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Research Article

Analyzing Of Under Five Children Aspect To Acute Respiratory Infection Disease (ARI) In Indonesia: Meta-Analysis 2015-2020

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ABSTRACT

Acute Respiratory Infection (ARI) is one of the health problems that exist in developing and developed countries. The proportional mortality rate (PMR) due to ARI in children under five in the world is 16%, two-thirds of deaths are infant deaths. The mortality rate is very high in infants, children and the elderly, especially in developing countries. The purpose of this study was to analyze the intrinsic risk factors for the characteristics of children under five in Indonesia. The method in this study uses meta-analysis, which is a statistical method that combines several (two or more) research results quantitatively by looking for effect size values or summaries using JASP software version 0.9.2. Sources of data in this study came from Google Scholar, Science Direct, and Pubmed then sorted according to inclusion and exclusion criteria and obtained 37 research articles. The result of the meta-analysis that has the highest risk factor for the variable characteristics of children under five is the nutritional status variable with a pooled PR value of e0.30 = 1.350 (95% CI 0.03 – 0.58), then the variable age under five with a pooled PR value of e0.16 = 1.174 (95% CI -0.40 – 0.72) and the lowest variable for the characteristics of children under five was found in the sex of children under five with a pooled PR value of e0.08 = 1.083 (95% CI -0.04 – 0.19). The conclusion from the results of the meta-analysis that has the highest level of risk is the nutritional status of children under five, age of toddlers, and gender. It is hoped that the puskesmas can make efforts to control the risk of ARI occurrence in toddlers by conducting periodic counseling.

Keywords: *ARI, age, gender, nutritional status of toddlers*

INTRODUCTION

Acute Respiratory Infection (ARI) is a disease that is a health problem in both developed and developing countries. ARI itself is a disease that occurs in the upper or lower respiratory tract,

where this disease can be contagious and can cause mild infection to severe and deadly disease, depending on host factors, causative pathogens and environmental factors (Winardi et al., 2015).

Deaths due to ARI in children under five in a year reach 2,200 children under five every day, 100 children under five every hour, and 1 toddler per second. This is the cause of death for children under five with the highest number of infections worldwide (UNICEF, 2016). The incidence of ARI among children under five in developing countries is estimated at 0.29 children each year and in developed countries as many as 0.05 children each year.

World Health Organization data shows globally that as many as 15% or 808,694 cases of death due to pneumonia in children under five are manifestations of ARI (WHO, 2019). ARI is included in the group of airborne diseases that are transmitted through the air. Pathogens attack and infect the respiratory tract and cause inflammation (Lubis et al., 2019). The prevalence of ARI in Indonesia is still high, based on the 2018 Riskesdas data which shows there are 1,017,290 cases in Indonesia. Central Java Province ranks in the top three, including West Java and East Java with a total of 132,565 cases or 13.03% (Riskesdas, 2018).

The emergence of ARI is influenced by several risk factors. The risk factors associated with the incidence of ARI are divided into intrinsic factors and extrinsic factors. Intrinsic factors include age, gender, nutritional status, low birth weight (LBW), immunization status, breastfeeding, and vitamins. Extrinsic factors include residential density, air pollution, ventilation, cigarette smoke, use of fuel for cooking, use of mosquito coils, as well as maternal factors such as education, age, and mother's knowledge.

The purpose of this study was to analyze the intrinsic risk factors for the characteristics of children under five (including age, gender, and nutritional status) to the incidence of ARI and to examine the sensitivity of risk factors for the characteristics of children under five with the incidence of ARI in children under five in Indonesia.

MATERIAL AND METHODS

This research is a research with Meta-analysis method. This study uses secondary data, the main data sources used are Google Schoolar (2015-2020), Pubmed (2015-2020), and Science Direct (2015-2020). The keywords used in the search were “Acute Respiratory Infections in Toddlers”, “characteristics of toddlers”, and “Children”. In order to be related to the research, the population used in this study is national and international research articles. Articles that examine the risk factors that influence the incidence of ARI in children under five in Indonesia are the articles selected in this study.

The PICOS method is formulated to search for articles using keywords that are (Notobroto, 2019). Articles that have abstracts in accordance with research and available full text are articles that will be downloaded. Articles that have been collected must be selected first based on clear inclusion and exclusion criteria. The articles that will be studied are journal articles, Indonesian and English theses with the research subjects being toddlers with ARI occurrences. The year of publication of the articles being explored is from 2015 to 2020.

Keywords are used in the Google Scholar database, Sciene Direct and Pubmed are used in article search. The next stage is the screening stage based on a review of the abstracts of all collected articles. In the process of screening based on the completeness abstract of the article, it is also selected and excluded articles that are not available in full text.

The articles will be re-screened based on the research study design. In this study, we only took articles with a cross sectional study design. The data used are secondary data types from

selected research articles. The independent variables (independent) of this study are the risk factors for the characteristics of children under five and family behavior. Meanwhile, the dependent variable (dependent) of this study is the incidence of ARI in children under five in Indonesia. In meta-analysis there are 4 stages, namely data abstraction, data analysis, publication bias test, and sensitivity test: Data analysis in this research article uses the fixed effect model or random effect model.

JASP Software Version 0.9.2 is used to perform meta-analysis on the secondary data that has been obtained. To describe the combined effect size of each variable studied, the results of data processing will be presented in a forest plot graph. Funnel plot is a technique used to identify the presence of publication bias in this study. In order for the results of the meta-analysis to be relatively stable, the sensitivity test was continued. The sensitivity test was carried out in this study by comparing the results when analyzed using the fixed effect model with the results analyzed by the random effects model.

To obtain data that can meet the objectives of this research, the articles that have been collected will then be extracted and synthesized. The data is then compiled and analyzed to be used as material for solving problems carried out by metha-analysis.

RESULTS AND DISCUSSION

Risk factors for the characteristics of children under five (age, gender, and nutritional status) with the incidence of acute respiratory infections (ARI) in children under five in Indonesia.

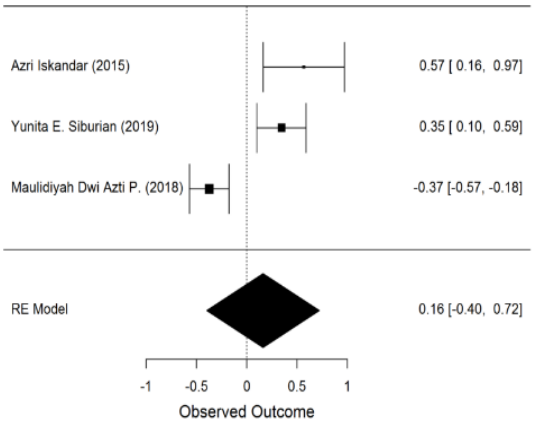

Figure 1. Variable Age Characteristics of Toddler

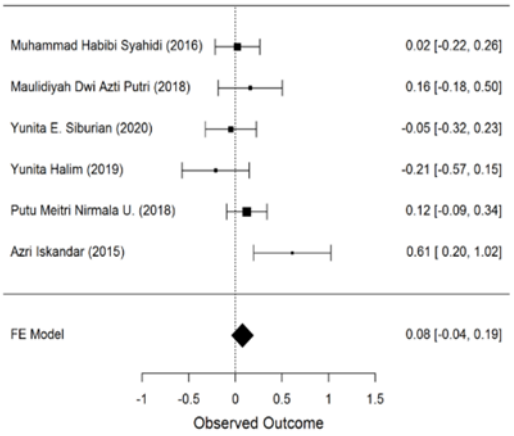

Figure 2. Variable Gender of Toddler

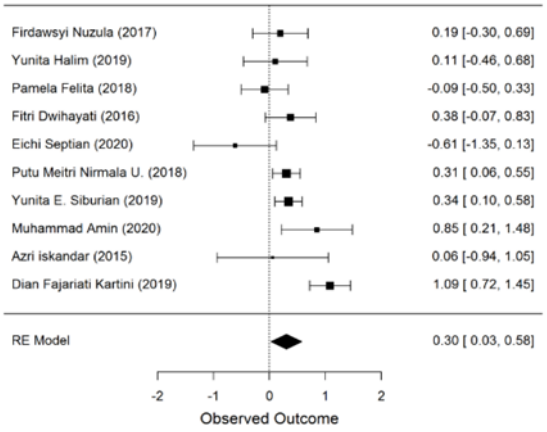

Figure 3. Variabbles of Toddler Nutritional Status

The following is a picture of the Forest plot of the Risk Factors Characteristics of Toddlers with the Incidence of ARI in Toddlers. Figure 1 is Forest Plot of Toddler Age Risk Factors with ISPA Incidence in Toddlers, figure 2 is Forest Plot of Risk Factors for Gender of Toddlers with the Incidence of ARI in Toddlers and figure 3 is Forest Plot of Risk Factors for Nutritional Status of Toddlers with the Incidence of ARI in Toddlers. The RE or FE Model represents the prevalence ratio and the 95% CI value.

Meta-analysis of Risk Factors Characteristics of Age with the Incidence of ARI in Toddlers

Table 1. Heterogeneity Test Meta-Analysis of Toddler Age with the Incidence of ARI in Toddlers Random Effects Model

	Q	Df	P
Omnibus test of Model Coefficients	0.321	1	0.571
Test of Residual Heterogeneity	29.060	2	< 0.001

Note. *p* -values are approximate.

Table 1 shows that the p-value in the heterogeneity test is smaller than 0.05, namely p = <0.001, which means that the variation between studies is heterogeneous, so this analysis uses a random effects model. The result of the forest plot of the 2-point image (a) shows that the value of pooled PR = e0.16 = 1.174 (95% CI -0.40 – 0.72). So it can conclude that the characteristics of under-fives at risk have a risk of 1.174 times greater for the incidence of ARI in infants compared to under-fives who do not have a risk with a 95% CI value that does not exceed one so that the difference between the two groups of cases and controls is statistically significant. The publication bias test was not carried out for the variable age under five because the number of data in the meta-analysis was less than ten studies.

The incidence of ARI in infants and toddlers will give a more comprehensive and worse clinical picture because ARI in infants and toddlers is generally the first occurrence of infection, and the natural immune process has not been optimally formed. In addition, the child's immunity is not good, and the airway lumen is still narrow. Therefore, the incidence of ARI in infants and children under five will be higher compared to adults.

Meta-analysis of Gender Characteristic Risk Factors with the Incidence of ARI in Toddlers

Table 2. Table of Gender Meta-Analysis Heterogeneity Test with the Incidence of ARI in Toddlers Fixed Effects Model

	Q	Df	P
Omnibus test of Model Coefficients	1.701	1	0.192
Test of Residual Heterogeneity	10.281	5	0.068

Note. p -values are approximate.

Based on Table 2. it is known that the p-value in the heterogeneity test is greater than 0.05, namely p = 0.068, which means that the variation between studies is homogeneous, so in this analysis using a fixed effect model. The result of Figure 2 Forest Plot point (B) shows that the value of pooled PR = e0.08 = 1.083 (95% CI -0.04 – 0.19). So it can be concluded that the gender characteristics of children under five who are at risk have a risk of 1,083 times greater for the incidence of ARI in children under five compared to the sex of children under five who do not have a risk with a 95% CI value that does not exceed 1 so that the difference between the two groups of cases and controls is statistically significant. meaning. The gender variable was not tested for publication bias because the number of data in the meta-analysis was less than 10 studies.

The factor can cause the mechanics of the relationship between gender and the incidence of ARI that boys tend to be more active than girls, thus enabling boys to be more often exposed to the causative agents of ARI (Meitri et al., 2018).

Meta-analysis of Risk Factors Characteristics of Nutritional Status with the Incidence of ARI in Toddlers

Table 3. Meta Heterogeneity Test Table Analysis of Nutritional Status With The Incidence of ARI in Toddler Random Effects Model

	Q	Df	P
Omnibus test of Model Coefficients	4.750	1	0.029
Test of Residual Heterogeneity	30.161	9	< .001

Note. p -values are approximate.

Based on Table 3. it is known that the p-value in the heterogeneity test is less than 0.05, namely p = < .001, which means that the variation between studies is heterogeneous, so in this analysis a random effect model is used. The result of Figure 2. forest plot point (c) shows that the value of pooled PR = e0.30 = 1.350 (95% CI 0.03 – 0.58). So it can be concluded that the characteristics of the nutritional status of toddlers who are abnormal or poor have a risk of 1,350 times greater for the incidence of ARI in toddlers compared to normal nutritional status, with a 95% CI value that does not exceed 1 so that the difference between the two groups of cases and controls is statistically meaning.

When a toddler is in a good nutritional state, the person's immune response can function optimally compared to a poor one. Nutrition deficiencies, especially in toddlers, can interfere with the body's immunity to acute infectious diseases such as ARI (Meitri et al., 2018).

Figure 4. shows the results of the funnel plot. There is an indication of Publication bias because the model formed is symmetrical. Namely, the black circle partially exits the triangle area.

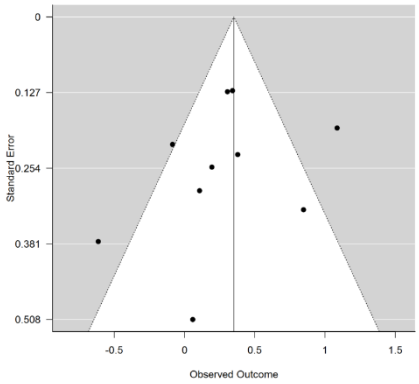

Figure 4. Funnel Plot of Nutritional Status Risk Factors with the Incidence of ARI in Toddlers

Based on Table 4. it is known that the p-value in Egger's test is smaller than 0.05, namely p-value = 0.0235, which indicates Publication bias. Based on the results of the meta-analysis above, the one with the highest risk factor for the characteristics of children under five (age, gender and nutritional status of children under five) is the nutritional status variable with a pooled PR value = e0.30 = 1.350 (95% CI 0.03 – 0.58), so it can conclude that the characteristics of the nutritional status of children under five who are not normal or poor have a risk of 1,350 times greater for the incidence of ARI in children under five compared to normal nutritional status.

Table 4. Egger's test Meta- Test Table Nutritional Status Risk Factor Analysis With The Incidence of ARI in Toddlers

	Z	p-value
Egger's Test	-1.188	0.0235

Then the second highest risk factor is found in the variable age of toddlers with a pooled PR value = e0.16 = 1.174 (95% CI -0.40 - 0.72) so that the age characteristics of toddlers at risk have a risk of 1.174 times greater for the incidence of ARI in toddlers compared to age. Toddlers who are not at risk. The lowest risk factor for the characteristics of children under five is the gender of children five, with a pooled PR value of e0.08 = 1.083 (95% CI -0.04 – 0.19). It can conclude, the gender characteristics of children under five who are at risk have a risk of 1.083 times greater ARI in toddlers.

Table 5. Comparative Sensitivity Test Pooled Prevalence Ratio Fixed Model and Random Model

No	Research Variable	N	*Heterogenity (p-value)*	*Fixed effect Models*		*Random Effect Model*	
				PR	95% CI	PR	95% CI
1.	Risk Factors Age With Incidence of ARI in Toddlers	3	< .001	0.990	-0.15 – 0.13	1.173	-0.40 – 0.72
2.	Risk Factors Gender With Incidence of ARI in Toddlers	6	0.068	1.083	-0.04 – 0.19	1.094	-0.08 – 0.25
3.	Risk Factors Nutritional Status With Incidence of ARI in Toddlers	10	< .001	1.419	0.23 – 0.48	1.349	0.03 – 0.58

Based on Table 5 above, it can be seen that there is an increase in the pooled PR value from the fixed model to the random model and the wider the confident interval for the age variable, so it can be seen that the age variable varies between studies. In the gender variable, nutritional status

has a pooled PR value from the fixed model to the random model and the confident interval is not much different.

CONCLUSION AND SUGGESTION

Based on the results of the meta-analysis, the highest risk factor for the variable characteristics of children under five is the nutritional status variable with a pooled PR value = e0.30 = 1.350 (95% CI 0.03 – 0.58). Then the second highest risk factor was found in the variable age under five with a pooled PR value = e0.16 = 1.174 (95% CI -0.40 – 0.72). To be the lowest risk factor for the characteristics of children under five in the gender of the toddlers, with a pooled PR value = e0.08 = 1.083 (95% CI -0.04 – 0.19).

Based on the results of the sensitivity test by comparing the pooled prevalence ratio fixed model and random model, it was found that the meta-analysis results were relatively stable, namely, the gender of toddlers and the nutritional status of toddlers. In contrast, the meta-analysis results are relatively unstable regarding the age of toddlers.

Things that need to be done by parents of toddlers to reduce the risk of ARI in toddlers, namely if toddlers show symptoms of poor nutrition (both thin and thin) or have no appetite, it is recommended to get counselling so that nutritional status is good, it is necessary to pay attention to other ARI factors such as protein intake.

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