Exposure of the physical state of the home environment to the incidence of ARI in the Sangaji Village coastal area

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Abstract

Nearly all health centers list ARI among the top 10 ailments each year. ARI may be a contributing factor in death in specific age groups. The physical environment of the home, in particular, can have an impact on the development of ARI disease. Determining the physical environment of the home's exposure to the occurrence of ARI is the goal of this study. This study uses a case-control study design and is observational in nature. implemented at Ternate City's Sangaji Village's coastal area. There were 76 respondents in the study's sample. To ascertain how exposed the physical environment of the home was to ARI episodes, information was gathered using measurements, interviews, and observations. To ascertain the relationship between the variables under study, apply the Chi-square test. The study's findings demonstrated that there was no correlation between the incidence of ARI and illumination (p-value = 1.000), floor (p-value = 0.381), or humidity (0.185). Conversely, there is a statistically significant correlation (p-value=0.037) between ventilation and the incidence of ARI. In summary, the majority of the respondents' home condition factors do not fit the criteria. The ventilation variable was linked to the incidence of ARI among the five physical condition factors of the residence under study. It is therefore advised that this study looks at aspects related to home conditions and how they affect other health issues, particularly conditions that are based on the physical state of the home. This study demonstrates a strong correlation between home ventilation and ARI incidence. Other factors including humidity, floor, and temperature, however, did not demonstrate a meaningful correlation. Thus, other aspects of living environments that may have an impact on health can be the subject of future research.

Keywords: Exposure, physical state, home environment, incidence of ARI

Introduction

An infection known as ARI makes breathing difficult(1). Depending on where the illness occurs, there are two types of acute respiratory infections: acute lower respiratory infections and acute upper respiratory infections(1). The upper tract consists of the airways that run from the nose to the voice cords in the larynx.

The lower tract includes the alveoli and the airways that continue from the trachea and bronchi to the bronchioles(2)(3). All age groups and sexes combined, respiratory illness is the leading cause of morbidity and mortality(4)in low- and middle-income countries(5). Lower respiratory infections caused 652, 572 deaths worldwide in children under the age of five in 2016. Particularly, pneumonia, an acute lower respiratory tract infection, is thought to be the world's top cause of childhood mortality, accounting for 16% of all fatalities in 2015. One of the most prevalent infections in children is acute respiratory tract infection, which almost always causes serious health issues and even leads to death in children under the age of five(5)

Of the estimated 10.4 million fatalities of children under five that occurred worldwide, ARIs were shown to be responsible for 73% of them(6). The under-five death rate in the WHO African Region is 74/1000 live births, which is more than eight times higher than the rate in the WHO European Region (9/1000 live births). In Ethiopia, the under-five mortality rate is 67/1000 live births, according to the 2016 Ethiopian Demographic and Health Surveys. Children under the age of five are affected by four to five

episodes of ARI annually. For children under the age of five, ARI accounts for 20–40% of hospital admissions and 30–50% of visits to healthcare facilities(7).

In Ternate, sufferers of acute respiratory infections (ARI) in the city of Ternate tend to increase from year to year based on data obtained through the health services sector at the Health Office. From the data collected last Wednesday, it was recorded that throughout 2017, ARI sufferers in the city of Ternate and Ternate Island numbered 25,787 people. This figure actually increased in 2018 to 93,753 people, dominated by toddlers, children and adults. However, the data obtained from the health services department is different from data in the field of disease control and eradication. If we look at the data collected through the field of disease control and eradication, it is claimed that people suffering from ISPA decreased in 2018 when compared to 2017. It is known that throughout 2017 people suffering from ISPA reached 25,159 people, according to data from the field of disease control and eradication. This total consists of 12,797 toddlers and 12,362 adults. Meanwhile in 2018, there was a decrease to 21,776. Where, there are 10,594 special sufferers aged under five and 11,182 adults, who are summarized from 11 health centers spread across the city of Ternate and Ternate Island.

A house is one of the basic human needs besides clothing and food, so the house must be healthy so that its residents can work productively. House construction and a home environment that does not meet health requirements are risk factors as a source of transmission of various diseases, especially environmental-based diseases. Based on the Household Health Survey (SKRT) carried out in 1995, Acute Respiratory Infection (ARI), which is the second most common cause of death, is closely related to unhealthy housing sanitation conditions (Munaya, 2013). Room humidity is categorized as meeting the requirements if it ranges from 40-60% and is categorized as not meeting the requirements if <40 or >60%

Natural lighting in the house is a minimum of 60 lux. Apart from that, the PM2.5 level permitted in the house is a maximum of 35 µg/m3. PM2.5 levels that exceed the required limits can cause respiratory system disorders such as pneumonia, allergies, eye irritation and chronic bronchitis.

The density of residential houses that technically meet health requirements, but if their use is not in accordance with their intended purpose, disturbances will occur (for example, a house built to be occupied by four people is often occupied by more people than it should be), this can cause disease transmission, especially through The air will speed up the higher the density (Achmadi, 2010 and Sinaga, 2012). This is the basis for conducting this research.

Method

This type of research is an analytical observational study with a case control study design to analyze the physical conditions and home environment on the incidence of acute respiratory infections (ARI) in the coastal area of Sangaji Village. The sample in this research was the community in Sangaji Village. The number of samples in this study was 76 respondents. Data was collected through observation, interviews and measuring parameters of the physical condition of the house. Bivariate analysis was carried out to determine the relationship between the independent variable and the dependent variable. The test that will be used is the Chi-square test. Multivariate analysis was carried out to determine the independent variable that had the greatest influence on the dependent variable. The test that will be used is the logistic regression test.

Results

Table 1. Mean Age of Respondents

Category	Average	Standard deviation
Age	39.86	13.79

Table 1 shows that the mean age of the 76 respondents (consisting of 31 cases and 45 controls) was 39.86 ± 13.79.

Table 2. Distribution Based on Respondent Characteristics

No	Category	n	%
1	Gender		
	Man	25	32.9
	Woman	51	67.1
2	Education		
	No school	0	0.0
	elementary school	5	6.6
	JUNIOR HIGH SCHOOL	5	6.6
	SENIOR HIGH SCHOOL	46	60.5
	College	20	26.3
3	Work		
	IRT	29	38.2
	Civil servants/TNI/Polri	9	11.8
	Self-employed	16	21.1
	Farmer	3	3.9
	Fisherman	5	6.6
	Doesn't work	14	18.4

Table 2 shows that the majority of respondents (67.1%) are female. 60.5% with high school education. There were 18.4% of respondents who did not work.

Physical Condition of the House
Table 3. Distribution Based on Physical Condition of Respondents' Houses

No	Category	n	%
1	**Lighting**		
	Not eligible	73	96.1
	Qualify	3	3.9
2	**Humidity**		
	Not eligible	66	86.8
	Qualify	10	13.2
3	**Ventilation**		
	Not eligible	69	90.8
	Qualify	7	9.2
4	**Floor**		
	Not eligible	14	18.4
	Qualify	62	81.6

Table 3 shows that 96.1% of the lighting does not meet the requirements, 86.8% of the humidity does not meet the requirements, 90.8% of the ventilation does not meet the requirements and only 18.4% of the floor conditions in the respondents' homes do not meet the requirements.

Knowledge, Attitudes and Preventive Actions for ISPA
This research not only identified the characteristics of respondents and observed the physical conditions of the home environment, but also measured the knowledge and attitudes of respondents regarding ISPA and the ISPA prevention measures practiced by respondents. The results of measurements regarding knowledge, attitudes and preventive measures for ISPA taken by respondents can be seen in table 4.

Table 4. Distribution Based on Respondents' Knowledge, Attitudes, and ISPA Prevention Actions

No	Category	n	%
1	**ARI status**		
	Case	31	40.8
	Control	45	59.2
2	**Knowledge**		
	Not good	24	31.6
	Good	52	68.4
3	**Attitude**		
	Not good	34	44.7
	Good	42	55.3
4	**Action**		
	Not good	33	43.4
	Good	43	56.6

Table 4 shows that of the 76 respondents, 31 were cases (suffering from ISPA) and 45 were controls (not suffering from ISPA). From this table we can see that 68.4 respondents had good knowledge, 55.3% of respondents had good attitudes and 56.6% of respondents were in the good preventative action category.

Bivariate Analysis
a. Respondent Characteristics

Table 5. Relationship between gender and the incidence of ARI

Variable	ARI status				Total		Statistic test	
	Case		Control					
	n	%	n	%	n	%	p value	OR
Gender							0.180	0.438
Man	7	28.0	18	72.0	25	100.0		(0.16 – 0.12)
Woman	24	47.1	27	52.9	51	100.0		

Table 5 shows that there is a difference in the number and percentage of male and female ISPA sufferers, but the difference is not significant and the results of statistical tests (p value = 0.180) also show that there is no statistically significant relationship between gender and the incidence. ISPA.

b. Physical Condition of the House

Table 6. Relationship between the physical condition of the house and the incidence of ARI

Variable	ARI status				Total		Statistic test	
	Case		Control					
	n	%	n	%	n	%	p value	OR
Lighting							1,000	1,395
Not eligible	30	41.1	43	58.9	73	100.0		(0.12 – 16.09)
Qualify	1	33.3	2	66.7	3	100.0		
Humidity							0.185	3,135
Not eligible	29	43.9	37	56.1	66	100.0		(0.62 – 15.91)
Qualify	2	20.0	8	80.0	10	100.0		

	N	%	n	%	n	%	p value	OR
Ventilation Not eligible Qualify	31	44.9	38	40.9	69	100.0	0.037	1,551 (1.45 – 1.68)
	0	0.00	7	100.0	7	100.0		
Floor Not eligible Qualify	8	51.7	6	42.9	14	100.0	0.281	2,261 (0.70 – 7.34)
	23	31.7	39	62.9	62	100.0		

Table 6 shows that the percentage of lighting that does not meet the requirements and that meets the requirements is not much different and the results of statistical tests also show that there is no relationship between lighting and the incidence of ARI. Humidity also does not have a statistically significant relationship with the incidence of ARI. The condition of the floor also has a statistically insignificant relationship with the incidence of ARI. However, ventilation variables are different, these variables have a statistically significant relationship with the incidence of ARI.

c. Knowledge, Attitudes and Preventive Actions for ISPA

Table 7. Relationship between Knowledge, Attitudes and Preventive Actions with ARI events

Variable	ARI status				Total		Statistic test	
	Case		Control					
	N	%	n	%	n	%	p value	OR
Knowledge Not good Good	12 19	50.0 36.5	12 33	50.0 63.5	24 54	100.0 100.0	0.390	1.74 (0.65 – 4.62)
Attitude Negative Positive	13 18	38.2 42.9	21 24	61.8 57.1	34 42	100.0 100.0	0.863	0.83 (0.33 – 2.08)
Action Not good Good	10 21	30.3 40.8	23 22	69.7 51.2	33 43	100.0 100.0	0.163	0.46 (0.18 – 1.18)

Table 7 shows that the percentage of knowledge categorized as poor and good is not much different and the results of statistical tests also show that there is no relationship between knowledge and the incidence of ARI. Attitude also does not have a statistically significant relationship with the incidence of ARI. Likewise, preventive measures do not have a statistically significant relationship with the incidence of ARI.

Multivariate Analysis
Table 8. Multivariate Analysis of Factors Associated with ISPA incident

No	Variable	B grade	OR	p-value	CI 95%
1	Humidity	1,528	4,609	0.079	0.84 – 25.32
2	Gender	-1,001	0.368	0.071	0.12 – 1.89
3	Preventive measure	-0.995	0.385	0.063	0.14 – 1.06
	Constanta	-1,020	0.361		

Discussion
1. Gender

The results of bivariate analysis showed that there was no statistically significant relationship between gender and the incidence of ARI. This research is not in line with research which shows that there is a statistically significant relationship between gender and ARI. Male ARI sufferers are at 1.7 times the risk compared to women[8]. However, there is also an opinion that in general there is no difference in the occurrence of ARI caused by viruses or bacteria in both men and women. This is supported by research which shows that there is no significant relationship between gender and ARI[9]. Likewise, research shows that as many as 54.2% of male toddlers experience ARI, but statistically there is no significant relationship between gender and the incidence of ARI.[10]. A study shows that the number of ISPA sufferers in men and women is almost the same[11]. These results are also supported by research conducted in Sleman which found that there was no significant difference between male ISPA sufferers and female ISPA sufferers.[12].

2. Physical Condition of the House
a. Lighting
Solar lighting is very important, because it can kill pathogenic bacteria in the house, for example bacteria that cause ISPA and TB. Therefore, a healthy house must have sufficient light access. The light entrance (window) is at least 15% to 20% of the floor area in the house.

The results of bivariate analysis showed that there was no statistically significant relationship between lighting and the incidence of ARI. The percentage of respondents with lighting conditions in houses that do not meet the requirements is almost the same as lighting in houses that meet the requirements. This result is different from research which shows that there is a statistically significant relationship between lighting and the incidence of ARI[13]. Natural light is obtained from sunlight entering through windows or open spaces. Light should not be blocked by buildings, trees or high fences. Lighting that meets the requirements is 60 – 120 lux[14]. Lack of lighting can extend the life span of airborne bacteria[15].

b. Humidity
Humidity is the proportion of the amount of water or water vapor in the air. The nasal mucous membrane becomes dry due to high humidity, dry mucous membranes are less effective in blocking microorganisms so they are more susceptible to respiratory tract infections. Home humidity is influenced by many factors such aslighting both natural and artificial, ventilation, house temperature and house walls[15].

A damp house is a suitable condition for pathogenic microbes to grow and reproduce, including bacteria that cause ISPA[16]. The incidence of ARI tends to be low in people who live in environments with humidity levels of 40 – 70%[17]. This theory is supported by research which shows that there is a statistically significant relationship between humidity and the incidence of ARI[13]. However, the results of bivariate analysis in this study showed that there was no statistically significant relationship between humidity and the incidence of ARI. Humidity is closely related to floor conditions and lighting, and in this study the relationship between floor conditions and the incidence of ISPA was not statistically significant. This finding is in line with research which states that there is no relationship between house humidity and the incidence of ARI[15].

c. Ventilation
Ventilation in the house functions as air circulation or air exchange in the house because fresh air in the room is really needed by humans. The results of the bivariate analysis in the study showed that there was a statistically significant relationship between ventilation and the incidence of ARI. These results are in line with research which shows that there is a statistically significant relationship between ventilation and the incidence of ARI. The minimum ventilation requirement is 10% of the floor area. Improper ventilation can cause the proliferation of microorganisms that can cause health problems[18].A house that has ventilation that is not functioning properly will result in 3 consequences, namely a lack of oxygen, an increase in CO_2 concentration and the presence of toxic organic materials that settle in the house. Inadequate ventilation can cause a lack of clean air supply from outside the house, resulting in inadequate air exchange. Air quality depends on ventilation. Indoor air contamination may increase due to ventilation. On the other hand, adequate ventilation can reduce pathogenic bacteria that can be transmitted through the air[13].

d. Floor

House construction and a house environment that does not meet the requirements can be a risk of disease transmission, especially environmental-based diseases. Good floors can reduce water absorption and the occurrence of dampness in the house. A damp house can become a breeding ground for disease-causing germs(14). The floor is an excellent medium for the growth of bacteria. A good floor is a floor that is dry and not damp and must be watertight so it is easy to clean.

The results of the bivariate analysis regarding the relationship between floors and the incidence of ISPA in this study showed that there was no statistically significant relationship between the condition of the floor and the incidence of ISPA. These results are in line with a study which showed that there was no significant relationship between floor conditions and the incidence of ARI(12). The same thing was found in Padang, that statistically, there was no relationship between floors and the incidence of ISPA(13). A study in Bangladesh also found that there was no relationship between floor type and the incidence of ISPA(19). Floors are closely related to humidity and lighting, but in this study it was found that there was no relationship between humidity and lighting with the incidence of ARI.

3. Knowledge, Attitudes and Precautions

a. Knowledge

Knowledge about ISPA plays an important role in forming good habits for quality health. Knowledge or cognitive is a very important domain in the formation of a person's actions (over behavior). Based on knowledge, awareness and good attitudes that will last a long time and be permanent, good knowledge about ISPA is expected to have a positive impact on health so that the risk of ISPA can be eliminated as early as possible(20). There is a significant relationship between parental knowledge and the incidence of ARI in toddlers. Most respondents with good knowledge about ISPA did not experience ISPA incidents(21).

The results of bivariate analysis showed that there was no statistically significant relationship between knowledge and the incidence of ARI. The percentage with poor and good knowledge is almost the same in ARI sufferers (cases). These results are in line with Fahdiyani's research that there is no significant relationship between knowledge and the incidence of ISPA(22). Knowledge is not always related to a person's behavior in carrying out an action. Knowledge is influenced by a person's experience, environment, both physical and non-physical and socio-cultural, which then becomes known, perceived, believed, giving rise to motivation, intention to act and ultimately becomes action. and this action can have health impacts on that person(23).

b. Attitude

Attitude is a general feeling that expresses a person's approval or disapproval of an object that encourages his or her response. An attitude will be followed by an action that refers to the current situation, other people's experiences, a person's experience of many or few of the values that apply to social life.(23). There is a relationship between the mother's attitude and the incidence of ISPA in toddlers in the working area of the Selamat Dalam Health Center(20).

The results of the bivariate analysis in this study showed that there was no statistically significant relationship between attitudes and the incidence of ARI. A person's attitude is closely related to the knowledge they possess. In this study, no relationship was found between knowledge and the occurrence of ISPA. These results are in line with research findings that there is no significant relationship between attitudes towards the incidence of ISPA in toddlers in the working area of the Sidomulyo Community Health Center.(24).

c. Preventive measure

Community behavior can influence the occurrence of ISPA. Community behavior related to ISPA incidents includes not practicing clean and healthy living habits (PHBS) properly, smoking behavior, rarely using masks and other protective equipment.(14). Apart from risky behavior, there are also behaviors that can be done to prevent transmission of ARI, such as covering your mouth and nose, sleeping separately, etc. Actions taken to prevent ISPA include covering the mouth and nose and sleeping in separate rooms(25). Other actions that can be taken to prevent ISPA are complete immunization as an effort to increase immunity, increase the capacity and quality of health services, protect children from ISPA sufferers.(26). A study shows that there is a relationship between behavior and the incidence of ISPA in toddlers in Tangerang(27). However, the results of the bivariate analysis of this study show that there is no statistically

significant relationship between preventive measures and the incidence of ARI. The percentage of ISPA sufferers who have good knowledge is not much different from those who have poor knowledge. This is in line with Barros' findings that the percentage of ISPA sufferers with knowledge categorized as good, sufficient and poor is not much different, namely 31% less, 38.6% enough and 29.6% good.(14). A person's actions can be influenced by knowledge and attitudes, but in this study, neither attitudes nor knowledge were related to the incidence of ISPA.

Conclusion

Most of the respondents' house condition variables did not meet the requirements. Of the five physical condition variables of the house studied, the ventilation variable was related to the incidence of ARI. Therefore, in this study it is recommended to examine house condition factors and their impact on other health disorders, especially diseases based on the physical condition of the house. This study highlights the importance of addressing house condition factors in relation to health disorders. By examining other diseases based on the physical condition of the house, a more comprehensive understanding of their impact can be achieved. Further research in this area could provide valuable insights for improving overall public health.

Reference

1. Broor S, Parveen S, Bharaj P, Prasad VS, Srinivasulu KN, Sumanth KM, et al. A Prospective Three-Year Cohort Study of the Epidemiology and Virology of Acute Respiratory Infections of Children in Rural India. PLOS One. 2007;2(6):1–6.
2. Merera AM. Determinants of acute respiratory infection among under-five children in rural Ethiopia. BMC Infect Dis [Internet]. 2021;21(1):1–12. Available from: https://doi.org/10.1186/s12879-021-06864-4
3. Khalek E, Abdel-Salam D. Acute respiratory tract infections in children under 5 years of age in Upper Egypt. Int J Community Med Public Heal. 2016;3(5):1161–6.
4. Ramanathan K, Antognini D, Combes A, Paden M, Zakhary B, Ogino M, et al. Global burden of childhood pneumonia and diarrhea. Lancet [Internet]. 2020;(January):19–21. Available from: http://dx.doi.org/10.1016/ S0140-6736(13)60222-6
5. Troeger C, Forouzanfar M, Rao PC, Khalil I, Brown A, Swartz S, et al. Estimates of the global, regional, and national morbidity, mortality, and aetiologies of lower respiratory tract infections in 195 countries: a systematic analysis for the Global Burden of Disease Study 2015. Lancet Infect Dis. 2017;17(11):1133–61.
6. Abioye AI, Bromage S, Fawzi W. Effect of micronutrient supplements on influenza and other respiratory tract infections among adults: A systematic review and meta-analysis. BMJ Glob Heal. 2021;6(1):1–15.
7. Ali Mir A, AI, Fazili A, Iqbal J, Jabeen R, Salathia A. Prevalence and Risk Factor Analysis of Acute Respiratory tract Infections in Rural areas of Kashmir valley under 5 Years of Age. Int J Med Public Heal. 2012;2(3):47–52.
8. Utami PMN, Purniti PS, Arimbawa IM. Relationship between gender, nutritional status and birth weight with the incidence of ARI in toddlers at the Banjarangkan II Community Health Center in 2016. Digest of Medical Science. 2018;9(3):135–9.
9. Mugopal RI, Dewi AMK, Hardaningsih G, Nugroho TW. Diponegoro Medical Journal the Difference of Risk Factors of Acute Upper Respiratory Tract Infection in the Urban and Rural Public Health Center Semarang. Diponegoro Med J (Diponegoro Medical Journal). 2021;10(3):183–8.
10. Fibrilia F. Relationship between child's age, gender and birth weight with the incidence of ARI. J Health Metro Sai Wawai. 2015;8(2):8–13.
11. Tyas NMW, Indawati R. An Overview of Acute Respiratory Infection Cases Before and After Exposure To Volcanic Ash. J Berk Epidemiol. 2019;7(3):233–40.
12. Fathmawati F, Rauf S, Indraswari BW. Factors Related to The Incidence of Acute Respiratory Infections in Toddlers in Sleman, Yogyakarta, Indonesia: Evidence From TheSleman Health and Demographic Surveillance System. PLOS One. 2021;(September 9):1–13.
13. Hidayanti R, Yetti H, Putra AE. Risk Factors for Acute Respiratory Infection in Children Under

Five in Padang, Indonesia. J Matern Child Heal. 2019;4(2):62–9.

14. Barros SD, Indasah, Yudhana A. Physical Conditions of House and Community Behavior Analysis of Acute Respiratory Tract Infection in Working Region Central Public Health Soe City South East Central District. J Glob Res Public Heal. 2019;4(2):175–82.

15. Suryani I, Edison, Nazar J. The Relationship between the Physical Environment and Population Actions and the Incidence of ISPA in Toddlers in the Lubuk Community Health Center Working Area. J Andalas Health. 2015;4(1):157–67.

16. Laily Trisnaningdyah D, Supriyadi, Al-Irsyad M. Relationship between Physical Environment and Smoking Behavior with Accurate Respiratory Infection in Class-I Correctional Institutions in Lowokwaru, Malang. In: ISMoPHS 2020. 2021. p. 204–15.

17. Budiyono, Rismawati, Jati S., Ginandjar P. Potential Impact of Climate Variability on Respiratory Disease in Infants and Children in Semarang. In: International Conference on Tropical and Coastal Region Eco Development. 2017.

18. Zulaikhah ST, Soegeng P, Sumarawati T. Risk factors of acute respiratory infections in practice area for community of medical students in Semarang. Public Health. 2017;11(4):192–7.

19. Sultana M, Sarker AR, Sheikh N, Akram R, Ali N, Mahumud RA, et al. Prevalence, determinants and health care-seeking behavior of childhood acute respiratory tract infections in Bangladesh. PLOS One. 2019;14(1):1–18.

20. Sarif A, Anam HK, Rizal A. The relationship between maternal knowledge and attitudes and the incidence of acute respiratory infections in toddlers in the working area of the Spirit Community Health Center in Barito Kuala Regency, South Kalimantan, 2020. Banjarmasin; 2020.

21. Wulaningsih I, Hastuti W, Pradana AI. The relationship between parental knowledge about ISPA and the incidence of ISPA in toddlers in Dawungsari Village, Pegandon District, Kendal Regency. J Smart Nursing. 2018;5(1):90.

22. Fahdiyani R, Raksanagara AS, Sukandar H. Influence of Household Environment and Maternal Behaviors to Upper Respiratory Infection among Toddlers. Public Health J Health Masy Nas. 2016;10(4):Pg 120-126.

23. Taarelluan KT, Ottay RI, Pangemanan JM. Relationship between Knowledge and Community Attitudes towards Preventive Actions for Acute Respiratory Infections (ARI) in Tataaran 1 Village, South Tondano District, Minahasa Regency. J Community Cover And Trop. 2016;4(1).

24. Fitriani A, Hansen. The Relationship between Attitudes and Behavior and the Incidence of ISPA in Toddlers in the Sidomulyo Community Health Center Working Area. Borneo Student Res. 2019;1(1):69–72.

25. Thamrin EP, Utami RK, Santoso F, Thamrin AA, Ain SS, Pakasi TA. Problems Related to Acute Respiratory Infection Among Under-5 Children in Sorong, West Papua: A Community Diagnosis Approach. J Community Empower Heal. 2019;2(2):198–207.

26. Handayuni L, Ridha Alfian A, Amran A, Razak A. Knowledge of mothers about the household environment against acute respiratory infections in Padang Pasir: A literature study. IOP Conf Ser Earth Environ Sci. 2019;314(1).

27. Sari EN, Sri E, Tinambunan L, Prameswari G, Kartika L, Stageary PA. The Relationship between Parents' Knowledge and Behaviors with The Acute Respiratory Infection Incidence of Children Under Five in Tangerang. Str J Health Science. 2021;10(1):1403–11.