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Analysis of Pulmonary Tuberculosis based on Home Sanitation in Sembung Hamlet, Margopatut East Java

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ABSTRACT

Pulmonary Tuberculosis (TB) disease is a contagious disease. TB can spread quickly in environment with sanitation. The study aimed to analyze the effect of house sanitation toward pulmonary TB incidence in Sembung Hamlet, Margopatut Village, Sawahan District, Nganjuk Regency. The study is quantitative analytic research with a cross sectional approach. The study was conducted toward 212 respondents taken using simple random sampling. The results showed that there was an influence of house sanitation including house ventilation, type of floor, sky, the ceiling of the house, lighting, and residential density of houses toward pulmonary TB incidence in Sembung Hamlet, Margopatut Village, Sawahan District, Nganjuk Regency. People who have house with high density occupancy should rearrange the number occupants and can consider seeking other room with more spacious space. People need arrange the house or room so the room can get better air circulation and natural lighting to the house or room.

Keywords: pulmonary TB, sanitation, tuberculosis

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BACKGROUND

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis* which is characterized by the formation of granulomas and causing tissue necrosis (Gary, 2014). TB infection can affect various tissues and the lung tissue is most commonly affected. Pulmonary TB accounts for 80% of the total incidence of TB disease, while the remaining 20% is extrapulmonary TB. Pulmonary TB has been known almost all over the world, as a chronic disease that can seriously reduce the physical endurance (Christof, Nußbaumer-Streit and Gartlehner, 2020; Saber and Hossain, 2022).

This disease is actually a curable disease, but many patients stop treatment prematurely. Pulmonary TB patients misunderstand healing, patients think the disease has been cured because the symptoms of the disease have disappeared or are reduced. Pulmonary TB therapy needs to be carried out for at least six months (Sugito, 2013). By taking medication for 6-8 months regularly, it can be ensured that patients with pulmonary TB recover, so that patients do not lose work time and do not lose productivity (Makalew *et al.*, 2019; Sartiwi, Sandra and Asak, 2021).

The WHO report in 2020 states that in 2016, as much as 9,369,038 TB cases worldwide, the most TB patients were in Southeast Asia (34%), Africa (30%), Western Pacific (21%), Middle East (7%), Europe (5%), and America (3%). Southeast Asia carries more than a third of the global TB burden with 3.2 million new TB patients per year (Joob and Wiwanitkit, 2019; Christof, Nußbaumer-Streit and Gartlehner, 2020).

Pulmonary TB has a global impact; around 80% of reported TB cases occur in 22 countries in the world. Based on the report on the results of a survey conducted by WHO from 2008 to 2012, the use of Directly Observed Treatment Short Course (DOTS) and Stop TB strategies can reduce the burden of TB every year. The use of DOTS and the Stop TB strategy is a treatment with direct supervision of therapy by helping patients takes drugs regularly to ensure patient adherence in pulmonary TB treatment (Nababan and Jael, 2019; Irfani *et al.*, 2021).

Data from the Ministry of Health of the Republic of Indonesia in 2020 there were 197,000 new cases of pulmonary TB, namely 117,000 men and 80,000 women. The prevalence of tuberculosis per 100,000 population of East Java Province in 2020 is 106.42. The highest prevalence of tuberculosis was in Ngawi Regency, which was 358.91 per 100,000 populations and the lowest was in Surabaya Regency, namely 44.04 per 100,000 populations. The number of new cases of positive smear pulmonary TB in Nganjuk was found 1,101 people out of 1,181,678 people so that Nganjuk Regency was ranked in the top twenty highest in East Java Province (Wahyudi, Raufuddin and Suarilah, 2019; Sartiwi, Sandra and Asak, 2021).

More specifically, in one of the Puskesmas in Nganjuk Regency, namely the Sawahan Health Center, the number of pulmonary TB cases in 2020 was 97 patients. This number increased from the previous year which only amounted to 74 patients. Currently, there are 97 TB patients at the Sawahan Health Center in three categories. In Category 1, there are 82 patients; Category 2 has 12 patients while MDR TB has 3 patients. There are 34 TB patients who regularly take drugs and 63 patients who do not regularly. Therefore, it is very important for pulmonary TB patients to get motivation and support from their families so they can do the treatment until it is completely cured. Regular treatment for TB patients can be completely cured, if the patient adheres to the TB treatment rules (Zerdo *et al.*, 2014; Pranoto, Claramita and Pramantara, 2018).

People who live in densely populated and poorly ventilated conditions have a high chance of getting infected. Sources of transmission are tuberculosis patients when coughing or sneezing, patients spread germs through the air in the form of phlegm splashes or droplet nuclei (Kenedyanti and Sulistyorini, 2017). Home sanitation that does not meet health requirements such as humidity, temperature, and natural lighting that does not meet the requirements can be a good environment for the proliferation of respiratory tract disease bacteria, especially pulmonary tuberculosis (Aditama, Sitepu and Saputra, 2019; Joob and Wiwanitkit, 2019).

Physical sanitation of the house must be considered. The house must be equipped with a ventilation area of at least 10% of the floor area so that there is good air exchange in the house. The allowed temperature in a house is 18ºC - 30ºC with 40%-60% humidity. Humidity must be maintained optimally because humidity that is too high or too low can cause the growth of disease microorganisms to thrive. While the intensity of natural lighting in the house is at least 60 lux. In addition, the permissible level of PM2.5 in the house is a maximum of 35 g/m^3. PM2.5 levels that exceed the required limits can

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cause respiratory system disorders such as pneumonia, allergies, eye irritation, chronic bronchitis, and tuberculosis (Singh, Kashyap and Puri, 2018). The study aimed to analyze the effect of house sanitation toward pulmonary TB incidence in Sembung Hamlet, Margopatut Village, Sawahan District, Nganjuk Regency.

METHODS

The study is a quantitative analytical research with a cross sectional approach, which is a study to study the dynamics of the regression between risk factors and effects, by approaching, observing or collecting data all at once (point time approach), that is, each subject The study was only observed once and measurements were made on the status of the character or variable of the subject at the time of examination. This does not mean that all research subjects are observed at the same time. This study will analyze the effect of house sanitation on the incidence of pulmonary TB in Sembung Hamlet, Margopatut Village, Sawahan District, Nganjuk Regency with a population of 452 respondents and a sample of 212 respondents taken using the simple random sampling technique.

RESULTS

The study showed pulmonary TB incidence and home sanitation characteristic including ventilation, floor type, home ceiling, lighting, and house occupancy density.

Table 1. Cross-tabulation between home sanitation and the incidence of pulmonary TB

Home Sanitation	Pulmonary TB Incidence				n	%	Results Analysis
	No		Yes				
	n	%	n	%			
Ventilation							
Qualify	81	38,20	8	3.78	89	41.98	
Not Qualify	92	43.40	31	14.62	123	58.02	
Total	173	81.60	39	18,40	212	100	
Floor Type							
Qualify	83	39.15	10	4.72	93	43.87	
Not Qualify	90	42.45	29	13.68	119	56.13	
Total	173	81.60	39	18,40	212	100	
Home Ceiling							P value = 0.001
Qualify	72	33.96	9	4.25	81	38.21	Odds Ratio = 0.562
Not Qualify	101	47.64	30	14.15	131	61.79	Hosmer Test=0.658
Total	173	81.60	39	18,40	212	100	
Lighting							
Qualify	75	35.38	11	5.19	86	41.57	
Not Qualify	98	46.22	28	13.21	126	59.43	
Total	173	81.60	39	18,40	212	100	
House Occupancy Density							
Qualify	64	30,19	13	6.13	77	36.32	
Not Qualify	109	51.41	26	12.27	135	63.68	
Total	173	81.60	39	18,40	212	100	

Based on the results of the identification of the characteristics of the house sanitation owned by the respondents, it is known that most of the respondents have ventilation in the category of does not meet the requirements, totaling 123 respondents (58.02%). Most of the types of floors owned by respondents does not meet the requirements, totaling 119 respondents (56.13%). Most of the respondents' house ceilings does not meet the requirements, totaling 131 respondents (61.79%). Most of the lighting in the respondent's house does not meet the requirements, totaling 126 respondents (59.43%). Most of the housing conditions occupied by the respondents does not meet the requirements because they had a dense occupancy category, totaling 135 respondents (63.68%).

The total of all respondents that respondents who suffer from pulmonary TB are 39 respondents (18.40%) of which among those who have a house with ventilation conditions that does not meet the requirements are 31 respondents (14.62%), the type of floor that does not meet the requirements is 29 respondents. (13.68%), the ceilings of their houses does not meet the requirements, totaling 30 respondents (14.15%), and most of the houses occupied by respondents does not meet the requirements because they are in the densely populated category, totaling 26 respondents (12.26%).

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Based on the results of the Logistics Regression analysis, it showed that the p-value was 0.001 < 0.05, so H1 was accepted, so it was concluded that there was an effect of house sanitation on the incidence of pulmonary TB in Sembung Hamlet, Margopatut Village, Sawahan District, Nganjuk Regency.

Based on the results of the analysis of the Hosmer and Lemeshow Test, it shows that the value is 0.658 > 0.05, so H1 is accepted, so it can be concluded that there is a match between the independent variable and the dependent variable. In addition, the Odd Ratio value obtained is 0.562, which means that respondents with eligible sanitation categories will have TB incidence of 0.421 times compared to respondents who have unqualified sanitation.

DISCUSSION

Based on the results of the analysis of the Hosmer and Lemeshow Test, it shows that the value is 0.658 > 0.05, so H1 is accepted, so it can be concluded that there is a match between the independent variable and the dependent variable. In addition, the Odd Ratio value obtained is 0.562, which means that respondents with eligible sanitation categories will have TB incidence of 0.421 times compared to respondents who have unqualified sanitation.

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Transmission of pulmonary tuberculosis occurs because germs are coughed or sneezed out into droplet nuclei in the surrounding air. These infectious particles can remain in the air for 1-2 hours, depending on the presence or absence of ultraviolet light, poor ventilation, and humidity. In a humid and dark environment, germs can last for days to months. When these infectious particles are inhaled by a healthy person, they will stick to the respiratory tract or lung tissue. These particles can enter the alveolar if the size is less than 5 micrometers (Makalew *et al.*, 2019; Christof, Nußbaumer-Streit and Gartlehner, 2020).

The very dense environment and settlements in urban areas are likely to have facilitated the transmission process and played a major role in the increase in the number of TB cases. The process of infection by M. tuberculosis is usually by inhalation, so pulmonary TB is the most frequent clinical manifestation compared to other organs. Transmission of this disease is mostly through inhalation of bacilli containing droplet nuclei, especially those obtained from pulmonary TB patients with coughing up blood or phlegm containing acid-fast bacilli (Cardoso *et al.*, 2017; Nababan and Jael, 2019; Garry, Weraman and Ndoen, 2021).

Physical sanitation of the house must be considered. The house must be equipped with a ventilation area of at least 10% of the floor area so that there is good air exchange in the house. The allowed temperature in a house is 18ºC - 30ºC with 40%-60% humidity. Humidity must be maintained optimally because humidity that is too high or too low can cause the growth of disease microorganisms to thrive. While the intensity of natural lighting in the house is at least 60 lux. In addition, the permissible level of PM2.5 in the house is a maximum of 35 g/m3. PM2.5 levels that exceed the required limits can cause respiratory system disorders such as pneumonia, allergies, eye irritation, and chronic bronchitis (Pranoto, Claramita and Pramantara, 2018; Mariana *et al.*, 2020).

Good physical sanitation in a house can make the ecosystem of life more quality starting from health, comfort level and even feeling safe about something. Lack of physical sanitation can cause discomfort due to air conditions that feel not fresh and humid, making a person too often wear thick clothes or vice versa often take off clothes because the room temperature feels hot. The inconvenience of physical sanitation at home in the long term can lead to disruption of the health quality of the family (Zerdo *et al.*, 2014; Singh, Kashyap and Puri, 2018; Aditama, Sitepu and Saputra, 2019).

Lighting conditions are a significant risk factor, this can be seen from the research above, with insufficient lighting, the pulmonary TB germs in the environment do not die because sunlight is one of the factors that can kill pulmonary TB germs, so if the lighting is good then transmission and

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reproduction of germs can be prevented.

CONCLUSION

There is an effect of house sanitation including house ventilation, type of floor, sky, roof of the house, lighting, and residential density of houses on the incidence of pulmonary TB in Sembung Hamlet, Margopatut Village, Sawahan District, Nganjuk Regency People who have house with high density occupancy should rearrange the number occupants and can consider seeking other room with more spacious space. People need arrange the house or room so the room can get better air circulation and natural lighting to the house or room.

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