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Risk of Tuberculosis among Prisoners: A Case Control Study in Narcotics Prison Class II A Jakarta

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Abstract

This study aimed to determine the risk factors for tuberculosis in prisons. A case control study conducted at narcotics prison class II.A Jakarta with data collection conducted from December 2013 to February 2014. Seventy-six prisoners who tested positive for tuberculosis and 152 control healthy prisoners were identified. Multivariate logistic regression was applied to determine the risk factors. The results show that significant risk factors for tuberculosis among prisoners were the presence of a person or persons with tuberculosis in the same room, the length of detention, being HIV positive, and no use of antiretrovirals among HIV positive persons. The presence of people with tuberculosis in the same room was the most significant risk factor for acquiring tuberculosis in prison (OR = 13.0, 95% CI 4.4—38.4). Detention for three or more years increased an inmate's risk of acquiring tuberculosis by 3.7 times (95% CI 1.4–9.5). Those who were HIV positive had a 4.7-times higher risk of tuberculosis (95% CI 1.4–9.5). Those who were HIV positive and did not use antiretrovirals had 5.8 times the risk of contracting tuberculosis compared to controls (95% CI 1.1–31.2). Improvements and modifications, such as isolating those infected with tuberculosis and routine testing for HIV and tuberculosis, can be used in efforts to prevent tuberculosis transmission in prison.

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1. INTRODUCTION

Tuberculosis (TB) is a contagious respiratory disease which a accounts for the high death rate. Respiratory tract infections caused by the bacteria Mycobacterium tuberkulosiss has many types, but the greatest manifestation is in the lungs. The World Health Organization (WHO) states that TB is the leading cause of death from infectious disease in adults. An estimated there are 7.96 million new cases each year. In 2006, 9.2 million

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new TB cases occurred, and approximately 1.7 million people died from the disease. TB kills 1 million women and children each year. In addition,450,000 children under the age of 15 years die of TB [8].

According to the 2010 Global Report by WHO, the total number of TB cases in 2009 was 294,731. This includes169,213 new cases that were TB smear positive, 108,616 cases that were smear negative, 11,215 extra-pulmonary cases, 3,709 cases of recurrent TB, and 1,978 that were retreatment cases. According to Indonesia's National Household Health Survey (SKRT) for 2001, TB accounted for 9.4% of the total deaths in the country.

In SKRT 2004, the prevalence of pulmonary tuberculosis based on microscopic examination of acid-fast bacilli (AFB) was reported as 104 positive tests for every 1,000 people. In 2011, the Ministry of Health in Indonesia reported that the prevalence of pulmonary tuberculosis in the country was as much as 289 cases per 100,000 population, with an incidence of 189 per 100,000 population. TB is found in densely populated low and middle-class residential areas. ([9].

The incidence of tuberculosis in prisons is considered as a special case. Prison populations are increasing every year. Many prisons exceed their occupancy capacities. According to WHO (2000), TB in prisons is much higher than in the general population. Prisons in Indonesia are over capacity and overcrowded, with inadequate infrastructure and ineffective environmental and sanitation measures. The government's strategies for TB control have been implemented ineffectively. The purpose of this study was to determine the risk factors of tuberculosis in prisons.

2. METHODS

This study used a case control study design. The population of this research was currently incarcerated prisoners. Samples were taken from the Narcotics Prison Class II A Jakarta, and data collection was conducted from December 2013 to February 2014. The determination of cases and controls was carried out by medical records and interviews with prisoners. Cases were prisoners who had been diagnosed with tuberculosis or those who drank anti-tuberculosis drugs; altogether 76 cases were selected. Controls were prisoners who had not been diagnosed tuberculosis and never drank anti- tuberculosis drugs, amounting to 152 people chosen at random. Risk factor variables were measured through interviews with the prisoners, while nutritional status variables were measured by anthropometry body mass index.

Table 1: Results of Multivariate Logistic Regression Risk of Tuberculosis among Prisoners

Variable	p-value	OR	95% CI of OR
Rooming with Tuberculosis patient	<0.001	13.0	4.4 - 38.4
Detention for 3 years or more	0.008	3.6	1.4 - 9.5
HIV positive	0.260	4.7	0.3 - 67.9
HIV positive and do not use antiretrovirals	0.039	5.8	1.1 - 31.2
Not married/divorced	0.178	1.6	0.6 - 3.9
Low education level (secondary or lower)	0.141	1.9	0.7 - 4.6
Having history of detention	0.168	2.3	0.7 - 7.7
Having family history of TB	0.128	1.8	0.4 - 8.3
Low nutritional status (BMI < 18.5)	0.154	1.9	0.7 - 5.0
Note: OR = Odds Ratio, CI = Confidence Interval			

3. RESULTS

Most respondents were younger than 30 years old (28.5%), had a high school education or more (60.5%), were married (46.9%), and injected drug users (26.8%). Half of respondents were in prison more than 3 years (49%), and as much as 27.2% of the respondents had a roommate who suffered from tuberculosis. A total of 22.8% of respondents were living with HIV, and 15.4% of respondents used antiretroviral therapy regularly. A total of 38.6% of respondents had a BMI lower than 18.5, indicating a lesser nutritional status.

The presence of people with tuberculosis in the same room was the most significant risk factor for tuberculosis in prison (OR = 13.0, 95% CI 4.4–38.4). Those who had been incarcerated three or more years had a 3.7-times higher risk of developing tuberculosis compared to controls (95% CI 1.4–9.5). Those who were HIV positive had an increased risk 4.7 times higher (95% CI 1.4–9.5). Those who were HIV positive and did not use antiretrovirals had risk 5.8 times higher for acquiring tuberculosis (95% CI 1.1–31.2).

Other variables that were risk factors for tuberculosis in prison but not statistically significant, although the substance was quite significant (an increased risk of over 1.5 times), were being unmarried, having a secondary or lower level of education, having a history of incarcerations, having a family history of TB, and having a low nutritional status. Unmarried or divorced prisoners had a risk of developing TB 1.6 times greater than those who were married. Prisoners with a low education level (secondary or lower) had a risk 1.9 times greater than those with a high school or college education.

Prisoners who had been detained or went to prison previously had a 2.3 times greater risk of developing TB than those who had not been arrested or in jail before. Prisoners who had a history of TB in the family had a 1.8 times greater risk of developing the disease. Prisoners who were malnourished had 1.9 times greater the risk of developing TB.

4. DISCUSSION

The existence of TB among prison populations may be due to smear-positive bacteria in the environment. Results of multivariate logistic regression analysis of this study confirmed that prisoners who lived with people with TB were at a high risk of developing the disease compared to those who did not have a roommate who suffered from TB. The results also showed that the longer in custody, the greater the risk of developing TB. Prisoners who had been held in custody for three or more years had a risk of developing TB 3.6 times higher than those held for less than three years. These results are consistent with Hussain et al. (2003), for whom a multivariate analysis indicated that those who had been detained for more than two years had a risk of acquiring TB 3.4 times higher, and those held one to two years had a risk of 1.6 times higher, than those incarcerated less than one year.

Based on the risk analysis of education levels and TB incidence, prisoners who had a secondary education or less had a 1.9-times higher risk of acquiring TB compared to prisoners who a high school education or more. The results of this study are consistent with Hussain et al. (2003) in their study of the risk factors for bacterial TB infections among prisoners in Pakistan. They found that prisoners who had low education levels were at a risk of TB 2.2 times greater than those who had a college education. A low level of education is associated with less health knowledge and less prevention behavior, making those people more prone to disease.

Concerning the marital status variant, the analysis showed that unmarried prisoners had a 1.6-times greater risk for developing TB compared to married respondents. These results are empirically consistent with research conducted by Lienhardt et al. in "Investigation of the Risk Factors for Tuberculosis: A Case-Control Study in Three Countries in West Africa" (2005), which shows a higher risk for TB among people who were not married or who were divorced. People who were divorced had a risk 2.34 times higher than married people, while unmarried persons had a risk 1.86 times higher. The single respondents may interact with other people more and have a higher potential for being exposed to TB bacteria.

Prisoners who had previously been incarcerated had a risk of developing TB 2.3 times higher than respondents who had never been detained before. A history of prior incarceration became a concern, because it was known that the rate of TB transmission within the facility was 10 times higher than in the general population. People who had been detained several times were at risk for being agents of the bacteria in prison due to possible infection in a previous detention environment.

A prison that had based its security on the shape of the building and on the environment also had openings that allowed in light. The entire prison environment was later surrounded by a wall that nearly exceeded the height of the building. This condition affected the ability of light to reach every room inside. In addition to these conditions, overcrowding rendered it impossible to implement suitable rooming situations for the inmates. This, along with inappropriate insulation, allowed the spread of TB bacteria. Research conducted by Hera et al. in 2013 showed a significant relationship between the incidence of TB and ventilation conditions, population density, humidity, and natural lighting. Concerning the occupancy density variable, the risk of TB was 10.0 times higher, while the natural lighting variable showed a risk of acquiring TB at 4.7 times higher. This study showed that environmental conditions were significant factors in the spread of TB.

Malnutrition is known as one of the causes of the decline of the immune system. The results of this study showed that a prisoner with a low nutritional status (Body Mass Index less than 18.5) had a risk of developing TB 2.7 times higher than respondents who had a normal nutritional status. The results of this study are consistent with the results of research conducted by Pakasi (2009) concerning the relationship between malnutrition and TB on Timor and Rote Islands that inferred the existence of a significant relationship between body mass index (BMI) and TB. Pakasi's studies show that an increase of 1 kg/m2 BMI may reduce by 0.5 times the risk of developing TB (95% CI 0.4–0.6).

HIV is known to be a disease associated with illegal drug use behavior. It is known that TB is an opportunistic disease, and those with HIV are at a greater risk for acquiring TB than those who do not have HIV. Many studies show the significance of the relationship between HIV and TB. Likewise, this research, based on a multivariate analysis, found that people suffering from HIV were 4.7 times more likely to get TB than people who did not have HIV.

The use of antiretroviral therapy is known to decrease the incidence of TB. In our multivariate analysis, it appeared that the regular use of antiretroviral drugs lowered the risk of developing TB by 0.17 times, compared to those who did not consume

antiretroviral drugs. Although the results showed that the consumption of antiretroviral drugs could reduce the incidence of TB, implementation in the field is not easily done. Precautions are required for the use antiretroviral drugs and for drugs that treat TB, because both types are hepaotoxic.

5. CONCLUSIONS

The significant risk factors for acquiring tuberculosis among prisoners are presence of others with TB in the same room, the length of detention, being HIV positive, and HIV positive persons not using antiretrovirals. Other variables that are risk factors for tuberculosis in prisons but not statistically significant, although the substance is quite significant (risk of over 1.5 times) are being unmarried, having a secondary or lower education, having a history of incarceration, having a family history of TB, and low nutritional status.

It is advisable to prevent TB in prisons through actions such as (a) implementing regular checks on inmates who have long languished in detention or those who have roommates that are TB patients, (b) detection and isolation of prisoners with infectious diseases, (c) stepping up efforts to increase the use of therapeutic drugs with a priority on preventing TB, while not overlooking considerations for HIV, and (d) modifying the prison's environment without compromising security; for example, by adjusting the indoor lighting levels and humidity by changing the vents, windows, and room lights.

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