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The Effect of Exclusive Breastfeeding, Nutrition Status, Smoking Habits and Workplace Distance Towards Frequency of *Acute Respiratory Tract Infection* in Toddlers

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Abstract

Acute Respiratory Tract Infection is one of the causes of children death in developing countries, such as Indonesia. Piyungan Subdistrict, which is one of the sub-districts in Bantul Regency, has many industries and factories which experience an increase of Acute Respiratory Tract Infection cases each year, namely 1004 cases in 2016 and 3124 cases in 2017. The purpose of this study was to analyze the effects of exclusive breastfeeding, nutritional status, smoking habits and the distance of houses from factories to the frequency of Acute Respiratory Tract Infection in toddlers. This research was a correlation analytic with cross-sectional approach. The sampling technique used purposive random sampling of 101 toddlers from a total population of 947. The instruments used were questionnaires and observation sheets. Data analysis used chi-square test and logistic regression. The results showed that exclusive breastfeeding had an effect on the frequency of Acute Respiratory Tract Infection in infants (p-value 0,000; OR 0.081), nutritional status (p-value 0,000; OR 0.017). Smoking habits affect the frequency of Acute Respiratory Tract Infection toddlers and have a risk of 0.17 times to increase the frequency of Acute Respiratory Tract Infection toddlers (p-value 0,000; OR 0.170), while the distance of the house from the factory has an effect on the frequency of Acute Respiratory Tract Infection of children under five and has a risk of 0.212 times greater to increase the frequency of Acute Respiratory Tract Infection in toddlers (p-value 0.001; OR 0.212). Therefore, there is a need for programs that support parents' knowledge and awareness of children nutrition and environmental health to reduce the risk of Acute Respiratory Tract Infection in toddlers in industrial estates.

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INTRODUCTION

Acute Respiratory Tract Infection is one of the causes of death in children in developing countries. Data from WHO in 2015 out of 6 million children who died, 16% were caused by Acute Respiratory Tract Infection and this disease is the number 1 toddler killer in the world (UNICEF, 2015). Acute Respiratory Tract Infection includes Upper Respiratory Tract and Lower Respiratory Tracts along with adnexa.

The prevalence of *Acute Respiratory Tract Infection* in Indonesia was 13.3 percent (Riskesdas, 2018). *Acute Respiratory Tract Infection* causes high mortality rate in toddlers under-five years, which is about 1 in 4 deaths. In Special Region of Yogyakarta province, 40% - 60% of visits to health centers and 15% -30% of visits in outpatient and hospital stays were caused by *Acute Respiratory Tract Infection*. This is evidenced by the increase in the incidence of *Acute Respiratory Tract Infection* from 2014 to 2016, namely 1,813 cases to 2,936 cases (Special Region Yogyakarta Provincial Health Office, 2017).

Bantul Regency ranks first in the incidence of *Acute Respiratory Tract Infection* annually and Piyungan District is the region with the highest incidence of *Acute Respiratory Tract Infection* and increases every year (Profile of Bantul Health Office, 2017).

From these problems, it is necessary to examine the factors that influence the frequency of *Acute Respiratory Tract Infection* in toddlers. The purpose of this study was to analyze the impact of exclusive breastfeeding, nutritional status of toddlers, smoking habits and distance of houses from factories with the frequency of *Acute Respiratory Tract Infection* in toddlers. It is expected that the community can improve the quality of life, especially in the prevention of risk factors of *Acute Respiratory Tract Infection* in infants.

METHODS

This research was quantitative. The research design was analytical correlation research with cross sectional design. The populations in this study were toddlers who had experienced Acute Respiratory Tract Infection in 2017 which were recorded at Piyungan Health Center as many as 947 toddlers. The sampling technique used purposive random sampling. The sample size was 101 mothers of children under five years old.

The Acute Respiratory Tract Infection ables in this study were exclusive breastfeeding, nutritional status, smoking habits, distance of home from the factory, and frequency of Acute Respiratory Tract Infection in infants. Instruments in retrieving data were questionnaire sheets and observation sheets. The analysis test used in processing the data was chi-square test for bivAcute Respiratory Tract Infection ate analysis, and logistic regression test for multivAcute Respiratory Tract Infection ate analysis.

RESULT AND DISCUSSION

Descriptive analysis

Table 1. The frequency distribution of exclusive breastfeeding, nutritional status, smoking habits, distance of home from the factory and frequency of Acute Respiratory Tract Infection in toddlers

VAcute Respiratory Tract Infection able	Frequency	Percentage
Exckusive breast feeding		
Yes	48	47.5
No	53	52.5
Nutritional Status		
Good	42	41.6
Less	59	58.4
Smoking Habit		

Mild	42	
Heavy	59	41.6
		58.4
Distance to the factory		
Qualified	48	47.5
Unqualified	53	52.5
ACUTE RESPIRATORY		
TRACT	39	38.6
INFECTION	62	61.4
frequency in toddlers		
Normal		
Abnormal		

According to table 1, it shows that the provision of exclusive breastfeeding in the industrial area of Piyungan District, Bantul Regency is 47.5% of all samples. The awareness of the importance of Exclusive Breastfeeding is still not comprehensive. People still don't know much about the benefits of giving breast milk to babies. In the breast milk contains nutrients that are suitable for growth, immunity, and prevent Acute Respiratory Tract Infection ous diseases with antibody substances in them (Soetjiningsih, 2012).

In the industrial area of Piyungan Subdistrict, Bantul Regency, the average mothers are workers in the factory. In case of that, many babies do not get breast milk exclusively. Some babies who are not even 6 months old have been given formula milk as a substitute for breast milk. In addition to these factors, there are other factors, namely mother's occupation; the baby is entrusted to her grandmother or neighbor. From this situation, there are some babies who have not been even 6 months old given compelentary food beside breast milk.

The impact of not giving exclusive breastfeeding, among others, is the babies do not get maximum immunity, so that they will be more at risk for getting infected with the disease. Breast milk contains food proteins that can reduce the death rate from the upper gastrointestinal and respiratory tract (Prasetyono, 2009). In addition, children aged 6-23 months who did not get exclusive breastfeeding for 5 months had a 2-fold higher risk of infection-related mortality compared with infants (0-5 moths) who get exclusive breastfeeding (Sankar, et al., 2015) .

Toddlers in the industrial area of Piyungan Subdistrict, Bantul Regency have a poor nutritional status of 58.4%. Nutritional status is directly affected by diet and health status. Parenting is given by parents to children indirectly affect diet and health status. In addition, the availability and patterns of home consumption are also very influential on the diet of toddlers. Health and environmental services can affect the health status of children under five. Research conducted by Acute Respiratory Tract Infection and Ratnawati (2018) proved that there was a relationship between knowledge of feeding patterns and nutritional status of children.

In India, 69% of children experienced malnutrition. For the 37-60 month age group, it reached 52.6%. Some factors found related to the prevalence of malnutrition are mothers' education, hygiene and mother's eating habits (Sethy, et al., 2017). Factors from mothers have more influence on the nutritional status of children. This is because toddlers still cannot manage their diet independently. A toddler's diet is still influenced by his mother's eating habits. In addition, exclusive breastfeeding can also affect nutritional status. Nutritional status between toddlers who are given exclusive breastfeeding and those who are not given exclusive breastfeeding were 95.5%: 59.1% (Yustianingrum and Adriani, 2017).

Most respondents have family members who smoke both heavy smokers and light smokers (see in Table 1). Family members who smoke include father, grandfather and grandmother from a toddler in the Piyungan industrial area generally smoke inside the house when they gather after dinner. In Bantul Regency, especially Piyungan, there are still mothers or grandmothers from toddlers who smoke. So, the environment in which toddlers live and grow has been contaminated with

cigarette smoke. In addition, other pollutant smoke that are associated with Acute Respiratory Tract Infection in toddlers are smoke from burning anti-mosquito (Saleh, Gafur and Aeni, 2017).

This bad smoking habit can be prevented by conducting health promotion and interventions through counseling programs, giving leaflets and posters, installing banned smoking signs can be proven to increase knowledge, attitudes in smoking behavior (Usman, 2018).

The result of the study of majority house distance to factories was not fulfilling the requirements, which amounted to 52.5%. It is said that it does not meet the requirements if the distance of the house from the factory is ≤2000 meters. This situation is not in accordance with the ideal distance between housing and industrial housing as determined by the regulations of the industrial ministry no. 35 / M-IDN / 3/2010. The regulation states that the ideal distance between settlements and industry is 2 kilometers, because the industry will produce pollutants and wastes that are harmful to the community.

The results of this study were supported by Khairiah (2012) who found that settlements around the industry were also not good for health. Smoke from industrial products can produce air pollutants that will later disrupt the respiratory tract. The environment strongly supports the health level of its inhabitants.

Most of the frequency of *Acute Respiratory Tract Infection* in under-fives y/o toddlers is 61.4%. The frequency of *Acute Respiratory Tract Infection* shows abnormal rather than toddlers whose frequency is normal. In fact, some respondents admitted that their children often get *Acute Respiratory Tract Infection,* which reaches every month in the past year. That can be caused by several reasons, including health behavior. There is a significant relationship between family health behavior and the incidence of *Acute Respiratory Tract Infection.* Toddlers with poor family health behavioral environment are 3.38 times more likely to effect Acute Respiratory Tract Infection compared to families with good health behavior (Fidiani, 2011).

According to observations made by researchers, the environment in which the research was conducted was an industrial area, which was exposed to factory production of smoke pollution. Toddlers with a higher frequency of abnormal *Acute Respiratory Tract Infection* (> 6 times in the past 1 year) can be due to exposure to smoke production. That can also be caused by cigarette smoke in the family. This can be proven by the high number of heavy smokers compared with the number of mild smokers (44%: 56%).

The effect of exclusive breastfeeding on the frequency of *Acute Respiratory Tract Infection* in toddlers.

Table 2. The analysis of exclusive breastfeeding and the frequency of *Acute Respiratory Tract Infection* in toddlers.

Exclusive Breastfeeding	Frequency of *ARI*				Total	
	Normal		Abnormal			
	f	%	f	%	f	%
Yes	28	58.3	20	41.7	48	100
No	11	20.8	42	79.2	53	100
Total	39	38.6	62	61.4	101	100

p-value = 0,000 (chi-square test)

Table 2 shows the *p*-value is 0,000 <α (0,05), it means that Ha is accepted and it can be concluded that exclusive breastfeeding affects the frequency of *Acute Respiratory Tract Infection* in toddlers on the industrial area of Piyungan District, Bantul.

These findings are supported by United States that showed the prevalence of ear, throat and sinus infections in children is associated with exclusive breastfeeding. The longer exclusive breastfeeding is given, the lower the risk of sinus infection (Li, et al., 2014). The findings are also in line with findings in

Indonesia. Toddlers who are not given exclusive breastfeeding have a risk of *Acute Respiratory Tract Infection* 3.2 times more than those who are given exclusive breastfeeding. There is also a strong and meaningful relationship between exclusive breastfeeding and the occurrence of *Acute Respiratory Tract Infection* in infants aged 6 months - 5 years (Wibianto, et al., 2009).

The research shows that from 53 respondents with no exclusive breastfeeding, there were 42 respondents (79.2%) who entered the abnormal category (> 6 times in the last 1 year) for the *Acute Respiratory Tract Infection* frequency. A total of 11 respondents (20.8%) were toddlers who did not get Exclusive Breastfeeding with a normal *Acute Respiratory Tract Infection* frequency (3-6 times in the last 1 year). This shows that children under five who are not given exclusive breastfeeding have a greater risk of experiencing *Acute Respiratory Tract Infection* more often. In accordance with the findings of Al Sabarti and Al Juma (2012), where toddlers in Baghdad, Iraq who did not get breast milk and drink formula milk had a risk 2.7 times higher for suffering from *Acute Respiratory Tract Infection* . And babies who breastfeed briefly or only drink ASI for 3 months have a 1.4 times higher risk of suffering from *Acute Respiratory Tract Infection* compared to babies who don't drink ASI at all.

The Effect of nutritional status on the frequency of *Acute Respiratory Tract Infection* in toddlers

Table 3. The analysis of nutritional status on the frequency of *Acute Respiratory Tract Infection* in toddlers

Nutritional status	*Acute Respiratory Tract Infection* Frequency				Total	
	Normal		Abnormal			
	f	%	F	%	f	%
Good	34	81	8	19	42	100
Less	5	8.5	54	91.5	59	100
Total	39	38.6	62	61.4	101	100

p-value = 0,000 (chi-square test)

In table 3,it shows that the *p*-value is 0,000. It means that Ha is accepted and it can be concluded that nutritional status affects the frequency of *Acute Respiratory Tract Infection* in toddlers around the industrial area of Piyungan District, Bantul. The results of this study are in accordance with the findings by Gebeetsadik, et al. (2015) which states that children with malnutrition from low socioeconomic categories are more at risk of suffering from *Acute Respiratory Tract Infection* .

The results of this study are supported by the findings of Sukmawati and Ayu (2010) in Maros Regency, which states that toddlers with poor nutrition will be more susceptible to *Acute Respiratory Tract Infection* than toddlers who have good nutrition. This is due to lack of immune system. In line with these findings, Widia (2017) also states that in Tanah Bumbu Regency, South Kalimantan Province with most children under five positive who suffer *Acute Respiratory Tract Infection* are toddlers with malnutrition.

The findings in the city of Kendari Infection state that toddlers with malnutrition have a relationship with toddlers who have a history of infection (Ratufelan, Zainuddin and Junaid, 2018). This is in line with what was stated by Nugroho, Adi and Angelina (2018), that nutrition problems are not closely related to the incidence of *Acute Respiratory Tract Infection* . In addition, there was also a significant relationship between infectious disease and nutritional status in children under five in the Gambesi District Health Center (Rasyid, Mayulu and Kandou, 2013).

The effect of smoking habits on the frequency of *Acute Respiratory Tract Infection* in toddlers

Table 4. The analysis of smoking habits on the frequency of *Acute Respiratory Tract Infection* in toddlers

Smoking Habit	*Acute Respiratory Tract Infection* Frequency				Total	
	Normal		Abnormal			
	F	%	F	%	f	%
Mild	28	66.7	14	33.3	42	100
Heavy	11	18.6	48	81.4	59	100
Total	39	38.6	62	61.4	101	100

p-vaue = 0,000 (*chi-square test*)

According to table 4, the p-value is 0,000. Therefor, it means Ha is accepted and it can be concluded that smoking habits influence the frequency of *Acute Respiratory Tract Infection* in toddlers around industrial area of Piyungan sub-district, Bantul.

The results of this study are in accordance with the findings in South Minahasa Regency, where there is a relationship between smoking status of family members and the habits of parents smoking with *Acute Respiratory Tract Infection* . If there are families who have smoking habits, then toddlers have a risk of 4.2 times greater for suffering from *Acute Respiratory Tract Infection*. Whereas, toddlers who have parents with heavy smoking habits, their children at risk 21.1 times greater for suffering from *Acute Respiratory Tract Infection* (Kewas, Ratag and Tumbol, 2014).

In addition, Nasution, et al. (2009) stated that the prevalence of *Acute Respiratory Tract Infection* has a significant relationship with cigarette smoke exposure. The families of respondents with heavy smokers were 59 respondents, 11 respondents (18.6%) including the frequency of normal toddlers with *Acute Respiratory Tract Infection.* In addition, 48 respondents (81.4%) had toddlers with an abnormal frequency of *Acute Respiratory Tract Infection* . Smoking habits carried out by parents of toddlers will disrupt the toddler's respiratory system. If toddlers breathe air which contaminated with cigarette smoke, it is possible to have respiratory tract irritation which can then be easily infected.

Suryani, et.al (2015) found that smoking at home was associated with *Acute Respiratory Tract Infection* in toddlers. Families who smoke at their house have a risk of 3.429 times greater than families who do not smoke (Syahputra, Sabrian and Utomo, 2014). Similar research conducted in Vietnam, fathers who smoke can increase their risk of respiratory infections in their children by 1.76 times greater. Fathers who smoke in front of children have a very bad impact on children. This study was conducted in a hospital with a sample of children with a diagnosis of *Acute Respiratory Tract Infection* (Miyahara, et al., 2017).

The effect of distance from home to the factory with frequency of *Acute Respiratory Tract Infection* in toddlers.

Table 5. The analysis of distance from houses to factories with frequency of *Acute Respiratory Tract Infection* in toddlers

Distance from home to factory	*Acute Respiratory Tract Infection* Frequency				Total	
	Normal		Abnormal			
	f	%	f	%	f	%
Qualified (>2000 meter)	27	56.2	21	43.8	48	100
Unqualified (≤2000 meter)	12	22.6	41	77.4	53	100
Total	39	38.6	62	61.4	101	100

p-value = 0,001 (*chi-square test*)

Based on table 5, the *p*-value is 0.001. So, Ha is accepted and it can be concluded that the distance of the house from the factory affects the frequency of *Acute Respiratory Tract Infection* in itoddlers around the industrial area of Piyungan District, Bantul.

The results of this study are in line with the findings by Esposito, et al. (2014) which states that children who live in a house with polluted air have a risk factor of 1.79 times higher for the occurrence of respiratory problems. Whereas children who live in areas with clean air have a risk that is 0.5 times greater for respiratory problems. In addition, the findings in Pringsewu District showed that smoke originating from burning firewood in the tile burning industry is very dangerous and has a high risk of causing *Acute Respiratory Tract Infection* disease (Nuryati, 2017).

Other findings in Hanoi, said that pollutants in the air are positively associated with the incidence of pneumonia in children

who are hospitalized. All pollutants except CO substances are positively related to the causes of pediatric patients with bronchitis and asthma. A stronger association is found in babies than in toddlers (Nhung, et al., 2017). In addition, the findings by Karakir, et al. (2009) stated that the incidence of death due to chronic respiratory disorders in children living in rural areas of Negev was affected by exposure (distance, wind direction and odor complaints) to emissions from industrial estates.

Bielska, et al. (2015) found that children under the age of 3 who lived with no house rules related to smoking behavior (smoke-free in any part of the house) can cause an increase in respiratory infections in children.

Multivariate analysis of *the variables*

Tabel 6. The analysis of Multivariate variables

Variables	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
			Lower	Upper
Exlusive Breastfeeding	0.005	0.081	0.014	0.468
Nutritional Status	0.000	0.017	0.003	0.097
Smoking habit	0.018	0.170	0.040	0.734
Distance from home to factory	0.038	0.212	0.049	0.919

The variable that has the highest OR value is the distance between the house and the factory, with an OR value of 0.212 with a 95% Confidence interval value of 0.049 - 0.919. Then followed by smoking habit variable with OR value of 0.170 and 95% *CI* of 0.040 - 0.734. Next is the exclusive breastfeeding, with an OR value of 0.081 and 95% *CI* of 0.014 - 0.468.

If the settlement is close to the factory location, it does not rule out the possibility of more pollutant fumes from motorized vehicles, so in the study found that toddlers with a distance from home to factory that did not meet the requirements were 0.212 times more at risk for *Acute Respiratory Tract Infection*.

In a research conducted by Ijana in 2017 concerning the analysis of risk factors for *Acute Respiratory Tract Infection* in infants in the ceramic factory area of Dinoyo Public Health Center, Malang Regency found that the greatest risk factor of all factors studied were unhealthy environmental factors with OR 11.35. In this study the environmental factors in question were the distance between toddlers' houses that were too close to the ceramic factory.

Research conducted by Sukana et al. 2013 in the coal plant environment, is in line with Ijana's research (2017) with the results of *Acute Respiratory Tract Infection* incidence in exposed locations (appropriation areas), higher than non-exposed areas (not appropriation areas).

As is the case in South Africa, children who live in areas full of road traffic dust in industrial estates tend to experience more dry coughs and asthma by 3.88 times greater than children who live in areas with air which is clean (Olutola, et al., 2018).

In addition, due to air pollution, the Indonesian people must experience respiratory problems. From an economic standpoint, there will be major problems related to spending funds to carry out hospital treatment. On average, the Indonesian people must bear the cost of this pollution as much as Rp 1.53 million or 6.7% of income per capita (Mursinto & Kusumawardani, 2016).

Families who have a smoking habit increase the risk of 0.170 times greater on the frequency of *Acute Respiratory Tract Infection* in toddlers. The results of this study are in line with the findings of Jang, Jun and Park (2016), where pollutants originating from traffic and tobacco smoke are still the highest causes of worsening of upper respiratory tract disease. This finding is in accordance with the existing research in Indonesia, that the air pollution in the room, smoking habit is the most influential variable on the incidence of *Acute Respiratory Tract Infection* with a risk of 11,517 times higher (Jayanti, Ashar and Aulia, 2016).

In addition, Riyanto and Kusumawati (2016) found that toddlers with exposure to cigarette smoke ≤20 minutes per day as much and suffering from *Acute Respiratory Tract Infection* <3 during the year were 30.77%. While toddlers with exposure to cigarette smoke ≥20 minutes a day and suffering from *Acute Respiratory Tract Infection* are ≥3 times a year, there are as many as 69.23%. In conclusion, cigarette smoke has an influence on the frequency of occurrence of *Acute Respiratory Tract Infection* in toddlers.

In addition, the risk factors that can cause children to suffer from *Acute Respiratory Tract Infection* are lack of breastfeeding, poor immunization status, the presence of a child care center, the number of families living together having a large number, poor parents' education methods, parents who smoke, live in urban areas and use of biomass fuels (FA. Ujunwa and CT Ezeuonu, 2014).

It can be concluded that the frequency of *Acute Respiratory Tract Infection* in toddlers is most influenced by the smoking habits of the toddler's family and the distance of the house from the nearby factory. The variavle of distance from house to their workplace is related to exposure of air which has been contaminated by hazardous chemicals from the factory production process.

CONCLUSION

Factors that influence the frequency of *Acute Respiratory Tract Infection* in children under five years old are exclusive breastfeeding, nutritional status, smoking habits, and distance of home to the factory. The most influential factor on the frequency of *Acute Respiratory Tract Infection in* toddlers in the Piyungan sub-district industrial area, Bantul, is the distance from the house to the factory.

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