Condition Environment Home Physical and Events Pulmonary Tuberculosis Case-Control Study in Rural Communit

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ABSTRACT

Background: Disease Pulmonary Tuberculosis is a problem for developing countries, including Indonesia, and is still becoming a global commitment in effort handling. Risk factors for tuberculosis transmission come from environmental and behavioral factors. Environmental factors include ventilation, housing density, temperature, lighting, and humidity. Research objectives This is to analyze the influence of the condition environment physique House with incident tuberculosis lungs in society.

Methods: Design study This is an observational study with an approach to *Case-control*. Population all over suffer from tuberculosis lungs (Cases), and respondents have No tuberculosis lungs (Control). The sample is a sample case of as many as 30, and the sample control is 30. Using total sampling (Cases) and purposive sampling techniques (Control), data was obtained through interviews, measurements, and documentation. Data were analyzed using the *Chi-square test*.

Results: Research result There is a connection between density housing (p=0.000, OR=8.000), lighting house (p=0.038, OR=3.000), temperature room house (p=0.004, OR=4.929), and humidity House with incident tuberculosis lung (p=0.035, OR=3.143). Density residence is the variable that has the most significant risk for the occurrence of tuberculosis Lung in rural communities with OR=8,000.

Conclusion: Society should increase efforts to prevent the transmission of tuberculosis lungs through repairing the sanitation environment physique home and applying behavior life clean Healthy. Officers' health should be increased by educating the Community and improving surveillance. Good to the number of events and factors the risk of pulmonary TB.

Keywords: Density Occupancy, Lighting, Temperature, Humidity, Events, Tuberculosis Lungs

BACKGROUND

Problem health that is still becoming attention are diseases, infectious consequence behavior, and an environment that is not healthy (Rarmaliza; Zakiyuddin, 2019.) One of the most frequent contagious problems is the disease tuberculosis lungs even until the moment This Still becomes global commitment in the solution. Every year there are 2 million people in the world's population are affected by tuberculosis infection, some in developing countries including Indonesia (Herawati et al., 2020). Estimate number of people diagnosed with tuberculosis in 2021 globally is as many as 10.6 million cases or an increase of around 600,000 cases from 2020, which is estimated at 10 million tuberculosis case(Minggarwati et al., 2023).

It is estimated that 95% of sufferers of tuberculosis are in developing countries, and 75% of sufferers of tuberculosis are residents 15-50 years old and are categorized into the group age productive (Probo Sasongko et al., 2020). In 2022, based on the TB cases in Indonesia, the TB cases will occupy order third in the world after India and China. Disease The most common tuberculosis in Indonesia is pulmonary TB. Estimates of TB

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cases have been reaching 842,000 cases and 93,000 deaths per year or equivalent, with 11 deaths per hour (Dewi Oktaviani et al., 2023). In Indonesia, tuberculosis is a problem in the primary health society. Five Provinces with pulmonary TB highest are West Java (0.7%), Papua (0.6%), Gorontalo (0.5%), Banten (0.4%), and West Papua (0.4%), while For area Bengkulu Province diagnosis of Pulmonary TB is around 0.2%(Reva Mardianti; Choirul Muslim; Nanik Setyowati, 2020).

West Java contributed to the First case of tuberculosis the most in January-August 2022; there were 75,296 reported cases, or 59% of the target until August, 60%, and the annual target of 90%. Tuberculosis cases lung in the Cirebon district in 2020 were as many as 3,403 cases. Incident case new tuberculosis Lungs Health Center Dukupuntang in 2020, as many as 9 cases, 2021 as many as 19 cases, and in 2022 as many as 65 cases. New cases are six months, final 2023 to June, and there are as many as 30 cases (Nuryanti & Agustina, 2024).

Incident Tuberculosis lungs: There is No balance between host, agent, and environment (Rizkaningsih; Mustafa, 2023). The condition of the environment influences the distribution of Mycobacterium tuberculosis, which spreads in the Community faster if the House is moist, has less light, and has ventilation air (Intan Noberta Sigalingging, 2019). *Mycobacterium tuberculosis* can live for 1-2 hours at home without enough light sun, poor ventilation, high humidity, and residence-overloaded house (Meliasari, 2021).

Risk factors disease tuberculosis lungs are related to the environment, agents, and hosts (Yuslita Eli Martin et al., 2022). Conditions Are one of the factors that risk transmission of tuberculosis lungs. Environmental factors of the House include density, floor house, ventilation, lighting, humidity, type floor, and wall types (Arni Zuraidah; Haidina Ali, 2020). Floors and walls that are difficult to house and clean up will cause an accumulation of dust, so that will make into a suitable media for germ proliferation.14 House is place duration contact and quality Exposure with sufferer tuberculosis lungs, contact closest same House will double more at risk transmission occurred (Mufti Azzahri Isnaeni & Rahmawati Lestari, 2021).

One of the factors that greatly influences the health level of the house's occupants is the condition of the environment (Lili Amaliah et al., 2022). There is a correlation between ventilation, lighting, humidity, housing density, floor type with the incidence of pulmonary tuberculosis (Sukmawati et al., 2023).

Reva Mardiyanti's research results et al. (2020) showed that intensity lighting does not fulfill the condition, causing 76.5% to suffer from pulmonary TB. Humidity air that does not meet conditions causes 82.4% to suffer from pulmonary TB, and overcrowding of residents that do not fulfill conditions causes 88.2% to suffer from pulmonary TB. There is a connection between intensity lighting, humidity, and density of residence House to the incidence of pulmonary TB (Reva Mardianti; Choirul Muslim; Nanik Setyowati, 2020).

Based on preliminary studies on June 7, 2023, against 10 affected houses with tuberculosis lungs, 70 % of the residences are crowded because there are > 2 people/8m^2. Still, many less house lighting in a way experience as much as 70% of houses Because Still $\leq$ 60 lux. The temperature inside the room House is ^{50} % above 18 ^{0} c or below 30 0 c normal limits. And humidity inside the room. Still, 30% of houses have humidity (40% and > 60% RH).

Based on the identification problem study, an objective survey will be conducted to analyze the influencing conditions of the environment and the incidence of tuberculosis Lung in rural communities. Research This needs to be done Because it can benefit theoretical development knowledge related to effort prevention and control disease Pulmonary Tuberculosis in the Community. Research Results This can be used as material evaluation and policy in planning strategies and intervention efforts to countermeasure disease Pulmonary Tuberculosis, which has become a global commitment to accelerate TB's elimination.

METHODS

Study Method and Population

Study This is an observational study with design *Case Control*. Study cases that are all over sufferers of tuberculosis lungs in 2023 include as many as 30 cases. Control in a survey that is Respondent No sufferer

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tuberculosis lungs in as many as 30 cases. The control chosen is worth it with a case based on the same characteristics. Taking a sample case uses a total sampling technique, and the method of taking sample control uses Matched Purposive *Sampling* with characteristics case based on age, occupation, income, and education.

Study Setting and instrument

The primary data collection methods are interviews, measurements, and observational data to see the environmental condition of the home. Method secondary data collection with review record medical Health Center regarding incident data tuberculosis lungs Year 2023. Measuring tools used: Rollmeter For measuring vast building House For know density residence, Thermohygrometer to gauge temperature at a room home, Hygrometer for measuring humidity in the room home, and Luxmeter for measuring level lighting room House.

Data Analysis and Research Time

Data analysis was conducted through the Chi-Square statistical test. Research time conducted in August 2023.

Ethical Considerations

Research This has done permission ethics, with number permission ethics 54/B/STIKes Crb /III/2023, provided by the Research Institute Development and Service to the Cirebon Health Sciences College Community.

RESULT

Table 1. Distribution Case and Control Frequency Based on Density Housing, Lighting, Temperature Rooms, and House Humidity

Variables	Group				Amount	
	Case		Control			
	n	%	n	%	n	%
Density Residence						
Does not meet the Condition	20	66.7	6	20.0	26	43.3
Fulfill Condition	10	33.3	24	80.0	34	56.7
Lighting						
Does not meet the Condition	20	66.7	12	40.0	32	53.3
Fulfill Condition	10	33.3	18	60.0	28	46.7
Temperature						
Does not meet the Condition	23	76.7	12	40.0	35	58.3
Fulfill Condition	7	23.3	28	60.0	25	41.7
Humidity						
Does not meet the Condition	22	73.3	14	46.7	36	60.0

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Fulfill Condition	8	26.7	16	53.3	24	40.0
Amount	30	100	30	100	60	100

Table 1 shows that the group with the most cases , namely 20 respondents (66.7%), have density housing that is not fulfilled. In most cases, 20 respondents (66.7%) have to light a house that does not fulfill terms. In most cases, 23 respondents (76.7%) have a temperature room in a home that is not fulfilled. In groups, most cases, namely 22 respondents (73.3%), have humidity in a house that is not in good condition.

Table 2. Relationship between Density Residence, Lighting, Temperature Rooms, and House Humidity With incident Pulmonary Tuberculosis

Variables	**Pulmonary Tuberculosis**				**Amount**		**P**	**OR**	**95% CI**	
	Case		**Control**						**Lower Limit**	**Upper Limit**
	n	**%**	**n**	**%**	**n**	**%**				
Density Residence							0.000	8,000	2.475	25,860
Does not meet the Condition	20	66.7	6	20.0	26	43.3				
Fulfill Condition	10	33.3	24	80.0	34	56.7				
Lighting							0.038	3,000	1,046	8,603
Does not meet the Condition	20	66.7	12	40.0	32	53.3				
Fulfill Condition	10	33.3	18	60.0	28	46.7				
Temperature							0.004	4.929	1,612	15,071
Does not meet the Condition	23	76.7	12	40.0	35	58.3				
Fulfill Condition	7	23.3	18	60.0	25	41.7				
Humidity							0.035	3.143	1,066	9.267
Does not meet the Condition	22	73.3	14	46.7	36	60.0				
Fulfill Condition	8	26.7	16	53.3	24	40.0				
Amount	30	100	30	100	60	100				

Table 2. It is obtained that respondents with density housing that does not fulfill condition part big in group case that is as many as 20 respondents (66.7%), and respondents who have density residence part big in group

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control fulfill condition as many as 24 respondents (80.0%). Obtained mark *p-value* 0.000, value *Odds Ratio (OR)* 8,000 then respondents with density residence no fulfill condition at risk bigger 8 times will experience tuberculosis lungs compared to respondents with density residence fulfill requirements. Respondents who have lighting a house that does not fulfill condition part big in group case are as many as 20 respondents (66.7%), and respondents who have lighting House part big in group control fulfill condition as many as 18 respondents (60.0%). A *p-value of* 0.038 was obtained *OR* 3,000, and respondents with a lighting house, no fulfillment condition, are at risk. A person who is 3 times bigger will experience tuberculosis in the lungs.

Respondents with a temperature room in a house that does not fulfill condition part big in group case are as many as 23 respondents (76.7%), and respondents who have a temperature room House in House part big in group control fulfill condition as many as 18 respondents (60.0%). *A p-value* of 0.004 was obtained *OR* 4.929, then respondents with a temperature room House no fulfill condition at risk more 4 times more considerable will experience tuberculosis lungs. Respondents with the humidity in a house that does not fulfill condition part big in group case are as many as 22 respondents (73.3%), and respondents who have part big in group control humidity House fulfill condition as many as 16 respondents (53.3%). The *p-value is* 0.035, so the OR is 3.143. Respondents with humidity House no fulfill condition at risk more 3 times more considerable will experience tuberculosis lungs.

DISCUSSION

Density Residence with Incident Pulmonary Tuberculosis

Research results found There is a connection between density residents with incident tuberculosis lungs (*p-value* 0.02), in line with the study by Oktavia et al. (2016), which showed the existence of a connection between density residents with incident tuberculosis lungs (*p-value* 0.023) (Oktavia et al., 2016) and the results of research by Zahid (2021) shows existence connection between density residence with incident tuberculosis lungs (Wilayah et al., 2021).

Research results This obtained OR 8,000, than respondents who have density residence House No fulfill condition at risk more big 8 times will experience tuberculosis lungs compared to with respondents who have density residence House fulfill conditions, in line with research by Puji Eka Mathofani et al. (2019), with results (OR 4.364) than respondents who are dense residence No fulfill condition tend to own greater risk 4 times bigger will experience pulmonary tuberculosis (Mathofani et al., 2020).

Based on the results, the study obtained a big part of the case of own-density residence. There were no fulfilled conditions, which is as many as 20 respondents (66.7%). Density residence is a factor that risks the occurrence of tuberculosis lungs. Density residence is a comparison between a wide House and a Resident home. If a wide house is not comparable with the home's residents, it will cause *overload*. The more congested the occupants inside the House will impact various health problems, including tuberculosis disease (Nur'aini; Suhartono; Mursid Raharjo, 2018).

The more congested the number of residents, the faster the transmission of TB. Because tuberculosis lungs can be transmitted via air media, the germs are very infectious if the House is a congested inhabitant. The area of the House is not comparable with the number of inhabitants, and it is overcrowded. This is not healthy Because of the lack of oxygen consumption. If one of the member's family suffers from tuberculosis lungs, then it will quickly infect the member's other family (Gulo et al., 2021).

Based on field observations , significant respondents who have density residence No fulfill conditions, things the show that wide House Respondent No comparable with the amount the inhabitants so that need oxygen No sufficient so can trigger the occurrence tuberculosis lungs, and some big One House inhabited by more from One head family.

Home Lighting with Incident Pulmonary Tuberculosis

Research results found There is a connection between lighting House with incident tuberculosis lungs (*p-value*

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0.038), in line with the study by Ahmad et al. (2021), which showed the existence of a connection between lighting House with incident tuberculosis lungs (p-value 0.002) (Ahmad Zakiudin, 2021) and Alfi research et al. (2022), showed existence connection between lighting House with incident tuberculosis lungs (*p-value* 0.038) (Nurjannah et al., 2022).

Research results obtained, OR 3,000 showed that respondents who have lighting House No fulfill condition at risk more 3 times more will experience tuberculosis lungs compared to respondents who have lighting House fulfill conditions, in line with research by Candra Raditya (2020) with (OR 3.455), so respondents who have to light his House No fulfill condition tend to own greater risk 3 times bigger will experience pulmonary tuberculosis (Marsyah et al., 2023).

Based on the results, the study obtained part big on the case of lighting a house that does not fulfill the condition of as many as 20 respondents (66.7%), then lighting the House's connection with incident tuberculosis lungs. Lighting houses have a critical role in the existence of *mycobacterium tuberculosis*. Minimum light entering in House of 60 lux. Measurement lighting The House originates from the light experience in the form of sun rays coming into the windows, ventilation, and doors (Intan Noberta Sigalingging, 2019).

Respondents with wide ventilation fulfil condition but No open window in the morning until Afternoon day, so that lack of exchange air can make mycobacterium tuberculosis endure life in room (Sahadewa et al., 2019).

In the research, this lighting has its own connection with incident tuberculosis lungs. Based on observation, the researcher lacks lighting in the House Respondent because of The lack of hole wind ventilation and roof tile glass. Condition lighting that does not fulfill the condition can cause darkness and become a suitable medium for growth germs, increasing the number of bacteria and risking the transmission of tuberculosis lungs.

Temperature House Room with Incident Pulmonary Tuberculosis

Research results found the existence of a significant relationship between temperature room House and incident tuberculosis lungs (*p-value* 0.004), in line with the study The Fajar et al. (2024), stated the existence of a connection between temperature room House with incident tuberculosis lungs (p-value 0.001) (Fajar Wijayanti; Septia Dwi Cahyani, 2024) and the results Ni Komang's research, which states existence significant relationship between temperature room House with incident tuberculosis lungs (p-value 0.066) (Ni Komang ayu tria meriyanti; I Wayan Sudiadnyana, 2018).

Research results This obtained OR 4.929, than respondents who have temperature room House No fulfill condition at risk more 5 times more significant will experience tuberculosis lungs compared to with respondents who have temperature room a house that fulfills conditions, in line with research by Nur'aini et al. (2020), with the result (OR 3.455) than respondents who have temperature room House No fulfill condition at risk more 3 times more significant will experience pulmonary tuberculosis (Raditya et al., n.d.).

Based on the results, the study obtained part big on the case of temperature room a house that does not fulfill the condition of as many as 23 respondents (76.7%), so the temperature room House is a factor risk the occurrence of tuberculosis Lungs. Requirements temperature in the House is 18°C - 30 ° C. Suboptimal temperatures can cause humidity to be not optimal, which can cause the growth of microorganisms such as viruses and bacteria *mycobacterium tuberculosis* in the room to get faster (Ferly Oktriyedi; Ari Fauta; Agustin, 2021).

Temperature room House has a role in transmitting tuberculosis in the lungs. The temperature room in a house that does not fulfill health will increase the loss of a hot body. Loss of a hot body This will lower the body's vitality and is a predisposition for caught infection, especially infection channel breath by infectious disease agents (Salsa Sabila et al., 2024).

Research results This temperature room house relates to incident tuberculosis lungs. Based on field observations, part of the significant temperature is that the house respondent did Not fulfill conditions because it was supported by level-wide ventilation, humidity, and lighting that did not meet conditions. The

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temperature in an abnormal house has a role in the reproduction process of bacteria that can trigger the occurrence of tuberculosis lungs.

Home Humidity with Incident Pulmonary Tuberculosis

Research result This found There is a connection between humidity House and incident tuberculosis lungs (p-value 0.035), in line with the study by Nonok et al. (2024) that states the existence of a connection between humidity House with incident tuberculosis lungs (p-value 0.007)(Karlina et al., 2024) and the results study Ni Komang et al. (2019), indicated existence connection between humidity House with incident tuberculosis lungs (p-value 0.013) (Ni Komang ayu tria meriyanti; I Wayan Sudiadnyana, 2018).

Research results This obtained OR 3.143, than respondents who have humidity House No fulfill condition at risk more 3 times more significant will experience tuberculosis lungs compared to with respondents who have humidity fulfill conditions, in line with research by Dwi et al. (2020) with results (OR 5,211), than respondents who have humidity House No fulfill condition at risk more 5 times more significant will experience tuberculosis lungs (Dwi Santy Damayanti; Andi Susilawaty; Maqfirah, 2018).

Based on the study results, this obtained part is significant in the case of humidity, which does not fulfill the condition of as many as 22 respondents (73.3%). Humidity is a factor that risks the occurrence of tuberculosis lungs. Condition humidity air in house minimum 40% – 60% and temperature ideal room between 18°C – 30°C (Adinda mega putri; Imam Thohari; Ernita Sari, 2022). Humidity House respondents in cases that do not fulfill condition due to 70% humidity window in condition closed, then ray sun No can enter into the room so that as a medium for development pulmonary tuberculosis germs (Falah et al., 2023).

Increasing direct counseling as an effort to prevent environmentally based diseases, especially regarding the physical condition of the house that meets the requirements for preventing tuberculosis (Sukmawati et al., 2023). The importance of counseling on the causes of pulmonary TB, how to prevent it, how to treat it, and a healthy home environment (Aditama et al., 2019).

Research results obtained that humidity in the House has a connection with incident tuberculosis lungs. Based on observation researcher during research, one factor affecting humidity in the House Respondent is Still lack of hole wind or ventilation and insufficient roof tile glass. Condition humidity that is not fulfilled can cause bacteria to live longer inside a level room. Its humidity is high, so more efficiently, it can cause the disease of tuberculosis lungs.

CONCLUSION AND RECOMMENDATIONS

Density housing in groups case part significant No fulfill condition as many as 20 (66.7%), lighting House in group case part significant No fulfill condition as many as 20 (66.7%), temperature room house in group case part significant No fulfill condition as many as 23 (76.7%), and humidity house in group case part significant No fulfill condition as many as 22 (73.3%). There is a relationship between density housing (p=0.000, OR=8.000), lighting house (p=0.038, OR=3.000), temperature room house (p=0.004, OR=4.929), and humidity House with incident tuberculosis lung (p=0.035, OR=3.143). Density residence is the variable that has the most significant risk for the occurrence of tuberculosis Lung in rural communities with OR=8,000.

The Community should increase efforts to prevent the transmission of tuberculosis lungs by repairing the sanitation environment. The House method applies density housing that meets the condition that the room Sleep measures 8m² and is not inhabited by more than 2 people, maximizing entry lighting sun to in-room House with method open window House every day, addition hole ventilation House or roof tile glass For reduce level humidity a tall house, and apply behavior life clean Healthy. Officer health should increase promotional efforts with education to the Community and improve surveillance. Good to the number of events and factors the risk of pulmonary TB.

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Conflicts of Interest

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