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The Relationship between Housing Condition and Pulmonary Tuberculosis Disease in Baraya Village Bontoala Makassar, Indonesia

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Abstract

Objective: This study aims to determine the relationship between the incidence of pulmonary tuberculosis with housing conditions consist of several factors, such as occupancy density, roomization, ventilation, temperature, humidity, and lighting.

Method: This study was observational with a cross-sectional approach. The population in this study was the patient's home with pulmonary TB disease in Baraya village, Bontoala sub-district, Makassar. The samples were selected by simple random sampling involved 65 houses. Data were analyzed using SPSS for Windows with the Chi-square test.

Result: This research found a significant relationship between pulmonary tuberculosis with occupant density ($p=0.000$), roomization ($p=0.000$), ventilation ($p=0.000$), temperature ($p=0.000$), and humidity ($p=0.001$). There is no relationship between lighting exposure ($p=0.757$) to the incidence of pulmonary tuberculosis.

Conclusion: The house condition primarily occupant density, roomization, ventilation, temperature, and humidity has strongly influenced the occurrence of Tuberculosis in the community, especially in Indonesia, even though lighting exposure statistically not significant.

Keywords: housing condition, tuberculosis, density, roomization, temperature.

Introduction

Tuberculosis is a transmitted disease caused by infection with *Mycobacterium tuberculosis*. Generally, after entering the body through the respiratory cavity, these bacteria will go to the lung. Not only in the lung, but these bacteria can also go to other organs, such as the kidneys, spleen, bones, and brain. Someone who is infected with Tuberculosis will cause various impacts on his life, both physically, mentally, and socially. Physically, someone who has been infected with pulmonary tuberculosis will often cough, shortness

of breath, chest pain, weight loss, decreased appetite, and sweating at night. All these things will certainly cause someone to become weak. Mentally, someone who has been infected with tuberculosis will generally feel a variety of fears in him, such as fear of death, long time treatment, side effects in doing the treatment, loss of work, the possibility of transmitting the disease to others, and fear of being rejected and discriminated against by people around them.¹

South Sulawesi health profile report 2015 recorded the most positive smear, pulmonary TB patients, in Makassar at 1,982 cases. The increase in the incidence of pulmonary tuberculosis in Makassar is related to the high population density. Population density causes more house had not met healthy housing standards.²

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At the Malimongan Baru Community Health Center in the city of Makassar based on data obtained in 2017, pulmonary tuberculosis still included the top ten diseases with a total of 224 cases. Malimongan Baru Health Center covered five villages area, namely the Wajo Baru, Baraya, Tompo Balang, Timungan Lampoa, and Malimongan Baru.³

Based on the initial observation in the Baraya village, Bontoala, there were 1,123 houses with densely populated conditions, dense environmental conditions for houses become factors causing diseases due to unhealthy environments. In the Baraya, there were 78 residents positive with pulmonary TB disease.

Method

This study was conducted in the Baraya village, the Bontoala sub-district, Makassar. The independent variables identified in this study were occupant density, roomization, ventilation, temperature, humidity, and lighting. The dependent variable in this research was the incidence of pulmonary TB disease in the Baraya village, the Bontoala sub-district, Makassar.

The population in this study was the patient's house with pulmonary TB disease located in the Baraya village,

totally was 78 houses. Research samples were taken randomly from the population, the number of samples as many as 65 houses.

4 Data collection was taken by a questionnaire developed by the researcher based on the literature. The questionnaire was consist of one question about density, five questions about roomization, one question about ventilation, one question about humidity, one question about lighting, and followed by home physical sanitation measurement for humidity, lighting, and temperature.

Processing and analysis of data in this study were performed by using the SPSS for Windows carried out in several stages. Correlation between variables analyzed by the Chi-square test and presented using tables and described in narrative form.

Results

The density of residents with pulmonary TB disease in the Baraya village, Bontoala sub-district, Makassar detailed, as shown in Table 1 presented below:

6 **Table 1. Relationship between Occupancy Density and the incidence of Tuberculosis in Baraya Village, Bontoala sub-district, Makassar in 2019**

Occupation density	Pulmonary TB				Total	%	Statistic
	TB Cases		Non-TB				
	n	%	n	%			
Fullfilled	11	44.0	14	56.0	25	100.0	p=0.000
Not fullfilled	39	97.5	1	2.5	40	100.0	

5 Roomization was related to the incidence of pulmonary TB cases in Baraya Village, the Bontoala sub-district, Makassar.

Table 2. Relationship between Roomization and the incidence of Tuberculosis in Baraya Village, Bontoala sub-district, Makassar in 2019

Roomization	Pulmonary TB				Total	%	Statistic
	TB Cases		Non-TB				
	n	%	n	%			
Qualified	12	44.4	15	55.6	27	100.0	p=0.000
Not qualified	38	100.0	0	100.0	38	100.0	

Ventilation was related to the incidence of pulmonary TB cases in Baraya village, Bontoala sub-district, Makassar

Table 3. Relationship between Ventilation and the incidence of Tuberculosis in Baraya Village, Bontoala sub-district, Makassar in 2019

Ventilation	Pulmonary TB				Total	%	Statistic
	TB Cases		Non-TB				
	n	%	n	%			
Adequate	15	51.7	14	48.3	29	100.0	p=0.000
Inadequate	35	97.2	1	2.8	36	100.0	

The temperature was related to the incidence of pulmonary TB cases in Baraya village, Bontoala sub-district, Makassar

Table 4. Relationship between Temperature and the incidence of Tuberculosis in Baraya village, Bontoala sub-district, Makassar Tahun 2019

Temperature	Pulmonary TB				Total	%	Statistic
	TB Cases		Non-TB				
	n	%	n	%			
Qualified	15	51.7	14	48.3	29	100.0	p=0.000
Not qualified	35	97.2	1	2.8	36	100.0	

Humidity was related to the incidence of pulmonary TB cases in Baraya village, Bontoala sub-district, Makassar

Table 5. Relationship between Humidity and the incidence of Tuberculosis in Baraya village, Bontoala sub-district, Makassar Tahun 2019

Humidity	Pulmonary TB				Total	%	Statistic
	TB Cases		Non-TB				
	n	%	n	%			
Qualified	22	61.1	14	38.9	36	100.0	p=0.001
Not qualified	28	96.6	1	3.4	29	100.0	

Lighting was related to the incidence of pulmonary TB cases in Baraya village, Bontoala sub-district, Makassar

Table 6. Relationship between Humidity and the incidence of Tuberculosis in Baraya village, Bontoala sub-district, Makassar Tahun 2019

Lighting	Pulmonary TB				Total	%	Statistic
	TB Cases		Non-TB				
	n	%	n	%			
Qualified	17	81.0	4	19.0	21	100.0	p=0.757
Not qualified	33	75.0	11	25.0	44	100.0	

Discussion

The relationship between occupancy density and the incidence of tuberculosis in this research showed significantly related. Statistic analysis with the chi-square test resulted in significant value ($p = 0.000 < \alpha = 0.005$), which meant H_0 was rejected, implied that there was a relationship between the occupant's density and the incidence of pulmonary tuberculosis in the Baraya village, Bontoala sub-district, Makassar. This result suggested that the occupant's density who met the requirements and TB Cases indicated as many as 11 houses (44.0%), and did not fulfill the criteria as much as 39 homes with TB Cases (78%).

The high density of occupants in a house affects the health status of occupants. Occupancy density can also affect the quality of air in the home, where the more number of occupants, the faster quality of air decreased in the house because of oxygen decreases. This poor quality of air could affect the development

of microorganisms if there is a carrier or person as a source of infection living in the house; it will easily be transmitted to others directly or indirectly.

In another study⁴ found that there was a significant relationship between room occupancy and the incidence of pulmonary tuberculosis ($p = 0.010$, $OR = 7.000$). According to government regulation,⁵ the total sleeping area should be at least $8m^2$ and not recommended occupying by more than two people. Buildings that are narrow and not suitable for the number of occupants will cause a lack of oxygen in the room and lately decrease the resilience of the inhabitants.

Roomization in this study has a significant correlation with the incidence of pulmonary tuberculosis in Baraya village, Bontoala sub-district, Makassar. Statistic analysis result using the Chi-square test found p-value ($0.000 < \alpha = 0.005$) confirmed that H_0 was rejected and H_a was accepted.

Based on the results, it was shown that qualified roomization with TB cases found in 12 cases while not qualified roomization with TB cases found in 38 houses. The condition of a house without roomization does not meet the requirements of the healthy house due to this will facilitate easily the transmission of disease in the home, especially respiratory infections and other diseases that spread through the air. The transmission facilitated by the absence of room wall that separates occupants from the air droplet and other residents, especially a family member suffering from the disease.

The results of this study support previously study⁶ that there was a relationship between roomization and the incidence of pulmonary tuberculosis. Another finding in the Malawei Village, Sorong also found that roomization ($p=0.029$) had a significant correlation with the occurrence of Pulmonary Tuberculosis.

In preventing the transmission of Tuberculosis, the house needs to be arranged for fulfilling a qualified room. The aim of this act to avoid infection contact between family members. Besides that, roomization also serves as a place of isolation to avoid direct contact or disease transmission from family members who suffer from illness to other family members, especially children under five who are still vulnerable to the disease.

This study found the relationship between ventilation with the incidence of pulmonary tuberculosis in the village of Baraya, Bontoala sub-district, Makassar. Analysis statistics using the Chi-square test found p -value ($p=0.000 < \alpha=0.005$),³ concluded that ventilation has a significant relation with the occurrence of pulmonary tuberculosis.

In this study, the proportion of TB cases related to adequate and Inadequate ventilation approximately 1: 2 cases. TB cases with adequate ventilation found 15 cases while 35 cases found in the house with inadequate ventilation.

Ventilation greatly determines adequate air quality in the house because adequate ventilation will allow the flowing circulation of air and the entry of sunlight that can kill bacteria. Ventilation inadequate of a healthy home is less than 10% of the floor area. The air quality in the house become worse due to a lack of fresh air supply from outside into the house. The expenditure of dirty air

out of the house is also not optimal.

In another study⁷ stated an association between home ventilation and the incidence of pulmonary TB. This study found risk being exposed to pulmonary TB 1.314 times in occupants living in a home with inadequate ventilation compared to adequate ventilation and met healthy ventilation requirements.

This condition certainly has the potential to increase the risk of pulmonary TB disease to others. Besides, home conditions do not meet the requirements, such ventilation less than 10% of the floor area, one of the consequences is the lack of sunlight entering the house so that microorganism like bacteria can multiply.

This study found a significant relationship between temperature and the incidence of pulmonary tuberculosis in Baraya village, the Bontoala sub-district, Makassar. From the results of the chi-square test results obtained ($p = 0.000 < \alpha = 0.005$), Based on the results show that the temperature met the requirements and be founded occupant suffer from Tuberculosis as many as 15 houses (51.7%), while in the house with temperature not qualified be founded 35 occupants suffer from tuberculosis (97.2%).

One of the conditions of indoor air is that the temperature and humidity requirements are fulfilled the requirements, so bacteria growth can occur and the number of germs in the air increases.

The results of this study are following the previous studies⁸ found that the temperature of the bedroom ($p=0.000$) with $OR=0.036$ has a significant relationship with the incidence of pulmonary tuberculosis. The research also found that the temperature of the bedroom based on multivariate analysis becomes a risk factor for pulmonary tuberculosis.

This is because the house is not getting enough sunlight and the air circulation is not flowing. So that the increase in indoor temperature causes the growth of bacteria that can cause disease. Besides, there is a lack of respondents' houses that have ceilings so that during the day it feels hot inside the house and vice versa if the night will feel cold. This can provoke an illness.

The relationship between humidity and the incidence of tuberculosis in this research showed significantly

related. Statistic analysis with the chi-square test resulted in significant value ($p = 0.001 < \alpha = 0.005$), it mean H_0 was rejected, implied that there was a relationship between humidity and the incidence of pulmonary tuberculosis in the Baraya village, Bontoala sub-district, Makassar. This result suggested that the humidity who met the requirements and TB Cases indicated as many as 22 houses (61.1%), and did not fulfill the criteria as much as 28 homes with TB Cases (96.6%).

High humidity can affect a person's immune system and increase the body's susceptibility to diseases, especially pulmonary tuberculosis. Moisture can also increase the survival of bacteria.

The results obtained are in line with the previously research⁹ found the relationship between home humidity and the risk of pulmonary tuberculosis (OR=1.3; 95%CI=1.1 to 1.5).

The natural humidity of the house was closely related to temperature and ventilation that does not meet health requirements. Humid air will interfere with the health of its inhabitants. The air humidity in the home is a good medium for the growth of bacteria that cause pulmonary tuberculosis.

Relationship of lighting with the incidence of pulmonary TB disease in the Baraya village, Bontoala sub-district, Makassar. From the results of the chi-square test results were obtained ($p = 0.757 > \alpha = 0.005$). Thus it can be concluded that there was no relationship between lighting and the incidence of pulmonary tuberculosis in the Baraya village, Bontoala sub-district, Makassar. This showed that other factors cause pulmonary tuberculosis. These factors could come from the home environment and behavior.

A healthy home requires sufficient light, not less, and not too much. Lack of light entering the house, especially sunlight, besides being uncomfortable, is also a medium or a place that is not good for life is also the development of seeds of disease. Conversely too much light in the house will cause glare that can damage our vision.

The results of another study also stated that people who live in homes whose lighting does not meet the requirements are at risk of developing pulmonary

tuberculosis based on statistical tests obtained ($p = 0.128 < \alpha = 0.005$).¹⁰

Many respondents suffered from tuberculosis because the room in the house received less sunlight in the morning. The respondent's habit not used to open the window in the early morning for lighting. This enables an appropriate environment for viruses and pathogenic bacteria to live and multiply.

Conclusion

Based on the results of research in the Baraya village, Bontoala sub-district, Makassar in 2019, found that there was a relationship between the density of occupants of the house, roomization, ventilation, air temperature, humidity and the incidence of pulmonary TB disease in the Baraya village, Makassar while no relation found between home lighting and the incidence of pulmonary TB disease in the Baraya village, Makassar.

More attention needed to ventilation, roomization, occupant density, temperature and humidity of the house for preventing tuberculosis occurrence by always keeping the house clean from dust, keep the windows of the house open in the appropriate time so that sunlight can go straight into the house and the air circulation in the house is well maintained. Preventive and promotive efforts in the context of controlling infectious diseases need to improve by the government of Indonesia.

Conflict of Interest: There was no conflict of interest regarding this study and publication.

Ethical Clearance: This study has been ethically approved and allowed by the Regional Investment and Coordination Board of South Sulawesi in Makassar.

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