

Determinant and Spatial Analysis of Factor that Influenced multi Drug Resistant Tuberculosis Cases Inindramayu District, Indonesia at 2017-2018

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Abstract

One of the public health problems in the world today is Tuberculosis (TB). In Indonesia, there is an increase in TB cases from year to year and only around 77.57% had completed treatment. This study discusses the factors that caused multi drug tuberculosis (MDR TB) as well as an overview of the work area of the Puskesmas in Indramayu Regency which is a MDR TB patient. This research using applied research with case control design. The case is MDR TB patients and controls are patients who have proven to be MDR TB negative by laboratory examination. The comparison of case controls is 45:55. Data analysis with chi-square and logistic regression. The results of the research obtained from the facts related to MDR TB are income with, nutritional status, prior consultation, medication consultation, occupancy density of houses with and receiving supervisor of TB medicine. The most dominant factor was immunization status with $p: 0.030$ and $OR: 34.358$. The working area of the primary health center was at risk of occurring MDR TB. The conclusion of this study unimmunized patients have status affect the incidence of MDR TB. Obtained from the support of health workers and the community in immunization activities in the community so that TB occurs.

Keywords: Multi Drug Resistant Tuberculosis, Immunization Status, Spatial Analysis

Background

Tuberculosis (TB) is still a global public health problem [1]. There are still many cases of Tuberculosis that have not been successfully cured from the increasing number of cases [1]. World Health Organization estimates that in 2011 in the world there were around 500,000 cases of TB that were resistant to the drug Isonicotinoyl hydrazine and Rifampicin called Multi Drug Resistant Tuberculosis (MDR TB) [2]. The prevalence of multi drug-resistant TB (MDR TB) in the world has increased by 40% and is estimated to be 2-3 times higher than the incidence. From 2016 to 2017, while from 2017 to 2018 there was an increase of 54.8% [3].

Drug-resistant tuberculosis is a condition where the germ was already immune to TB medicine [1]. Tuberculosis is a disease that is transmitted directly through droplets with Tuberculosis patients who have positive Acid Resistant Bacteria. An increase in TB cases and cases of Drug-Resistant TB from 2016 -2018 can be caused by incomplete TB treatment so that the number of TB drugs increases [4].

The patient's desire to recover is low and the irregularity of treatment is a risk factor for the occurrence of MDR TB [5]. From other studies mention compliance with taking medication, sex and smoking history are risk factors for MDR TB [6].

With the existence of Government programs such as early detection of TB sufferers and the presence of Supervisor of TB medicine for TB sufferers was expected to prevent the expected occurrence of TB drug resistance. In addition to the above activities also carried out counseling activities about Drug-Resistant TB in every health facility and the existence of funding from the government in the treatment of Drug-Resistant TB is expected to facilitate the treatment of Drug-Resistant TB patients.

Method

This study uses applied research with case control design. Data analysis conducted was univariate, bivariate with Chi-Square test, to determine the magnitude of risk (odds ratio) using multivariate logistic regression analysis and spatial analysis with quantum geographic information system (GIS).

The population taken is all drug resistant TB sufferers in Indramayu District, which were 43 patients. Case samples are all cases of MDR TB in 2017-2018, 43 patients, and control samples are expected to double the number of cases, but due to the number of Category 2 TB cases, only 55 patients, 55 controls were taken.

The research variables were gender, education, occupation, income, nutritional status, immunization status, previous medication history, TB medicine compliance, side effects of TB medicine, contact history with TB drug resistant patients, residential density, home access to health services, drug monitoring volunteer presence and

the incidence of MDR TB.

Result

Frequency distribution based on independent variables can be seen in table 1. Summary of the results of bivariate analysis with chi-square test can be seen in table 2. From the results of bivariate analysis shows there are 6 variables that affect the incidence of MDR TB. The final results of multivariate analysis can be seen in table 3 which shows that there are 4 variables that influence the incidence of MDR TB. The results of spatial analysis can be seen in Figure 1 through Figure 7

Table 1: Independent Variable Frequency Distribution

No	Variable	Frequency (N)	Percentage (%)
1	Age		
	Child- Adult (0-44 year)	39	39,8
	Elderly (> 45 year)	59	60,2
2	Sex		
	Male	63	64,3
	Female	35	35,7
3	Education		
	Low level (Elementary, Middle school)	76	77,6
	High Level(High school, college, university)	22	22,4
4	Occupation		
	Working (Farmer, Civil Services/Army/Police, Employee, Domestic Helper, Lainnya)	82	83,7
	Non Working (Student/University Student, Not Working People)	16	16,3
5	Income		
	< Salary Standard (< Rp. 2.117.636)	70	71,4
	≥ Salary Standard (≥ Rp. 2.117.636)	28	28,6
6	Nutritional Status		
	Below Average	52	53,1
	Normal	46	46,9
7	Immunization		
	Already vaccinated	9	9,2
	Non vaccinated	89	90,8
8	Previous Healthcare issues		
	No	11	11,2
	Yes	87	88,8
9	TB Drug Treatment		
	Yes	43	43,9
	No	55	56,1
10	Side Effect		
	Yes	33	33,7
	No	65	66,3
11	Contact History		
	Yes	14	14,3
	No	84	85,7
12	House Density Rate		
	Dense	29	29,6
	Sparse	69	70,4
13	Healthcare Access		

	Easy	65	66,3
	Difficult	33	33,7
14	Drug Monitoring Staff		
	No	26	26,5
	Yes	72	73,5

Table 2. Bivariate Analysis Result

No	Variable	MDR TB				p value	OR (95% CI)
		Yes		No			
		N	%	N	%		
1	Age						
	Child- Adult (0-44 year)	19	44,2%	20	36,4%	0,564	0,722
	Elderly (> 45 year)	24	55,8%	35	63,6%		(0,320-1,631)
2	Sex						
	Male	27	62,8%	36	65,5%	0,952	1.123
	Female	16	37,2%	19	34,5%		(0,489-2,579)
3	Education						
	Low level (Elementary, Middle school)	35	81,4%	41	74,5%	0,574	0,669
	High Level(High school, college, university)	8	18,6%	14	25,5%		(0,252-1,781)
4	Occupation						
	Working (Farmer, Civil Services/Army/Police, Employee, Domestic Helper, etc)	35	81,4%	47	85,5%	0,792	0,745
	Non Working (Student/University Student, Not Working People)	8	18,6%	8	14,5%		(0,255-2,178)
5	Income						
	< Salary Standard (< Rp. 2.117.636)	39	90,7%	31	56,4%	0,000	7,548
	≥ Salary Standard (≥ Rp. 2.117.636)	4	9,3%	24	43,6%		(2,369-24,050)
6	Nutritional Status						
	Below Average	28	65,1%	24	43,6%	0,056	2,411
	Normal	15	34,9%	31	56,4%		(1,059-5,491)
7	Immunitation						
	Already Immuned	1	2,3%	8	14,5%	0,084	7,149
	Non Immuned	42	97,7%	47	85,5%		(0,858-59,565)
8	Previous Healthcare issues						
	No	34	79,1%	53	96,4%	0,010	0,143
	Yes	9	20,9%	2	3,60%		(0,029-0,700)
9	TB Drug Compliance						
	Yes	10	23,3%	33	60,0%	0,001	0,758
	No	33	76,7%	22	40,0%		(0,324-1,777)
10	Side Effect						

	Yes	13	30,2%	20	36,4%	0,673	0,758
	No	30	69,8%	35	63,6%		(0,324-1,777)
11	Contact History						
	Yes	9	20,9%	5	9,10%	0,145	2,647
	No	34	79,1%	50	90,9%		(0,816-8,587)

Table 3: Multivariate Analysis Result

Variable	p value	OR	95% CI		Nagelkerke R Square
			Lower	Upper	
Income	0,044	3,902	1,037	14,686	0,475 (47,5%)
Nutritional Status	0,035	3,164	1,087	9,214	
Immunization Status	0,018	37,940	1,849	778,668	
Healthcare history	0,020	0,070	0,007	0,659	
Contact History	0,212	2,493	0,594	10,456	
House Density Rate	0,001	6,741	2,077	21,873	

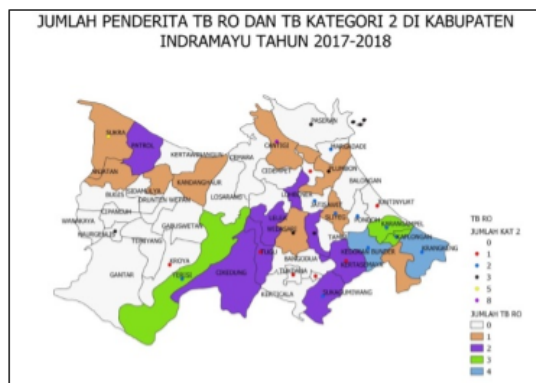


Figure 1: MDR TB dan Category 2 patients in Indramayu District Public Healthcare Center



Figure 3: MDR TB Patients Description Based On Nutritional Status



Figure 2: MDR TB Patients Description Based on Income

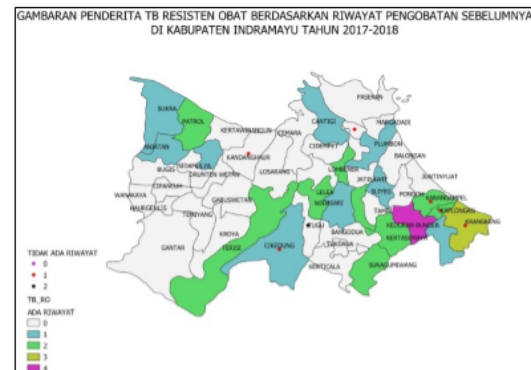


Figure 4: MDR TB Patients Description Based On Previous Healthcare Issues

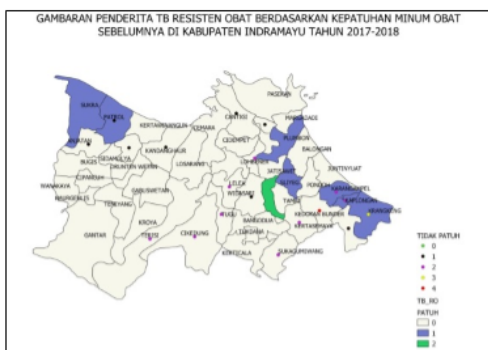


Figure 5: MDR TB Patients Description Based on TB medicine Adherence

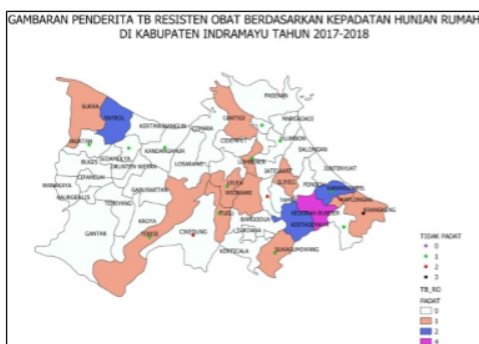


Figure 6: MDR TB Patients Description Based on Home Density Rate

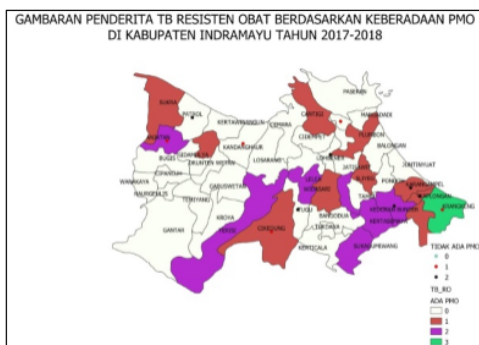


Figure 7: MDR TB Patients Description Based on Drug Monitoring Supervisor of TB medicine

Source: Primary Health Center in Indramayu District, Indonesia

Factors that influence MDR TB Cases

The results of the Chi-Square analysis show that income influences the incidence of MDR TB. Income is not the main factor causing MDR TB, but the lower the level of one's income, the greater the risk of suffering from pulmonary TB. Small family income is not possible to earn optimal health services. Communities with low socioeconomic conditions result in poor nutritional conditions, unhealthy housing conditions and low access to health services.

Chi-Square analysis and logistic regression results show that nutritional status influences the incidence of MDR TB. Poor nutrition

can cause the formation of antibodies in the body is reduced and the body's immune system decreases so it is susceptible to disease [7].

Multivariate analysis results show immunization status influences the incidence of MDR TB. One of controlling TB is immunization. This immunization provides active immunity against tuberculosis. The vaccine given is the Bacillus Calmette Guerin (BCG) vaccine [8]. One of the government's preventive efforts to prevent the occurrence of TB is by immunizing Bacillus Calmette Guerin (BCG). The effectiveness of the 60%-80% BCG vaccine in protecting against TB in children is around 60%-80%, especially meningitis [9].

The results of the bivariate and multivariate analyzes showed that previous treatment history had an effect on the incidence of MDR TB. One of the suspected bases for the occurrence of MDR TB is TB patients who have a history of previous treatment such as TB patients failing in either category 1 or category 2, loss to follow up and relapse or relapse [1].

The results of the bivariate and multivariate analysis showed that adherence to taking medication had an influence on the incidence of MDR TB. Low adherence to TB treatment is a risk factor for MDR TB [3]. Long therapy time which is between 6-9 months causes many patients who are not compliant to take medication while undergoing therapy [10].

The results of the bivariate and multivariate analyzes showed that the density of the residential houses affected the incidence of MDR TB Room with dense occupants can influence the development of germs so that it can increase the incidence of Tuberculosis and other infectious diseases [11].

The results of bivariate analysis showed that the presence of PMO had an effect on the incidence of MDR TB. The drugs supervisory program includes being able to supervise TB patients in order to swallow medicine regularly until after treatment, encourage patients to be willing to seek regular treatment, remind patients to have a sputum re-examination and provide counseling to patients' family members. This supervisor of TB medicine usually someone who lives close to patients [12].

The results of spatial analysis obtained the most number of patients with MDR TB in the Krangkeng Health Center and Kedokan Bunder. Variables that influence both directly and indirectly in this study are income, nutritional status, the presence of medication history, medication adherence, home density and the existence of supervisor of TB medicine. And of these variables everything were in Krangkeng and Kedokan Bunder Health Center

Factors that not influenced MDR TB Cases

The results of bivariate analysis showed that age had no effect on the incidence of MDR TB. From the results of this study the age distribution of children to adults and the elderly who suffer from MDR TB and TB there is no significant difference in proportion. This is in line with research by Lili Maria, Bresaw Demile, and Girum [6, 4, 13]. Spatial factor already researched in Debebe [14].

The results of the bivariate and multivariate analysis showed that gender had no effect on the incidence of MDR TB. Gender was not a risk factor for MDR TB, because from the results of this study the distribution of men and women who suffer from drug resistant

tuberculosis had no significant difference in proportion.

The results of bivariate and multivariate analysis showed that education had no effect on the incidence of MDR TB. Education does not have a significant relationship with the occurrence of MDR TB, as well as the results of this study indicate there are no significant differences between people with low education and higher education, because the results of this study are people with low education and higher education both suffer from MDR TB.

The results of bivariate and multivariate analysis showed that work had no effect on the incidence of MDR TB because the proportion of respondents who worked between MDR TB and Category 2 was almost the same.

The results of the bivariate and multivariate analysis showed that the side effects of the drug had no effect on the incidence of MDR TB. Drug side effects are not a risk factor for MDR TB, because the proportion of drug side effects in respondents with MDR TB and Category 2 did not experience a significant difference.

The results of bivariate and multivariate analysis showed contact history had no effect on the incidence of MDR TB. There was no significant difference in the proportion between respondents who have a contact history in patients with MDR TB and Category 2.

Although according to the Ministry of Health it was stated that contact history is one of the criteria for patients suspected of having MDR TB.

The results of bivariate and multivariate analysis showed access to health services had no effect on the incidence of MDR TB. Access to health services is influenced by the ability of the community to receive, seek, reach, pay and participate in health services [15]. From our results it was found that the average respondent had a short distance to health services and had private transportation but did not have the motivation to seek treatment regularly.

Conclusion

Factors influencing the incidence of MDR TB are income, nutritional status, history of previous treatment, adherence to previous medication, density of home occupancy and the presence of supervisor of TB medicine. Factors that contributed 47.5% to the incidence of MDR TB were family income, nutritional status, immunization status, previous treatment history, and residential density. The dominant factor is immunization status.

Factors that did not affect the incidence of MDR TB were age, sex, education, occupation, contact history and access to health services

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