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A Case Control Study: Physiological Aspect of Housing in the Relationship with Incidence of Tuberculosis in Tulungagung District East Java

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ABSTRACT

About one-third of the world's population has been infected by *Mycobacterium tuberculosis*. Indonesia is the third largest TB cases in the world. Tuberculosis Eradication Program has been implemented with a DOTS strategy but TB cases in Indonesia are still high. Many factors caused high rates of TB incidence in Indonesia but most of them can be modified. Physiological aspect of housing is one of them which can be modified. This study objective is to analyze the relationship between physiological factors of housing with the incidence of pulmonary TB in Tulungagung District in 2016. This study is a case control that located in 2 health centers. Observation was carried out in February. Samples were selected by consecutive sampling with inclusion criteria: male (>18 years old) and if there are ≥2 male head of family in a house, researcher choose one randomly. Sample size were 64 participants which consist of 32 participants of case group and 32 participants of control group. Data was analyzed by chi square test. Results showed that there were significant correlation between dwelling density (OR=1.9; 95%CI: 1.2-3.0; p=0.00), lighting (OR=9.5; 95%CI: 3.0-30.4; p=0.00) and ventilation (OR=7.7; 95%CI: 2.5 - 23.2; p=0.00) with tuberculosis incidence. It is recommended to improve quality of environment needs to be measured.

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I. INTRODUCTION

About one-third of the world's population has been infected by *Mycobacterium tuberculosis*. This is due to the incidence of Tuberculosis (TB) reported to increase dramatically in the last decade worldwide as well as in Indonesia. A previous survey conducted in 1995 estimated 9 million new TB patients with 3 million deaths from TB worldwide. The disease is common in developing countries (95%) or those with lower middle-class socioeconomic status (1).

Tuberculosis (TB) is an infectious disease of death (mortality) in the order of the incidence of disease (morbidity) with a long diagnosis and therapy. World TB report by WHO in 2006 put Indonesia as the third largest TB contributor in the world after India and China with new cases of about 539,000 and deaths around 101,000 per year. The number of TB patients from year to year in Indonesia continues to increase. At present every minute there is one new TB patient, and every two minutes one new infectious tuberculosis emerges. Even every four minutes one person dies from TB in Indonesia (2).

Since 1995 the Tuberculosis Eradication Program has been implemented with a DOTS strategy (directly observed treatment short course chemotherapy) recommended by WHO. Countermeasures with the DOTS strategy are considered to provide a high cure rate. However, data on TB Prevention and Control programs in Indonesia shows that the number of new TB case findings has not met the target. In addition, because long treatment periods cause many irregular patients to undergo treatment. This leads to the immunity of TB germs against widespread or multi drug drug resistance (MDR) (1).

Many factors cause high rates of TB incidence in Indonesia, including the physiological factors of housing, which consists of lighting, ventilation, and occupancy density. This study aims to analyze the relationship between physiological factors of housing with the incidence of pulmonary TB in Tulungagung District in 2016. This research had been through proposal seminar stages which was held by Institute of Research and Community Service of STIKes Hutama Abdi Husada Tulungagung. In addition, this research has obtained Ethical Clearance from Institutional Ethics Commission (LPPM STIKes Hutama Abdi Husada Tulungagung). The Research Ethics from this research consists of Informed Consent, Anonymity and Confidentiality.

II. METHOD

This study is a case control. The case-control study is an observational analytic epidemiological study that examines the association between certain health effects (illnesses or health conditions) with certain risk factors (3). The locations were in 2 health centers of Tulungagung District that is Sembung and Majan. Observation was carried out in February, 2016. Population are the head of family who owns house in Sembung and Majan, Tulungagung. Samples were selected by consecutive sampling method with inclusion criteria such as: male (>18 years old) and if there are 2 or more male head of family, researcher choose one randomly. Sample size were 64 participants which consist of 32 participants of case group and 32 participants of control group.

III. RESULTS AND DISCUSSION

In this research, univariate analysis had been done to distribution frequency and percentage of each variable based on case and control group. It was showed in table 1.

Table 1. Characteristics of Study Participants

Characteristics	Case (N=32) n (%)	Control (N=32) n (%)
Age (years)		
18 – 30	15 (46.9)	14 (43.8)
> 30	17 (53.1)	18 (56.2)
Education		
Primary	20 (62.5)	22 (68.8)
Secondary	12 (37.5)	10 (31.2)
Working status		
Working	25 (78.1)	14 (43.8)
Not working	7 (21.9)	18 (56.2)

From the table 1, it can be concluded that in case and control group, most respondents are aged more than 30 years with basic education level. Majority respondents in case group were workers and in control group, respondents who worked and did not work was almost comparable.

To find out whether the independent variable related to the dependent variable, then bivariate analysis using Chi-Square statistical test with the following results:

Table 2. Association of Tuberclose Risk Factors

Risk Factors	Case (N=32)		Control (N=32)		OR (95% CI)	p value
	n	%	n	%		
Density						
Not Eligible	25	78.1	13	40.6	1.9 (1.2 -3.0)	0.000*
Eligible	7	21.9	19	59.4	1	
Lighting						
Not Eligible	22	68.8	6	18.6	9.5 (3.0-30.4)	0.000*
Eligible	10	31.2	26	81.4	1	
Ventilation						
Not Eligible	24	75.0	19	28.1	7.7 (2.5 – 23.2)	0.000*
Eligible	8	25.0	23	71.9	1	

* statistical significant, p value <0.05

The result of bivariate analysis between house density and incidence of pulmonary tuberculosis showed that there were 25 respondents (78,1%) occupancy rate which did not fulfill requirement and the rest 13 respondents (40,6%) in control, while for occupancy rate fulfilled requirement counted 7 respondents (21.9%) were in the case, and 19 respondents (59.4%) in the control. The result of chi-square statistic test obtained RR = 5,220 then biologically it can be concluded that the respondent whose home occupancy rate did not fulfill the requirement had risk factor 5,220 times to experience the incidence of tuberculosis of lung compared with the respondent with the occupancy rate of the house qualified and p-value = 0.005 it can be concluded that there is a statistically significant relationship between the density of the house with the incidence of pulmonary tuberculosis. While the result of the analysis of lighting variables obtained OR = 9,533 (2,987-30,426), meaning that respondents who lighting in the house does not meet the requirements will have a chance 9,533 times to experience the incidence of pulmonary tuberculosis compared with respondents who lighting in eligible housing.

Density of occupants is a process of disease transmission. The more dense the transfer of disease, especially infectious diseases through the air will be easier and faster, let alone there are family members who suffer from pul TB with AFB (+). Tuberculosis lungs are quite resistant to antiseptics but will rapidly become inactive by sunlight, ultraviolet light that can damage or weaken the vital function of the organism and then shut down. The density of the dwelling place in the most pulmonary TB patients is low density. Temperature in the room is closely related to dwelling density and house ventilation (4). Several studies have been conducted that confirm that occupancy density may be one of the factors causing (pulmonary TB) risk factors such as a study conducted by Daryatno (5) in Semarang stating that occupancy density is related to pulmonary TB incidence. Ratnasari (6) also stated that one of the factors influencing pulmonary tuberculosis is the level of illumination (OR 2,7 with 95% CI: 1,18-5,99)

Results of analysis between ventilation and pulmonary tuberculosis show that there were as many as 24 (75.0%) respondents with unsuitable home ventilation in the case, while in control there were 9 (28.1%) respondents, eligible home ventilation conditions in the case were as many as 8 (28.0%) and 23 (71.9%) in controls. The result of chi-square statistic test shows that p-value 0,000 can be concluded that there is a significant relationship between home ventilation and pulmonary tuberculosis occurrence, the OR value of the analysis is 7.667 (2,524 - 23,284), this indicates that respondents with unqualified home ventilation will have a chance of 7,667 times to experience the incidence of pulmonary tuberculosis compared with respondents with home ventilation meets. Interval estimates can be concluded that 95% of OR values in the population lie between 2,524 - 23,284.

The research conducted by Sugiyarti (7) about the correlation between house condition and health practice characteristics with the incidence of pulmonary TB in the work area of Gemuh I Public Health Center Gemuh District Kendal District found that ventilation area was associated with pulmonary TB incidence with OR of 3.125. Furthermore, Sugiarto (2003) stated that the area of ventilation is associated with pulmonary TB incidence (p value = 0.004 and OR = 2.5) and Sumini

(2005) which states that ventilation area is associated with pulmonary incidence (p value = 0.046 and OR = 2.1).

This is understandable because ventilation has various functions such as freeing the house from pathogenic bacteria, especially germs tuberculosis. The Tb gum that is transmitted through droplet nuclei can float in the air because it has a very small size (50 microns). Ventilation is not cool because it can block the sunlight into the room, whereas bacteria Tb can only be killed by direct sunlight (8).

Adnani and Mahastuti (9) who studied pulmonary tuberculosis in Paseh sub-district showed that individuals who had poor ventilation chose the risk of pulmonary TB by 3.69 of those who had eligible ventilation. Furthermore, a study conducted by Rusnoto et al (10) on factors related to pulmonary TB incidence at Balai Prevention and Treatment of Lung Disease found wide ventilation associated with pulmonary TB incidence where the OR value was 29.99 with 95% CI: 3,39-265,50

IV. CONCLUSION

1. It is known that the largest frequency is, the occupancy rate of the house does not fulfill the requirement of 78.1%, the house ventilation does not fulfill the requirement of 75%, the in house lighting is not qualified 68.8%, and the respondent's knowledge about the disease of the pulmonary tuberculosis is not good 56.3%
2. Based on the result of Bivariate Analysis, it is known that there is a significant correlation between physiological factors of housing consisting of dwelling density, lighting and ventilation with risk of positive smear pulmonary tuberculosis incidence in Tulungagung Regency
3. It is recommended to be monitored for evaluation by authorized officers in this regard to determine whether an effective prevention or intervention effort can be effective. Monitoring is done by measuring environmental quality. The quality of the environment needs to be measured to see if the prevailing standards need to be improved.

V. ACKNOWLEDGMENT

Thanks to Dinas Kesehatan Kabupaten Tulungagung,. According to this research, it is recommended for Dinas Kesehatan and also health centers to give explanation and guidance about preventive, promotive, curative or rehabilitative efforts, in accordance with the efforts of national tuberculosis control with DOTS strategy (Directly Observed Treatment Shortcourse Chemo Therapy).

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