother's children may get ARI increases with decreasing maternal education. Children whose mothers have a low education level are more likely to develop ARI than children whose mothers have a higher education level. This is in line with research conducted by Tekle et al., (2015); Mahmood et al., (2017); Amsalu et al., (2019) that the incidence of ARI is less common in children whose mothers have secondary education and above. In addition, Tekle et al. observed that mothers with secondary education are likely to have a high level of knowledge, therefore their educational background indirectly contributes to their ability to protect their children from infectious diseases like ARI (2015).

Quintiles of household wealth are significantly related to the incidence of ARI in children aged 6 to 35 months in Indonesia. According to the findings of this study, the lower-middle wealth quintile is more susceptible to developing ARI than the lowest wealth quintile. This is in line with the research conducted by (Hassen et al., 2020), which is a potential reason why this study determined that the risk of ARI is more at risk for children from lower-middle-income families compared to the lowest families because the lowest families have less livestock which can lead to infection.

Exclusive breastfeeding is the biological factor of mother and child that has a significant relationship with the incidence of ARI in children aged 6-35 months in Indonesia. The results of the study on the history of breastfeeding, children who have not received exclusive breastfeeding within six months are more at risk of developing. This is in line with Amugsi et al., and Khan & Lohano, which showed significant results between exclusive breastfeeding and the incidence of ARI Amugsi et al., (2015); Khan & Lohano, (2018). Breast milk is the best source of nutrition for babies because breast milk can provide everything the baby needs. In addition to being used as baby food for the first six months of a baby's life, breast milk contains colostrum, a natural immunological component that works to defend against infection by preventing bacterial and viral invasion of the respiratory system. Exclusive breastfeeding can affect a baby's development, particularly between the ages of 6 and 35 months, when the benefits of exclusive breastfeeding are to provide immunity, increase affection, support motor development, promote personality development, emotional intelligence, spiritual maturity, and healthy social relationships (Kumala & Purnomo, 2019).

5. CONCLUSION

Data from 2017 Indonesian Demographic and Health Survey shows that young mothers with basic education are individual factors that cause the risk of ARI incidence in children aged 6-35 months in Indonesia. This is because mothers who are younger and have basic education often lack experience in taking good care of their children. Young mothers are also the most dominant variable associated with the incidence of ARI in children aged 6-35 months in Indonesia. It takes sufficient experience and sufficient knowledge to create good parents for children. The wealth quintile is one of the indirect factors that causes the incidence of ARI in children. Children living in low-middle wealth quintile families have a higher risk than children living in the lowest wealth quintile. This is since the lowest wealth quintile has fewer livestock and pets, which may represent an infection risk, than the lowest medium wealth quintile. Children who are exclusively breastfed for six months have a reduced incidence of acute respiratory infections (ARI). This is because breast milk contains colostrum, a naturally occurring immunological component that defends against bacterial and viral infection. In Indonesia, the mother's age is the most influential variable related to the prevalence of ARI in children aged 6 to 35 months. This study advises giving health education addressing the prevention of ARI diseases, such as exclusive breastfeeding, prevention, and treatment of ARI in children, to young moms with basic education, in particular.

6. ACKNOWLEDGEMENT

7. CONFLICT OF INTEREST

The authors declare that no conflict of interest exists.

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