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Original Article

Analysis of Factors Influencing Acute Respiratory Infection among Under-Five Children in Sering Public Health Centre, Medan Tembung Subdistrict

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Abstract

Introduction: Nowadays, acute respiratory infection (ARI) is the most common cause of high morbidity and mortality rate in children. ARI is defined as an infection either in the upper or lower respiratory tract that lasts for 14 days and caused by either viruses or bacteria. The incidence of ARI in 2017 is 20.54%, with the most prominent characteristic in children aged 1 to 4 years. Factors that affect ARI frequency are gender, birth weight, nutritional status, immunization status, vitamin A status, exclusive breastfeeding, smoke exposure, family income, and mother's formal education.

Aim: This study aims to find out risk factors that potentiate ARI among children from age 1 to 5.

Materials and methods: This study used a descriptive-analytical method with a cross-sectional study approach. The data is taken by consecutive sampling method with a questionnaire as the tool.

Results: The bivariate analysis result using Fisher's exact test shows that there is no relation between sex (p=0.642), birth weight (p=0.683), completion of immunization (p=0.195), vitamin A supplementation (p=1.000), exclusive breastfeeding (p=0.157), crowding (p=1.000), family income (p=0.658), knowledge (p=1.000), attitude (p=0.156), and behavior (p=1.000) with the frequency of ARI. The bivariate analysis result using Kruskal-Wallis test shows that there is no significant difference between groups in each factor of smoke exposure (p=0.988) and mother's formal education (p=0.899) with the frequency of ARI.

Conclusions: There is no relation between each factor with ARI frequency and there is no significant difference between groups in each factor with ARI frequency.

Keywords

acute respiratory infection, infants, risk factors, pre-schoolers, toddlers

INTRODUCTION

World Health Organization (WHO) estimated that each year 1.9 million children die from acute respiratory infection (ARI).[1] In Indonesia, ARI always accounts for the most common mortality and morbidity cause among children under five. In 2010, 14% of the mortality rate in children under five was caused by ARI.[2] In 2013, ARI was the most commonly found illness in out-patients at Medan's public center which occupies 39.4%. It was also the most common in 2014 and 2015 (46.1% and 39.87%, respectively).[3] Based on a statistics by Medan's Department of Health, ARI ranks first as the most commonly found out-patient illness for 5 years straight.[4]

ARI is defined as an infection in the respiratory tract that proceeds for 14 days and caused by either virus or bacteria. The symptoms can be mild (cough and cold), medium (wheezing), and severe (cyanosis, nose flare respiration). Host factors (age, gender, birth weight, nutritional status, immunization status, exclusive breastfeeding, and vitamin A status) and environmental factors (cigarette smoke exposure, overcrowding, family income, mother's/caregiver's formal education, knowledge, attitude, and behavior) are thought to attribute ARI frequency.

In 2013, research in the Tebet subdistrict found that the environmental factors that contribute to the incidence of ARI are caregiver's education, knowledge, family income, crowding, and cigarette smoke exposure. But respondent's age and occupation did not influence the incidence of ARI.[5]

AIM

This study aims to find out risk factors that contribute to the incidence of ARI. The result is then set as a counseling material for parents.

MATERIALS AND METHODS

This study used a descriptive-analytical method with a cross-sectional study approach and was conducted in Sering Public Health Centre, Medan Tembung Subdistrict from July 2019 to December 2019. We approached children who either came as patients or as their parents' companion. Only children under five years old were included with approving parents who completed the questionnaire. We also excluded children with chronic respiratory diseases, congenital diseases, and long-term medication. By using the consecutive sampling method, we selected 35 children for this study. The data was then analyzed using Fisher's exact test and Kruskal-Wallis test with 25th edition of Statistical Package for Social Sciences (SPSS) as a tool. This research was approved by the Health Research Ethical Committee of the Faculty of Medicine, Universitas Sumatera Utara. Written informed consent from the parents was also obtained before the investigation.

RESULTS

The host characteristics of the 35 subjects are summarized in **Table 1**. Male gender and female gender only differ less (54.3% and 45.7%). We also found the same frequency between toddlers (40%) and pre-schoolers (40%). In this study, there was only one (2.9%) patient with low birth weight while the rest (97.1%) had normal birth weight. Macrosomia patient wasn't found in this study. Most of the patients had good nutritional status (54.3%) and only

Table 1. Distribution of host characteristic frequency in sample

Characteristics	Frequency (n)	Percentage (%)
Gender		
Male	19	54.3
Female	16	45.7
Age (years)		
Infant (<1 y/o)	7	20
Toddler (1-3 y/o)	14	40
Pre-schooler (3-5 y/o)	14	40
Birth weight (gram)		
Low birth weight	1	2.9
Normal birth weight	34	97.1
Macrosomia	0	0
Nutritional Status		
Severely wasted	3	8.6
Wasted	3	8.6
Good	19	54.3
Possible risk of overweight	5	14.3
Overweight	2	5.7
Obese	3	8.6
Immunization Status		
Complete	29	82.9
Not complete	6	17.1
Vitamin A Supplementation		
Regularly	20	57.1
Irregularly	15	42.8
Exclusive breastfeeding		
Exclusively	12	34.3
Not exclusively	23	65.7
ARI incidence last month		
Yes	22	62.9
No	13	37.1
ARI frequency		
<3 times per year (not frequent)	30	85.7
≥3 times per year (frequent)	5	14.3

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a few didn't complete their immunization (17.1%). Almost half of the patients didn't have a regular supplementation of vitamin A (42.8%) and there were still a lot of patients who weren't exclusively breastfed (65.7%). 62.9% of the patients had ARI in last month and 14.3% of the patients were classified as frequent ARI.

Table 2 presents the summary of the environmental characteristics of 35 subjects. Half of the patients still lived in an overcrowded house (54.3%). Among the 35 subjects, only 7 patients weren't exposed to cigarette smoke, while the rest were exposed mildly (13 patients) and moderately (15 patients). There wasn't much difference between family with low and high income (51.4% and 48.6%, respectively). The result of formal education spread was almost equal. Most of the respondents had low knowledge of ARI (91.4%). The difference between negative and positive attitudes was almost the same (45.7% and 54.3%) as well as the difference between good and not good behaviour (42.9% and 57.1%).

Table 2. Distribution of environment characteristic frequency in sample

Characteristics	Frequency (n)	Percentage (%)
Overcrowding		
Yes	19	54.3
No	16	45.7
Cigarette Smoke Exposure		
No	7	20
Mild	13	37.1
Moderate	15	42.9
Severe	0	0
Family Income		
Low	18	51.4
High	17	48.6
Formal Education		
Low	13	37.1
Moderate	12	34.3
High	10	28.6
Knowledge		
Low	32	91.4
High	3	8.6
Attitude		
Negative	16	45.7
Positive	19	54.3
Behaviour		
Not good	20	57.1
Good	15	42.9

DISCUSSION

Among a variety of variables, no variable was found to be significant causing the incidence of ARI. In this study, there was no significant correlation between gender and ARI incidence (p=0.642) (see **Table 3)**. A study by Syahidi et al.[5] and Putri et al.[6] also found the same results (p=1.000 and 0.764, respectively). According to Hidayat[7], boys are more prone to ARI because they usually are more active than girls. Another mechanism is due to the presence of estradiol hormone in women. Estradiol increases immunity meanwhile, male have testosterone which lowers immunity.[6,7]

Table 3. Bivariate between host risk factors and ARI frequency

Variable	ARI frequency		P value
	Frequent	Infrequent	
Gender			
Male	2	17	0.642
Female	3	13	
Age (Years)			
Infant (<1 y/o)	1	6	0.567
Toddler (1-3 y/o)	1	13	
Pre-schooler (3-5 y/o)	3	11	
Birth weight (gram)			
Low birth weight	0	1	0.683
Normal birth weight	5	29	
Macrosomia	0	0	
Nutritional status			
Severely wasted	0	3	
Wasted	0	3	
Good	4	15	0.418
Possible risk of overweight	0	5	
Overweight	1	1	
Obese	0	3	
Immunization status			
Complete	3	26	0.195
Not complete	2	4	
Vitamin A supplementation			
Regularly	3	17	1.000
Irregularly	2	13	
Exclusive breastfeeding			
Exclusively	5	19	0.157
Not exclusively	0	11	

Age was not a factor that had a significant association with the incidence of ARI in this study (p=0.567) (see **Table 3)**. A study by Mairusnita[8] didn't find a significant correlation between age and ARI incidence (p=0.795 and 1.000). Inadequate immune response due to lack of IgG is the

reason why ARI is more common in children.[8]

In this study, low birth weight did not significantly correlate with the incidence of ARI (p=0.683) (see **Table 3)**. Similar finding are reported by Iskandar et al.[9] (p=0.910). Shahidi et al.[5] proposed that the absence of significance was due to a few low birth weight samples. Thus, making it enough to describe low birth weight with ARI incidence.

In our study, each group of nutritional status didn't show a significant difference in ARI incidence (p=0.418) (see **Table 3)**. Darsono et al. also had a similar result.[10] A study from Yulianti et al.[11] stated that low nutritional status had 10.947 times greater risk to develop ARI than children with good nutritional status. Low nutritional status can result in a slow immunology reaction so the children will be prone to ARI.

Complete immunization isn't the factor that has a significant correlation with ARI incidence (p=0.195) (see **Table 3)**. A study by Putri et al.[6] also found that there was no significant correlation between immunization status and ARI incidence (p=0.272). Meanwhile, a study by Sambominaga et al.[12] did find a significant correlation between immunization status and ARI incidence (p=0.033). A study by Rasyid[13] stated that children with complete immunization had 1.636 times greater chance to not have ARI.

Our study shows that vitamin A supplementation didn't have a significant correlation with ARI incidence (p=1.000) (see **Table 3)**. A study by Ayun[14] has a contrary result to Nurmawati's study[15] which found a significant correlation of vitamin A supplementation and ARI incidence. Children with incomplete vitamin A supplementation had 10.8 times greater risk to have ARI.

In this study, children who were exclusively breastfed didn't have a significant correlation with ARI incidence (p=0.157) (see **Table 3)**. A study by Putri et al. also found the same result.[6] Based on Rasyid, children who are not exclusively breastfed have 1.994 times greater risk to have ARI.[13]

Overcrowding is not the factor that has a significant correlation with ARI in this study (p=1.000) (see **Table 4)**. A study by Jayanti et al.[17] also shows a similar association (p=0.247). A further study stated that children who live in the overcrowded home have 2.4 times greater risk to develop ARI.[16] Large quantity of inhabitants in narrow houses makes agent exchange easier in the air.

There was no significant difference found between each degree of cigarette smoke exposure and ARI incidence (p=0.988) (see **Table 4)**. Megasari et al.[18] also found this result (p=0.959). Megasari et al. stated that smoking 12 cigarettes each day is needed to result in extensive respiratory cell death. But Wardani et al.[19] found a significant correlation between cigarette smoke exposure and ARI frequency.

In this study, it was found that there was no significant difference between each group of formal education and ARI incidence (p=0.899). Our study has the opposite result to the studies by Nurmawati[15] (p=0.000) and Nur[20]. Another study also didn't find a significant correlation between formal education and ARI incidence (p=0.06).[21]

Family income wasn't the factor that had a significant correlation with ARI incidence (p=0.658) (see **Table 4)**. A study by Anggraini et al.[16] also found the same result. Meanwhile, Syahidi[5] found no significant correlation between family income and ARI incidence. Low family income and lack of knowledge results in a habit of cooking with charcoal and rarely sanitizing quilts and dolls.[22]

There was no significant correlation between knowledge and ARI incidence (p=1.000) (see **Table 4)**. It is thought that another factor like habits in the community which usually are not correlated with knowledge had a stronger influence on ARI incidence. In this study, the lack of significance was due to low knowledge level about pneumonia by parents, which resulted in low knowledge about ARI. A study by Taarelluan et al.[23] also didn't find a significant correlation between knowledge and ARI incidence.

Attitude wasn't the factor that had a significant association with ARI incidence (p=0.156) (see **Table 4)**. Another study that had the same result stated that insignificance is due to personal experience and media influence.[6,24] Our study has the opposite result to the study by Taarelluan et al.[23] which found a significant correlation between attitude and ARI incidence (p=0.003).

Table 4. Bivariate between environment risk factors and ARI frequency

Variable	ARI frequency		P value
	Frequent	Infrequent	
Overcrowding			
Yes	3	16	1.000
No	2	14	
Cigarette Smoke Exposure			
No	1	6	
Mild	2	11	0.988
Moderate	2	13	
Severe	0	0	
Family Income			
Low	2	16	0.658
High	3	14	
Formal Education			
Low	2	11	0.899
Moderate	2	10	
High	1	9	
Knowledge			
Low	5	27	1.000
High	0	3	
Attitude			
Negative	4	12	0.156
Positive	1	18	
Behaviour			
Bad	3	17	1.000
Good	2	13	

This study shows that there is no significant correlation between behavior and ARI incidence (p=1.000) (see **Table 4**). A study by Rahman et al.[25] found a significant correlation between behavior and ARI incidence (p=0.001). This is due to the low awareness of parents towards ARI prevention. For example, not covering their mouth while sneezing and allowing family members to smoke inside the house. A study found that parents learn how to prevent ARI from television, not from a healthcare person, whereas the information from television might be incorrect.[22]

CONCLUSIONS

Acute respiratory infection is the most common cause of high morbidity and mortality rate in children. Most of the children in our study rarely develop ARI. In this study, there was no significant correlation between each factor and the incidence of ARI. There are only a few children who aren't exposed to tobacco smoke and most of the parents have shifted to not exclusively breastfeed their child. We also found that parents/caregivers still have low knowledge of ARI, especially subjects on pneumonia. Parents should be given more information about the risk factors that affect the incidence of ARI.

Author contribution

S.S., L.D.L.: conception, design of the study, data interpretation, article drafting, article revising, final approval.
C.A.A., M.D., E.R.M.: conception, design of the study, article drafting, article revising, final approval.

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Анализ факторов, влияющих на острую респираторную инфекцию среди детей в возрасте до пяти лет в Центре общественного здравоохранения „Серинг", район Тембунг, Медан

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Резюме

Введение: В настоящее время острая респираторная инфекция (ОРИ) является наиболее частой причиной высокой заболеваемости среди детей. ОРИ определяется как инфекция верхних или нижних дыхательных путей, которая длится 14 дней и вызывается вирусом или бактерией. Заболеваемость ОРИ в 2017 г. составляет 20.54%, как наиболее специфическая характеристика среди детей в возрасте от 1 до 4 лет. Факторы, влияющие на заболеваемость ОРИ, включают пол, массу тела при рождении, статус питания, статус иммунизации, статус витамина А, исключительно грудное вскармливание, курение, доход семьи и формальное образование матери.

Цель: Выявление факторов риска, вызывающих ОРИ у детей в возрасте от 1 до 5 лет.

Материалы и методы: В данном исследовании используется описательный аналитический метод с изучением текущего состояния. Данные собираются методом последовательной выборки с использованием опроса в качестве инструмента.

Результаты: Двухвариантный анализ с использованием точного теста Фишера не показал взаимосвязи между полом (p=0.642), массой тела при рождении (p=0.683), завершением иммунизации (p=0.195), добавками витамина А (p=1000), исключительно грудное вскармливание (p=0.157), скопление людей (p=1000), доход семьи (p=0.658), образование (p=1000), отношение (p=0.156) и поведение (p=1000) с частотой ОРИ . Двухвариантный анализ с использованием теста Краскела-Уоллиса показал, что не было значимой разницы между группами по каждому фактору воздействия дыма (p=0.988) и уровню образования матери (p=0.899) с частотой ОРИ.

Заключение: Нет связи между каждым фактором с частотой ОРИ и нет значимой разницы между группами по каждому фактору с частотой ОРИ.

Ключевые слова

острая респираторная инфекция, младенцы, факторы риска, дошкольники, дети ясельного возраста