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THE RELATIONSHIP BETWEEN ENVIRONMENTAL SANITATION AND THE INCIDENCE OF ISPA DISEASE IN THE NICKEL MINING AREA PT. VDNI MOROSI VILLAGE MOROSI SUB-DISTRICT KONAWE DISTRICT

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ABSTRACT

Upper respiratory tract infection (ARI), is one of the main causes of pain in toddlers in developing countries. Based on data from the Puskesmas Morosi acute respiratory in 2020, ARI as many as 420 cases and in 2021, as many as 704 cases. This study aims to determine the relationship between environmental sanitation and the incidence of ARI disease in the nickel mining area of Morosi Village, Morosi District, Konawe Regency, type of research with a crosss secional study design. The population in this study was 500 houses, with a sample of 84 houses. Sampling technique by means of Proportional Random Sampling.The data were analyzed with univariate and bivariate analysis using the Chi square test. The results of the study with the Chi square test showed that there was a significant relationship between the incidence of ARI Disease and the variables of ventilation area (p-value 0.012), humidity (p-value 0.043), occupancy density (p-value 0.059). while the insignificant variable is exposure (p-value 0.795). There is a moderate relationship between ventilation, humidity and occupancy density with the incidence of ARI. and there is no connection between lighting and ari events. Residents of the house should clean the house so that it does not become a breeding ground for germs and bacteria. It is suggested that the public can pay more attention to the signs or symptoms of ARI and immediately take advantage of the available health services.

INTRODUCTION

The 2017 consensus of the Acute Respiratory Infection (ARI) Expert Meeting highlighted ARI as an important public health problem, especially in developing countries such as Indonesia, where the disease can be fatal (1). ARI is an environmentally-based disease that spreads through the air, via droplets from coughing or sneezing, with an incubation period of 1 to 4 days. Air quality greatly affects the transmission of ARI, as harmful substances in the air can increase the risk of infection (1). Based on 2019 WHO data, the global incidence of ARI in children is estimated to be 0.29 cycles in developing countries and 0.05 cycles in developed countries, with 151 million of the 156 million cases occurring in developing countries. Every year, ± 4 million children under five dice from ARI, mostly in low-income countries. India records 43 million cases, followed by China (21 million), Pakistan (10 million), and Indonesia with 6 million cases. In Indonesia, ARI

is the number one cause of death for infants (32.1% in 2018) and children under five (18.2% in 2019, increasing to 38.8% (7). In 2021, ARI case coverage in Indonesia exceeded the target with 18,749 cases. West Papua and DKI Jakarta provinces recorded the highest prevalence, while Southeast Sulawesi was 19th with 21% (2).

In 2018, Southeast Sulawesi recorded an ARI prevalence of 35.2%, with Konawe as the highest district (85.04%) and North Konawe the lowest (0.87%). In 2019, cases decreased to 13.01%, but Konawe remained the highest (81.06%). In 2020, ARI prevalence in Southeast Sulawesi dropped to 4.24%, with Konawe Islands recording the highest cases (10.18%) (Southeast Sulawesi Provincial Health Office, 2020). Data from Morosi Health Center shows a fluctuating trend of ARI cases: 672 cases in 2019, decreased to 420 in 2020, and increased again to 704 (Southeast Sulawesi Health Office, 2021). Based on data from the Morosi Health Center in 2021, the breakdown of ARI cases is as follows: Morosi Village (18%) cases, Puruy Village (13%) cases, Tanggobu Village (12%) cases, Tondowatu Village (11%) cases, Besu Village (11%) cases, Paku Village (11%) cases, Paku Jaya Village (8%) cases, Wonuamorini Village (8%) cases, and Mendikonu Village (8%) cases. Based on data obtained from the Puskesmas, the most cases of ARI were in Morosi Village, 120 cases (18%) (4).

Morosi Village is an industrial area with high mining activity, including 6 large companies under PT Virtue Dragon Nickel Industrial Park (VDNIP) operating on an area of 2,200 hectares. Mining activities have the potential to pollute land, especially productive land such as rice fields, plantations and ponds, which has a negative impact on the environment in the long term. Air pollution due to dust particles from mining can cause ARI. In addition, the physical conditions of a crowded environment, poor ventilation, and lack of sunlight at home can increase the risk of spreading environment-based diseases (6).

METHODOLOGY

This study is an analytic survey with a cross-sectional design, which measures dependent and independent variables simultaneously. The aim was to determine the relationship between environmental sanitation in the mining area of PT VDNI, Morosi Village, Konawe. The study population consisted of 500 houses, with a total sample of 84 houses, which were taken using proportional random sampling technique. Data collection used direct observation, with tools such as Roll Meter, Lux Meter, and Hygrometer. The data collected were analyzed using univariate and bivariate analysis with the Chi-square test to see the relationship between variables. The study paid attention to ethical aspects such as informed consent, anonymity, and data confidentiality.

RESULTS AND DISCUSSION

Classification of study groups

Morosi Village is one of the villages in Morosi Sub-district with an area of 971 hectares. The boundaries of the village area, namely north bordering the Porara Village area, south bordering the Paku and Besu Village areas, east bordering the Puuruy Village area, west bordering the Tanggobu, Paku Jaya and Tondowatu Village areas.

a. Characteristics of respondents

The characteristics of respondents based on age are described in the following table:

Table 1. Distribution of Respondents Based on Age in Morosi Village, Morosi Kec. Morosi Kab. Konawe

No.	Age	n	%
1.	30-40	48	57%

2.	41-50	24	29%
3.	51-60	12	14%
Total		**84**	**100%**

b. Last Education

a. The characteristics of respondents based on education are described in the following table:

b. Table 2. Distribution of Respondents Based on Education in Morosi Village, Morosi Kec. Morosi Kab. Konawe

No.	Education	N	%
1.	Elementary school	34	40%
2.	Ssecondary school	28	33%
3.	Senior high school	13	16%
4.	Diploma I/II	9	11%
Total		**84**	**100%**

c. Occupation

c. The characteristics of respondents based on occupation are described in the following table:

d. Table 3.Distribution of Respondents Based on Occupation in Morosi Village, Morosi Kec. Morosi Kab. Konawe

No.	Occupation	n	%
1.	Housewife	29	36%
2.	Self-employed	45	54%
3.	Farmer	10	12%
Total		**84**	**100%**

d. Gender

e. The characteristics of respondents based on gender are described in the following table:

f. Table 4. Distribution of Respondents Based on Gender in Morosi Village, Morosi Kec. Morosi Kab. Konawe

No.	Gender	n	%
1.	Male	43	51%
2.	Female	41	49%
Total		**84**	**100%**

e. Incidence of ARI

g. The distribution of respondents based on the incidence of ARI can be seen in the following table:

h. Table 5. Distribution based on ARI incidence in Morosi village, Morosi sub-district, Konawe district

No.	ARI occurrence	n	%
1.	ARI	52	62%
2.	No. ARI	32	38%
Total		**84**	**100%**

f. Ventilation Area

i. Distribution based on the ventilation area of respondents' homes can be seen in the following table:

j. Table 6. Distribution based on the ventilation area of the respondent's house in Morosi village, Morosi sub-district, Konawe

No.	Ventilation area	n	%
1.	Does not meet the requirements	57	67,1%
2.	Meets the Requirements	27	32,9%
Total		**84**	**100%**

g. Lighting

k. Distribution based on lighting in respondents' homes can be seen in the following table:

l. Table 7. Distribution based on lighting in the respondent's house in Morosi village, Morosi sub-district, Konawe district

No.	Lighting	n	%
1.	Does not meet the requirements	63	75%
2.	Qualified	21	25%
Total		**84**	**100%**

h. Humidity

m. Distribution based on humidity in respondents' homes can be seen in the following table:

n. Table 8. Distribution Based on Humidity in Respondents' Homes in Morosi Village, Morosi Kec. Morosi Kab. Konawe

No.	Humidity	n	%
1.	Does not meet the requirements	57	67,9%
2.	Qualified	27	32,1%
Total		**84**	**100%**

i. Residential Density

o. Distribution based on residential density can be seen in the following table:

p. Table 9. Distribution based on residential density in respondents' homes in Morosi village, Morosi sub-district, Konawe district.

No.	Residential Density	n	%
1.	Does not meet the requirements	69	82,1%
2.	Qualified	15	17,9%
Total			**100%**

j. Relationship between ventilation area and ARI incidence in Morosi Village, Morosi Subdistrict, Konawe Regency

q. The distribution of the relationship between ventilation area and the incidence of ARI in Morosi Village, Morosi Subdistrict, Konawe Regency can be seen in the following table:

r. Distribution of the relationship between ventilation area and ARI incidence in Morosi Village, Morosi Subdistrict, Konawe Regency

Ventilation area	**RI incidence**				**Total**		**p-value**	***Phi***
	Suffering from ARI		**No ARI**					
	n	%	n	%	n	%		
Does not meet the requirements	41	48,8	16	19,0	57	32,1	0.012	0.300
Qualified	11	13,1	16	19,0	27	67,9		
Total	**52**	**61,9**	**32**	**38,1**	**84**	**100**		

The results of the univariate analysis showed that of the 84 respondents studied, 57 respondents (67.9%) had home ventilation that did not meet the requirements. This is because the vents or windows in the house are not opened regularly, so that the air exchange process in the house does not run properly. As a result, the air humidity in the house increases and creates ideal conditions for the growth of germs or viruses, including the cause of ARI (Acute Respiratory Tract Infection). From the results of the bivariate analysis, it is known that there are 27 respondents (32.1%) who have ventilation that meets the requirements. However, of this group, 11 people (13.1%) still experienced ARI. This is due to the lack of ventilation which causes low levels of oxygen (O2) in the house, while O2 levels that are toxic to the occupants increase. In addition, the lack of ventilation also causes the humidity in the house to increase, which worsens health conditions. On the other hand, 57 respondents (67.9%) who had unqualified ventilation, there were 16 people (19.0%) who did not suffer from ARI. This condition is caused by their habit of always opening windows and doors every morning, so that air exchange still occurs even though the existing ventilation does not meet ideal standards. Statistical test results using Chi square showed a significant relationship between ventilation conditions and the incidence of ARI, with a p value of 0.012, which is smaller than the α value (0.05). This indicates that home ventilation does affect the incidence of ARI. In addition, the relationship closeness test resulted in a Phi value of 0.300, indicating a moderate relationship between ventilation conditions and ARI incidence. Based on the results of the analysis and discussion, it can be concluded that unqualified ventilation has a

strong association with an increase in ARI incidence. Therefore, it is recommended for people who live in houses with inadequate ventilation to always open windows and doors every morning, so that the air in the house can circulate properly, reduce humidity, and prevent the spread of germs that cause ARI. This study is in line with the results of research conducted (8) in Tuapukan Village, which found that most houses in the village (80.2%) did not have adequate ventilation (<10% of the floor area). The results of the study also showed a relationship between home ventilation and the incidence of ARI in toddlers. Children with ARI are identified by symptoms of hoarse cough, runny nose, breathing sounds, red throat, body temperature above 39°C, red spots on the skin, and pain in the ears. Poor home ventilation is one of the main risk factors for the spread of ARI in children under five. The relationship between lighting and the occurrence of ARI in Morosi Village, Morosi District, Konawe Regency.

k. The distribution of the relationship between lighting and the incidence of ARI in Morosi Village, Morosi District, Konawe Regency can be seen in the following table:

s. Table 11: Distribution of the relationship between lighting and the incidence of ARI in Morosi Village, Morosi Subdistrict, Konawe Regency

Lighting	**RI incidence**				**Total**		**p-value**	***phi***
	Suffering from ARI		**Suffering from ARI**					
	n	%	n	%	n	%		
Does not meet the requirements	38	45,2	25	29,8	63	75,0	0,795	
Qualified	14	16,7	7	8,3	21	25,0		
Total	**52**	**61,9**	**32**	**38,1**	**84**	**100**		

The results of univariate analysis showed that out of 84 respondents, 63 (75%) had unqualified house lighting. This was due to the lack of ventilation, closed windows, and unopened curtains, which prevented sunlight from entering the house. Bivariate analysis showed that although 21 houses (25%) had eligible lighting, 14 (16.7%) of them still suffered from ARI. The reason for this was overcrowding, which caused a lack of oxygen in the rooms and facilitated disease transmission. In contrast, out of 63 houses with inadequate lighting, 25 (29.8%) did not suffer from ARI due to low occupancy density. Chi square statistical test showed that there was no significant association between lighting and ARI incidence ($P = 0.795$, greater than $\alpha = 0.05$), with a Phi value = 0.057 indicating a very weak association. The low level of community knowledge about the importance of lighting contributes to this problem. This study is in line with (5) research, which also found that lighting did not have a significant relationship with the incidence of ARI in toddlers. The community is advised to increase ventilation and open windows so that sunlight can enter.

l. Relationship between humidity and ARI incidence in Morosi Village, Morosi Subdistrict, Konawe District

t. The distribution of the relationship between humidity and the incidence of ARI in Morosi Village, Morosi Subdistrict, Konawe Regency can be seen in the following table:

u. Tabel 12. Distribusi Hubungan Antara Kelembaban Dengan Kejadian ISPA Di Desa Morosi Kecamatan Morosi Kabupaten Konawe

Humadity	**RI incidence**				**Total**		**p-value**	***phi***
	Suffering from ARI		**Suffering from ARI**					
	n	%	n	%	n	%	0,043	0,247

Does not meet the requirements	40	47,6	17	20,2	57	67,9		
Qualified	12	14,3	15	17,9	27	32,1		
Total	**52**	**61,9**	**32**	**38,1**	**84**	**100**		

The results of univariate analysis showed that out of 84 respondents, 57 (67.9%) had unqualified house humidity. This is due to the lack of ventilation and unsupportive building materials, such as the use of plaster or dirt floors, which increase humidity and trigger the development of ARI-causing germs. Bivariate analysis showed that out of 27 (32.1%) respondents with eligible humidity, 12 of them still suffered from ARI, due to the habit of not opening vents or windows. Conversely, of the 57 respondents with unqualified humidity, 17 (20.2%) did not suffer from ARI because they often opened windows to let in sunlight and reduce humidity. Chi square statistical test showed that there was a significant association between humidity and ARI incidence (P = 0.043, smaller than α = 0.05), with a Phi value = 0.247, indicating a moderate association. Humid homes can harbor bacteria and viruses that trigger respiratory diseases, including ARI. To prevent ARI, people are advised to maintain humidity by opening vents or windows every day and keeping the house clean. This study is in line with (3), which found a significant relationship between house humidity and the incidence of ARI in toddlers, with a P value = 0.002.Hubungan antara kepadatan hunian dengan kejadian ISPA Di Desa Morosi Kecamatan Morosi Kabupaten Konawe

m. The distribution of the relationship between humidity and the incidence of ARI in Morosi Village, Morosi District, Konawe Regency can be seen in the following table:

v. Tabel 13. Distribution of the Relationship Between Residential Density and ARI Incidence in Morosi Village, Morosi Subdistrict, Konawe Regency

Residential Density	**Suffering from ARI**				**Total**		**p-value**	***Phi***
	Suffering from ARI		**Suffering from ARI**					
	n	%	n	%	n	%		
Does not meet the requirements	39	46,4	30	35,7	69	82,1	0,059	0,238
Qualified	13	15,5	2	2,4	15	17,9		
Total	**52**	**61,9**	**32**	**38,1**	**84**	**100**		

The results of the univariate analysis showed that out of 84 respondents, 69 (82.1%) had unqualified residential density. This high density is caused by the number of occupants not proportional to the size of the house, often related to socio-economic factors. Bivariate analysis found that 15 (17.9%) of the respondents with eligible residential density, but 13 (15.5%) of them suffered from ARI. This was due to lack of ventilation which reduces sunlight, which should kill the germs that cause ARI. On the other hand, of the 69 respondents with unqualified occupancy density, only 2 (2.4%) did not have ARI, possibly due to their knowledge about healthy homes, such as the importance of ventilation and impermeable floor types to prevent moisture. Chi square statistical test showed a p value (0.059) greater than α (0.05), so there was no significant association between occupancy density and the incidence of ARI. The value of Phi = 0.238 indicates a moderate relationship. Dense living conditions can increase air pollution and disrupt air circulation, potentially increasing the number of disease-causing microorganisms, especially ARI. From the analysis, it is concluded that unqualified residential density does not have a significant relationship with the incidence of ARI. The community is expected to regulate the number of residents to prevent ARI, in line (9), which also showed no significant relationship between residential density and ISPA (p-value = 0,243). The community is expected to regulate

the number of residents to prevent ARI, in line with (9), which also showed no significant relationship between residential density and ARI (p-value = 0.243).

CONCLUSION

The conclusion of this research is that there is a weak relationship between ventilation area and the incidence of ARI, there is no relationship between lighting and the incidence of ARI, there is a moderate relationship between humidity and the incidence of ARI and there is no relationship between residential density and the incidence of ARI in the Nickel Mining Area of PT.VDNI Morosi Village, Konawe Regency.

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