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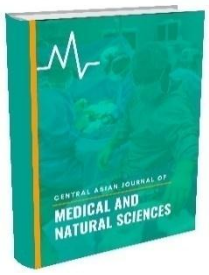

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Determinants of Pulmonary TB Patient Deaths in the Sukaraja Community Health Center, Bogor Regency, 2019-2022

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Abstract: Indonesia is ranked third in the number of tuberculosis cases in the world after India and China. Tuberculosis is a contagious disease that can cause death. The risk of developing TB disease includes individual factors (age, gender, income level, education level, socio-economic), home environmental factors, smoking habits, contact history, and so on. This study aims to determine the factors associated with the death of pulmonary TB patients in the working area of the Sukaraja Public Health Center, Bogor Regency. This study uses a quantitative method with a case control design. Data collection techniques using a questionnaire. A sample of 82 respondents with a ratio of 1:4, namely 19 cases and 63 controls. The sampling frame comes from TB registers 01, 04 and 06 at the Sukaraja Health Center who died in the period 2019 - 2022 as cases. Meanwhile, the controls were TB patients who did not die during the same year and were declared cured or had complete treatment. Univariate analysis, bivariate with chi square test and multivariate analysis using logistic regression test. The results showed that the risk factors associated with the death of pulmonary TB patients were gender (p=0.013), BCG vaccine (p=0.002), comorbidities (p=0.006), previous history of TB (p=0.010), smoking (p= 0.007), and the physical condition of the house (p=0.008). The final model of this study is that smoking is associated with TB death at the Sukaraja Health Center, Bogor Regency, with a risk of death for pulmonary TB patients up to 7,273 times compared to non-smokers, if the patient has a history of not being vaccinated with BCG, male gender, previous history of TB, has comorbidities, and living in a non-standard physical home environment.

Key words: Death for Pulmonary TB Patients, Smoking.

It is recommended that the Bogor District Health Office establish a smoking cessation program for pulmonary TB patients and carry out continuous monitoring of smoking behavior, especially in pulmonary TB patients. Continuing research with a better retrospective or prospective cohort design, especially exposure to cigarette smoke which causes the death of pulmonary TB patients.

INTRODUCTION

According to the WHO Global TB Report (2020), 10 million people worldwide suffer from Tuberculosis (TB), 1.2 million people die each year. The prevalence of TB in Indonesia still ranks third after India and China, namely nearly 700 thousand cases, with a mortality rate of 27 per 100,000 population (WHO Global Tuberculosis Report, 2017).(1) In 2021, there will be 385,295 TB cases found and treated in Indonesia.(2) This number decreased by 2.04% from 2020, with the discovery of 393,323 treated TB cases (Ministry of Health, 2021).(2) TB cases in 2020 totaled 79,840 cases, with the highest number of TB in three districts/cities ranging from 7-12% of the number of new cases in West Java, namely Bogor Regency, Bandung City and Bandung Regency. There were 45,879 cases of TB in Bogor Regency (public health center, health services, hospitals, clinics and 12 private hospitals), consisting of 35% of adult cases, and 4.5% of TB cases in children aged 0-14 years.(2)

Risk factors for TB are individual factors (age, gender, income, education level, socio-economic), home environment factors, smoking habits, contact history, and so on. The results of Fitriani's research (2013) showed that there was a relationship between the incidence of pulmonary TB and age, income level, home environmental conditions, behavior, and history of contact with pulmonary TB sufferers.(3) Older age is at risk for death in pulmonary TB patients with OR = 3.543 (Butiop HML et al, 2015).(4) Gender is male with the risk of death of pulmonary TB patients in the work area of the Kejaksan Public Health Center, Cirebon Regency OR= 8.415.(5) Hard workers such as farmers and laborers have a 3.6 times higher risk of dying compared to TB patients whose jobs are not farmers and laborers. The results of the study by Widagdo et al, 2010 showed that low socioeconomic (income) was 3 times more at risk than high socioeconomic (OR = 3.188).(6) Not being vaccinated with BCG (Fitri, 2008) has a 2.8 times higher risk of dying in pulmonary TB patients than patients who have received BCG vaccination, p value = 0.049, OR = 2.851.(7) Indah, et al (2012), stated that the chances of pulmonary TB patients living in poor physical conditions at home had a risk of death 3.172 times greater than that of pulmonary TB patients living in good physical conditions of homes, with p = 0.016; OR=3,172 (95% CI: 1,268−7,986). (8)Having comorbidities/comorbidities is at risk of dying in pulmonary TB patients by 3.4 times compared to those without comorbidities, with a p value of 0.55, OR 3.412 (Sugih, 2011). Novi's research (2014), states that patients who have a history of TB treatment are 2.3 times more at risk of dying with a p value = 0.036 and OR = 2.366.(9) Stefany et al (2020), stated that smoking is 2.464 times more risky compared to patients who do not smoke for the death of pulmonary TB patients, with a p value = 0.035 OR = 2.464.(10)

This study discusses the risk factors associated with the death of pulmonary TB patients in the working area of the Sukaraja Public Health Center, Bogor Regency in 2022 with a sample of all patients who were recorded as having died from pulmonary TB totaling 19 patients and 57 controls and an additional 10% to 63 patients who recovered from TB. lungs and performed univariate, bivariate and multivariate analysis.

METHOD

The study design used was a case control that compared the case group and the control group based on their exposure status, the direction of the study moved backwards/ backwards/ retrospectively, or looking back on the history of the research exposure status experienced by the subjects from the consequences/outcomes/outcomes/disease. , to cause/ exposure/ exposure status. The case control

design is the best design for studying cases with a long latency period, suitable for diseases with a small prevalence, can see several risk factors at once, relatively short study period and low cost and energy efficient. However, this design is prone to bias, namely selection bias, information bias, and recall bias.

The location of this research is in the working area of the Sukaraja Public Health Center, Bogor Regency. Data collection was carried out in June 2022. Secondary data sources were obtained from TB patient registers. While the primary data was obtained from interviews through home visits to the subjects and families of the research subjects, namely TB patients as cases and interviews with recovered TB patients as controls. The actual population in this study were all TB patients registered at the TB-01, TB-04 and TB-06 registers for the 2019-2022 period. All TB patients who met the selection criteria for case and control samples were sampled in the study until they met the requirements for calculating the maximum number of samples from Lemeshow (1997), 17 samples were obtained, plus 10% to anticipate lost to follow-up to 19 subjects as TB cases/patients who experience death. With a comparison of the number of samples 1 case: 4 controls obtained a total of 82 subjects. So that 63 controls will be taken.

Univariate analysis to obtain information on the frequency distribution or tabulation of the variables of sex, age, comorbidities, occupation, history of TB treatment, history of BCG vaccine, last education, smoking history, physical condition of the house, and income. Bivariate analysis to determine the significance relationship with the limit value of p <0.05. Odd Ratio information in table 2x2, with an interpretation of OR=1, meaning that the independent variable is not a risk factor, OR>1 and CI does not include number 1, meaning that the independent variable is a risk factor, and if OR<1 and CI do not include number 1, meaning that the independent variable is a protective/preventive factor. Stratification analysis in epidemiological studies to assess the presence of confounders caused by confounding factors that may mask the effect of the risk factors studied on disease outcomes. The interaction test is only carried out when an interaction is suspected. Multivariate analysis to determine the relationship of more than one independent variable with one dependent variable, with the modeling step, namely creating a basic model/full model with a p value <0.25, removing variables 1 by one starting from the least significant (p value <0.05) while at the same time calculating the confounding value <10% is maintained in the model, so that a final fit model is obtained.

RESEARCH RESULT

Sukaraja Health Center is located on Jl. Cikeas Raya, Sukaraja, Bogor Regency, West Java, Indonesia. The working area of the Sukaraja Health Center is quite extensive and consists of 7 (seven) villages. It is a non-inpatient Health Center with the criteria of a rural work area. The built area is ± 4,202 Ha, covering 2,889 hectares of land consisting of 1,313 hectares of paddy fields. To the north it is bordered by the Cibinong sub-district. To the south it is bordered by the city of Bogor and the Megamendung sub-district. West side is bordered by the city of Bogor. To the east it is bordered by the Babakan Madang sub-district. The Sukaraja Health Center seeks to increase TB coverage through the JeDaR innovation activity (Pick Dahak Rame-Rame). Through TB cadre training.

The results of the univariate analysis in table 1 explain the distribution of the frequency of deaths of pulmonary TB patients as the dependent variable with the independent variables namely sex, age, comorbidities, occupation, history of TB treatment, BCG vaccine, education, smoking, housing conditions, and income.

Table 1. Univariate Analysis Result (n=82)

Variable	Categori	Pulmonary TB Patient Mortality				Total	
		Control		Case			
		n	%	n	%	n	%
Sex	Female	30	47,6	3	15,8	33	40,2
	Male	33	52,4	16	84,2	49	59,8
	Total	63	100	19	100	82	100
Age	<20 years	16	25,4	4	21,1	20	24,4
	>=20 years	47	74,6	15	78,9	62	75,6
	Total	63	100	19	100	82	100
Employment	Office	21	33,3	3	15,8	24	29,3
	Labourer	42	66,7	16	84,2	58	70,7
	Total	63	100	19	100	82	100
BCG Vaccine	Yes	36	57,1	3	15,8	39	47,6
	No	27	42,9	16	84,2	43	52,4
	Total	63	100	19	100	82	100
Comorbid	No	39	61,9	5	26,3	44	53,7
	Yes	24	38,1	14	73,3	38	46,3
	Total	63	100	19	100	82	100
TB History	No	31	49,2	3	15,8	34	41,5
	Yes	32	50,8	16	84,2	48	58,5
	Total	63	100	19	100	82	100
Income	>=4.039.067	12	19,0	5	26,3	17	20,7
	<4.039.067	51	81,0	14	73,7	65	79,3
	Total	63	100	19	100	82	100
Merokok	No	32	50,8	3	15,8	35	42,7
	Yes	31	49,2	16	84,2	47	57,3
	Total	63	100	19	100	82	100
Education	Hight	31	49,2	7	36,8	38	46,3
	Low	32	50,8	12	63,2	44	57,7
	Total	63	100	19	100	82	100
Living Condition	Healthy	47	74,6	8	42,1	55	67,1
	Non Healthy	16	25,4	11	57,9	27	32,9
	Total	63	100	19	100	82	100

Of the 82 respondents, there were 19(23.17%) the case group and 63(76.83%) the control group. The case and control samples were dominated by 33 (52.4%) male respondents in the control group, and 16 (84.2%) cases. Dominated by respondents aged ≥20 years as many as 47 (74.6%) in the control group, and cases of 15 (78.9%). Dominated by respondents with the type of labor as much as 42 (66.7%) in the control group, and as many as 16 cases (84.2%). Dominated by respondents who received the BCG vaccine as many as 36 (57.1%) in the control group, while the group kasus sebanyak 16(84,2%). Didominasi responden yang 39 (61.9%) did not have comorbidities in the control group, while the case group was dominated by 14 (73.3%) respondents who had comorbidities. Dominated by respondents who had a history of pulmonary TB as many as 32 (50.8%) in the control group, and in the case group as many as 16 (84.2%). Dominated by respondents whose income <4,039,067 were 51 (81.0%) in the control group, while the case group was 14 (73.3%). Dominated by 32 respondents (50.8%) who did

not smoke in the control group, while the case group was dominated by respondents who smoked by 16 (84.2%). Dominated by respondents who had low education as many as 32 (50.8%) in the control group, and as many as 12 cases (63.2%). Dominated by 47 (74.6%) respondents who had healthy physical housing conditions in the control group, while the case group was dominated by 11 (57.9%) respondents who had unhealthy physical housing conditions.

Bivariate analysis was carried out to see the relationship between the independent variables which included gender, age, occupation, BCG vaccine, comorbidities, previous TB history, income, smoking, education, and the physical condition of the house with the dependent variable, namely the death of pulmonary TB patients. The statistical test used is the Chi-Square test. The results of the bivariate analysis are explained in the following table:

Table 2. Bivariate Analysis (n=82)

Variabel	*P Value*	OR	CI(95%)
Jenis Kelamin	0,027	4,848	1,284-18,306
Umur	1	1,277	0,369-4,413
Pekerjaan	0,236	2,667	0,698-10,182
VaksinBCG	0,004	7,111	1,880-26,894
Komorbid	0,014	4,550	1,454-14,237
RiwayatTB	0,020	5,167	1,369-19,503
Pendapatan	0,526	0,659	0,199-2,186
Merokok	0,015	5,505	1,458-20,782
Pendidikan	0,493	1,661	0,578-4,769
Fisik Rumah	0,018	4,039	1,381-11,810

Of the 10 variables, there are 6 variables that have a significant relationship with pulmonary TB mortality, namely gender with a p value = 0.027,OR=4,848 (95%CI;1,284-18,306), BCG vaccine variable with p=0,004;OR=7,111 (95%CI;1,880-26,894), comorbid variable p=0,014;OR=4,550 (95% CI; 1.454-14.237), variable history of TB with p = 0.020; OR = 5.167 (95% CI; 1.369-19.503), smoking variable value p = 0.015 ; OR = 5.505 (95% CI; 1.458-20.782), variable physical condition of the house with a value of p = 0.018 ; OR=4.039 (95%CI;1.381-11.810). While the 4 variables were not significant, namely age with a value of p = 1, OR = 1.277 (95% CI; 0.369-4.413), meaning that there was no effect of age on the death of pulmonary TB patients. Job variable with p value = 0.236; OR = 2.667 (95% CI; 0.698 10.182), meaning that there is no effect of work on the death of pulmonary TB patients. Income variable with p = 0.526; OR = 0.659 (95% CI; 0.199-2.186), meaning that there is no effect of income on the death of pulmonary TB patients. Education variable with p=0.493; OR = 1.661 (95% CI; 0.578-4.769), meaning that there is no effect of education on the death of pulmonary TB patients.

Variables that are entered as multivariate candidate variables in bivariate selection, produce the initial model of multivariate analysis. The following variables are candidates for multivariate modeling. There were 7 out of 10 variables entered as candidates with a p value <0.25, namely gender, occupation, BCG vaccination, comorbidities, history of TB, smoking and physical condition of the house.

Table 3. Multivariate Candidates (n=82)

Variabel	OR	CI(95%)	*P Value*	Ket
Sex	4,848	1,284-18,306	0,009	Kandidat
Age	1,277	0,369-4,413	0,696	
Employment	2,667	0,698-10,182	0,124	Kandidat
BCG Vaccine	7,111	1,880-26,894	0,001	Kandidat
Comorbid	4,550	1,454-14,237	0,006	Kandidat
History of TB	5,167	1,369-19,503	0,007	Kandidat
Income	0,659	0,199-2,186	0,502	
Smoking	5,505	1,458-20,782	0,005	Kandidat
Education	1,661	0,578-4,769	0,341	
Living Conditions	4,039	1,381-11,810	0,010	Kandidat

Here is the full multivariate model

Table 4. Full Model (n=82)

Variabel	B	S.E.	Wald	Df	Sig.	Exp(B)	95% CI for EXP(B)	
							Lower	Upper
Jenis_Kelamin	1.730	.876	3.900	1	.048	5.638	1.013	31.376
Pekerjaan	.117	.892	.017	1	.895	1.124	.196	6.456
Vaksinasi_BCG	1.895	.809	5.489	1	.019	6.652	1.363	32.463
Komorbid	1.261	.757	2.780	1	.095	3.530	.801	15.551
Riwayat_TB	1.368	.912	2.249	1	.134	3.928	.657	23.485
Merokok	1.974	.881	5.021	1	.025	7.200	1.281	40.478
Fisik Rumah	1.123	.763	2.166	1	.141	3.073	.689	13.710

In the full model, a multivariate analysis was carried out, where variables that had a P−value > 0.05 were excluded from the model one by one starting from the largest p value, taking into account the change in the OR value when the variable was excluded. If the change in OR is 10%, then it is maintained in the model, if there is a difference in OR <10% then the variable is removed from the model.

Following the results of the multiple logistic regression test, we obtained the most fit/best model to obtain a predictive model of the independent variables associated with the occurrence of pulmonary TB patient mortality in the working area of the Sukaraja Health Center, Bogor Regency, as in the following table:

Table 5 Multivariate Final Model

Variabel	B	S.E.	Wald	Df	Sig.	Exp (B)	95% C.I. for EXP(B)		R Square
							Lower	Upper	
Smoking	1,984	0,879	5,091	1	0,024	7,273	1,298	40,757	0,539
BCG Vaccine	1,913	0,798	5,744	1	0,017	6,775	1,417	32,388	
Sex	1,744	0,870	4,018	1	0,045	5,719	1,039	31,470	
TB History	1,417	0,838	2,859	1	0,091	4,123	0,798	21,296	

Comorbid	1,254	0,753	2,770	1	0,096	3,503	0,800	15,334	
Living Condition	1,120	0,762	2,161	1	0,142	3,064	0,689	13,630	

In the final model, the predictive model for pulmonary TB patient mortality in the working area of the Sukaraja Health Center, Bogor Regency, is smoking, p=0.024; OR 7.273 (95% CI 1.298-40.757) means that smoking TB patients are predicted to die 7.2 times compared to non-smoker patients, with control variables being history of BCG vaccine, gender, history of TB, comorbidities, and physical condition of the house. While the value of R2 = 0.539, meaning that the 6 independent variables can explain the variable variation in the occurrence of death in pulmonary TB patients by 53.9%. While the remaining 46.1% is influenced by other variables not examined.

DISCUSSION

Several weaknesses in the case control design became a limitation in this study. Information bias in this study can come from respondents or interviewers where the respondents between cases and controls are not equal. In the cases interviewed were the families of the TB patients, while the controls were the subjects. Recall bias may occur. Ignorance of information on questions about BCG vaccination history, smoking history, and previous history of TB. Measurement bias occurs in the questionnaire, because the measurement is carried out regardless of how many cigarettes are consumed per day whether they are heavy smokers or smoke only occasionally. Selection bias that can occur in controls is not cured patients, but complete treatment. To reduce these errors, the researchers cross-checked with the intensive stage sputum examination laboratory results card (TB 11), not only on the patient card (TB 01).

Results of bivariate analysis on unrelated variables, age p value = 0.699, because most of the study population was ≥20 years old. The results of this study are not in accordance with the results of the study of Butiop HML et al (2015), which showed that the age variable is a factor that influences the death of pulmonary TB patients with OR = 3.543.(4) Job variable pvalue = 0.141, work is not significant because most of the study population work as laborers compared to office workers. Income with p value = 0.717, because most of the study population has low income <4,039,067. The results of this study are not in accordance with Widagdo et al (2010), there is a relationship between socio-economic and death of pulmonary TB patients p value 0.034 and OR 3.188.(6,11) Education pvalue = 0.343, not in line with Aditama's study (2002), which stated that there was a relationship between education and the death of pulmonary TB patients, TB patients with high school and PT education had a 4.2 times chance of dying compared to those with elementary-junior high school education.(12)

While the related variable is gender pvalue = 0.013, OR: 4.848 (95% CI: 1.284-18.306). Men experience more deaths than women, with a ratio of 2:1, although there are several areas that show almost the same incidence.(12) This is in line with Sitepu's study (2019) that the risk of death for pulmonary TB patients is higher for men (64.9%) than women (35.1%).(13) In men, work activity and social interaction are high, causing an increased risk of death, in addition to alcohol consumption and smoking habits which cause a decrease in the body's resistance in men to make them more susceptible to infection. The results of this study are in line with research on the risk of death of pulmonary TB patients in the work area of the Kejaksan Public Health Center, Cirebon Regency, that gender is significantly related to gender and the risk of death of pulmonary TB patients with a ρ-value of 0.001; OR = 8.415.(5) The BCG vaccine is statistically significant with a p value = 0.002, in line with Fitri's study (2008), there is a relationship between BCG vaccination and the death of pulmonary TB patients, p value = 0.049, OR 2.851 meaning that not receiving the BCG vaccine has a risk of dying 2.851 times compared to those who are vaccinated.(3) Comorbidities were statistically significant pvalue=0.006, OR=4.550 (95% CI: 1.454-14.237). Most of the samples died because they only had

pulmonary TB disease by 60%, and the others died because of TB disease accompanied by other diseases (40%). Other diseases include HIV, diarrhea, gouty arthritis, kidney disease, anemia and gastritis. The results of this study are in line with the study of Sugih, 2011 which showed that there was a relationship between comorbidities (comorbidities) and the risk of death in pulmonary TB patients. 28.6% with a p value of 0.55 and OR 3.412.(14)

The table shows that a history of previous TB was statistically significant with pvalue = 0.010, associated with death in pulmonary TB patients, with an OR of 5.167 (95% CI: 1.369-19.503). The number of re-treatment cases in Indonesia is 8,542 cases and 70% of them are relapse cases. The high incidence of relapsing pulmonary TB can increase the source of pulmonary TB transmission so that it can hinder the achievement of the goals of treatment and control of pulmonary TB.

The results of this study are in line with Novi's study, 2014 that there was a significant relationship between previous TB treatment history and the risk of death in pulmonary TB patients with a p value = 0.036, OR 2.366 (OR> 1), meaning that respondents who had a history of TB treatment were at risk of 2.366 times experienced the death of pulmonary TB patients compared to patients who did not have a history of TB treatment.(15)

The table shows that smoking is statistically significant with pvalue = 0.007, associated with death in pulmonary TB patients, with OR5.505 (95% CI: 1.458-20.782). Half of deaths due to pulmonary TB in men are caused by smoking and 3.25 of smokers develop into pulmonary tuberculosis sufferers. Death in patients with pulmonary TB is 4 times greater in the smoking group than in non-smokers (Gajalakshmi, 2003).(16) The results of this study are in line with the research of Stefany et al, 2020 that there is a significant relationship between smoking behavior and the risk of death in pulmonary TB patients with a p value = 0.035, OR 2.464 (OR> 1), meaning that respondents who have smoking behavior are 2.464 times the risk of patient death Pulmonary TB compared to patients who do not have smoking behavior.(17)

The table shows that the physical condition of the house is statistically significant with pvalue = 0.008, associated with the death of pulmonary TB patients, with OR = 4.039 (95% CI; 1.381-11.810). An unhealthy home environment can cause TB bacteria to continue to multiply. The results of this study are in line with the opinion which states that it is necessary to have a physical condition of a house that meets health requirements in order to prevent the spread of pulmonary TB. The physical condition of the house, including the type of house building materials and the location of the house, such as the type of walls, floors and roofs. The type of house building materials will affect water absorption and the amount of dust in the house.

The results of this study are in line with the research of Indah et al (2012), which showed that statistically there was a significant relationship between the physical condition of the house and the risk of death for pulmonary TB patients in respondents (p=0.016; OR=3.172; 95% CI: 1.268−7.986). The chance of pulmonary TB patients who live in poor physical conditions at home is at risk of dying 3.172 times greater than pulmonary TB patients who live in good physical conditions of homes.(15)

Multivariate Analysis Results

In the final model, there are risk factors associated with death in pulmonary TB patients, starting from the largest OR, namely smoking, p value 0.024; OR= 7.273; 95% CI: (1,298-40,757), not vaccinated with BCG p value 0,017, OR 6,775, and 95% CI: 1,417-32,388, male sex p value 0,045, OR 5,719, and 95% CI: 1,039-31,470), with a history of TB p value 0.091, OR 4.123, and 95% CI: 0.798-21.296, has comorbidities p value 0.096, OR 3.503, and 95% CI: 0.800-15.334 and has an unhealthy physical condition of the house p value 0.142, OR 3.064, and 95% CI: 0.689-13.630). TB patients who smoke have an increased risk of death up to 7.273 times compared to non-smokers. Respondents who were smokers in the case group were 15.8% lower when compared to the control group 50.8%, while

respondents who were dominant smokers in the case group were 84.2% higher than the control group 49.2%. Smoker respondents are generally in a smoker's environment that is difficult to quit. Smoking cessation programs, tobacco control policies, education about the dangers of smoking, and developing smoking-free areas are urgently needed to control tobacco smoke. According to Gajalakshmi (2003), half of the deaths of sufferers Pulmonary TB in men is caused by smoking and 3.25% of smokers develop pulmonary TB. Eisner (2008), the risk of death in patients with pulmonary TB is 4 X in the smoker group. Smoking can cause obstructive lung function disorders, pneumonia, influenza and acute respiratory infections. A history of BCG vaccination in this study reduced the risk of death by 6.7 times. BCG vaccination in the world is quite effective, around 80% prevents TB infection, and almost 100% prevents infection from becoming fatal (Centers for Disease Control, 1979). The need for a physical condition of the house that meets health requirements in order to prevent the spread of Tuberculosis in the environment. The condition of this house includes the type of floor, walls, ventilation. According to WHO, a house that is too cramped can cause disease for the occupants. The house should be able to meet technical and hygiene requirements, namely not too densely populated, good ventilation conditions, good type of floor. Unhealthy housing (poor housing) is the cause of low levels of physical and spiritual health. This facilitates the spread of disease and reduces one's work power or production power (Gunawan, 2009). A healthy home must meet requirements including meeting physiological needs, preventing disease transmission and preventing accidents (Sanropie et al, 2005). According to the respondents, the physical condition of the houses still did not meet the requirements, such as the type of floor which was still made of earth and cracked plaster, most of the ventilation was permanent so it could not be opened.

CONCLUSIONS & RECOMMENDATIONS

The conclusion that can be drawn from this study is that the predictors associated with the death of pulmonary TB patients in the working area of the Sukaraja Public Health Center, Bogor Regency, are gender, BCG vaccine, comorbidities, history of pulmonary TB, smoking, and physical condition of the house. The final model of this study is smoking is associated with TB death at the Sukaraja Health Center, Bogor Regency, with a risk of death for pulmonary TB patients up to 7.273 times compared to non-smokers, if the patient has a history of not being vaccinated with BCG, male gender, previous history of TB, has comorbidities, and living in a non-standard physical home environment.

The suggestion that the researchers gave was that the Sukaraja Health Center conduct health promotion on the dangers of smoking for pulmonary TB patients and is a contributing factor to the death of pulmonary TB patients. So that the Bogor District Health Office creates a smoking cessation program for pulmonary TB patients and continuously monitors smoking behavior, especially in pulmonary TB patients. Continuing research with a better retrospective or prospective cohort design, especially exposure to cigarette smoke which causes the death of pulmonary TB patients.

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