

## ORIGINAL ARTICLE

### Acute Breathing Infection (ARI) in the Toddlers in the Working Area of Pancasan Health Center, Bogor City, Indonesia

Fathimi, Ririn Arminsih Wulandari\*

---

Department of Environmental Health, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

\*Correspondence to Ririn Arminsih Wulandari ([ririn@ui.ac.id](mailto:ririn@ui.ac.id))

(Accepted: 25 November 2019)

#### Abstract

**Introduction:** ARI is often misinterpreted as upper respiratory tract infection, whereas ARI does not only attack the upper respiratory tract but also includes the lower respiratory tract. Infection is the entry of germs or microorganisms into the human body and proliferates to cause respiratory tract diseases ranging from the nose to the alveoli and their adnex such as the sinuses, middle ear cavity and pleura.

**Objective:** This study aims to determine the effect of individual and environmental characteristic factors on the incidence of ARI in infants. **Method:** This study used a cross sectional study design, the number of samples of 163 toddlers, the study location in the work area of the Pancasan Health Center, the time of the study from 27 April to 30 May 2019. **Results:** The results showed 41.1% of children under five suffered ARI, statistically the variables associated significantly with the incidence of ARI were gender (OR: 2.89) and age (OR: 2.04). **Conclusion:** Many factors can influence the incidence of ARI in infants, both from the characteristics of children under five, parental characteristics, characteristics of the physical environment of the home and the health service facilities themselves. The next researcher can add research variables, the importance of the role of health workers especially to increase public awareness/ parents in maintaining and maintaining children's health and the existence of cross-program and cross-sector cooperation.

**Keywords:** *Diabetes Mellitus, Knowledge, Diet*

## **Introduction**

ARI is a worldwide problem where the incidence of ARI is still high, especially in developing countries, globally the highest incidence of ARI is in India with an incidence of 700 million ARDs every year (UNICEF, 2017). An estimated 20% of under-five deaths are associated with ARI, especially in developing countries, namely the average child mortality rate of 6.7 / 1000 births in Central European countries, while in Eastern Europe it reaches 9.7 / 1000 births (IHME, 2014). Early mortality in infants due to PM2.5 pollution at the global level continues to increase from 3.5 / 1000 births in 1990 to 3.8/1000 births in 2000, in 2015 reached 4.2/1000 births and in 2017 deaths children under five years of age reach 5.5/1000 births (WHO, 2017). In Asia ARI is also a serious problem, as explained that the incidence of ARI is associated with high air pollution as a result of an increase in population followed by increased transportation needs and many industries, Indonesia including developing countries in Asia which is inseparable from this problem (RI Ministry of Health, 2011). Outdoor air conditions that are polluted (outdoor) cause air pollution in the room (indoor) where children usually spend more time indoors, this condition will get worse if the house is built without meeting physical requirements such as poor ventilation, the type of floor and type of roof that does not meet the requirements will result in unhealthy temperature, humidity and room lighting so that this condition causes children to be more susceptible to ARI disorders. In addition to the physical environment factors, the ARI also

relates to host factors including nutritional status, immunity, the presence of accompanying infections and unhealthy behaviors such as smoking habits, the habit of not opening windows, behavior when coughing and the habit of burning garbage. Another factor that is not less important is the availability and effectiveness of health services as well as prevention measures to prevent spread including the availability of vaccinations, ease of access to health services and the existence of health insurance from the government (WHO, 2007). ARI is a major cause of under-five mortality, especially in developing countries, this is associated with poor environmental conditions where air pollution causes at least 600,000 number of under-five deaths each year and increases the risk of respiratory infections, besides air pollution is estimated to reach 361,000 deaths every year because improper sanitation and drinking water are also included due to environmental threats such as electronic waste. This is still far from the MDG target, namely that each country aims to reduce under-five mortality rates by no more than 25/1000 births by 2030 (WHO, 2017).

West Java Province is an area close to the national capital which consists of 27 districts /cities with population density reaching 1,221.56/km<sup>2</sup>, ranking second after the DKI Jakarta province with a density of 12,978.59 / km<sup>2</sup> (BPS Province of Java West, 2017). This condition triggered an increase in pollution in each regency/city, especially in several large cities located in the West Java province such as

Bogor City. Bogor City is a densely populated area with a total population of 1,081,009 people with a population density of 9,122/Km<sup>2</sup> and a population growth rate of 1.53%, there are still a number of houses that have a floor area of <20m<sup>2</sup> in percentage 5.76 (BPS Kota Bogor, 2018) . High population density triggers an increase in activity and an increase in the need for transportation and industrial technology needs that can increase air pollution both outdoors (indoor) and indoors (indoor) and can even cause water and soil pollution so as to increase the risk of environmental-based diseases (DIKPLHD of Bogor City, 2017).

Increasing the need for industrial technology along with the increasing need for transportation equipment, based on data from the Bogor City Transportation Agency (2018) Bogor City is an area with a high level of traffic, there are around 12,000 units of transportation that are transferred from and to Bogor City / month, conditions This is thought to be one of the triggers for the high incidence of ARI in Bogor City. Based on data from the Bogor City Health Office it was explained that ARI was ranked first in the top 10 diseases suffered by residents where the total ARI patients reached 110,235 cases and ARI in children reached 5,308 cases including those suffering from pneumonia (Bogor City Health Office, 2017). The city of Bogor consists of 25 puskesmas working areas which are first-rate health care facilities in the hope that they can detect as early as possible the health problems experienced by the community including the incidence of ARI. Based on data from the Bogor City Health

Office the highest incidence of ARI was in the work area of Pancasan Community Health Center, West Bogor District, which was 375 cases and the lowest was in the work area of Tanah Sereal Health Center, Tanah Sereal District, which was 99 cases. The working area of the Pancasan Health Center with the highest population distribution according to vulnerable groups is under five (21.19%) and the lowest in the baby group (4.18%), this is predicted to cause health problems and require optimal management efforts in the age group toddlers (Bogor City Health Office, 2017).

## **Methods**

The design of this study uses a cross sectional study (cross sectional study). This research was conducted in the work area of Pancasan Health Center, West Bogor District, Bogor City, West Java Province. The reason for choosing this location is based on the initial survey of ARI events with the highest pneumonia in the city of Bogor in the working area of the Pancasan Community Health Center (Bogor City Health Office, 2017). This research was conducted on April 27 to May 30, 2019. The inclusion criteria that were sampled were toddlers aged 0-59 months, seeking treatment at the Pancasan Health Center, recorded in the health center register book, domiciled with a distance of ≤1 km from the puskesmas. The exclusion criteria are suffering from other respiratory tract disorders such as Bronchial Asthma, Bronchitis or pulmonary Tuberculosis, cannot be visited at the time of the study, are not willing to be respondents. The estimated sample size of this study was calculated based on the sample size

for the cross-sectional design of the different proportions test proposed by Lemeshow (1997) to obtain a sample of 163 respondents. The sampling technique used is probability random sampling by means of systematic random sampling (sampling through systematic random sampling), each population has the same opportunity to be sampled (Najmah, 2015). The sampling step in this study by sorting the patient numbers according to those listed in the Puskesmas register book then an odd sequence number is taken to be sampled according to the required number of 163 respondents. It is estimated that the number of pediatric patients who go to the Pancasan health center is between 25 and 30 people every day, thus the estimated number of samples obtained is 13-15 respondents in a day (Puskesmas Pancasan Subdistrict, West Bogor, 2017). Based on data from the Bogor City Health Office in 2017 the number of ARI in infants in the Pancasan Community Health Center work area was 375 cases with the highest incidence occurring from February to May (Bogor City Health Office, 2017).

## **Results**

### 1. General description of the location of the study

Pancasan Health Center is located in Bogor Barat Subdistrict, Bogor City, has 2 assisted villages, namely Pasir Jaya Village and Pasir Kuda Village, consisting of 27 RWs and 121 RTs.

### 2. Analysis of the Picture and Relationship of Characteristics of Toddlers, Characteristics of Parents and Environmental Characteristics with ISPA in Toddlers

#### a. ISPA incidence in toddlers

The results of the analysis of the incidence of ARI in infants showed that children under five suffering from ARI were less than those who did not suffer from ARI. Distribution of children under five suffering from ARI was 67 people (41.1%), and those who did not suffer from ARI were 96 people (58.9%). (Table 1)

**Table 1.** Distribution of ARI events in infants

<b>Responden</b>	<b>n</b>	<b>%</b>
ISPA (+)	67	41,1
ISPA (-)	96	58,9
Total	163	100

#### b. Characteristics of toddlers

The characteristics of toddlers studied in this study consisted of 4 variables, namely age, gender, nutritional status and immunization status variables. From the results of statistical tests show that the variables that are significantly related to the incidence of ARI in children under five are gender variables (P value: 0.005) where sex affects the incidence of ARI in infants, namely toddlers with male sex having a risk of ARI 2.66 times greater than toddlers with female gender. While the variables of age, nutritional status and immunization status did not statistically indicate a relationship, but this variable is a risk factor that can influence the incidence of ARI in infants, it can be seen from the results of analysis show that toddlers aged 1- <5 years have a risk of ARI 1, 78 times greater than

toddlers with age <1 year, toddlers with incomplete immunization status have a risk of

ARI 2.49 times greater than toddlers with complete immunization status. (Table 2)

**Table 2.** Relationship of Characteristics of Toddlers with ARI Incidents

Variables	ARI		(-) %	freq	%	P value	OR	CI 95%	
	(+) %								
<b>Age</b>									
- 1-<5 year	49	45,8	58	54,2	107	100 (65,6)	0,13	<b>1,78</b>	0,91-3,51
- <1 year	18	32,1	38	67,9	56	100 (34,3)	-	-	-
<b>Gender</b>									
- Male	47	51,1	45	48,9	92	100 (56,4)	<b>0,005</b>	<b>2,66</b>	1,40-5,15
- Female	20	28,2	51	71,8	71	100 (43,5)	-	-	-
<b>Nutritional Status</b>									
- Less	8	36,4	14	63,6	22	100 (13,5)	0,80	0,79	0,31-2,01
- Well	59	41,8	82	58,2	141	100 (86,5)	-	-	-
<b>Immunization Status</b>									
- Incomplete	11	61,1	7	38,9	18	100 (11,0)	0,11	<b>2,49</b>	0,91-6,82
- Complete	56	38,6	89	61,4	145	100 (88,9)	-	-	-

c. Characteristics of Parents

The characteristics of the parents of children under five studied in this study were parental education, parental work, parental income and parental smoking status. From the results of statistical tests show that there are no variables that are significantly related to the incidence of ARI in infants, but parental characteristics are risk factors that influence the incidence of ARI in infants. This can be seen from the results of the analysis showing that toddlers with low

educated parents have a risk of ARI 1.44 times greater than toddlers with highly educated parents, toddlers with parents who have precarious jobs are more at risk of ARI 1.42 times compared toddlers with parents who have a permanent job, toddlers with parents who have low income are more at risk of developing ARI which is 2.95 times compared to toddlers with parents who have high income, toddlers with parents who smoke have a risk of ARI 1.20 times greater than toddlers with non-smoking parents. (Table 3)

**Table 3.** Relationship of Characteristics of Parents with ARI Events

Variabel	ARI		(-) %	freq	%	P value	OR	CI 95%	
	(+) %								
<b>Education</b>									
- Low	62	41,9	86	58,1	148	100 (90,8)	0,71	<b>1,44</b>	0,47-4,43
- High	5	33,3	10	66,7	15	100 (9,20)	-	-	-
<b>Work</b>									
- No	64	41,6	90	58,4	154	100 (94,5)	0,74	<b>1,42</b>	0,34-5,89
- Yes	3	33,3	6	66,7	9	100 (5,52)	-	-	-
<b>Income</b>									
- Low	65	42,5	88	57,5	153	100 (93,9)	0,20	<b>2,95</b>	0,61-14,40
- High	2	20,0	8	80,0	10	100 (6,13)	-	-	-

Variabel	ARI				freq	%	P value	OR	CI 95%
	(+)	%	(-)	%					
<b>Smoking Status</b>									
- Yes	46	42,6	62	57,4	108	100 (66,3)	0,71	<b>1,20</b>	0,62-2,33
- No	21	38,2	34	61,8	55	100 (33,7)	-	-	-

d. Environmental characteristics

The characteristics of the physical environment of the houses studied in this study were room temperature, room air humidity, lighting, ventilation adequacy and occupancy density. From the results of statistical tests show that there are no variables that are significantly related to the incidence of ARI in infants, but the characteristics of the physical environment of the house are risk factors that can affect the incidence of ARI in infants. This can be seen from the results of the analysis showing that toddlers who live at home with temperatures not meeting the risk of ARI 5.19 times greater than toddlers who live at home with qualified temperatures, toddlers who live in homes with

moisture do not meet the requirements of having risk of ARI is 4.40 times greater than toddlers who live in homes with eligible humidity, toddlers who live in homes with lighting do not meet the requirements of having a risk of ARI 2.95 times greater than toddlers who live in homes with lighting meet the requirements , toddlers living in homes with ventilation do not qualify to have a risk of ARI 1.90 times greater than toddlers who live in eligible ventilated homes, toddlers who live in homes with residential density do not qualify to have the risk of getting ARI 1.89 times greater than toddlers who live at home d with occupancy density meets the requirements. (Table 4)

**Table 4.** Relationship of Physical Environmental Characteristics of Houses with ARI Events in Pancasan Health Center Work Area, West Bogor District, Bogor City, West Java Province 2019

Variables	ARI				freq	%	Pvalue	OR	CI 95%
	(+)	%	(-)	%					
<b>Temperature</b>									
- Not eligible	66	42,6	89	57,4	155	100 (95,1)	0,14	<b>5,19</b>	0,62-43,22
- Qualify	1	12,5	7	87,5	8	100 (4,91)	-	-	-
<b>Humidity</b>									
- Not eligible	66	42,3	90	57,7	156	100 (95,7)	0,24	<b>4,40</b>	0,52-37,42
- Qualify	1	14,3	6	85,7	7	100 (0,43)	-	-	-
<b>Lighting</b>									
- Not eligible	65	42,5	88	57,5	153	100 (93,9)	0,20	<b>2,95</b>	0,61-14,40
- Qualify	2	20,0	8	80,0	10	100 (6,13)	-	-	-
<b>Ventilation</b>									
- Not eligible	57	44,2	72	55,8	129	100 (79,1)	0,17	<b>1,90</b>	0,84-4,30
- Qualify	10	29,4	24	70,6	34	100 (20,9)	-	-	-
<b>Occupanty density</b>									
- Not eligible	55	44,7	68	55,3	123	100 (75,5)	0,14	<b>1,89</b>	0,88-4,05
- Qualify	12	30,0	28	70,0	40	100 (24,5)	-	-	-

3. The dominant factor influencing the incidence of ISP in toddlers

After multivariate analysis, the final model of this analysis was obtained. From the multivariate analysis, it was found that the independent variable predicted to have the most influence on the incidence of ARI in infants was the variable with the highest OR value. In this study the variables with the highest OR value were sex variables (OR: 2.89), toddlers with male sex had a risk of having ARI which was 2.89 times greater than toddlers with female gender. (Table 5)

**Table 5.** Final Model of Multivariate Analysis

Variabel	Nilai P	Exp (B)	CI 95 %
Age	0,047	2,04	0,009-4,135
<b>Gender</b>	<b>0,002</b>	<b>2,89</b>	<b>1,475-5,690</b>

**Discussion**

**1. Relationship of Risk Factors with ARI Events in Toddlers**

**a. Characteristics of Toddlers**

**- age**

From the results of the study it was found that toddlers with ages 1- <5 years were 65.5% while toddlers with age <1 year were 43.6%. Toddlers aged 1- <5 years there were 45.8% suffering from ARI. The results of the analysis show that toddlers with ages 1- <5 years have a risk of 1.78 times greater risk of ARI compared to children under five <1 year. This research is in line with the research conducted by Sari & Ardianti (2015) which states that there is a

relationship between age and the incidence of ARI in toddlers where toddlers aged 1-4 years have a risk of 2.13 times more likely to develop ARI than toddlers with age less than 1 year.

Infants aged less than 3 months experience fewer respiratory infections because of the presence of antibodies, namely through ASI, especially exclusive breastfeeding for 6 months. ASI is a natural food that is perfect, easy to digest, contains nutrients that are suitable for growth, increases endurance, prevents various diseases and increases intelligence. The first milk comes out (colostrum) which is high in protein and contains many antibodies to protect babies from infectious diseases including ARI (Unicef, 2002). Related research results show that infants with a history of non-exclusive breastfeeding have a risk of ARI 2.83 times greater than babies with a history of exclusive breastfeeding (Hasan, 2012). Infection will increase in infants aged 3-6 months where there is a transitional process between the loss of maternal antibodies and the functioning of the baby's antibodies. Respiratory infections will increase in children under 5 years of age (50%) due to an increase in physical activity outside the home and children not yet skilled in terms of maintaining cleanliness, infections will decline again in children aged 5-12 years (30%) where children at this age communication can be better invited (Rahajoe, Supriyatno & Setyanto, 2008). Age is a factor that cannot be changed because it attaches closely to individuals, efforts that can be made to reduce the risk of infection in infants is to pay attention

to other factors that can exacerbate these risks, including the importance of maintaining and improving infant health through good nutrition. ASI is a good source of nutrition for babies, especially colostrum, which is high in protein as a builder substance and increases endurance, there is still a mistaken assumption in the community that the first milk coming out in clear color is dirty and many do not directly give to the baby.

#### **- Gender**

The results showed that there were 56.4% of toddlers with male gender while 43.6% of toddlers with female gender, 51.1% of toddlers with male gender had ARI. The results of the analysis showed that toddlers with male sex had a risk of 2.66 times greater risk of ARI compared to toddlers with female gender. This is in line with the study of Christi, Rahayuning & Nugraheni (2014) which states that there is a relationship between sex with ARI incidence in infants where underfives with male sex have a risk of ARI 2.43 times greater than toddlers with gender women. In principle there is no difference in the incidence of ARI due to viruses or bacteria that attack other children and women, but this can happen because boys play more outdoors with higher activity than girls so boys are more exposed to ARI risk factors. Thus gender is one of the factors that influence the incidence of ARI in infants (Wong, 2008). Gender includes factors that cannot be changed because gender is a characteristic that is not separate from the individual. Efforts that can be done to reduce the risk of ARI related to gender factors are to always pay attention to the health

conditions of children, improve children's nutritional status and monitor activities outside the home, especially for boys.

#### **- Nutritional status**

The results showed that almost all toddlers with good nutritional status were 86.5% while toddlers with poor nutritional status were 13.5%, toddlers with poor nutritional status as much as 36.4% had ARI. The results of the analysis of this study indicate that nutritional status has no risk relationship with the incidence of ARI in toddlers, as is the case with research conducted by Hadiana (2013) which states that there is a relationship between nutritional status and the incidence of ARI in infants with less nutrition at risk of ARI 27.5 times greater than toddlers with good nutrition.

One of the predisposing factors for ARI cases in children is lack of nutrition or malnutrition, because malnutrition causes disruption of the immune response, namely malnutrition will inhibit immunological reactions and are associated with disease prevalence and the severity of the disease. Infection will cause an increase in the destruction of body tissue because it is used for the formation of proteins and enzymes needed in immunity. Malnutrition will affect the immune system and immunological response to a disease or poisoning event (Soemirat, 2000). The relationship of infectious diseases to the condition of nutritional status can be described as a reciprocal relationship. If an individual has an infection, this condition will worsen the condition of nutritional status. The opposite



happens if individuals experience poor nutrition conditions, their bodies will be vulnerable to infection (disease) (Supariasa, 2002). In this study showed that most toddlers have good nutritional status which is balanced between age and toddler weight during the study. Although there is no significant relationship between nutritional status and the incidence of ARI in infants in the Pancasan Health Center work area, it is possible that the nutritional status of children under five will change, because the nutritional status of children is also influenced by parenting, socioeconomic level, education and parental knowledge (Hasan, 2012) To overcome and prevent the occurrence of these problems, parents' education and knowledge need to be improved by providing information through counseling to the community, especially mothers, because mothers play an important role in providing food for the family. Consumption of balanced family nutrition depends on how the mother's knowledge about nutrition and how to process it. In addition to counseling, disseminating leaflets about diverse and balanced nutrition at the posyandu is an effective thing to do. Health promotion is carried out in places such as posyandu, pustu and also puskesmas. Another way to overcome the problem of nutritional status is the provision of supplementary food (PMT) for toddlers, health workers in collaboration with play groups (play groups. In addition to PMT, health workers also play a role in providing vitamin A routinely to toddlers. Vitamin A is an important nutrient that cannot be produced by the body, but children need it for growth and development and increase

endurance. Giving vitamin A in addition to in the form of supplements can also be sourced from meat, fruit and vegetables and contained in breast milk.

#### **- Immunization status**

Immunization status is categorized into two, based on completeness and adjusted for age. From the results of the study showed that toddlers with complete immunization status were 89.0%, while toddlers with incomplete immunization status as much as 11.0%, toddlers with incomplete immunization status as much as 61.1% experienced ARI. The results of the analysis showed that toddlers with incomplete immunization status had a risk of 2.49 times greater risk of ARI compared to toddlers with complete immunization status. This research is in line with research conducted by Medhyna (2016) which states that there is a relationship between immunization status and ARI incidence in infants where incomplete immunization status has a risk of 4.41 times causing ARI.

Currently in Indonesia there are still children who have not received complete immunization and have never even received immunization since birth, this causes children to easily contract the disease because they do not have an immune system against the disease. Immunization is adjusted to the age of the child so that the concept of complete basic immunization is changed to complete routine immunization, where children aged 0 to 9 months must get complete basic immunization (HB, BCG, Polio, DPT, Hib and Measles),

followed by immunization at the age 18 months (DPT, HB, Hib and Measles), immunization in grade 1 elementary school students (DT and measles) as well as grade 2 and grade 5 SD (DT) (Ministry of Health, 2018). The working principle of a vaccine is through the activation of antibodies by inserting a virus or into the body which is a virus that has been weakened or only taken one part called an antigen or even a virus that has been turned off. Thus the body is familiar with the virus and when there is a virus that actually enters the antibodies it is easier to hold resistance. The most effective immunization to prevent ARI is DPT and measles immunization. DPT immunization can prevent three diseases at once namely diphtheria, pertussis and tetanus. Diphtheria is an infection of the bacteria that attacks the mucous membranes in the nose and throat, causing children to have difficulty eating and breathing, if the infection lasts for a long time it can cause nerve, kidney and heart damage. Pertussis is better known as whooping cough is a bacterial infection that attacks the respiratory system and causes severe coughing. If the child is less than 1 year old, suffering from pertussis, it is possible to experience pneumonia and brain damage and experience seizures. Tetanus is a bacterial infection that is transmitted through wounds that are dirty and exposed to soil, tetanus can cause muscle stiffness, muscle spasms and paralysis.

Measles is a viral infection with initial symptoms of fever, coughing cold, reddened eyes, then red spots appear throughout the body. Measles can have severe consequences

because it can cause ear infections, lung infections can even cause brain damage (WHO, 2013).

## **b. Characteristics of Parents**

### **- Parent education**

The results showed that there were 9.2% of toddlers with highly educated parents and as many as 90.8% of children with low education parents, there were 41.9% of children under five suffering from ARI in the group of parents with low education. The results of the analysis show that toddlers with parents who are low educated have a risk of 1.44 times greater risk of ARI compared to toddlers with parents of higher education. This is in line with the research conducted by Hasan (2012) stating that there is a relationship between parental education and the incidence of ARI in infants where underfives with parents with low education have a risk of ARI 1.97 times greater than toddlers with parents who are highly educated. Higher education allows parents, especially mothers, to have the power of analysis so that it is easy to receive information about health problems. Education is an effort of persuasion to parents, especially mothers who have toddlers in order to take action (practice) to maintain / overcome health problems and improve children's health. Health education must be carried out sustainably to the community because to get behavior change must go through a learning process and require a long time (Notoatmodjo, 2012). This study shows that there is a relationship between parental education and the incidence of ARI in

infants in the Pancasan Health Center work area, education has a large contribution to the incidence of ARI in infants, with education expected that the community has knowledge related to health and maintaining health, because of higher education the broader the knowledge and insight that is possessed, the more positive aspects and objects, especially health problems, are known, it will lead to a positive attitude towards children's health (Wawan, 2010). Education is not only formally obtained but can also be obtained non-formal, non-formal education related to ARI problems in infants is obtained from health promotion and health education. Health education can be done to the community, especially mothers during posyandu activities, recitation of ta'lim assemblies, PKK, and community organizations involving mothers is the best means for officers to provide health education, especially how to care for and maintain children's health. good including choosing a place of treatment if the child has a health problem (Soetjningsih, 2012).

#### **- Parents' job**

The results showed that there were 5.5% of toddlers with permanent working parents and 94.5% of toddlers with parents who did not work permanently, as many as 41.6% of children under five suffered from ARI in the group of parents with precarious work, while toddlers with parents who worked permanently 33.3% suffer from ARI. The results of the analysis show that toddlers with parents who do not work still have a risk of 1.42 times greater risk of ARI compared to toddlers with parents

who work regularly. This is in line with the research conducted by Chandra (2014) stating that there is a relationship between the work of parents and ARI incidence in children under five where toddlers with parents who do not have a job are more risky, namely 2.11 times affected by ARI compared to toddlers with parents who have jobs permanent. Work is a status symbol of someone in the community. Bridge work to get money in order to meet the needs of life and to get the desired health service. Work is closely related to income, where income is the result obtained from work or business that has been done. Income will affect a person's lifestyle. People or families who have high economic or income status will practice a luxurious lifestyle for example more productive because they are able to buy all that is needed when compared to families whose middle class economy is lower (Friedman, 2004).

#### **- Parent income**

The results showed that toddlers with low income parents had more ARI, 42.5%, while toddlers with high income parents were 20.0%. The results of the analysis show that toddlers with low income parents have a risk of 2.95 times more likely to suffer from ARI compared to toddlers with high income parents. This is in line with research conducted by Vitaria (2014) stating that there is a relationship between the level of income of parents and ARI incidence in children under five where children with low income parents have a risk of ARI 2.53 times greater than toddlers with high-income parents . The family's socio-economic level is related to

the ability to meet the needs for growth and physical development of children. Economic status is the position of a person or family in the community based on income per month. Economic status can be seen from income adjusted for the price of basic goods (Kartono, 2006). Economic status is very difficult to be limited, the relationship with health is also less evident clearly that poverty is closely related to disease, it's just difficult to analyze which cause and which result. Economic status determines food quality, occupancy density, nutritional adequacy, education level, availability of clean water facilities, sanitation, size of family, technology etc. (Soemirat, 2000). Income levels are often associated with the use of health services and prevention of disease. Someone is not utilizing existing health services maybe because there is not enough money to buy drugs and pay for transportation so that it affects health behavior (Notoatmodjo, 2012).

#### **- Smoking status of parents**

The results showed that toddlers with parents who smoked more suffered from ARI, there were 42.6%. While toddlers with parents do not smoke as much as 38.2%. The results of the analysis show that toddlers with parents who smoke have a risk of 1.20 times more likely to suffer from ISPA than toddlers with parents who do not smoke. This is in line with the research conducted by Novianti (2012) stating that there is a relationship between smoking parents with ARI incidence in children under five where toddlers with smoking parents have a risk of ARI 3.14 times greater than toddlers with parents who do not smoke. Cigarette

smoke from parents or residents of a one-stop house with toddlers is a material of pollution in a living space that is serious and will increase the risk of pain from toxic substances in children. Continuous exposure will cause respiratory problems, especially exacerbating the incidence of acute respiratory infections and lung disorders as adults. The more cigarettes smoked by the family, the greater the risk for the incidence of ARI, especially if smoking is carried out by the mother of the baby (Ministry of Health, 2002). WHO analysis shows that the bad effects of cigarette smoke are greater for passive smokers than active smokers. When smokers burn a cigarette and suck it, the smoke smoked by smokers is called mainstream smoke, and the smoke coming out of the tip of the cigarette (the burning part) is called sidestream smoke or side smoke. This side smoke has been shown to contain more results from burning tobacco than the main smoke. This smoke contains 5 times greater carbon monoxide, 3 times tar and nicotine, 46 times ammonia, 3 times nickel, nitrosamines as the cause of cancer levels reaching 50 times greater in side smoke compared with the main smoke levels (WHO, 2008) .

#### **c. Characteristics of Physical Environment of Houses**

##### **- temperature**

The results showed that toddlers who lived at home with a temperature that did not meet the requirements suffered more ARI, there were 42.6%, while toddlers who lived at home with temperatures fulfilled the requirements as much

as 12.5%. The results of the analysis show that toddlers who live at home with a temperature that do not meet the requirements have a risk of 5.19 times more likely to suffer from ARI compared with toddlers who live at home with temperatures that meet the requirements. This is in line with the research conducted by Soolani, Umboh & Akili (2013) stating that there is a relationship between the temperature and the incidence of ARI in toddlers where toddlers who live at home with temperatures do not meet the risk of having ARI 3.21 times greater than toddlers who lives at home with temperature meets the requirements. Changes in indoor air temperature are influenced by several factors including inadequate ventilation, occupancy density, fuel use, building structure, geographical and topographical conditions. Indoor temperature is also strongly influenced by outdoor air temperature, air movement, air humidity and the temperature of objects around it. Indoor air temperature must remain in the range of 18-20°C (Indonesian Ministry of Health, 2011). In the rainy season low temperatures and high humidity, this allows the growth of mold on paper or paper to be bumpy because of the rise and fall of air temperature, in the high temperature dry season while the humidity is low because high temperatures cause precipitation (condensation) of molecules, the temperature high causes the body to lose fluids and electrolytes more easily (Chrismonica & Anggara, 2015). The results of the study show that the room temperature is closely related to poor ventilation, occupancy density, and building structures that do not meet the requirements.

#### **- humidity**

The results of the study show that toddlers who live in homes with moisture that do not meet the requirements suffer more ARI there are 42.3%, while toddlers who live in homes with moisture meet the requirements as much as 14.3%. The results of the analysis show that toddlers who live in homes with non-compliant humidity have a risk of 4.40 times greater suffering from ARI compared to toddlers who live in homes with moisture fulfilling the requirements. This is in line with the research conducted by Oktaviani (2009) stating that there is a relationship between humidity and ARI incidence in children under five where toddlers who live at home with no conditions are at risk of having ARI 1.79 times greater than toddlers who live at home with moisture meets the requirements. Moisture is closely related to ventilation, moisture problems can be overcome by always opening doors and windows during the day so that air and light circulation can enter the house, increase ventilation area so that air and incoming light can be adequate, always maintain the cleanliness of floors, walls and also keep the roof from leaking. Humidity that does not meet the requirements (40-60%) can fertilize several types of microorganisms, moisture which is less than the threshold value allows mice, cockroaches and fungi to play a role in the pathogenesis of respiratory diseases. This is in accordance with the efforts to improve air space as stated by the Indonesian Ministry of Health (2011) on guidelines for air sanitation in house spaces. High humidity can cause the nasal

mucous membranes to dry up so that it is less effective in blocking microorganisms, such as pneumococcal bacteria will thrive in environments with high humidity because water forms > 80% the volume of bacterial cells and is essential for the growth and survival of cells bacteria, high humidity can also interfere with lung function because inhaled air is too wet (Azwar, 1990 in Pramayu, 2012).

#### **- lighting**

The results of the study show that toddlers who live in homes with lighting do not meet the requirements of suffering more ARI there are 42.5%, while toddlers who live in homes with lighting meet the requirements as much as 20.0%. The results of the analysis show that toddlers who live in homes with lighting do not meet the requirements of having a risk of 2.95 times more likely to suffer from ARI compared to toddlers who live in homes with lighting to meet the requirements. This is in line with the research conducted by Syam & Rony (2015) stating that there is a relationship between lighting and ARI incidence in infants where under-fives living in homes with lighting do not meet the requirements of having ARI risk 2.03 times greater than toddlers who live at home with lighting that meets the requirements. Natural lighting is very important in lighting the house to reduce moisture problems. Lighting can originate naturally, from sunlight entering the room through open windows, cracks and other parts of the house, besides being useful for lighting, sunlight can also repel mosquitoes or other insects and kill certain disease-causing germs. Sunlight capable of killing bacteria is

light with a wavelength of 4000A, such as ultra violet light (Azwar, 1990 in Pramayu, 2012). The thing that needs to be considered in making windows is to make sure that sunlight can enter the room and not be blocked by other buildings. In other words the function of the window can also be used as a light entry, natural lighting is considered good if the size is between 60-120 lux and is said to be bad if <60 or > 120 lux. (Permenkes No. 1077, 2011).

#### **- Ventilation**

The results of the study show that toddlers who live in homes with ventilation do not meet the requirements suffer more ARI there are 44.2%, while toddlers who live in homes with lighting meet the requirements as much as 29.4%. The results of the analysis show that toddlers who live in homes with ventilation do not meet the requirements of having a risk of 1.90 times more likely to suffer from ARI compared to children under five who live in ventilated homes that meet the requirements. This is in line with the research conducted by Dewi (2011) stating that there is a relationship between ventilation and the incidence of ARI in infants where ventilation that does not meet the risk requirements is 4.70 times causing ARI compared to children under five who live in ventilated homes that meet the requirements. Ventilation is a very important factor because it can affect the air quality in the house, the area of permanent natural ventilation is at least 10% of the floor area of the house, providing fresh air from the outside with an optimum temperature of 22-24°C and humidity of 60%. Less ventilation will cause a lack of O<sub>2</sub> in the

house and increased levels of toxic CO<sub>2</sub> (Kusnopranto, 2000). Good ventilation can cause fresh air to easily enter the house, otherwise poor ventilation can endanger health, especially the respiratory tract because ventilation serves to provide fresh air into and remove dirty air from closed spaces naturally and mechanically (Nindya, 2005). Ventilation has the main function of keeping the air flow in the house fresh so that there is a balance of O<sub>2</sub> and CO<sub>2</sub>, where lack of ventilation causes a lack of O<sub>2</sub> levels and increased toxic CO<sub>2</sub> levels. Ventilation also affects the air humidity in the room because it can be a good medium for the proliferation of disease-causing bacteria. Bacteria in the air can easily flow out with adequate ventilation.

#### **- Occupancy density**

The results of the study show that toddlers who live in homes with residential densities that do not meet the requirements suffer more ARI there are 44.7%, while toddlers who live in homes with occupancy density meet the requirements as much as 30.0%. The results of the analysis show that toddlers who live in homes with occupancy densities do not meet the requirements of having a risk of 1.89 times greater for suffering from ARI compared to toddlers who live in ventilated homes that meet the requirements. This is in line with the research conducted by Wahyuningsih, Raodhah & Basri (2014) stating that there is a relationship between occupancy density and the incidence of ARI in infants where infants living in homes with residential density do not qualify to have a risk of ARI 3.12 times greater

compared to toddlers who live in homes with residential densities qualify.

Occupancy density that does not meet the conditions facilitates transmission of ARD from one person to another in the house because one of the infections occurs through the air, this occurs as a result of the frequency of contact and the proximity of one person to another in a house that causes transmission of the causative germs diseases, especially ARI, are easier. Healthy occupancy density for each member of the house occupants is at least 10m<sup>2</sup> / person (Permenkes No.1077, 2011). Residential density conditions that do not meet the requirements lead to non-fulfillment of oxygen requirements among members so that it can aggravate respiratory system disorders, high occupancy density also affects the temperature of the room to increase so that the condition of the room feels hot and tight because of the lack of clean air. The role of health workers is very important to provide information to the public about the need for regulation and consideration of the number of family members related to residential requirements that meet the requirements.

#### **2. Dominant Factors Affecting ARI in Toddlers**

The results of multivariate analysis conducted using logistic regression models of determinants / predictions obtained results that statistically predicted the most influential on the incidence of ARI in infants in the Pancasan Community Health Center working area in West Bogor District, Bogor City are factors

characteristic of toddlers, namely gender variables in which toddlers with male sex having a risk of 2.89 times exposed to ARI compared to toddlers with female gender. The next dominant factor is the age variable where toddlers aged 1- <5 years are more at risk of ARI, which is 2.04 times greater than toddlers aged <1 year.

## **Conclusion**

From the results of this study it can be concluded that toddlers with positive ARI are 41.1%. The characteristics of toddlers with ages 1- <5 years are 65.6%, toddlers with male gender are 56.4%, toddlers with malnutrition status are 13.5%, toddlers with incomplete immunization status are 11.0%. The characteristics of parents, toddlers with parents of low education are 90.8%, toddlers with parents of precarious jobs are 94.5%, toddlers with low income parents are 93.9%, toddlers with parents smoking are 66.3%. Environmental characteristics, 95.1% of children living in homes with temperatures that do not meet the requirements, 95.7% of children living in homes with non-eligible humidity, 93.9 %, toddlers who live in homes with ventilation do not meet the requirements are 79.1%, toddlers who live in homes with residential densities do not meet the requirements are 75.5%. There is a significant relationship between age and the incidence of ARI (OR: 1.78; 95% CI: 0.91-3.51), gender

with ARI (OR: 2.66; 95% CI: 1.40-5.15 ), immunization status with ARI (OR: 2.49; 95% CI: 0.91-6.82), while nutritional status was not associated with ARI (OR: 0.79; 95% CI: 0.31-2, 01). The relationship between parental education and ARI (OR: 1.44; 95% CI: 0.47-4.43), parental work with ARI (OR: 1.42; 95% CI: 0.34-5.89) , income of parents with ARI (OR: 2.95; 95% CI: 0.61-14.40), smoking status of parents with ARI (OR: 1.20; 95% CI: 0.62-2.33). There is a relationship between temperature and ARI (OR: 5.19; 95% CI: 0.62-43.22), humidity with ARI (OR: 4.40; 95% CI: 0.52-37.42), lighting with ARI (OR: 2.95; 95% CI: 0.61-14.40), ventilation with ARI (OR: 1.90; 95% CI: 0.84-4.30), occupancy density with ARI ( OR: 1.89; 95% CI: 0.88-4.05). The final results of the analysis showed that gender variables were the variables that most influenced the incidence of ARI in infants (OR: 2.89; 95% CI: 1.475-5.690). ARI problem is a comprehensive problem for that there needs to be involvement of many parties in terms of establishing good cooperation across programs and across sectors, especially related institutions including health services, environmental agencies, public works services and public housing and local government to increase awareness of health related to individual characteristics and improving the quality of healthy community housing related to environmental characteristics.



## References

- BPS Indonesia. (2018). *Profil Badan Pusat Statistik Indonesia Tahun 2018*. Retrieved from <https://www.bps.go.id/publication/2018/07/03/5a963c1ea9b0fed6497d0845/statistik-indonesia-2018.html>. Diakses tgl 11 Februari 2019.
- BPS Kota Bogor. (2018). *Kecamatan Bogor Barat Dalam Angka 2018*. Retrieved From <https://bogorkota.bps.go.id/publication/2018/09/26/8df43b45e15280891404aec5/kecamatan-bogor-barat-dalam-angka-2018.html>. Tgl 26 Mei 2019.
- Chandra. (2014). *Penelitian Hubungan Pendidikan dan Pekerjaan Ibu Dengan Upaya Pencegahan Ispa Pada Balita Oleh Ibu Yang Berkunjung Ke Puskesmas Kelayan Timur Kota Banjarmasin*. Retrieved From <http://ojs.uniska-bjm.ac.id/index.php/ANN/article/download/976/828.pdf>. Diakses tgl 31 Mei 2019.
- Chrismonica, T. & Anggara, G. (2015). *Percobaan Laboratorium Hubungan Kelembaban, Suhu dan Kapasitas Udara*. Retrieved From [https://www.academia.edu/31571823/Hubungan\\_Kelembaban\\_Suhu\\_Dan\\_Kapasitas\\_Udara](https://www.academia.edu/31571823/Hubungan_Kelembaban_Suhu_Dan_Kapasitas_Udara). Diakses tgl 15 Juni 2019.
- Christi, H., Rahayuning, D., & Nugraheni, S.A. (2014). *Penelitian Faktor yang berhubungan dengan kejadian ISPA pada Bayi Usia 6-12 bulan yang memiliki Status Gizi Normal*. Retrieved From <https://ejournal3.undip.ac.id/index.php/jkm/article/view/11876/11531>. Diakses tgl 28 Mei 2019.
- Dewi, A.P. (2011) *Faktor yang Berhubungan dengan Kejadian ISPA pada Balita di wilayah Kerja Puskesmas Banyudono I Kabupaten Boyolali*. Retrieved From [https://www.researchgate.net/publication/277761448\\_Faktor-Faktor\\_Yang\\_Berhubungan\\_Dengan\\_Kejadian\\_Infeksi\\_Saluran\\_Pernafasan\\_Akut\\_ISPA\\_Pada\\_Balita\\_DI\\_Wilayah\\_Kerja\\_Puskesmas\\_Banyudono\\_1\\_Kabupaten\\_Boyolali](https://www.researchgate.net/publication/277761448_Faktor-Faktor_Yang_Berhubungan_Dengan_Kejadian_Infeksi_Saluran_Pernafasan_Akut_ISPA_Pada_Balita_DI_Wilayah_Kerja_Puskesmas_Banyudono_1_Kabupaten_Boyolali). Tgl 28 Mei 2019.
- DIKPLHD Kota Bogor. (2017). *Pencemaran Udara Kota Bogor*. Retrieved from <https://www.facebook.com/pages/category/LocalBusiness/Dlhkotabogor/posts/>. Diakses tgl 20 Februari 2019.
- Dinas Kesehatan Bogor. (2017). *Anak-anak rawan terkena ISPA*. Retrieved from <http://bogor.tribunnews.com/2017/02/09/musim-hujan-anak-anak-rawan-penyakit-ispa-hindari-dengan-cara-ini>. Diakses tgl 13 Agustus 2018.
- Dinas Kesehatan Kota Bogor. (2017). *Profil Dinas Kesehatan Kota Bogor Tahun 2017*. Retrieved from <http://dinkes.kotabogor.go.id/.../profil-kesehatan-tahun-2016.pdf>. Diakses tgl 02 Maret 2019.
- Environmental Protection Agency. (2007). *The Health Impact of Coarse Particulate Matter, Air Resources Board*. Retrieved from <http://www.arb.ca.gov/research/health/healthup/jan07.pdf>. Diakses 13 Agustus 2018.
- Friedman.2004. *Keperawatan Keluarga*. Jakarta:EGC.
- Hadiana, S.Y. (2013). *Penelitian tentang Hubungan Status Gizi terhadap Terjadinya Infeksi Saluran Pernafasan Akut pada Balita di Puskesmas Pajang Surakarta*. Retrieved From [http://eprints.ums.ac.id/22566/9/Naskah\\_Publikasi.pdf](http://eprints.ums.ac.id/22566/9/Naskah_Publikasi.pdf). Diakses tgl 30 Mei 2019.
- Hasan, N.R. (2012). *Penelitian Faktor-faktor yang Berhubungan dengan Kejadian ISPA pada Balita di Wilayah Kerja UPTD Kesehatan Luwuk Timur Kabupaten Banggai provinsi Sulawesi Tengah*. Retrieved From [https://id.search.yahoo.com/yhs/search?hspart=trp&hsimp=yhs-001&type=Y61\\_F11\\_165725\\_122318&p=penelitian+Nani+rusdawati+hasan+tentang+ISPA+pada+balita](https://id.search.yahoo.com/yhs/search?hspart=trp&hsimp=yhs-001&type=Y61_F11_165725_122318&p=penelitian+Nani+rusdawati+hasan+tentang+ISPA+pada+balita). Diakses tgl 28 Mei 2019.
- Hastono, S.P. (2017). *Analisis Data Kesehatan*, Fakultas Kesehatan Masyarakat Universitas Indonesia. Depok: PT Raja Grafindo Persada.
- IHME. (2014). *Angka Kematian Anak Tertinggi*. Retrieved from <https://health.detik.com/anak-dan-remaja/d-2572886/angka-kematian-anak-paling-tinggi-di-dunia-ada-di->

- [negara-ini](#). Diakses tgl 16 Februari 2019.
- Kartono. 2006. *Perilaku Manusia*. ISBN. Jakarta.
- Kementerian Kesehatan RI. (2011). *Kementerian Kesehatan RI tentang Pedoman Pengembangan Kawasan Tanpa Rokok*. Retrieved from [www.depkes.go.id/resources/download/promosi-kesehatan/pedoman-ktr.pdf](http://www.depkes.go.id/resources/download/promosi-kesehatan/pedoman-ktr.pdf). Diakses tgl 18 Maret 2019.
- Kementerian Kesehatan RI. (2011). Permenkes Nomor: 1077 Tahun 2011 *Mengenai Pedoman Penyehatan Udara dalam Ruang Rumah*. Retrieved from [http://www.hukor.depkes.go.id/up\\_pro\\_d\\_permenkes/PMK%20No.%201077%20ttg%20Pedoman%20Penyehatan%20Udara%20Dalam%20Ruang%20Rumah.pdf](http://www.hukor.depkes.go.id/up_pro_d_permenkes/PMK%20No.%201077%20ttg%20Pedoman%20Penyehatan%20Udara%20Dalam%20Ruang%20Rumah.pdf). Diakses tgl 22 Juli 2018.
- Kementerian Kesehatan RI. (2018). *Jumlah Kasus ISPA Seluruh Provinsi Tahun 2018*. Ditjen P2P Subdit ISPA Jakarta.
- Kusnoputranto, H & Susana, D. (2000). *Kesehatan Lingkungan. Fakultas Kesehatan Masyarakat*. Universitas Indonesia. Depok.
- Lemeshow, S., Hosmer, J.R. & Klar, J. (1997). *Besar sampel dalam penelitian kesehatan, edisi bahasa Indonesia*, cetakan pertama, Gajah Mada University Press: Yogyakarta.
- Medhyna, V. (2016). *Penelitian Faktor Yang Mempengaruhi Kejadian ISPA pada Bayi Usia 4 Sampai 6 Bulan*. Retrieved From. [https://www.researchgate.net/publication/328766570\\_Faktor\\_yang\\_mempengaruhi\\_kejadian\\_ISPA\\_pada\\_bayi\\_usia\\_4\\_sampai\\_6\\_bulan](https://www.researchgate.net/publication/328766570_Faktor_yang_mempengaruhi_kejadian_ISPA_pada_bayi_usia_4_sampai_6_bulan). Diakses tgl 28 Mei 2019.
- Najmah. (2015). *Epidemiologi untuk Mahasiswa Kesehatan Masyarakat*. Cetakan Pertama. Jakarta: PT Raja Grafindo Persada.
- Nindya, T.S. (2005). *Hubungan Sanitasi Rumah dengan ISPA*. Retrieved From. [www.journal.unai.ac.id/form-download.php?id.pdf.FKM](http://www.journal.unai.ac.id/form-download.php?id.pdf.FKM). Universitas Airlangga. Diakses tgl 28 Mei 2019.
- Notoatmodjo, S. (2012). *Promosi Kesehatan dan Perilaku Kesehatan*. Edisi Revisi. Jakarta: PT Rineka Cipta.
- Novianti, V. (2012). *Faktor-Faktor yang Mempengaruhi Kejadian Penyakit ISPA pada Balita di Sekitar Wilayah Tempat Pembuangan Akhir Sampah (TPAS) Tamangapa Kota Makassar Tahun 2012*. Retrieved From . <http://repositori.uin-alauddin.ac.id/3196/>. Diakses tgl 28 Mei 2019.
- Oktaviani, V.A. (2009). *Penelitian Hubungan Antara Sanitasi Fisik Rumah Dengan Kejadian Infeksi Saluran Pernafasan Atas (Ispa) Pada Balita Di Desa Cepogo Kecamatan Cepogo Kabupaten Boyolali*. Retrieved From <http://eprints.ums.ac.id/5965/1/J410050018.PDF>. Diakses tgl 30 Mei 2019.
- Pramayu, A.P. (2012). *Hubungan konsentrasi PM10 ruang kelas terhadap ISPA pada siswa SD di Kecamatan cipayung Depok*. (Tesis): Fakultas Kesehatan Masyarakat, Universitas Indonesia.
- Puskesmas Pancasan Bogor Barat. (2017), *Profil Kesehatan Puskesmas Pancasan Bogor Barat Kota Bogor*. <https://asgar.or.id/health/layanan-kesehatan/daftar-puskesmas/daftar-puskesmas-di-kota-bogor-provinsi-jawa-barat/>. Diakses tgl 02 Maret 2019.
- Rahajoe, N.N., Supriyatno, B., & Setyanto, D.B. (2008). *Buku Ajar Respirologi Anak*. Jakarta: IDAI.
- Riskesdas. (2018). *Hasil Utama Riset Kesehatan Dasar Kementerian Kesehatan*. Retrieved from [http://www.depkes.go.id/resources/download/info-terkini/materi\\_rakorpop](http://www.depkes.go.id/resources/download/info-terkini/materi_rakorpop). Diakses tgl 23 Februari 2019.
- Soejtiningsih. (2012). *Tumbuh Kembang Anak*. Penerbit Buku Kedokteran. Jakarta: EGC.
- Soemirat, J. (2000). *Epidemiologi Lingkungan*. Yogyakarta: Universitas Gadjah Mada Press.
- Soolani, D.C., Umboh, J.M.L & Akili, R.H. (2013). *Penelitian Hubungan antara Faktor Lingkungan Fisik Rumah dengan Kejadian Infeksi Saluran Pernapasan (ISPA) pada Balita di Kelurahan Malalayang 1 Kota Manado*. Retrieved From <http://fkm.unsrat.ac.id/wp-content/uploads/2015/02/Jurnal->

- [Deflyn-Soolani-101511003.pdf](#).  
Diakses tgl 30 Mei 2019.
- Supariasa., et al. (2002). *Penilaian Status Gizi*. Jakarta: EGC.
- Syam, D.M., & Ronny. (2015). *Penelitian Suhu, Kelembaban dan Pencahayaan Sebagai Faktor Risiko Kejadian Penyakit ISPA pada Balita di Kecamatan Balaesang Kabupaten Donggala*. Retrieved From <http://journal.uin-alauddin.ac.id/index.php/higiene/article/view/1822.pdf>. Diakses tgl 31 Mei 2019.
- Unicef. (2002). *Pedoman Hidup Sehat. Diadaptasi dari Facts For Life Third Edition. United Nations Children's Fund*. New York.
- Unicef. (2017). *Level and Trend in Child Mortality*. Retrieved from <http://data.unicef.org/resources/levels-trends-child-mortality-2017>. Diakses tgl 18 Maret 2019.
- Universitas Indonesia. (2017). *Pedoman Teknis Penulisan Tugas Akhir Mahasiswa Univeristas Indonesia*.
- Vitaria, F. (2014). *Penelitian tentang Faktor-faktor yang Berhubungan dengan Kejadian ISPA pada Anak Balita di Puskesmas Pasuruan*. Retrieved From. <https://anggorae.blogspot.com/2014/12/faktor-faktor-yang-berhubungan-dengan.html>. Diakses tgl 30 Mei 2019.
- Wahyuningsih, S., Raodhah, S., & Basri, S. (2014). *Infeksi Saluran Pernafasan Akut (ISPA) pada Balita di Wilayah Pesisir Desa Kore Kecamatan Sanggar Kabupaten Bima*. Retrieved From <http://journal.uin-alauddin.ac.id/index.php/higiene/article/view/3701>. Diakses tgl 28 Mei 2019.
- Wawan & Dewi. (2010). *Teori dan Pengukuran Pengetahuan Sikap dan Perilaku Manusia*. Yogyakarta: Nuha Medika.
- WHO. (2007). *Pencegahan dan Pengendalian Infeksi Saluran Pernafasan Akut (ISPA) yang cenderung menjadi Epidemik dan Pandemi di Fasilitas Pelayanan Kesehatan*. Retrieved from [https://www.who.int/csr/resources/publications/WHO\\_CDS\\_EPR\\_2007\\_8bahasa.pdf](https://www.who.int/csr/resources/publications/WHO_CDS_EPR_2007_8bahasa.pdf). Geneva. Alih Bahasa: Trust Indonesia. Diakses tgl 02 Maret 2019.
- WHO. (2013). *Pengertian Imunisasi Dasar, Campak, BCG, Polio, DPT, WHO, Defenisi dan Cara Pemberian*. Retrieved From <http://ikhsanbeck.blogspot.com/2013/05/pengertian-imunisasi-dasar-campak-bcg.html>. Diakses tgl 17 Juni 2019.
- WHO. (2017). *Jutaan Anak Meninggal Tiap Tahun Akibat Pencemaran Lingkungan*. Retrieved from <http://gakken-idn.id/articles/jutaan-anak-meninggal-tiap-tahun>. Diakses tgl 12 Februari 2019.
- Wong Dona, L., et al. (2008). *Buku Ajar Keperawatan Pedeatrik*. Vol. 1 & 2. Jakarta: EGC.