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The Relationship between Physical Environmental Sanitation and the Incidence of Acute Respiratory Infections (ARI) in Toddlers in the Lepo-Lepo Health Center Working Area, Kendari City

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ABSTRACT

Introduction: Acute Respiratory Infections are very big impact if it is not treated, especially if it attacks children. Besides being able to interfere with the child's growth and development, it can also cause death. The prevalence of ARI in 2020 was 28.3%, in 2021 it decreased to 25.3%, and in 2022 it increased again to 29.65% and in 2023 it increased to 30.8%. The aim of the research is to determine the relationship between sanitation of the physical environment in the home with the incidence of Acute Respiratory Infections (ARI) in children under five in the Lepo-Lepo Health Center, Kendari City

Method: This type of research is quantitative research with a Cross Sectional Study design. The population is all 2,998 children under five at the Lepo-Lepo Health Center in 2023 and the sample is 71 children under five taken using the accidental sampling technique. Sample identity data were obtained using a questionnaire. Data on ventilation area, temperature, humidity, lighting and dust particles are carried out by observation.

Result: The Chi-Square test results obtained a p value of 0.000, φ = 0.636 (ventilation area), a p value of 0.000, φ =0.611 (temperature), a p value of 0.000 and φ = 0.58 (humidity). p value 0.000, φ =0.579 (lighting), p value 0.000 and φ =0.731 (dust particles).

Conclusion: There is a relationship between the area of air ventilation, temperature, humidity, lighting, dust particles, with the incidence of ARI in toddlers.

Introduction

Acute Respiratory Infection (ARI) is a disease of the upper respiratory tract (rhinitis, pharyngitis, and otitis) and lower respiratory tract (laryngitis, bronchitis, bronchiolitis, and pneumonia) which can last for fourteen days.[1]

The World Health Organization (WHO) in 2022 stated that ARI is an infectious disease that most often causes death (motility) and illness

(morbidity) throughout the world. Approximately four million people die every year from ARI, with 98% of these deaths caused by lower ARI, mortality rates for infants, toddlers and the elderly are very high in low- and middle-income countries. The ARI mortality rate in children under five reaches 40 per 1000 live births, or around 15 to 20% per year.[2]

The incidence of ARI in Indonesia is always the first cause of infant death and the second cause of death in children and adolescents. The number of toddlers suffering from ARI in Indonesia reported in 2022 is 27.3% of the estimated number of ARI cases in toddlers. Prevalence according to a doctor's diagnosis, the prevalence of ARI sufferers is 6% and the same data shows that ARI sufferers who are diagnosed by a doctor and show symptoms are 10% of ARI sufferers who undergo routine examinations. Apart from that, on the list of ten diseases most commonly suffered in hospitals, it was found that between 20-30% of child deaths were caused by ARI.[3]

Based on the 2019 Southeast Sulawesi Provincial Health Profile, it can be seen that Acute Respiratory Tract Infection (ARI) is the most frequently occurring disease in the list of the 10 (ten) most common diseases in Community Health Centers and Hospitals (Southeast Sulawesi Provincial Health Office, 2019). The prevalence of ARI in Southeast Sulawesi Province in 2020 was 27.26% and in 2021 it increased to 28.39% and in 2022 the prevalence of ARI was 28.99%.[4]

Southeast Sulawesi Province consists of 17 regencies/cities and ARI cases in Kendari City have also increased, this is based on data obtained from the Kendari City Health Service in 2020 there were 28.1% of ARI cases, in 2021 it increased to 28.26% of cases, then in 2022 it will become 29.51% of cases and in 2023 it will increase to 30.06%.[5]

According to data obtained from the Kendari City Health Office in 2023, it shows that the Lepo-Lepo Community Health Center is one of the Community Health Centers in Kendari City with the highest number of ARI sufferers compared to other Community Health Centers such as the Kemaraya Community Health Center (21.5% and Wua-Wua (19.7%).[5] The prevalence of ARI in 2020 was 28.3%, in 2021 it decreased to 25.3%, and in 2022 it increased again to 29.65% and in 2023 it increased to 30.8%. Lepo-Lepo Village is one of the areas in Kendari City. The physical condition of houses in the Lepo-Lepo area generally uses permanent and semi-permanent houses which is reflected in the house buildings in the Lepo-Lepo Village area with a linear pattern of settlement andits orientation faces the road.[6]

The epidemiologicall triangle describes the basic concept of epidemiology which provides a reflection of the relationship between three main aspects that function in the formation of disease or other health problems.[7] This is a picture of interactions consisting of three aspects, namely host, agent (trigger aspects which include germs, fungi, viruses) and environment (areas which include residential density, ventilation, lighting, humidity, temperature). Risk factors for the occurrence of ARI consist of three factors, namely house sanitation factors, environmental sanitation factors, and individual child factors.[8]House sanitation factors include house ventilation, humidity, residential density, lighting, family members smoking in the house. Sanitation of the home environment is closely related to the source of disease transmission.

The requirements for a healthy house and environment must be met from various aspects in order to protect residents and communities living in an area from danger or health problems.[8]

Based on the results of interviews with 10 toddlers suffering from ARI in the work area of the Lepo-Lepo Health Center for the period December 2023, there were 8 people (80%) who had poor ventilation and 2 people (20%) who had sufficient ventilation, then 60% had poor temperature and 40% had good temperature. humidity 60% less and 40% good, lighting 70% less and 30% good, then residential density is 70% high and 30% low. Then there are 70% of family members smoking at home. Apart from that, the phenomenon that occurs in general is that toddlers are always kissed as a form of affection and feelings of excitement and joy by their families so that this can trigger the transmission of ARI disease in toddlers.

Based on this, it is necessary to study aim to analysis the relationship between physical environmental sanitation in the home and behavior with the incidence of ARI, especially in the work area of the Lepo-Lepo Health Center, Kendari City.

Method

This type of research is quantitative research with a Cross-Sectional Study design. This research was conducted from 19 February to 19 March 2024 in the Lepo-Lepo Community Health Center working area. The population is all 2,998 children under five at the Lepo-Lepo Community Health Center in 2023 and the sample is 71 children under five at the Lepo-Lepo Community Health Center in 2023, taken using the accidental sampling technique. Sample identity data includes respondent identity data including age, gender, occupation obtained by direct interviews using a questionnaire. Data on ventilation area, temperature, humidity, lighting and dust particles were obtained by direct observation in the respondent's house dan data processing uses a computer and is analyzed using the Chi-square test and the test for the closeness of the relationship between variables and the binary logistic regression test.

Result

Table 1 shows that of the 71 samples, the majority had ventilation areas that met the requirements and did not experience ARI, 31 people (72.1%), then a small portion of the sample whose house ventilation areas did not meet the requirements did not experience ARI, 12 people (12). 27.9%), then there were also samples whose house ventilation area did not meet the requirements, 26 people (92.9%) experienced ARI but 2 people (7.1%) did not experience ARI. The results of statistical analysis using the Chi-Square test obtained a p value of $0.000 < \alpha$ (0.05), and φ of 0.636, so it was concluded that there was a strong relationship between the area of air ventilation and the incidence of ARI in toddlers in the Lepo-Lepo City Health Center working area, Kendari city.

Table 2 shows that of the 71 samples, the majority had a house temperature that did not meet the requirements and experienced ARI, 29 people (85.3%), then a small portion of the sample whose air temperature in their house did not meet the requirements actually did not experience ARI, 5 people (14.7%), then there were also samples whose house temperature met the requirements, 28 people (75.7%) did not experience ARI but 9 people (24.3%) experienced ARI. The results of statistical analysis using the Chi-Square test obtained a p value of $0.000 < \alpha$ (0.05), and φ of 0.611, so it was concluded that there was a strong relationship between temperature and the incidence of ARI in toddlers in the Lepo-Lepo Health Center working area, Kendari City

Table 3 shows that of the 71 samples, the majority had room humidity that did not meet the requirements and experienced ARI, 29 people (82.9%), then a small number of samples whose house humidity did not meet the requirements actually did not experience ARI, 6 people (17.1%), then there were also samples whose air humidity in the house met the requirements, 27 people (75%) did not experience ARI, but 9 people (25%) experienced ARI. The results of statistical analysis using the Chi-Square test obtained a p value of $0.000 < \alpha$ (0.05), and φ of 0.58, so it was concluded that there was a moderate relationship between air humidity and the incidence of ARI in toddlers in the Lepo-Lepo Health Center working area. Kendari City

Table 4 shows that of the 71 samples, the majority had lighting that met the requirements and did not experience ARI, 30 people (69.8%), then a small portion of the sample whose house lighting met the requirements actually experienced ARI, 13 people (30.2%).), then there were also samples whose lighting in the house did not meet the requirements, 25 people (89.3%) experienced ARI, but 3 people (10.7%) did not experience ARI. The results of statistical analysis using the Chi-Square test obtained a p value of $0.000 < \alpha$ (0.05), and a φ of 0.579, so it was concluded that there was a moderate relationship between lighting and the incidence of ARI in toddlers in the work area of the Lepo-Lepo Health Center, Kendari City.

Table 5 shows that of the 71 samples, there were 39 people whose dust particles met the requirements and 32 people did not meet the requirements. Then, of the 39 people whose dust particles in their homes met the requirements, the majority did not experience ARI, namely 31 people (79.5%), but 8 people (20.5%) were found who experienced ARI even though they met the requirements. Furthermore, of the 32 samples whose dust particles did not meet the requirements, the majority experienced ARI, 30 people (17.1%), but there were 2 people (14.9%) who did not experience ARI, even though they did

not meet the requirements. The results of statistical analysis using the Chi-Square test obtained a p value of 0.000 < α (0.05), and φ of 0.731, so it was concluded that there was a strong relationship between dust particles and the incidence of ARI in toddlers in the Lepo-Lepo Health Center working area, Kendari City.

Table 1.
Relationship Between the Area of Air Ventilation and the Incidence of ARI in Toddlers in the Lepo-Lepo Health Center Working Area, Kendari City

Ventilation Area	The Incidence of Acute Respiratory Infections				Total		Statistical Test
	Acute respiratory Infections		No Acute respiratory Infections				
	n	%	n	%	n	%	
Qualify	12	27,9	31	72,1	43	100,0	p-value = 0,000
No Quality	26	92,9	2	7,1	28	100,0	α = 0,05
Total	38	53,5	33	46,5	71	100,0	φ = 0,636

Table 2.
Relationship Between Temperature and the Incidence of ARI in Toddlers in the Lepo-LepoHealth Center Working Area, Kendari City

Temperature	The Incidence of Acute Respiratory Infections				Total		Statistical Test
	Acute respiratory Infections		No Acute Respiratory Infections				
	n	%	n	%	n	%	
Qualify	9	24,3	28	75,7	37	100,0	p-value = 0,000
No Quality	29	85,3	5	14,7	34	100,0	α = 0,05
Total	38	53,5	33	46,5	71	100,0	φ = 0,611

Table 3.
Relationship Between Humidity and the Incidence of ARI in Toddlers in the Lepo-Lepo Health Center Working Area, Kendari City

Humidity	The Incidence of Acute Respiratory Infections				Total		Statistical Test
	Acute respiratory Infections		No Acute Respiratory Infections				
	n	%	n	%	n	%	
Qualify	9	25,0	27	75,0	36	100,0	p-value = 0,000
No Quality	29	82,9	6	17,1	35	100,0	α = 0,05
Total	38	53,5	33	46,5	71	100,0	φ = 0,580

Table 4.
Relationship Between Lighting and the Incidence of ARI in Toddlers in the Lepo-Lepo Health Center Working Area, Kendari City

Lighting	The Incidence of Acute Respiratory Infections				Total		Statistical Test
	Acute Respiratory Infections		No Acute Respiratory Infections				
	n	%	n	%	n	%	
Qualify	13	30,2	30	69,8	43	100,0	p-value = 0,000
No Quality	25	89,3	3	10,7	28	100,0	α = 0,05
Total	38	53,5	33	46,5	71	100,0	φ = 0,579

Table 5.
Relationship Between Dust Particles and the Incidence of ARI in Toddlers in the Lepo-Lepo Health Center Working Area, Kendari City

Dust Particles	The Incidence of Acute Respiratory Infections				Total		Statistical Test
	Acute Respiratory Infections		No Acute Respiratory Infections				
	n	%	n	%	n	%	
Qualify	8	20,5	31	79,5	39	100,0	p-value = 0,000
No Quality	30	17,1	2	14,9	32	100,0	α = 0,05
Total	38	53,5	33	46,5	71	100,0	φ = 0,731

Discussion

Relationship Between Air Ventilation and Incidence of ARI

The results of the research showed that of the 71 samples, the majority had ventilation areas that met the requirements and did not experience ARI, 72.1%, but it was also found that samples whose house ventilation areas did not meet the requirements did not experience ARI, 27.9%. Then there are also those whose house ventilation area does not meet the requirements, but do not experience ARI, 2 people (7.1%). This is because there are other factors that can prevent the occurrence of ARI in toddlers, such as the physical condition of toddlers who are able to fight disease, so even if the ventilation conditions do not meet the requirements. Ventilation conditions that do not meet the requirements are based on the ventilation area of the house which is less than 10% of the outside of the building and is measured in meters.

The results of the statistical analysis concluded that there was a strong relationship between the area of air ventilation and the incidence of ARI in children under five in the Lepo-Lepo Health Center working area, Kendari City. According to researchers' assumptions, ventilation conditions that meet the requirements can prevent the occurrence of ARI in toddlers.

There was a relationship between the ventilation area of the house, p value = 0.002 ($\alpha <$ 0.05), and the incidence of ARI in toddlers.[9] Likewise, Shows that there is a strong relationship between house ventilation and the incidence of ARI.[10] Fairly strong relationship between floor area and ARI. Then, in 2023, Rizaldi's research conducted a meta-analysis, it was found that the residential density variable was 1.135 times greater, thus indicating that the condition of the home environment with the least risk was residential density.[11]

Ventilation area is important for a house because it functions as a means of ensuring the quality and adequacy of air circulation going in and out of the room. Insufficient ventilation area can cause the supply of fresh air entering the house to be insufficient and the release of dirty air out of the house is also not optimal. Thus, it will cause the air quality in the house to become poor. Improper air exchange can cause the fertile growth of microorganisms, resulting in problems with human health.[12]

Relationship Between Temperature and the Incidence of ARI

The results of the study showed that of the 71 samples, the majority had house temperatures that did not meet the requirements and experienced ARI at 85.3%, then a small portion of samples whose air temperature in their homes did not meet the requirements actually did not experience ARI at 14.7%, then there were also, samples whose house temperature met the requirements did not experience ARI at 75.7%, but experienced ARI at 24.3%. This condition is due to other factors that also prevent ARI which are also studied in this research, such as humidity and also the factor of individual toddlers who have strong body immunity so they do not experience ARI even though the temperature conditions at home do not meet the requirements. The results of the statistical analysis concluded that there is a strong relationship between temperature and the incidence of ARI in toddlers in the Lepo-Lepo Health Center working area, Kendari City. According to researchers' assumptions, the temperature in the house plays a very important role in preventing and treating ARI in toddlers. The better the room temperature, which reaches 18^0C to 30^0C, the more toddlers can avoid ARI. However, if the room temperature is below 18^0C or above 30^0C, it can pose a risk of ARI in toddlers.

This research is in line with research by Harisa et al., that the existence of a healthy house is an important factor that can be directly related to the environment the community lives in. Poor housing conditions can facilitate the transmission of ARI diseases. Physical environmental conditions such as house temperature can influence the incidence of ARI.[13] This research is confirmed in the Ministry of Health's regulations that indoor temperatures that are too low can cause health problems, including hypothermia, while temperatures that are too high can cause dehydration and even heat stroke.[14]

Relationship Between Humidity and the Incidence of ARI

The results showed that of the 71 samples, the majority had room humidity that did not meet the requirements and experienced ARI of 82.9%, then a small number of samples whose house humidity did not meet the requirements actually did not experience ARI of 17.1%, then there were also samples Those whose air humidity in the house met the requirements did not experience ARI of 75%, but experienced ARI of 25%. The results of the statistical analysis concluded that there was a moderate relationship between air humidity and the incidence of ARI in toddlers in the work area of the Lepo-Lepo Health Center, Kendari City.

This research is found that room air humidity (p value = 0.013) was related to the incidence of ARI in toddlers in the Regional Technical Implementation Unit Working Area of Babelan 1 Health Center, Bekasi Regency. Likewise, shows that there is a relationship between house humidity P value = 0.001 ($\alpha <$ 0.05) and the incidence of Acute respiratory tract infection in toddlers.[9] Likewise, research by Handayani found that there is a fairly strong relationship between humidity and ISPA.[11] This research is also in line with research showing that air humidity in the room at home is significantly related to the incidence of ARI in toddlers (p value=0.011).[15]

High humidity can cause the nasal mucous membrane to become dry, making it less effective in blocking microorganisms, making it easier to get respiratory tract infections. Then the density of residents in a house will have an influence on the residents. This is unhealthy because apart from causing a lack of oxygen, if one family member is infected with an infectious disease, especially ARI, it will easily be transmitted to other family members.[15] Humidity that is too high or low can cause the fertile growth of microorganisms. Poor house construction, such as leaking roofs, floors and walls that are not watertight, as well as a lack of lighting, both artificial and natural.[14]

Relationship Between Lighting and Incidence of ARI

The results of the study showed that of the 71 samples, the majority had lighting that met the requirements and did not experience ARI at 69.8%, then a small portion of the samples whose house lighting met the requirements actually experienced ARI at 30.2%, then there were also samples that had indoor lighting. houses did not meet the requirements, experienced ARI of 89.3%, but did not experience ARI of 10.7%. The results of the statistical analysis concluded that there was

a moderate relationship between lighting and the incidence of ISPA in toddlers in the Lepo-Lepo Health Center working area, Kendari City.

This research is in line with research by Handayani which found that lighting p = 0.000, so it was stated that the relationship between lighting and the incidence of ARI in toddlers in the working area of the Cantigi Health Center, Indramayu Regency was accepted and showed a fairly strong relationship.[11] This research is confirmed in the Ministry of Health's regulations that direct or indirect natural and/or artificial lighting can illuminate the entire room with a minimum intensity of 60 lux and not be dazzling. A lighting value (Lux) that is too low will have an effect on the eye's accommodation process being too high, which will result in damage to the retina of the eye. Light that is too high will cause the temperature in the room to rise. The light intensity is too low, whether light from natural or artificial sources. Lighting in the home is attempted to suit the need to see surrounding objects and read based on a minimum requirement of 60 Lux. [14]

Relationship Between Dust Particles and Incidence of ARI

The results showed that of the 71 samples, there were 39 people whose dust particles met the requirements and 32 people did not meet the requirements. Dust particles that do not meet the requirements are based on the results of dust measurements with a diameter of $PM_{2.5}$ exceeding 65 gμ/m3. This research also found that of the 39 people whose dust particles in their homes met the requirements, the majority did not experience ARI as much as 79.5%, but it was found that 20.5% experienced ARI even though they met the requirements. Furthermore, of the 32 samples whose dust particles did not meet the requirements, the majority experienced ARI at 17.1%, but there were 14.9% who did not experience ARI, even though they did not meet the requirements. The results of the statistical analysis concluded that there was a strong relationship between dust particles and the incidence of ARI in toddlers in the Lepo-Lepo Health Center working area, Kendari City.

This research is in line with Azizah's research which also found that the effect of $PM2_{2.5}$ on the respiratory tract was proven to be related to the incidence of respiratory symptoms, especially coughing. Another effect caused by $PM_{2.5}$ on lung function is characterized by impaired ventilation which causes decreased function of lung expansion and obstructive disorders (slow air flow in the respiratory tract due to increased lung mucus).[16] $PM_{2.5}$ can cause pneumonia, respiratory system disorders, eye irritation, allergies, chronic bronchitis. PM2.5 can enter the lungs, resulting in pulmonary emphysema, bronchial asthma and lung cancer as well as cardiovascular disorders. In general, $PM_{2.5}$ arises from the influence of outside air (human activities due to burning and industrial activities). Sources from within the home include smoking behavior, use of cooking energy from biomass fuel, and use of mosquito coils.[14]

Conclusion

The conclusion of this research is that there is a strong relationship between air ventilation area, temperature, dust particles, and the incidence of Acute RespiratoryInfections in toddlers in the Lepo-Lepo Health Center Working Area, Kendari City. Then there is a moderate relationship between humidity, lighting and the incidence of Acute RespiratoryInfections.

Advice for mothers who have toddlers is expected to prevent Acute RespiratoryInfections by maintaining the cleanliness of the physical environment of the house, such as controlling air circulation, humidity, lighting, temperature and dust in the house as well as avoiding cigarette smoke and limiting the habit of kissing toddlers. For the Lepo-Lepo Community Health Center, especially for the Head of the Community Health Center and Health Workers, it is hoped that this research can become a basis for improving services in preventing and treating Acute RespiratoryInfections by emphasizing the importance of maintaining the cleanliness of the physical environment of the home, preventing smoking and kissing behavior in toddlers and for future researchers it is hoped that it can become a a basis for other researchers to conduct relevant research such as conducting experimental research by implementing innovations that can reduce the incidence of Acute RespiratoryInfections.

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