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The Factors That Affect the Occurrence of Pulmonary Tuberculosis (TB) Disease in the Health Center Serang City, Indonesia on 2021

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ABSTRACT

Background/Aim: Currently, tuberculosis is still a health problem in Serang sub-district, Serang city. Pulmonary TB disease is influenced by several factors. Factors related to pulmonary TB include age, gender, income, nutritional status, education, and BCG immunization status. This study aims to find out the factors that affect the occurrence of pulmonary tuberculosis (TB) disease in the Health Center of Serang City on 2021 including age, gender, income, education, nutritional status, and BCG immunization status
Method: This study used a case-control study design. The study sample was all lung TB sufferers who sought treatment at five health centers in Serang sub-district, Serang city that were registered on medical records until September 2021 and as a control were healthy people at the place where the study was conducted. Data collection using questionnaires. Data analysis is done with univariate analysis (frequency distribution), bivariate analysis with Chi Square test, and multivariate analysis with logistic regression test.
Results: The total samples in this study were 240 people with variables risk factor pulmonary TB incidence were income < IDR 3.8 million/month (OR= 7.6), Age 15-65 years old (OR= 4.4), and BCG immunization status No (OR= 3.3).
Conclusions: the factors that affect the incidence of pulmonary TB in the Health Center in Serang sub-district, Serang city, are income < IDR 3.8 million/month, age 15-65 years old, and immunization status.

Keywords: Pulmonary TB, TB risk factor, income, age, BCG immunization.

INTRODUCTION

Tuberculosis (TB) is a chronic infectious disease that is still a problem globally and is one of the indicators in the Sustainable Development Goals (SDGs).[1]. Tuberculosis is a disease of global concern. WHO has a goal to reduce deaths from tuberculosis by 95% and reduce the incidence of TB case finding by 90% by 2035 in accordance with Sustainable Development 2030.[2]According to WHO, tuberculosis is ranked above HIV/AIDS in the number of sufferers and the number of deaths in the world. In 2018, it was estimated that there were 10 million new tuberculosis cases or around 130 cases/100,000 population and 2.7 million deaths due to TB were recorded in the world. It is estimated that two-thirds of the world's cases occur in developing countries. About 57% of TB patients are economically productive age group (15-50 years) with a ratio of women of productive age 32%, children 11% (<15 years), and people living with HIV sufferers 8.6%.[3]

In Indonesia, TB is a public health problem. Indonesia is the country with the 3rd highest number of TB patients with around 8% of the total number of TB sufferers in the world.[3] The number of pulmonary TB patients in Indonesia in 2018 was 420.994 person. According to the Tuberculosis prevalence survey conducted in 2013-2014, the prevalence of smear-positive tuberculosis in Indonesia was 257 per 100,000 population of productive age and the prevalence of TB with bacteriological confirmation was 759 per 100,000 population of productive age.[2]

Serang City in 2020 new AFB (+) cases as many as 368 patients, with a total of 1354 TB cases. Meanwhile at the Serang City Health Center in 2020 there were 301 new cases with 163 BTA+ cases, 93 BTA-RO+ cases, 18 relapsed TB cases, and 8 extra pulmonary cases.[4]

When compared with other health centers in the city of Serang, the number of patients with pulmonary TB in the puskesmas area of Serang District, Serang city is still high. This is the basis for researchers to conduct research in order to determine the factors that influence cases of pulmonary TB disease at the regional health center.

METHOD

The study used an analytic observational study with the type of research design used, namely a case control study. A case is a TB person who has been diagnosed with pulmonary TB by several puskesmas in the city of Serang which consists of the Serang City Health Center and four sub-health centers in January 2020 to September 2021, while the controls are healthy people where the researcher collects data on cases with the same number and time. at the Serang City Health Center which consists of the Serang City health center and four supporting health centers for 1 month, from October to November 2021. The independent variables of this study are risk factors that affect the incidence of pulmonary TB which include education, income </> IDR 3.8 million/month , age, history of BCG immunization, nutritional status, and gender. The dependent factor is number of event TB

Inclusion criteria: (1) Pulmonary TB patients in five public health centers in Serang city with four supporting health centers consisting of Rau Health Center, Ciracas Health Center, Singandaru Health Center, and Unyur Health Center without seeing a history of previous treatment. (2) sign in an informed consent. (3) When studied, the subject was aware and understood the explanation of filling out the questionnaire. **Exclusion criteria:** (1) Subjects cancelled participation in the study. (2) If the subject forgets the answer to the questionnaire given, the data will be adjusted to the secondary data obtained from the health center where the research is located.

RESULT

The total number of samples in this study were 240 people with the characteristics of the research subjects in table 1

Table 1 Characteristics of the Research Sample

Variable		Frequency	Percentage (%)
Age	15-65 years old	217	90.4
	> 65 years old	23	9.6
Gender	Man	134	55.8
	Woman	106	44.2
Respondent's Income	< IDR 3.8 million/month	160	66.7
	IDR 3.8 million/month	80	33.3
Level of education	Elementary-Junior High	91	37.9
	High School-Bachelor	149	62.1
BCG Immunization	Not	105	43.8
	Yes	135	56.3
Nutritional status	BMI <18.5	73	30.4
	BMI 18.5	167	69.9

In this study, bivariate analysis was carried out using the Chi square test, as a bivariate selection, to determine the effect of age, sex, education, income, history of BCG immunization, and nutritional status, on the incidence of pulmonary TB in the community health center in Serang District, Serang City. from Table 2.

Table 2 Bivariate analysis between all variables with the incidence of pulmonary TB

Variable		TB patients n = 120 (%)	Non-TB patient n=120 (%)	OR	95% CI	P value
Age	15-65 years old	114 (95)	103 (85.8)	3.1	1.2-8.3	0.016†
	> 65 years old	6 (5)	17 (14.2)			
Gender	Man	68 (56.7)	66 (55)	1.1	0.6-1.7	0.795
	Woman	52 (43.3)	54 (45)			
Respondent's Income	< IDR 3.8 million/month	101 (84.2)	59 (49.2)	5.5	2.9-10.1	<0.001†
	IDR 3.8 million/month	19 (15.8)	61 (50.8)			
Level of education	Elementary-Junior High	58 (48.3)	33 (27.5)	2.5	1.4-4.2	0.001†
	High School-Bachelor	62 (51.7)	87 (72.5)			
BCG Immunization	Not	69 (57.5)	36 (30)	3.2	1.8-5.3	<0.001†
	Yes	51 (42.5)	84 (70)			
Nutritional status	BMI <18.5	52 (43.3)	21 (17.5)	3.6	1.9-6.5	<0.001†
	BMI 18.5	68 (56.7)	99 (82.5)			

** Chi-Square; Significant p<0.05*

The results of the Chi-Square analysis showed that the significant risk factors were age, gender, respondent's income, education, BCG immunization status and nutritional status. At the age of 15-65 years or so-called productive age, it is known that the risk of TB is 3 times higher than young people. Respondents' income < IDR 3.8 million / month is also at risk of 1.1 times increasing pulmonary TB. Education level is known to be at 2.5 times risk in elementary-junior secondary education. Respondents without BCG immunization are known to be at risk of 3.2 times compared to BCG. Undernutrition status is known to have a 3.6 times risk of developing TB compared to normal nutrition.

Furthermore, in this study, a multivariate analysis was carried out to determine the relationship between age, education, income, BCG immunization status and nutritional status on the incidence of pulmonary TB in the Public Health Center area of Serang District, Serang City, simultaneously carried out a multivariate analysis using logistic regression test (*logistic regression*). Logistic regression analysis was carried out at the same time to determine the independent variable that had the most influence on the dependent variable. Variables that become candidates for multivariate models are independent variables with p value < 0.25 in bivariate analysis. The variables that enter into the multivariate model can be seen in table 3

Table 3 Multivariate Analysis with Logistic Regression Test

No	Variable	P Value	OR	95% CI	Negelkerker R2
1	Age	0.005†	4.4	1.6 – 12.2	
2	Income	<0.001†	7.6	3.9 – 14.6	
3	Education	0.134	1.7	0.8 - 3.5	0.313
4	BCG immunization status	<0.001†	3.3	1.8 – 6.1	
5	Nutritional status	0.315	1.4	0.7 - 2.9	

†Significant p<0.05

The results of the multivariate analysis in table 3 show that age, income, BCG immunization status and nutritional status are factors that play a role in risk factors for pulmonary TB in the city of Serang. While for Nagelkerke R square obtained by 0.313, which shows the magnitude of the influence of the independent variables of age, income, and BCG immunization status on the incidence of pulmonary TB in Puskesmas Serang District Serang City is 31.3%, the remaining 68.7% is influenced by other factors. that are not variables in this study.

DISCUSSION

Risk factors for the incidence of pulmonary TB from the results of bivariate analysis showed that of the six independent variables that were significant for the incidence of AFB+ pulmonary TB, with p <0.05, were age, income, education, and immunization status. After doing multivariate analysis, it was found that the

variables that together had an effect were age, income, and BCG immunization status.

In the results of the analysis of income variables, it can be concluded that there is a significant relationship between income and the incidence of pulmonary TB p<0.001 and has a risk of 7.6 times for suffering from pulmonary TB and the researchers believe that 95% of the population at risk, someone with low income has a risk of 3.9 to 14, 6 times to suffer from pulmonary TB. This is also proven in the multiple logistic regression test that the income variable is the most dominant variable that affects the incidence of pulmonary TB in the public health center in the Serang sub-district, Serang city, OR 7.5 (95% CI 3.9-14.6; P value <0.001). Associated with poverty which is closely related to income. People with low incomes usually have a low economic level as well. Income affects the provision of food intake, a person's education,[5].

The incidence of pulmonary TB has a close relationship with a person's socioeconomic conditions, one of which can be known from family income. Families whose income is sufficient or are included in the middle and upper economic class, will have better behavior in maintaining health. This is in line with the research of Muaz, (2014) which states that patients with AFB+ pulmonary TB are 6.5 times more likely to occur in the low income group compared to those with high income.[4]

In the results of age, it can be concluded that there is a significant relationship between age and the incidence of pulmonary TB p = 0.016 with a 4.4 times risk of developing pulmonary TB compared to unproductive age where the researchers believe 95% in the population the risk of pulmonary TB incidence ranges from 1.6 to 12.2 times. at productive age. This was also proven in the multiple logistic regression test that age was the dominant variable affecting the incidence of pulmonary TB with an OR of 4.4 (95% CI 1.6-12.2; p: 0.005). A person of productive age has a high activity and is more likely to be in a place that has the opportunity to be a TB agent, so that he is more often exposed to agents that spread the disease.[6] This is in line with research Nurjana, (2015) which states that the number of patients with pulmonary TB is more in the productive age.[7]

On the BCG immunization status, it can be concluded that there is a significant relationship between BCG immunization status and the incidence of pulmonary TB p<0.001 and has a 3.3 times risk of suffering from TB compared to those who have received BCG immunization. Researchers also believe 95% that the population risk of developing pulmonary TB in someone who is not immunized with BCG ranges from 1.8 to 6.1 times. This is also proven in the multiple logistic regression test that the BCG immunization variable is the dominant variable that affects the incidence of pulmonary TB in the public health center in Serang sub-district, Serang city, OR 3.3 (95% CI: 1.8 – 6.1; p<0.001). These results are in accordance with the research Rosandali, (2016) which stated that there was a significant relationship between BCG immunization and pulmonary TB (P value: 0.022). A person without the BCG vaccine has a risk 3 times greater than someone with the BCG vaccine.[8]

The administration of BCG vaccine is closely related to the incidence of pulmonary TB. The body's immunocompetent cells have been fully formed at the time the baby is born, so giving the BCG vaccination at the time of the baby will cause a better immune response, especially the immune response. Immune response is closely related to the body's ability to fight disease, so the results of research that have been carried out indicate that immunization will grow the body's resistance to tuberculosis.[8]

According to Roy's journal (2014) stated that the administration of BCG vaccine can protect against active tuberculosis infection by 71% and protection from the development of

infection into active disease seen from the case group by 58%.[9]

On the results of the education level, it can be concluded that education has a significant relationship p 0.001 to the incidence of pulmonary TB where elementary-junior high school education has a 2.5 times risk of suffering from pulmonary TB compared to those with high school education and above. The results of multiple logistic regression analysis showed that the education variable was not the dominant variable affecting the incidence of pulmonary TB with an OR of 1.7 (95% CI 0.8-3.4; p=0.134). This is in accordance with research.[4,10,11] which states that education will describe a person's behavior in health. The low level of education and knowledge in the health sector affects a person's healthy lifestyle, such as knowledge of food intake, handling sick families and other preventive efforts. Education can also increase a person's intellectual maturity. Intellectual abilities add insight and influence the mindset in decision making and policy making. A person's level of education will affect a person's knowledge including knowledge about pulmonary TB disease and homes that meet health requirements.

The results of nutritional status can also be concluded that there is a significant relationship p<0.001 to the incidence of pulmonary TB. If you look at the Odds ratio value, it can be concluded that someone with poor nutritional status has a 3.6 times risk of suffering from pulmonary TB compared to those who have adequate nutrition. The results of multiple logistic regression analysis showed that the nutritional status variable was not the dominant variable affecting the incidence of pulmonary TB with an OR of 1.4 (95% CI 0.7-2.9; p=1.0.315). Malnutrition or malnutrition will affect the resistance and immune response to disease attacks. This factor often occurs in poor communities, both in adults and in children.[12] The results of this study are not in line with the research Karminiasih (2016) which states that nutritional status has a significant relationship p = 0.046 and is the dominant risk factor that affects the incidence of pulmonary TB (P value: 0.046, OR: 2.8, OR (95% CI): 1.02 – 7.72). Therefore, further research is needed with different methods.[13]

The results of this study also found that patients with pulmonary TB had normal nutritional status. This is because the knowledge and attitudes of respondents who already know about the signs and symptoms of pulmonary TB include coughing for more than 2 weeks, fever, decreased appetite, shortness of breath, so the respondent already knows and has a positive attitude, so the respondent immediately checks and gets TB treatment in health services before drastic weight loss occurs.[5]

The results of gender can be concluded that there is no significant relationship between gender and the incidence of pulmonary TB p = 0.795, with an Odds ratio value of 1.070 which means that gender is not a risk factor for the occurrence or suffering of pulmonary TB. The results of this study indicate that pulmonary TB sufferers are more common in men in quantity, namely 68 patients (57%) from women as many as 52 patients (43%) meaning that men in the case group suffer from 1.3 times more TB. lungs than women. This is in accordance with the results of a survey from Indonesian Ministry of Health, (2018) which stated that cases of pulmonary TB occurred 1.4 times greater in male than female.[2]In the Odd ratio analysis, a value of 1.1 was obtained, meaning that there was no significant difference in risk between the sexes of women and men. The analysis of the interval range resulted from 0.643-1.781, because the interval range past 1 means that gender is not a risk factor for pulmonary TB disease.

The results of this study are in accordance with Kan and Fahmi's research which states that there is no significant relationship between gender and pulmonary TB. Gender is not a risk factor for the

incidence of pulmonary TB because the role of women at this time has been doing a lot of activities outside the home such as work, social activities, and worship activities. So that contact with people with pulmonary TB also increases. In addition, when men suffer from TB in a family, women who are around them (family) have the opportunity to be infected as well because pulmonary TB is transmitted through droplets (splashes of phlegm) that are released when the patient coughs, sneezes or talks which can be inhaled by someone around the patient. the. The more germs that enter the lung tissue, the higher the chance of suffering from pulmonary TB.[14,15]

CONCLUSION

The risk factors for age, gender, nutritional status, income, education, and BCG immunization are only three factors that affect the incidence of pulmonary TB, namely income, age, and BCG immunization. Suggestions for Puskesmas and Kelurahan Officers (1) Increase counseling in the form of counseling and make banners or pamphlets distributed in every kelurahan. (2) Activating Drug Drinking Supervisors by providing education, which can be in the form of counseling about PMO to people who will become PMOs. (3) Adding insight about pulmonary TB disease by reading from print and electronic media and from attending pulmonary TB counseling. (4) Promote clean and healthy living programs. (5) Activating the BCG immunization program. Suggestions for the Health Office are to promote promotive and preventive programs regarding pulmonary TB at every puskesmas in Serang City.

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Conflict Of Interest

There are no conflicts of interest to declare by any of the authors of this study.

Ethical Approval:

This study has obtained ethical clearance issued by the Research Ethic Commission of Faculty of Medicine, Muhammadiyah Malang University, Malang, East Java, Indonesia

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