
RELATIONSHIP BETWEEN PHYSICAL HOME ENVIRONMENT AND THE INCIDENCE OF TODDLER PNEUMONIA IN JAMBI CITY PUBLIC HEALTH CENTER

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ABSTRAK

Latar Belakang: Pneumonia merupakan penyakit infeksi saluran pernafasan bawah yang sangat mempengaruhi kesehatan paru-paru. Angka kejadian pneumonia merupakan penyakit infeksi yang menyumbang kematian terbesar pada anak balita di dunia sebanyak 725.557 kasus. Penyakit ini berkorelasi dengan empat determinan yang saling berkorelasi dengan faktor lingkungan yang dominan sebesar 40% yaitu kepadatan hunian, pencahayaan alami, kelembaban, jenis lantai dan suhu. Tujuan: Penelitian ini bertujuan untuk mengetahui hubungan antara kepadatan hunian, pencahayaan alami, kelembaban, jenis lantai dan suhu dengan kejadian pneumonia pada balita di Puskesmas Kota Jambi. Metode: Penelitian ini menggunakan pendekatan kuantitatif dengan desain cross sectional. Teknik pengambilan sampel menggunakan proporsi binokular dengan memilih 72 responden untuk pengumpulan data. Hasil: Hasil penelitian menunjukkan bahwa kepadatan hunian tidak memenuhi syarat yaitu 72,2%, kelembaban ruangan tidak memenuhi syarat yaitu 79,2%, pencahayaan alami tidak memenuhi syarat yaitu 62,5%, jenis lantai tidak kedap air yaitu 63,9%, suhu tidak memenuhi syarat yaitu 84,7% Kesimpulan: Terdapat pengaruh interaksi terhadap loyalitas pasien yang lebih signifikan jika dinilai secara langsung dibandingkan jika dimediasi oleh variabel intervening kepuasan pasien.

Kata Kunci: Pneumonia, Lingkungan Fisik.

ABSTRACT

Background: Pneumonia is a lower respiratory tract infection that greatly affects lung health. The incidence of pneumonia is an infectious disease that contributes to the largest death in children under five years in the world as many as 725,557 cases. This disease is correlated with four determinants that are intercorrelated with dominant environmental factors of 40%, namely residential density, natural lighting, humidity, floor type and temperature. Objective: This study aims to determine the relationship between residential density, natural lighting, humidity, floor type and temperature with the incidence of pneumonia in toddlers at the Jambi City Health Center. Methods: This study uses a quantitative approach with a cross-sectional design. The sampling technique uses binomunla proportions to select 72 respondents for data collection. Results: The findings show that the housing density does not meet the requirements, namely 72.2%, the room humidity does not meet the requirements, namely 79.2%, the natural lighting does not meet the requirements, namely 62.5%, the type of floor is not waterproof, namely 63.9%, the temperature does not meet the requirements, namely 84.7% Conclusion:

There is a more significant influence of interaction on patient loyalty if assessed directly than if mediated by the intervening variable of patient satisfaction.

Keywords: *Pneumonia, Physical Environment.*

A. INTRODUCTION

Pneumonia is one of the most important causes of child death, and pneumonia-related child deaths continue to increase worldwide (Wu et al., 2020). Pneumonia is an infection of the lower respiratory tract that primarily affects the health of the lungs. This condition is characterized by the accumulation of fluid in the alveoli of the lungs, interfering with oxygen exchange and causing difficulty in breathing (Smithard & Yoshimatsu, 2022). Pneumonia is caused by an infection in the lung tissue. This infection can be caused by various types of microorganisms, including bacteria, viruses, fungi, or other microbes. are services that focus on individual health through curative, preventive, and promotive efforts (Sam et al., 2023). When someone has pneumonia, the alveoli in the lungs fill with fluid and pus, making it difficult to breathe and reducing the amount of oxygen that enters the body. Pneumonia is the most significant infectious disease that causes death in children globally. Each year, an estimated 921,000 children under the age of 5 die from pneumonia (Andualem et al., 2020).

Pneumonia risk factors are classified into two categories, namely intrinsic factors and extrinsic factors. Intrinsic factors include gender, age, provision of breast milk (ASI), provision of vitamin A, nutritional status, and immunization status. Extrinsic factors include the physical environmental conditions of the house, namely the density of residents in one house, area, natural lighting, humidity of the house, type of floor and temperature (Hsiao et al., 2022). Based on the pneumonia risk factors, it is in line with HL.Bloom's theory which states that there are four determining factors that correlate with each other to influence health status. The determining factors are 40% environmental factors, 30% behavior, 20% health services and 10% due to genetics. Therefore, health status will be optimal if these four factors are in optimal condition and if one of these factors is disturbed, then of course a person's health level will also be disturbed, especially in environmental factors that have a major impact on an individual's health (Loeb et al., 2023).

Based on the Decree of the Minister of Health of the Republic of Indonesia No. 0177/Menkes/Per V/2011, environmental factors that affect health are one of them, this is because one of the basic human needs that functions as a place to live or a residence used to protect against climate disturbances and other creatures, as well as a place for the development of family life. The physical environmental conditions of the house that do not meet health standards are a risk factor for the transmission of various types of diseases, including pneumonia. Healthy homes are also included in the healthy home development guidelines according to the Ministry of Public Works and Public Housing in 2016 which states that the need for a home can be categorized as one of the basic needs or as a minimum requirement that must be met by a family such as floors and walls must be dry (not damp) and easy to clean. In order to remain dry, the floor must be made of building materials that do not conduct

groundwater to the floor surface (waterproof), Sufficient ventilation/windows so that indoor air can always flow (Bramantono et al., 2021)

Pneumonia is common in developing countries, for example in Southeast Asia which recorded a figure of 39% and Africa with a figure of around 30%. This was conveyed in the United Nations Children's Fund (UNICEF) Report which showed that pneumonia was an infectious disease that contributed to the largest number of deaths in children under five (toddlers) in the world in 2021. The figure reached 725,557 cases in 2021. UNICEF said that this number had decreased by 54% from 2000 which reached 1,590,874 cases of death (UNICEF Indonesia, 2022). The United Nations Children's Fund (UNICEF) report also highlighted that Indonesia ranks eighth among 15 countries with the highest infant and child mortality rates caused by pneumonia. Based on the results of the 2023 Indonesian Health Survey (SKI), the highest cases of pneumonia were experienced by children, especially in the age group under 5 years, with a figure of around 26.9%. Meanwhile, the prevalence of pneumonia in the 55-64 age group reached 11%, in the 65-74 age group 12.4%, and in the age group 75 years and over reaching 12.6% (Kementrian Kesehatan Republik Indonesia, 2023).

Over the past 11 years, namely 2011 - 2021, the scope of pneumonia detection in 2021, visits have decreased to 4,432,177, which has an impact on the detection of pneumonia in toddlers nationally, only reaching 31.4%(Kemenkes RI., 2021). However, the target for detecting pneumonia in toddlers in several provinces in Indonesia, including Jambi City. In 2022, the coverage of pneumonia in toddlers in Jambi City was only able to realize detection of 10.44% and had not reached the target of finding 70%. The district with the highest coverage of pneumonia detection in toddlers was in Muaro Jambi (32.85) and the lowest was Tanjung Jabung Barat (2.84%) (Dinas Kesehatan Provinsi Jambi, 2022). Pneumonia is also the third leading cause of infant death in Jambi City.

Based on data from the Health Office in 2023, it is known that out of 20 Health Centers in Jambi City, only 9 health centers showed zero cases, while 11 Health Centers in Jambi City showed that there were still cases of pneumonia in toddlers with the highest cases at the Paal V Health Center in Jambi City. Based on an initial survey conducted with the person in charge of the disease control program at the Jambi City Health Center, it was found that the houses of residents in the work area at the Jambi City Health Center were densely populated, in addition to not getting enough natural lighting from outside and there was no air exchange so that the rooms felt stuffy. Based on these problems, the researcher felt the urgency to conduct an in-depth study regarding "The Relationship between the Physical Environment of the House and the Incidence of Pneumonia in Toddlers at the Jambi City Health Center"

B. RESEARCH METHODS

Study design

This type of research implements quantitative methods that analyze numerical data and perform statistical analysis. The goal is to test research hypotheses that describe fundamental relationships between quantitative variables. This research design is observational through a cross-sectional study design, where sample measurements are only taken once at a time to identify correlations between dependent and independent variables. This study was conducted

in 6 Health Center Areas of Jambi City that have a history of toddler pneumonia cases, namely:

1. Putri Ayu Health Center
2. Aur Duri Health Center
3. Simpang IV Sipin Health Center
4. Talang Bakung Health Center
5. Koni Health Center
6. Paal V Health Center

Sample and Participants

The population in this study was 88 toddlers (aged 0-59 months) who had pneumonia at the Jambi City Health Center. The sample was calculated using the binomial proportions sample size calculation with a significance level (α) of 5% and a test power of 95%. Based on these calculations, the minimum number of samples that must be taken to support the achievement of the research objectives is 72 respondents with the criteria of Respondents who have toddlers (children aged 0-59 months) with a history of pneumonia in the Jambi City Health Center Work Area and are willing to be research respondents as evidenced by filling out informed consent.

Instrument

Instruments are all measuring instruments used in a study, with the aim of measuring each research variable and obtaining the data needed in the study. Because the data used in this study comes from secondary data, the instruments used are observation sheets and tools used by researchers to collect data such as pens, cameras, and paper.

Data Collection

The data collection process involves approaching research respondents and setting up mechanisms to obtain subject characteristics that are relevant to what is to be achieved in the study. In this study, the data used are primary and secondary data. Primary data is information obtained directly from its source through observation, measurement, filling out questionnaires, or interactive interviews with research subjects. Meanwhile, secondary data is information that comes from reports and research results that have been conducted previously. In this study, data were collected through interviews using questionnaires and review of medical record documents and Healthy Menu Cards (KMS) for toddlers.

Data Analysis

Data Analysis The data used was started from univariate, bivariate and multivariate analysis using SPSS software to test the influence between variables.

- a. If $PR = 1$ and the confidence interval range does not exceed 1, this indicates that the variable is not a risk factor. This indicates that the risk between the exposed and unexposed categories is the same.
- b. If $PR > 1$ and the confidence interval range exceeds 1, the variable is considered a risk factor. This indicates an increased risk in the exposed category than in the unexposed.

- c. If $PR < 1$ and the confidence interval range does not exceed 1, the variable is considered a protective factor. This indicates a decreased risk in the exposed category than in the unexposed.

C. RESULTS AND DISCUSSION

Univariate Analysis Results

Based on a study conducted on 72 respondents with toddlers suffering from pneumonia and suffering from ISPA not pneumonia at the Jambi City Health Center, the characteristics of the respondents included the age of the toddler, gender of the toddler, maternal age, parity, and history of exclusive breastfeeding. The distribution of respondents was also obtained based on research variables including occupation, income, residential density environment, floor type, room humidity, natural lighting, room temperature, and pneumonia incidents.

Table 1 Distribution of Respondent Characteristics

Respondent Characteristics	n	Percentage (%)
Residential Density		
Not eligible	52	72.2
qualify	20	27.8
Room Humidity		
Not eligible	57	79.2
qualify	15	20.8
Natural Lighting		
Not eligible	45	62.5
qualify	27	37.5
Floor Type		
Not eligible	46	63.9
qualify	26	36.1
Temperature		
Not eligible	61	84.7
qualify	11	15.3

Based on the results of the data analysis presented in table 1, it shows the distribution of respondents based on research variables, namely the majority of respondents are in a residential density that does not meet the requirements, namely 52 respondents (72.2%), room humidity does not meet the requirements, namely 57 respondents (79.2%), natural lighting does not meet the requirements, namely 45 respondents (62.5%), the type of floor is not waterproof, namely 46 respondents (63.9%), the temperature does not meet the requirements, namely 61 respondents (84.7%).

Bivariate Analysis Results

Table 2 Relationship between Residential Density and the Incidence of Pneumonia in Toddlers at Jambi City Health Centers

Residential Density	Pneumonia Occurrence				Total	P Valu e	PR (95%C)	
	Pneumoni a		Not Pneumoni a					
	n	%	n	%				n
Not eligible	42	80.8	10	19.2	52	100	0.02	1.615 (1.022 - 2.553)
qualify	10	50	10	50	20	100		
Total	52	72.2	20	27.8	72	100		

Based on the results of statistical tests with the chi square test, a p-value of 0.02 ($p < 0.05$) was obtained, this indicates that there is a relationship between residential density and the incidence of pneumonia in toddlers in Jambi City. The results of the analysis also obtained a prevalence ratio (PR) value of 1.615 (95% CI = (1.022-2.553)), meaning that respondents with qualified residential density are 1.1615 times more at risk of having children with pneumonia compared to respondents with unqualified residential density.

Table 3 Relationship between Room Humidity and the Incidence of Toddler Pneumonia at Jambi City Health Center

Room Humidity	Pneumonia Occurrence				Total	P Value	PR (95%CI)	
	Pneumonia		Not Pneumonia					
	n	%	n	%				n
Not eligible	51	89.5	6	10.5	57	100	0.000	13.421 (2.016 - 89.338)
qualify	1	6.7	14	93.3	15	100		
Total	52	72.2	20	27.8	72	100		

Based on the results of statistical tests with the chi square test, a p-value of 0.000 ($p < 0.05$) was obtained, this indicates that there is a relationship between room humidity and the incidence of pneumonia in toddlers in Jambi City. The results of the analysis also obtained a prevalence ratio (PR) value of 13,421 (95% CI = (2.016-89.338)), meaning that respondents with room humidity that meets the requirements are at 13,421 times greater risk of having

children with pneumonia compared to respondents with room humidity that does not meet the requirements.

Table 4 The Relationship between Natural Lighting and the Incidence of Pneumonia in Toddlers at Jambi City Health Centers

Natural Lighting	Pneumonia Occurrence				Total	P Value	PR (95%C)	
	Pneumonia		Not Pneumonia					
	n	%	n	%				n
Not eligible	39	86.7	6	13.3	45	100	0.001	1.800 (1.197 - 2.706)
qualify	13	48.1	14	51.9	27	100		
Total	52	72.2	20	27.8	72	100		

Based on the results of statistical tests with the chi square test, a p-value of 0.001 ($p < 0.05$) was obtained, this indicates that there is a relationship between natural lighting and the incidence of pneumonia in toddlers in Jambi City. The results of the analysis also obtained a prevalence ratio (PR) value of 1,800 (95% CI = (1,197-2,706)), meaning that respondents with adequate natural lighting are 1,800 times more at risk of having children with pneumonia compared to those with inadequate natural lighting.

Table 5 Relationship between Floor Type and the Incidence of Toddler Pneumonia at Jambi City Health Centers

Floor Type	Pneumonia Occurrence				Total	P Value	PR (95%CI)	
	Pneumonia		Not Pneumonia					
	n	%	n	%				n
Not waterproof	40	87	6	13	46	100	0.001	1.884
waterproof	12	46.2	14	53.8	26	100		(1.226
								-
Total	52	72.2	20	27.8	72	100		2.896)

Based on the results of statistical tests with the chi square test, a p-value of 0.001 ($p < 0.05$) was obtained, this indicates that there is a relationship between floor type and the incidence of pneumonia in toddlers in Jambi City. The results of the analysis also obtained a prevalence ratio (PR) value of 1,884 (95% CI = (1.226-2.896)), meaning that respondents with non-waterproof floors have a 1,884 times greater risk of having children with pneumonia compared to respondents with waterproof floors.

Table 6 Relationship between Temperature and the Incidence of Pneumonia in Toddlers at Jambi City Health Centers

Temperatu re	Pneumonia Occurrence				Total	P Valu e	PR (95%C)	
	Pneumoni a		Not Pneumoni a					
	n	%	n	%				n
Not eligible	50	82	11	18	61	100	0.000	4.508 (1.280 - 15.879)
qualify	2	18.2	9	81.8	11	100		
Total	52	72.2	20	27.8	72	100		

Based on the results of statistical tests with the chi square test, a p-value of 0.000 ($p < 0.05$) was obtained, this indicates that there is a relationship between temperature and the incidence of pneumonia in toddlers in Jambi City. The results of the analysis also obtained a prevalence ratio (PR) value of 4.508 (95% CI = (1.280-15.879)), meaning that respondents with temperatures that do not meet the requirements are 4.508 times more at risk of having children with pneumonia compared to respondents with temperatures that meet the requirements.

Multivariate Analysis Results

Table 7 Multivariate Analysis Results

Variabel In the Equation		95% C.I.for EXP(B)
		P-Value
Step 1 ^a	Residential Density	.000
	Floor Type	.000
	Humidity	.000
	Natural Lighting	.000
	Temperature	.000
	Constant	

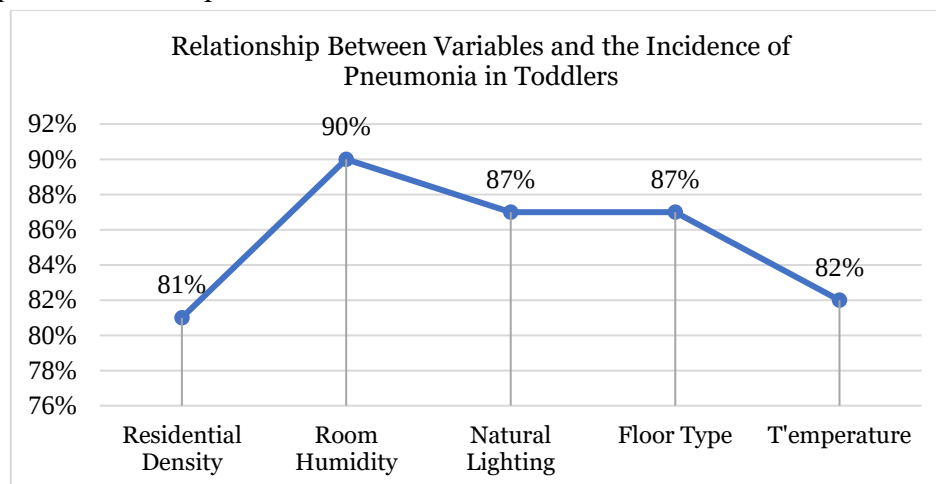
Step 2 ^a	Residential Density	.000
	Humidity	.000
	Natural Lighting	.000
	Temperature	.000
	Constant	

Based on the results of the multivariate analysis presented in the table above, it can be seen that there is a relationship between work, income, housing density, air humidity, natural lighting and temperature with the incidence of pneumonia with a p-value of 0.000 ($p < 0.05$). Meanwhile, there is no relationship between floor type and pneumonia incidence. This can be seen in the last stage of multivariate testing, there is no floor type variable.

Discussion

Based on the results of the research that has been conducted through the stages of univariate to multivariate analysis, it can be seen that there is a relationship between variables and the incidence of pneumonia in toddlers which can be seen in graph 1 as follows:

Graph 1 Relationship Between Variables and the Incidence of Pneumonia in Toddlers



Relationship between Residential Density and the Incidence of Pneumonia in Toddlers

Residential density is the result of dividing the area of a room by the number of occupants in a house. The area of a house that is not comparable to its occupants will result in high residential density in the house (Prihant et al., 2022). Residential density can also affect indoor air quality, residential density is said to be the cause of indoor physical pollution because residential density affects room temperature. In addition, residential density can cause high levels of CO₂ indoors, while CO₂ is one source of chemical air pollutants (Smithard & Yoshimatsu, 2022). The condition of densely populated houses that do not comply with the standard requirements causes an increase in the temperature in the house, so that the temperature becomes hot and humid and causes the frequency of meetings and contact between

one resident of the house and other residents (Bahri et al., 2023). Density of housing is one of the important factors in the transmission of disease. The denser the occupants of the house, the faster the decline in indoor air quality due to decreasing oxygen levels while carbon dioxide increases.

House density is closely related to house air ventilation. House conditions that are overdensely populated and lack of air ventilation can increase the air temperature in the house, so that the house feels hotter and the risk of disease transmission is greater (Wati et al., 2023). Dense living conditions can increase pollution factors in the home. Narrow living spaces, many residents, lack of ventilation, lack of understanding of clean and healthy living behavior can facilitate the occurrence of pneumonia (Huh et al., 2020). The narrow house area with a large number of family members causes an imbalance between the number of occupants and the area of the house. The interaction and frequency of contact between the occupants of the house with each other is high, which causes the temperature inside the house to increase. Oxygen exchange in a densely populated room is limited. Bacteria and viruses that are spread through the air enter through the respiration of one occupant of the house to another occupant of the house (Fathmawati et al., 2021).

In theory, high housing density will increase the room temperature caused by the release of body heat. The more occupants in the house, the faster the indoor air will be polluted, both gas pollution and bacterial or germ pollution. In addition, the small size of the house with a dense number of occupants will increase the transmission of disease through droplets and direct contact (Maliga et al., 2023). The results of this study are in line with research conducted by (Fathmawati et al., 2021) yang shows the results of the analysis using the chi square test obtained a p value of $0.006 < \alpha (0.05)$ so that H_0 is rejected and H_a is accepted, which means there is a relationship between housing density and the incidence of pneumonia in toddlers in the Rembang Purbalingga Health Center work area. The results of the statistical analysis obtained an OR value of 5.041 and 95% CI = 1.707-14.890. The results of this study are again supported by (Nurjayanti et al., 2022) which shows that the results of the chi square test analysis show a significant relationship ($p < \alpha$) with a risk of 13.214, which means that toddlers who live in housing that does not meet the requirements for a healthy home have a risk of pneumonia compared to toddlers who live in houses with a housing density that meets the requirements for a healthy home.

Relationship between Room Humidity and the Incidence of Pneumonia in Toddlers

Humidity is one of the environmental variables that plays an important role in maintaining health in a room. Humidity is the percentage of the volume of water content in the air, the water content in the air is usually expressed as a percentage. Humidity can also be defined as the ratio between the maximum amount of water vapor mass and the mass content of water vapor in the air in a certain time at the same pressurized air and temperature. High humidity arises from poor air circulation, which can cause pneumonia microorganisms to grow (Suriani & Naqiyah, 2024).

Room humidity is the relative vapor content of a room in a house measured using a Thermohygrometer and expressed as a percentage (%). The humidity of a room can be

categorized as qualified if it has a humidity ranging from 40% - 60%. Houses that have too high or too low humidity are good media for pathogenic microorganisms of pneumonia to grow. Like temperature, high room humidity can trigger pneumonia in toddlers because bacteria that cause pneumonia such as *Streptococcus pneumoniae* can grow optimally at humidity above 60% (Paneo et al., 2023) states Increased indoor air humidity causes bacteria to thrive, but with adequate ventilation this will not happen because good ventilation keeps indoor air humidity optimal. Poor air humidity conditions are less than 40% or more than 70%. While air humidity is said to be good if it meets 40% -70%. This is caused by less than optimal or inadequate ventilation so that the sunlight needed to enter the house to kill pathogens is reduced, which can cause pneumonia.

The relationship between humidity and pneumonia is in accordance with the theory that bacteria and viruses as agents of pneumonia can develop and survive in room environments with relatively high humidity. (Laliyanto et al., 2023). High humidity (> 80%), which means the water vapor content in the air is quite high, is a good condition for the growth and survival of bacterial cells (*pneumococcus*) so that the bacteria can grow quickly (Bahri et al., 2022). The results of this study are in line with research conducted by (Bahri et al., 2022) which shows the results of data analysis using the chi square test obtained a p value of $0.003 < \alpha (0.05)$ then H_0 is rejected so that it can be said that there is a relationship between humidity and the incidence of pneumonia in toddlers, then H_0 is rejected so that it can be said that there is a relationship between temperature and the incidence of pneumonia in toddlers in the Baturaden II Health Center work area with a risk of 2.9 times greater for toddlers getting pneumonia in the group of toddlers whose homes have humidity that does not meet health requirements.

These results are also supported by research conducted by which states that houses with too high or low humidity are good media for pneumonia pathogenic microorganisms to grow. Like temperature, high room humidity can trigger pneumonia in toddlers because pneumonia-causing bacteria such as *Streptococcus pneumoniae* can grow optimally at humidity above 60%.

The Relationship Between Natural Lighting and the Incidence of Pneumonia in Toddlers

A healthy home requires sufficient lighting (sunlight), not less and not more. Lack of light entering the house, especially natural sunlight, besides causing discomfort, is also a good place or medium for disease to live and grow. This light is very important besides being useful for reducing humidity and can kill pathogenic bacteria such as tuberculosis bacteria, eye diseases, and respiratory diseases. Therefore, efforts must be made so that the sunlight that enters is not blocked by trees, buildings or high walls. (Bahri et al., 2023). Lack of sunlight will cause germs to grow in the house, because it will make it easier for bacteria to live and breed in a damp house. Lack of lighting will affect the temperature and humidity in the house, adding glass tiles is needed so that sunlight can enter so that it can reduce humidity levels and kill the growth of bacteria that cause pneumonia. (Harahap et al., 2021).

Sunlight is useful as an explanation, sunlight also functions as ultraviolet light which has a wavelength < 290 nm. Ultraviolet light at a wavelength of 253.7 nm can kill germs and bacteria, viruses and fungi that can cause infections and allergies, asthma and other

diseases(Wimalasena et al., 2021) . Ultraviolet rays will damage the DNA of microbes (germs, bacteria, viruses, and fungi) so that the DNA of microbes becomes sterile. If microbes are exposed to ultraviolet rays, then the microbes cannot reproduce and eventually die (Rahmiza et al., 2019)

Risk factors for pneumonia can be caused by environmental factors where children under 1 year of age live. five years of life and the surrounding environment. One of the environmental factors can come from the living environment related to healthy home indicators, including: the habit of opening doors, windows, home ventilation conditions, and the intensity of home lighting(Cahyani et al., 2024).The results of this study are in line with research conducted by (Bahri et al., 2022) which shows the results of data analysis using the chi square statistical test obtained a p-value of $0.035 < \alpha$ then H_0 is rejected so that it can be said that there is a relationship between light intensity in the room and the incidence of pneumonia in toddlers in the Baturaden II Health Center work area with a risk of 2.1 times greater for toddlers getting pneumonia in the group of toddlers whose homes have light intensity that does not meet health requirements.

The results of this study are again supported by (Akbar et al., 2021) stated the results of the relationship test using the Chi Square test obtained a p value of 0.35. The p value < 0.05 indicates that there is a relationship between home lighting conditions and the incidence of pneumonia in toddlers. According to (Harahap et al., 2021) there is a relationship between lighting and the incidence of pneumonia in toddlers, this is proven by the results of statistical tests obtained p value 0.000 meaning there is a very significant relationship between lighting and the incidence of pneumonia in toddlers in Tarai Bangun Village, UPT BLUD Tambang Health Center Work Area. The OR value obtained is ,122 (95% CI: ,038 - ,388) meaning it can be concluded that toddlers who live in houses with lighting that does not meet the requirements will be at risk of experiencing pneumonia by ,122 times compared to toddlers who live in houses with lighting that meets the requirements.

(Rahmiza et al., 2019) also stated that there is a significant relationship between lighting and the incidence of pneumonia in toddlers. Toddlers who live in homes with inadequate lighting have a 4.117 times greater risk of developing pneumonia. suffer from pneumonia compared to babies who live in homes with adequate lighting.

The Relationship between Floor Type and the Incidence of Pneumonia in Toddlers

The type of floor is a type of basic material used as the base of a house. The type of floor is also categorized into 2, namely meeting the requirements and not meeting the requirements. The type of floor meets the requirements if a house has a type of floor made of cement, tiles or ceramics, while it does not meet the requirements if a house has basic materials in the form of soil and floors. The type of floor of a house if it does not meet the requirements will affect the humidity of a house . Floors that do not meet health requirements such as soil, wood/bamboo or non-waterproof materials have a greater risk of transmitting various respiratory diseases, especially pneumonia. This type of floor can increase humidity in the room. In addition, the floor is prone to dust and is difficult to clean. Humid air, dust from the

floor that mixes in the air increases the risk of causing pneumonia in toddlers (Nurjayanti et al., 2022).

Floors that are not waterproof and not supported by good ventilation can cause increased humidity and stuffiness which will facilitate the transmission of disease. The construction of the house floor must be watertight and always dry so that it is easy to clean from dirt and dust, in addition to avoiding the rise of the soil which can cause increased humidity in the room. So the floor of the house should be raised 20 cm from the ground surface. The condition of the house floor is made of waterproof materials so that the floor does not become damp and always wet such as tiles, cement, and ceramics. (Harahap et al., 2021).

Floors made of permeable materials can create a humid environment inside the house, which is an ideal place for the growth of germs and the spread of diseases, especially bacteria that cause pneumonia (Arum Hapsari, 2024). Houses with floors made of soil, walls that are not brick, and roofs that are not fitted with ceilings cause the house to become hot, dusty, and more humid. Hot temperatures can increase evaporation indoors so that not only humidity increases but also the pollutant content from the building materials of the house (Bahri et al., 2022).

Tiled houses have lower humidity compared to houses with untiled floors. Toddlers who often play on untiled floors or floors that do not meet the requirements will have a higher risk of developing pneumonia. The type of dirt floor will cause dusty conditions in the house. This dusty condition is one form of indoor air pollution. Dust in the air when inhaled will stick to the lower respiratory tract which causes the movement of cilia to slow down, so that the respiratory tract cleaning mechanism is disrupted. Toddlers with pneumonia are more often found in homes with floors that do not meet the requirements. Toddlers who play and live on dusty and damp floors have a higher risk of decreased immunity, thus increasing the risk of contracting various diseases, one of which is pneumonia (Maliga et al., 2023).

The results of this study are in line with research conducted by (Nurjayanti et al., 2022) which shows a relationship between the type of house floor and the incidence of pneumonia in toddlers ($p < \alpha$) with a risk of 11.915 for experiencing pneumonia in toddlers who live in houses with floors that do not meet the requirements. Floors that do not meet health requirements such as soil, wood/bamboo or materials that are not waterproof have a greater risk of transmitting various respiratory diseases, especially pneumonia. The results of this study are again supported by (Bahri et al., 2022) which shows the results of data analysis using the chi-square test obtained a p-value of $0.013 < \alpha (0.05)$ then H_0 is rejected so that it can be said that there is a relationship between floor type and the incidence of pneumonia in toddlers in the Baturaden II Health Center work area, with a significant risk of 3.167 times greater for toddlers getting pneumonia in the group of toddlers whose houses have floor types that do not meet health requirements.

Based on the results of the research that has been carried out which is supported by previous theories and research, it can be said that there is a relationship between floor type and the incidence of pneumonia in toddlers at the Jambi City Health Center. This is because the type of floor that does not meet the requirements will be prone to dust, difficult to clean and

much more humid, causing humid air, dust from the floor that mixes in the air increases the risk of causing pneumonia in toddlers.

The Relationship between temperature and the incidence of pneumonia in toddlers

High temperatures inside the house can allow bacteria to grow and multiply both inside and outside the house. Room temperature can be categorized as meeting the requirements if a room has a temperature ranging from 18°C-30°C. Room temperature conditions that meet the required health standards can protect toddlers from health problems, while temperatures that meet health standards can cause health problems in toddlers. Air temperature is closely related to the growth and reproduction of bacteria, viruses, fungi that are the etiological factors of pneumonia. Bacteria that cause pneumonia, for example *Streptococcus pneumoniae*, have an optimum temperature range where the bacteria can grow rapidly, namely a temperature of 31-37°C (Chung et al., 2024).

Low air temperatures can cause microorganisms to be more stable in the air, so that indoor conditions that tend to be cold can make it easier for pneumonia to spread, especially in toddlers with weak immune systems (Bahri et al., 2023). A room with an unqualified temperature can increase the risk of pneumonia in toddlers, this is because an unqualified room temperature is a good medium for the growth and development of bacteria such as *Streptococcus pneumoniae*. *Streptococcus pneumoniae* bacteria grow optimally at a temperature of 31°C-37°C so toddlers who live in houses with unqualified temperatures are susceptible to pneumonia. The results of this study are in accordance with the theory and in line with the research conducted that high room temperatures can increase the risk of pneumonia because at high temperatures *Streptococcus pneumoniae* bacteria can grow optimally. Temperature is also closely related to humidity, where if the temperature of a house shows a high temperature then the humidity of the house will be low or vice versa. High indoor air temperatures allow bacteria to grow and reproduce well in the house (Pramita, 2023).

(Huh et al., 2020) stated that there is a significant relationship between the temperature in the toddler's room and the incidence of toddler pneumonia. The humidity in all toddler rooms did not meet health requirements with an average humidity of 76.02%Rh. Opening the ventilation should be done periodically so that air circulation occurs so that the temperature in the toddler's room can meet health requirements.

The results of this study (Fathmawati et al., 2021) are again supported by which states that there is a relationship between room temperature and the incidence of pneumonia in toddlers (p value 0.010), in this study toddlers who live in houses with temperatures that do not meet the requirements are at risk of 12.571 times getting pneumonia compared to toddlers who live in houses with temperatures that meet the requirements. The relationship between temperature and the incidence of pneumonia in Pati Regency is because most respondents have housing densities that do not meet the requirements, indirectly housing densities that do not meet the requirements can increase room temperature because of the release of heat from the human body.

D. CONCLUSION AND SUGGESTIONS

Based on the results of the study, it was concluded that the distribution based on the physical environmental factors of the house, namely the density of housing did not meet the requirements, namely 72.2%, the humidity of the room did not meet the requirements, namely 79.2%, the natural lighting did not meet the requirements, namely 62.5%, the type of floor was not waterproof, namely 63.9%, the temperature did not meet the requirements, namely 84.7% and there was a relationship between the density of housing, humidity of the room, natural lighting, type of floor and temperature with the incidence of pneumonia in toddlers. In addition, the density of housing, humidity of the room, natural lighting and temperature had a significant relationship with the incidence of pneumonia in Jambi City Health Center, while the type of floor did not have a significant relationship with the incidence of pneumonia in toddlers.

Declaration Conflicting Interest

The authors have no conflicts of interest to declare.

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Author Contribution

The author confirm contribution to the paper as follows: study conception and design, Author, data collection, analysis and interpretation of results, draft manuscript preparation, reviewed the results of the manuscript

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