Analysis Of The Physical Environment Of Homes And Healthy Living Behavior On Tuberculosis Sufferer In The Working Area Of Singosari Health Center, Malang District

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ABSTRACT

The incidence of tuberculosis cases in Indonesia is 354 per 100,000 population. In Malang Regency, in the first 3 months of 2023, 618 people were infected with tuberculosis. In the Singosari Health Center work area in 2023, there were 60 people who tested positive for tuberculosis. Generally, transmission occurs indoors where sputum droplets are present for a long time. Ventilation can reduce the number of droplets, while direct sunlight can kill germs. Unmaintained healthy living behavior can increase disease transmission considering that tuberculosis is an infectious disease that is transmitted through droplets or air. The purpose of this study was to determine the relationship between the physical environment of the home and PHBS with the incidence of tuberculosis. The design of this study is case control, this type of study moves from the effect (disease) namely tuberculosis to the cause (exposure) namely the physical environment of the home and PHBS. The study population was divided into a case group (tuberculosis sufferers) and a control group (not tuberculosis sufferers). The sample size was calculated using the Lemeshow formula until a sample of 20 cases and 20 controls were obtained. The sampling method used is the simple random sampling method. The independent variables of this study are the physical environment of the house and PHBS while the dependent variable is the incidence of tuberculosis. The research instrument used a questionnaire, roll meter, lux meter and hygrometer. Data analysis used the chi-square test. The results of the statistical test at $\alpha = 0.05$ showed that the variables of the physical environment of the house that had a significant relationship with the incidence of tuberculosis were ventilation area ($p = 0.004$), lighting ($p = 0.002$) and humidity ($p = 0.003$). At $\alpha = 0.05$ the analysis test showed that there was a relationship between PHBS and the incidence of tuberculosis ($p = 0.001$). The physical environment of the house (ventilation area, lighting and humidity) and PHBS have been proven to have a relationship with the incidence of tuberculosis so that they need to be considered and applied in everyday life in order to reduce the risk factors for transmission. It is hoped that the community will pay attention to the construction of the house, if not possible, a healthy house can be attempted by implementing good and correct PHBS.developed until the intervention of the behavior of adolescent girls toward anemia prevention.

Keywords : Physical environment of the house, PHBS, Tuberculosis

INTRODUCTION

Case of Tuberculosis in Indonesia are estimated at 969,000 cases (one person every 33 seconds). This figure is up 17% from 2020, namely 824,000 cases. The incidence of Tuberculosis in Indonesia is 354 per 100,000 population, which means that for every 100,000 people in Indonesia, 354 people suffer from Tuberculosis. In 2022, the mortality rate will be 93 thousand per year or the equivalent of 11 deaths per hour (Ministry of Health, 2022). The incidence of Tuberculosis disease from the data above is due to the low level of compliance with taking medication, habits in the household and environmental influences, namely homes that do not meet health requirements. Apart from being dangerous for sufferers, an unprotected living environment can increase disease transmission considering that tuberculosis is an

infectious disease that is transmitted through droplets or air. Generally, transmission occurs indoors where phlegm splashes are present for a long time. Ventilation can reduce the amount of splashing, while direct sunlight can kill germs. Factors that allow a person to be exposed to tuberculosis germs are determined by the concentration of droplets in the air and the duration of breathing the air (Aji, 2022).

It is important to keep the home or residential environment clean and healthy and good household habits are needed. For this reason, it is necessary to find out about the relationship between the physical environment of the home in tuberculosis sufferers. Apart from the living environment, it is necessary to examine the habitual factors inherent in daily life, such as healthy living behavior for tuberculosis sufferers.

METHODS

This research uses quantitative methods. Consisting of independent variables (home physical environment and healthy living behavior) and dependent variables (tuberculosis incidence). The method used is the participatory observation method and questionnaires to respondents directly, using the Case Control approach method. The case population in this study was all tuberculosis sufferers from January 2023 to May 2024 who lived in the working area of the Singosari Health Center, Malang Regency, totaling 25 respondents. The control population is residents who live in the working area of the Singosari Health Center, Malang Regency with the criteria of not suffering from tuberculosis. The sample uses a simple random sampling method. From the Lemeshow formula, the number of samples studied was 20 case samples and 20 control samples with a ratio of 1:1. So the number of possible samples in this research is 40 samples. The data analysis used is univariate and bivariate analysis. The statistical test used is the chi-square test.

RESULTS

A. Analysis of Characteristic Variables

Table 1. Frequency distribution of respondents based on gender, age and place of residence.

Type of data	f	%
Sex Type		
male	20	50
female	20	50
Total	40	100.0
Age		
15-30 years	13	32.5
31-45 years	6	15.0
46-60 years	13	32.5
61-75 years	8	20.0
Total	40	100.0
Place of living		
Banjararum	7	17.5
Candirenggo	3	7.5
Dengkol	3	7.5
Gunungrejo	2	5.0
Klampok	3	7.5
Langlang	1	2.5
Losari	1	2.5
Pagentan	7	17.5
Purwosari	5	12.5
Tunjungtirto	3	7.5
Watugede	5	125
Total	40	100,0

Source: Primer Data, 2024

Based on table 1, it shows that the number of respondents who are male and female

has the same number of 20 people (50%). The majority of respondents were between the age groups 15-30 years and 46-60 years, namely 13 people each (32.5%). Most of the respondents live in the villages of Banjararum and Pagentan, namely 7 people each (17.5%).

Table 2. Frequency distribution of risk factors for ventilation, lighting, humidity and healthy living behavior in the Singosari Health Center Working Area, Malang Regency.

Type of data	f	%
Ventilation		
Not eligible	22	55
Eligible	18	45
Total	40	100,0
Lighting	19	47,5
Not Eligible		
Eligible	21	52, 5
Total	40	100,0
Humidity		
Not Eligible	26	65
Eligible	14	35
Total	40	100,0
PHBS		
Not Eligible	25	62,5
Eligible	15	37,5
Total	40	100,0

Source : Primer Data, 2024

Based on table 2, it shows that the number of ventilation areas that do not meet the requirements is 22 people (55%) and 18 people (45%) have ventilation areas that meet the requirements. The number of respondents with lighting that did not meet the requirements was 19 people (47.5%) and there were 21 people (52.5%) who had home lighting that met the requirements. The number of respondents with humidity that did not meet the requirements was 26 people (65%) and 14 people (35%) had house humidity that met the requirements. Of the 40 respondents, 25 people (62.5%) had PHBS that did not meet the requirements and 15 people (37.5%) had PHBS that met the requirements.

B. Bivariate Analysis

Table 3. The relationship between the physical environment of the house and PHBS with the incidence of tuberculosis in the work area of the Singosari Health Center, Malang Regency

Dependent Variable	Independent Variable						OR (95% CI)	P-value
	Case		Control		Total			
	F	%	F	%	F	%		
Ventilation								
Not eligible	16	40	6	15	22	55,0	9,333 (2,2-39,95)	0,004
Eligible	4	10	14	35	18	45,0		
Total	20	50	20	50	40	100,0		
Lighting								
Not Eligible	15	37,5	4	10	19	47,5	12 (2,7-53,33)	0,002
Eligible	5	12,5	16	40	21	52,5		
Total	20	50	20	50	40	100,0		
Humidity								
Not Eligible	16	40	6	15	22	55,0	9,333 (2,2-39,95)	0,004
Eligible	4	10	14	35	18	45,0		
Total	20	50	20	50	40	100,0		
Healthy Behavior								
Not Eligible	18	45	8	20	26	65,0	13,5 (2,42-74,87)	0,003
Eligible	2	5	12	30	14	35,0		
Total	20	50	20	50	40	100,0		

Source: Primer Data, 2024

Base on table 3, it can be seen that the ventilation area in the non-eligible category was 40%, there was an incidence of tuberculosis, while the ventilation area in the qualifying category was 10%, there was an incidence of tuberculosis. The chi-square test results showed that there was a significant relationship between ventilation area and the incidence of tuberculosis (p=0.004; OR=9.333; CI: 2.2 - 39.95). In the lighting variable in the category of not meeting the requirements, 37.5% were found to have tuberculosis incidents, while in lighting in the qualifying category, 12.5% were found to be in the case of tuberculosis. The results of the chi-square test showed that there was a significant relationship between lighting and the incidence of tuberculosis (p=0.002; OR=12; CI: 2.7 - 53.33). The same condition was also shown with the humidity variable, namely a relationship was found with the incidence of tuberculosis (p=0.003).

In the PHBS variable with the category of not meeting the requirements, 45% found the incidence of tuberculosis, while in PHBS with the category of meeting the requirements, 5% found the incidence of tuberculosis. The results of the chi-square test showed that there was a significant relationship between PHBS and the incidence of tuberculosis (p=0.001; OR=16.714; CI: 2.98 - 93.89).

DISCUSSION

A. The relationship between the physical environment of the house and the incidence of tuberculosis

Ventilation

The chi-suare test obtained a p-value of 0.004, meaning that at α = 5%, there is a significant relationship between ventilation area and the incidence of Tuberculosis in the working area of the Singosari Health Center, Malang Regency. From the results of the analysis, an OR value = 9.333 was obtained, meaning that respondents whose house ventilation area did not meet the requirements had 9.333 times the chance of experiencing an incident of Tuberculosis compared to respondents whose house ventilation area met the requirements.

A good and healthy house is a house that has sufficient ventilation (Dewi and Selviana, 2019). By maintaining fresh air in the house, it will maintain oxygen balance (Kaligis, Pinontoan and Joseph, 2019).

Lack of ventilation certainly results in a lack of oxygen circulation in the house, this makes the volume of carbon dioxide gas continue to increase. Carbon dioxide which is toxic can cause increased air humidity in a room, this is due to the process of evaporation from the skin and absorption, this air humidity will be a good medium for the development of disease-causing bacteria (Simbolon, Mutiara and Rahayu, 2019). The results of this study are in line with the research of Kaligis, Pinontoan and Joseph (2019) which stated that there was a relationship between ventilation and the incidence of pulmonary tuberculosis with a p-value of 0.000, research by Damayati, Susilawaty and Maqfirah (2018) also revealed that there was a relationship between ventilation and the incidence of pulmonary tuberculosis with a p-value 0.045 and research by Monintja, Warouw and Pinontoan (2020) that there is a relationship between ventilation and the incidence of pulmonary tuberculosis with a p-value of 0.001.

The theory above reveals the importance of ventilation in a building as a place for air circulation so that the indoor air is not humid and becomes a breeding medium for Mycobacterium tuberculosis. From the results of the analysis, information was obtained that the majority of the ventilation area in the houses of respondents who were cases or sufferers of tuberculosis did not comply with the requirements for a healthy house, namely less than 10% of the floor area of the house. Based on observations, this factor is caused by the ventilation area of the house being smaller than the standard ventilation that should be available for a particular floor size.

Tuberculosis is an infectious disease that can infect through air and phlegm splashes. A room where a Tuberculosis sufferer lives for a long time can expose the air to bacteria, this is where the role of air circulation becomes important. With ventilation, the air in the house can flow out which reduces the amount of splashes and sunlight entering through the ventilation can kill the bacteria that cause Tuberculosis. This is supported by research by Rahmawati, et al (2020) which states that ventilation conditions that do not meet health requirements cause reduced air exchange in the room which will result in disease-causing bacteria, especially tuberculosis bacteria, being able to multiply.

House ventilation functions to let sunlight into the house and maintain air flow so that the air in the house remains fresh (Mariana and Chairani, 2017). Based on the results of the analysis, there were 4 respondents whose house ventilation met the requirements but these respondents were still exposed to Tuberculosis. This is caused by house ventilation not functioning as it should. Even though the ventilation area of the house is more than 10% of the floor area, the ventilation or holes in the room cannot circulate air. Because the ventilation is closed and sometimes never opened at all. So the role of ventilation as a place for air exchange is not achieved.

Lighting

Based on bivariate analysis using the chi square test to determine the relationship between lighting variables and the incidence of tuberculosis, a p-value of 0.002 was obtained, meaning that at $\alpha = 5\%$, there is a significant relationship between lighting and the incidence of Tuberculosis in the working area of the Singosari Community Health Center, Malang Regency. From the results of the analysis, an OR=12 value was also obtained, meaning that respondents whose home lighting did not meet the requirements had a 12 times greater chance of experiencing Tuberculosis than respondents whose home lighting met the requirements with a 95% CI value (2.7-53.33).

The results of this analysis are supported by the results of Sahadewa's (2019) research that there is a significant relationship between residential lighting and the incidence of tuberculosis with (p-value 0.024), poor lighting has a 6.667 times greater risk of experiencing

pulmonary tuberculosis than respondents experiencing good levels of lighting. . The research results of Rahmawati, et al (2020) also found that there was a significant relationship between lighting and the incidence of pulmonary tuberculosis (p-value 0.000).

The lighting provisions needed to create a healthy environment are natural light that comes from sunlight entering directly through ventilation, doors and windows. The minimum lighting level in the house is 60 Lux (Permenkes N0 1077 of 2011). So it can be concluded that a healthy home environment must have lighting of more than 60 lux. So this means that home lighting below 60 lux does not meet the requirements and can be a risk factor for bacteria or germs to breed.

This is in accordance with research by Mardianti, et al (2020) which states that the high and low intensity of lighting entering the house will influence the development of mycobacterium tuberculosis germs. This germ is not resistant to sunlight. High light intensity (> 60 lux) entering the house can kill the development of mycobacterium tuberculosis germs, thereby reducing the risk of pulmonary tuberculosis. So lighting conditions play an important role in the occurrence of Tuberculosis, because with good lighting the transmission and proliferation of Mycobacterium tuberculosis can be prevented.

It can be seen from the distribution of lighting risk factors that 19 (47.5%) home lighting did not meet the requirements. Based on observations from several respondents' houses, it was found that the lighting in the house in cases did not meet the requirements where sunlight could not enter the house due to the close proximity of the house to other houses and the dense trees could also affect the entry of light. Sunlight has a role as a germicidal (germ or bacteria killer). In order to obtain lighting, especially natural light, every room must have light holes or ventilation that allow light to enter directly or indirectly (Rahmawati, et al, 2020). This is in line with research by Perdana and Yolan (2018) which stated that respondents with poor lighting (<60 lux) were at risk of contracting pulmonary tuberculosis 25.32 times (95% CI 4.06-143.1) compared to respondents with good lighting. good (>60 lux).

Based on the results of the analysis, there were 5 respondents, namely 12.5% of people who had home lighting that met the requirements, but these respondents were still exposed to Tuberculosis. After interviews with respondents, this was caused by another risk factor, namely physical contact with family members who had a history of Tuberculosis.

Humidity

The results of the statistical analysis show that the chi-square test value for the humidity variable in continuity correction with a p-value of 0.003 means that at α = 5%, there is a significant relationship between humidity and the incidence of Tuberculosis in the working area of the Singosari Health Center, Malang Regency. From the results of the analysis, an OR=13.5 value was also obtained, which means that respondents whose house humidity did not meet the requirements had a 13.5 times greater chance of experiencing Tuberculosis than respondents whose house humidity met the requirements with a 95% CI value (2.434-74.867).

The results of this analysis are supported by the research results of Rahmawati, et al (2020), where information was also obtained that there was a significant relationship between humidity and the incidence of Tuberculosis (p-value 0.000) in the Pekalongan Community Health Center working area. It can be seen from the distribution of humidity risk factors that 26 (65%) of the house humidity does not meet the requirements. Humidity does not meet the requirements if it is < 40% and > 60%, while it meets the requirements if it is ≥ 40% and ≤ 60% (Permenkes No. 1077 of 2011). Home air humidity is the average water content in the house. Humidity in the house will make it easier for microorganisms to breed. Increased air humidity is a good medium for bacteria including tuberculosis bacteria (Perdana and Yolan, 2018).

Based on observations, one of the causes that influences humidity is lack of sunlight. Air humidity that does not meet the requirements can cause the growth of microorganisms

which can harm human health. One of the factors that influences the lack of humidity in the respondent's house is the lack of vents or ventilation, as well as the lack of glass roof tiles (Rahmawati, et al, 2020). Inadequate humidity conditions can cause susceptible germs or bacteria to live better in rooms with high humidity levels. And often open the doors and windows in the morning, so that the air in the house can change.

If you pay attention to the detailed raw data regarding humidity risk factors, all humidity data that does not meet the requirements tends to exceed 60%. This means that it is very likely that this humidity is influenced by general regional environmental factors, for example weather, which is very closely related to humidity. Reporting from BMKG, the weather in Singosari District during the months of May and June 2024 tends to be cloudy and rainy with an average air humidity of 82% and an average temperature of 23□C. This has a big impact on the home environment because high rainfall risks helping bacteria and germs to reproduce, does not help break the chain of transmission and supports the emergence of several other diseases besides Tuberculosis. However, high humidity in the house can be reduced by diligently opening the ventilation so that air circulation is smooth and sunlight can enter the house.

Based on the results of the analysis, there were 2 respondents, namely 5% of people whose house humidity met the requirements, but these respondents were still exposed to Tuberculosis. It is very likely that this is caused by other physical environmental factors that do not meet the requirements, such as inadequate ventilation or lighting.

B. The relationship of healthy living behavior with the incidence of tuberculosis

The results of statistical analysis show that the chi-square test value for the healthy living behavior variable in continuity correction with a p-value of 0.001 means that at $\alpha=5\%$, it can be stated that there is a significant relationship between healthy living behavior and the incidence of Tuberculosis in the working area of the Singosari Community Health Center, Malang Regency. From the results of the analysis of the healthy living behavior variable, the OR value = 16.714 was also obtained, meaning that respondents whose healthy living behavior did not meet the requirements had a 16.7 times greater chance of experiencing Tuberculosis than respondents whose healthy living behavior met the requirements with a 95% CI value (2.976-93.885).

The research results are supported by research by Hidayati, Syarifatul (2022) which states that the results of statistical test analysis using chi square show p=0.001, it is known that ($p\leq0.05$) and OR: 8.143 (95% CI 2.294-28.901) which shows that healthy living behavior 8.143 times less likely to experience pulmonary tuberculosis. Healthy living behavior variable data collection was carried out by filling in a questionnaire. The questions presented in the questionnaire relate to habits of opening bedroom and living room windows, cleaning the yard, throwing feces into the latrine and throwing rubbish into the trash. The results of the analysis are in accordance with observations made during data collection at the respondent's house that the bedroom window could not be opened, the yard was not clean, in other words it was full of wet or dry food residue which made the environment unhealthy.

A person's habit of practicing PHBS can influence the incidence of Tuberculosis, because people who have good healthy living behavior can prevent the transmission of disease germs and are not easily infected by people who carry disease germs (Hanafi, et al, 2023). If you pay attention, the contents of the questionnaire are very closely related to habits in the home environment. The habit of opening bedroom and living room windows is closely related to sunlight and air exchange in the house. The high or low intensity of lighting entering the house will influence the development of mycobacterium tuberculosis germs (Mardianti, et al, 2020).

Based on the results of the analysis, there were 2 respondents, namely 5% of people who had healthy living behavior who met the requirements, but these respondents were still

exposed to Tuberculosis. It is very likely that this is caused by other physical environmental factors that do not meet the requirements, such as inadequate ventilation or lighting.

Good healthy living behavior includes not throwing saliva anywhere, covering your mouth when coughing and using a mask when in crowded places (Hanafi, et al, 2023). Observation results found that there were still several case respondents or respondents with Tuberculosis who did not wear masks, either when leaving the house or inside the house. Respondents did not wear masks even when interacting with family members. Some argued that the respondent's health condition was better than the previous day, so masks were not used. Even though he feels healthier, the respondent is still under treatment and has not been declared negative for tuberculosis on a sputum test. So we need to be reminded to always apply good healthy living behavior in order to stop transmission and prevent other people from contracting Tuberculosis.

CONCLUSION

The physical environment of the homes of tuberculosis sufferers in the working area of the Singosari Community Health Center is still not in accordance with the requirements. The majority of respondents in the study still had a ventilation area of less than 10%, house humidity of more than 60% and had lighting of less than 60 lux. This makes the house damp, lacks sunlight and the air cannot circulate.

Healthy Living Behavior for Tuberculosis Sufferers in the Singosari Community Health Center working area is still stated to be not good enough because there are still some people who rarely open the windows of their houses or even never at all. There are also those who rarely clean their yard and do not throw rubbish in the right place. And what is most at risk is that there are still those who do not wear masks when interacting with family members and when leaving the house.

There is a strong correlation between the physical environment of the house and the incidence of tuberculosis in the Singosari Community Health Center working area. In other words, there is a significant relationship between ventilation area, lighting and humidity with the incidence of tuberculosis in the working area of the Singosari Health Center, Malang Regency.

The relationship between healthy living behavior and the incidence of Tuberculosis is stated to have a strong correlation. In another sense, there is a significant relationship between Healthy Based Living Behavior and the incidence of tuberculosis in the Singosari Health Center Working Area, Malang Regency.

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