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The Influence of the Physical Home Environment and the Habits of Patients with the Incident of Pulmonary Tuberculosis in the Working Area of the Somambawa Puskesmas, Somambawa District, District South Nias Year 2022

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A B S T R A C T

Tuberculosis (TB) is an infectious disease caused by the bacterium Mycobacterium tuberculosis which infects about 10 million people causing the death of 1.3 million people worldwide, making it one of the environmental-based diseases that is still a public health problem. This situation was closely related to environmental factors, clean and healthy living behavior, and also the virus itself.

Type of research was an analytic observational study, with a case control design where the population of this study was all pulmonary tuberculosis patients who are recorded in the tuberculosis registration book at the Somambawa community Health Center starting from January 2022 - June 2022 with a sample of 28 cases and 28 controls.

The results showed that the humidity variable obtained p = 0.001 and OR = 0.10, temperature with p = 0.044 and OR = 0.162, occupancy density p = 0.006 and OR = 0.163, and the behavior of opening and closing windows p = 0.012 and OR = 0.188. It is hoped that they can try to be independent in improving healthy houses by being able to be more routine in opening and closing windows, maintaining cleanliness, and being able to try independently in realizing healthy homes so that they can break the chain of spread of pulmonary tuberculosis.

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INTRODUCTION

Tuberculosis (TB) infects around 10 million people and causes the death of 1.3 million people worldwide. Indonesia is ranked second after India with the largest number of tuberculosis sufferers in the world with the number of cases reaching 316 per 100,000 population with a death rate of 40 per 100,000 population (World Health Organization, 2022). The world health body declares countries with high burden countries (HBC) for tuberculosis based on 3 indicators, namely TB, TB/HIV, and MDR-TB. There are 48 countries on the list, but Indonesia, along with 13 other countries, is on the HBC list for these 3 indicators. This means that Indonesia has big problems in dealing with tuberculosis (Ministry of Health of the Republic of Indonesia, 2022).

Tuberculosis cases in Indonesia were found to be 420,994 cases in 2017, this shows an increase in cases in 2018, namely 566,623 cases. The treatment coverage target (Case Detection Rate/CDR) in Indonesia reached 64.5%, which has increased compared to the previous year, but is still far from the target recommended by WHO of ≥ 91%. The success rate for treatment in Indonesia has reached 86.6%, where the target set by the Ministry of Health is 85%, meaning that nationally the success rate for tuberculosis treatment has been achieved (Indonesian Health Profile, 2021).

North Sumatra Province is a province that has a large number of tuberculosis sufferers, namely 22,866 cases in 2016. After being examined and treated by 14,844 people, the success rate of treatment (recovery) was 11,611 people or around 78.2% (North Sumatra Health Profile, 2016). Meanwhile, in 2017 the number of cases increased by 27,017. In 2019, the notification rate for tuberculosis cases in North Sumatra reached 206 per 100,000 population with treatment coverage (CDR) of 47.4% and treatment success rate of 92.4% (Indonesian Health Profile, 2021)

North Sumatra Province consists of 25 districts and 8 cities. Based on data from the Central Statistics Agency in 2021, five districts/cities in North Sumatra Province with the highest number of tuberculosis sufferers are: Deli Serdang 3326 cases, Simalungun 1718 cases, Labuan Batu 1533 cases, Medan 12105 cases, Langkat 1450 cases, Mandailing Natal 997 cases, and Nias 173 cases.

According to John Gordon's theory in (Dr.H.Masriadi, 2017), the emergence of a disease is based on 3 very influential aspects, namely host (host), agent (disease), environment (environment). These three factors are called the epidemiological triangle. These three aspects must be balanced, if there is an imbalance then a person can become sick. In reality, efforts to prevent tuberculosis from agent (anti-tuberculosis drugs) and host (BCG vaccination) factors are still rarely discussed from an environmental perspective.

The spread of tuberculosis cases is closely related to the physical conditions of people's home environments such as ventilation, temperature, humidity, residential density, lighting, floors and walls (Agustina et al, 2015). Overcrowded, dirty housing, poor air circulation and lack of sunlight are triggers for the bacteria that cause tuberculosis to live for a long time, this is because the

room is dark, damp, cold and does not have good ventilation. Therefore, the construction of a residential house that meets health requirements must always be considered so that every room in the house gets a clean flow of air and gets sufficient sunlight so that the risk of disease caused by poor air quality can be reduced. (RI Government Regulation, 2016).

Based on the results of research conducted by (Nike Monintja, Finny Warouw, 2020), (Lestari Muslimah, 2019) and (Mathofani & Febriyanti, 2019) it is said that the physical condition of the house such as density of house occupancy, type of floor, poor ventilation area has a significant relationship with the incidence of pulmonary tuberculosis. Another study conducted by (Kenedyanti & Sulistyorini, 2017) concluded that the physical condition of a house (temperature and humidity) that does not meet the requirements has a risk of pulmonary tuberculosis 3 times greater than the physical condition of a house that meets the requirements. Apart from that, smoking also contributes to the risk of developing tuberculosis.

South Nias Regency is one of the areas in North Sumatra which is also not free from pulmonary tuberculosis. Even though it is not the district/city with the 5 most cases, tuberculosis sufferers in the district continue to appear every year, in fact the number is increasing. This can be seen based on Agency data. Center for Statistics in 2017 as many as 147 cases with a Case Detection Rate (CDR) of 22% and men

Formulation of the problem

Based on the background description, the research problem can be formulated as to how the physical environment of the home and the habitual factors of sufferers influence the incidence of pulmonary tuberculosis in the working area of the Somambawa Community Health Center, Somambawa sub-district, South Nias district.

RESEARCH METHODS

This research uses an analytical observational method, with a case control design, namely measuring the dependent variable first on the effects of tuberculosis, while on the independent variable retrospectively to determine whether there are physical environmental factors and habits related to the incidence of tuberculosis.

This research was conducted in Somambawa District in June-July 2022.

The population is all pulmonary tuberculosis sufferers recorded in the tuberculosis registration book at the Somambawa Health Center starting from January-June 2022, namely 56 respondents.

To calculate the number of cases in this study, the following formula according to Lemeshow (1997) was used:

$$n = \frac{Z2\ P\ (1-P)}{d2}$$

Information :

n = Minimum sample size required for a case

Z = Z table value with a confidence level of 95% or 1.96

P = Proportion of cases whose house humidity meets the requirements, namely 0.2 by (Kenedyanti & Sulistyorini, 2017)

1-P = Proportion of cases whose house humidity does not meet the requirements, namely 0.8 by (Kenedyanti & Sulistyorini, 2017)

d = Obsolute Precision 15% or 0.15

So that :

$$n = \frac{Z^2 P(1-P)}{d^2}$$

$$= \frac{(1.96)^2 \times 0.2 \times 0.8}{(0.15)^2}$$

$$= \frac{3.8416 \times 0.16}{0.0225}$$

$$= \frac{0.614656}{0.0225}$$

$$= 27.31 \approx 28$$

Based on the above calculations, the minimum sample size for tuberculosis cases was 28. This study used a 1:1 ratio between cases and controls, so the number of respondents for controls was 28. The total sample was 56.

1. Characteristics of Research Subjects

The objects in this research are all Pulmonary Tuberculosis Sufferers in the Somambawa Community Health Center Working Area, Somambawa District in January-June 2022 which can be seen in the table below:

Table 1 Frequency Distribution of Indvidual Characteristics by Gender in the Working Area of the Somambawa Community Health Center, Somambawa District, 2022

No	Gender	Frequensi (f)	Percentage (%)
1	Man	30	53,6
2	Women	26	46,6
	Amount	56	100

Based on the data from the respondent characteristics table above, it shows that the number of male respondents was greater with 30 (53.6%) respondents, while the number of female respondents was fewer with 26 (46.4%) respondents.

2. Respondent's age

Table 2 Frequency Distribution of Individual Characteristics by Age in the Working Area of the Somambawa Health Center, Somambawa District, Year 2022

No	Old (Year)	Frequency (f)	Percentage (%)
1	0 - 5	5	8,9
2	12 - 25	15	26,8
3	26 - 45	25	44,6
4	46 - 65	11	19,6

Amount	56	100.0

3. Education

Tabel 3 Frequency Distribution of Individual Characteristics based on Education in the Working Area of the Somambawa Health Center, Somambawa District, Year 2022

No	Pendidikan	Frekwensi (f)	Persentasi (%)
1	SD	7	12,5
2	SMP-SMA	36	66
3	D1 and above	12	21,5
Amount		56	100

Based on the data from the table of characteristics of respondents, the dominant educational background was high school/high school graduates, namely 36 (66%) respondents and the lowest education category was elementary school with 7 (12.5%) respondents.

4. Bivariate analysis

Bivariate analysis was carried out to see the influence between the dependent variable and the independent variable, namely to relate the physical environmental factors of the house (humidity, temperature, residential density) and habitual factors (opening and closing windows) with the incidence of pulmonary tuberculosis. The analysis was carried out statistically using the chi square test at a confidence level of 95% (α = 0.05) which can be interpreted as whether these risk factors may or may not influence the incidence of tuberculosis. The results of the bivariate analysis can be seen in the table below :

Table 4 Results of Bivariate Analysis of the Physical Environment and Habits on the Incidence of Tuberculosis in the Working Area of the Somambawa Community Health Center, Somambawa District in 2022

Risk Factor	Kejadian Tuberculosis				*p*.value	*OR*
	Ya		Tidak			
Humidity						
Qualify						0
Not eligible	4	4,3 5,7	7 1	0,7 9,3	,001	,108

Amount	8	00	4	00		
Temperature Qualify Not eligible	9	7,92,1	6	2,9,1	,044	0,162
Amount	8	00	8	00		
Residential density Qualify Not eligible	26	2,97,1	3	2,17,9	,006	0,163
Amount	8	00	8	00		
Window opening behavior Qualify Not eligible	35	6,43,6	3	2,17,9	,012	0,188
Amount	8	00	0	00		

DISSCUSION

House humidity is the amount of water vapor contained in the room. Humidity of more than 70% is a good means for the growth of microorganisms, especially Mycobacterium tuberculosis, because in this place these bacteria reproduce well (Ministry of Health of the Republic of Indonesia, 2007 in Indriyani novita, et al. 2016).

Based on the results of statistical analysis using the chi-square test on the room humidity variable, the p value = 0.001, where the value ($p<0.05$) is smaller than $\alpha = 0.005$, so there is a relationship between humidity and the incidence of pulmonary tuberculosis in the working area of the Somambawa Community Health Center, Somambawa District. in 2022 and the OR value = 0.108 which indicates that humidity that does not meet the requirements has a 0.108 times greater potential for pulmonary tuberculosis compared to humidity that meets the requirements.

The results of this research are in line with the research of (Indriyani Novita, et al. 2016) the results of the chi square test obtained a p value for humidity level

of 0.004, meaning that there is a significant relationship between house humidity and the incidence of pulmonary TB. The result of OR = 4.792 is that a house with high humidity will influence its occupants to contract pulmonary TB 4.792 times compared to a house with low humidity levels.

House humidity is declared healthy and comfortable if the air temperature and room humidity correspond to normal human body temperature. Air temperature and humidity in a room are greatly influenced by ventilation and lighting. Poor or uneven ventilation will make the room feel stuffy or stuffy and will cause high humidity in the room (Ministry of Health, 2011).

The ideal room temperature in the house is between 18-20°C. Temperature is influenced by outside air temperature, air movement, and room temperature humidity. Temperature also influences the transmission or spread of disease, namely Mycobacterium tuberculosis bacteria will reproduce optimally if the temperature is available in optimum quantities for their life (Maretta Anggie R 2013)

The room temperature in this study is the temperature in the room where the respondent's family gathers. This research shows that the Chi Square test results obtained a probability value (p-value) = 0.044, which means that the incidence of tuberculosis has a significant influence on room temperature. With an OR value = 0.162, it shows that respondents with temperatures that do not meet the requirements are at risk of exposure 0.162 times greater than those in respondents' homes with temperatures that meet the requirements.

The results of this research are in accordance with research (Dwi Diah Lestari M 2018) which states that the results of statistical tests show that there is a positive relationship between temperature and the presence of Mycobacterium tuberculosis with a p value of 0.000 so that temperatures that do not meet the requirements have the potential to increase conditions that are conducive for these bacteria to live and It also has the potential to increase transmission of pulmonary TB disease.

During the research, the temperature varied in the respondents' houses, this was influenced by several things, for example the humidity in the house, the ventilation was closed, and the windows were not opened, thus affecting the movement of air entering the house. Based on the results in the field, the temperature inside each respondent's house was 50 (89.3) respondents, and those who did not meet the requirements were 6 (10.7) respondents.

Overcrowded housing can encourage the transmission of respiratory microorganisms through coughing and sneezing through mucus droplets full of bacteria that are ejected from the respiratory tract into the air and are called droplet nuclei which can float in the air for a long time, giving the opportunity to be inhaled by other individuals so that more If there are many people living in a house, the risk of transmitting a disease is greater.

Based on statistical analysis using the Chi square test on residential density, it is known that the p-value = 0.006 and OR = 0.163, which means that residential density influences the incidence of tuberculosis and residential density that does not meet the requirements carries a 0.163 times risk of exposure to pulmonary tuberculosis. The density of residences that met the requirements was 35 (62.5)

respondents, and those that did not meet the requirements were 21 (37.5) respondents.

The results of the research above are in line with the research of (Paladan Clarita, et al. 2020) the results of bivariate analysis using the chi square statistical test obtained a p value = 0.002, meaning the p value < a (0.05), which means H0 is rejected, so there is a relationship between residential density and Tuberculosis Lung with an Odds Ratio (RO) value of 4.500 and a CI value = 1.793- 11.293 so it can be concluded that the residential density. So it can be concluded that residential density is a risk factor for pulmonary tuberculosis. Thus, the results of this study mean that respondents who live in houses with dense housing are at risk of developing pulmonary tuberculosis.

Residential density determines the incidence of disease and death, especially in Indonesia where there are still many infectious diseases, such as respiratory diseases and all diseases that spread through the air, for example tuberculosis, which are very easily transmitted (July Soemirat, 2000: 144 in Mareta Anggie 2013).

From the survey in the field, the average respondent's house has a house that is not too big so it is not possible for many extended family members to live in one house, each room is occupied by 3 to 4 people, namely husband and wife or their children. There are also 1 room occupied by their family. On average, they have quite a lot of relatives whose bedroom size does not meet the requirements, so it is very likely that pulmonary TB is influenced by the density of residents.

Windows function as a means of air exchange so they regulate humidity in the room. The air that comes from indoors contains dust and bacteria that must be removed and circulated with fresh air (Gannika, 2016).

The results of statistical analysis using the chi-square test on the window opening behavior variable showed that there was no significant influence on the incidence of tuberculosis where the p-value = 0.012 or p <0.05 with an OR value = 0.188, which means that the respondent's house did not open and close windows. 0.188 times risk of being exposed to tuberculosis than respondents who opened and closed the windows in their homes.

The results of this research are in line with research conducted by (Ratih and Wayan 2020). With the results of the chi square test and the obtained p value = 0.000, there is a relationship between behavior related to pulmonary TB and the incidence of pulmonary TB. Based on the results of interviews conducted from 10 questions about behavior, 5 questions were answered incorrectly by respondents. Respondents admitted that they did not practice opening the windows every day, drying the mattress every day, etc.

Transmission of pulmonary TB disease can be caused by behavior that is less than healthy, such as the habit of opening windows and closing windows. The Clean and Healthy Living Behavior Movement (PHBS) is the spearhead for building health in order to improve people's healthy living behavior. A person's clean and healthy living behavior is closely related to improving the health of individuals, families, communities and the environment.

From the field survey, the average respondent's house has a habit of not opening the windows in the morning so that less light enters the house. Of the 3 rooms measured (living room, family room and bedroom) the rooms were dark, sunlight entering was less than optimal and the lights were also dim. This makes TB transmission greater and TB germs can reproduce well. Every house should have adequate lighting by opening the windows every morning and closing them in the evening.

CONCLUSION

1. There is an influence between humidity and the incidence of pulmonary tuberculosis in the working area of the Somambawa Community Health Center, Somambawa District in 2022 with a value (p-value) = 0.001 and OR = 0.108
2. There is an influence between temperature and the incidence of pulmonary tuberculosis in the working area of the Somambawa Community Health Center, Somambawa District in 2022 with a value (p-value) = 0.044 and OR = 0.162
3. There is an influence between residential density and the incidence of pulmonary tuberculosis in the working area of the Somambawa Community Health Center, Somambawa District in 2022 with a p-value = 0.006 and OR = 0.163
4. There is an influence between the behavior of opening windows and the incidence of pulmonary tuberculosis in the working area of the Somambawa Community Health Center, Somambawa District in 2022, p-value=0.012 and OR=0.188

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