# The Characteristic of *Tuberculosis* Patients in Jakarta 2011 Based on Nutritional Status, History of Immunodeficiencies, History of *Tuberculosis*, and Source of Infection at Home

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## ABSTRACT

Our study's aim is to determine the Tuberculosis (TB) infection source in Jakarta to decrease its prevalence. This cross sectional study lasted 4 months involving 109 TB patients. Subjects should be diagnosed as primary lung TB patients. Questionnaire was used as this study's tool, comprising questions as follows: patient's identity and 4 main questions relating to Body Mass Index (BMI), TB history, history of immunodeficiencies, and TB infection source existence at home. From 109 TB patients, only 35 persons (32.1%) have BMI problem. Only 2 persons (1.8%) have all factors supposedly linked to TB prevalence. Other patients showed varied results on combination of 2 factors (e.g. BMI and immune disease), ranging from 1.8% to 11.9%.We also found that 15 persons (13.8%) have normal BMI, no history of TB, no immune disease, and no infection source at home. Bad nutritional status is the TB patients' main characteristic in Jakarta 2011.

*Keywords:* tuberculosis, pulmonary tuberculosis, body mass index, immune system

**Introduction and Objectives**

Tuberculosis (TB) is an endemic disease that is caused by *Mycobacterium tuberculosis*, a variety of bacteria which could spread easily. In a cough, bacteria are spread by the patient into the air. They could stay alive for a few hours, and could infect orally when inhaled. Those particular bacteria could stay dormant for a long time in human lungs. When our immune system are weakened or nearby environment supports the growth of the bacteria, we could be infected either in our lungs, or in other parts of our body.[1] The bacteria can infiltrate through and damage all tissues in the body.

Tuberculosis is a disease caused by interaction of human with another human, that is why one of the highest probability would be interaction with another TB patient at home.[1] Even so, not every person exposed to this bacteria would get infected, one of the reason is that there is genetic factor that creates resistance against tuberculosis.[3] Another point to be considered is the history of the patient. Since TB lies dormant inside human body, there would be a chance that a newly diagnosed pulmonary TB patient has already been diagnosed TB before, either pulmonary or extra pulmonary TB. Tuberculosis sometimes also happens because of the weakness of our immune system; that is why people with AIDS are more susceptible to this kind of infection. In Indonesia, 24% of HIV patients also suffers Tuberculosis.[4] Another point to consider is another severe pulmonary disease like Chronic Obstructive Pulmonary Disease (COPD). People with COPD are found to have three times the risk of being infected by TB.[5] Nutrition is another factor to consider. Nutritional status could be monitored from the Body Mass Index (BMI). It is found that obese people are more resistant to TB than those who are normal or undernutrition.[6]

It is estimated that TB has infected one third of the world's population. That is why tuberculosis has become a worldwide crisis.[2] WHO estimated at least 8 million people a year gets infected by TB, which is approximately 3 million of fatality. This incident occurred mostly in developing countries such as Indonesia. Indonesia ranks third after India and China which contribute about 10% of TB cases in the world.[1]. An epidemiological study of tuberculosis in Indonesia showed that the prevalence of tuberculosis in Indonesia has reached 555.000 cases in 2002. TB has become the third leading cause of mortality in Indonesia, which is about 9.4% of the total mortality.[2]

Considering this urgent condition, researchers choose this topic as a basis of an epidemiological study regarding TB, to determine and ascertain the factors that are related to the disease. The main purpose of this research is to find out the characteristic of TB patients based on nutritional status, history of TB, history of immunodeficiencies, and source of infection at home. This research is important as a pilot study to collect epidemiology data on TB patients to decrease prevalence of TB. There is no conflict of interest from all the authors. This study was funded partly by Persahabatan Public Hospital and partly by personal funding.

**Methods**

Cross-sectional method was used to determine the prevalence of tuberculosis in society. This research was done in 1 month period, from 26 August 2011 until 30 September 2011. A total of 109 subjects are included in this study. The subjects in this research are people who are at present diagnosed as primary pulmonary or lung TB or people who are still in medications in Persahabatan Public Hospital, which is the national center of TB in Indonesia. Inclusion

criteria for the subjects are people who agreed to sign the informed consent and are communicative. Meanwhile, the exclusion criteria are people who live in their current house for less than 1 year. To determine the sample, we used consecutive sampling. Period of recruitment is at the same time period as the data collection; 12-23 of September 2011. The Institutional Review Board approved this study and informed consent was obtained from all participants. Researchers used questionnaire to collect the data by asking personally to the subject to ensure the accuracy of data collected. Researchers inquire name, birth date, age, gender, height, weight, BMI, date diagnosed TB, history of past TB, history of other diseases, and the presence of other TB infected person in their domicile, especially inside their residence. Body height and weight was determined based on measurement. The questionnaire was validated prior to the data collection with 30 subjects. No subjects have received effect modifiers such as TB immunization and complete treatment for a previous TB. The data we obtained was analyzed using SPSS version 16.5 for Windows Operating System descriptively. Through SPSS, the data is presented descriptively without any interaction, sensitivity, or correlation test. All confounding factors are disposed. This research utilizes the Per-Protocol convention, therefore all missing data is excluded.

**Results**

The data collection was done in 2 weeks, each week from Monday to Friday. There were 120 potential subjects, 109 examined for eligibility, and 109 confirmed eligible and included in the study, and analyzed. The 11 potential subjects who did not participate in examination for eligibility rejected to be included in the study. Their social status does not vary much; most of them are

middle to lower class of society, which is shown by their possession and use of health insurance. They also live in the crowded parts of Jakarta, with poor sanitation around their house. There were no missing data from all 109 subjects. We summarize our results into four charts according to their respective variables. There were no continuous variables categorized.

From the survey of 109 people with TB, we can classify the source of infection based on single factor or multiple factors. The factors that are considerably included are Body Mass Index (BMI), history of TB, other diseases, and source of infection at home. Regarding to subjects' BMI, we can divide them into several nutritional status (based on WHO Classification of BMI for Asia Pacific), which are 16.5% severe malnutrition (<16.00), 35.8% undernutrition (16.00 – 18.49), 45% normal (18.50 – 24.99), and 2.8% overnutrition (>25.00). Meanwhile, based on subjects' history of TB, we can classify them into 78% have no history, 6.4% ever got TB in childhood (≤12 year old), and 15.8% ever got extra pulmonary TB. When we see the existence of other disease, we find that 85.3% subjects are immunocompetence, 0.9% suffering from AIDS, and 13.8% suffering from another severe pulmonary disease. Last, we find that 60.6% subjects have no source of infection at home, 28.4% have sibling who is suffering from TB, 9.2% have non-sibling who is suffering from TB, and 1.8% have both sibling and non-sibling are suffering from TB.

However, if we integrate all source of infections that may have correlation with TB, it can be shown that only 15 people (13,8%) with TB have no risk factors at all, which are normal nutritional status (BMI around 18,5-25 kg/m$^2$), immunocompetence (have no other diseases like AIDS or another severe pulmonary disease), there is no history of TB before and also no source of

infection at home. In the other hand, there are only 2 people (1,8%) have bad nutritional status, immune status, history of TB before, and existence of infection source at home (siblings, non-siblings, or both) as well. Meanwhile, rest of respondents have varied aspects of 4 characteristics which are appointed by researcher (they can have 1 characteristic only until 3 characteristics). It also can be seen from the survey that most of the respondents have problem on nutritional status, which only 35 people (32,1%), whether they are mostly severe underweight or underweight.

**Discussion**
From the result of our research for those four aspects, we found a rather broad result. First of all, regarding the result of nutritional status, our result has shown that most of the TB patients are in normal and under nutrition condition. Meanwhile, from other studies, low weight (in this case, low body mass index) is one of the established risk factor for TB patients. A cohort study from *International Journal of Epidemiology* also has concluded that there is a consistent log-linear relationship between TB incidence and BMI which means that the amount of TB incidences happened following the log-linear curve. From that study, it was also shown that the peak amount of the incidences happened at low BMI, from 15-20.[7] These are in contrast to the findings of our study. There are some reasons that can be the base of our result, such as that TB patients in Jakarta have more good nutrition uptake, better and more balanced eating lifestyle before and after infected by TB, those patients can be fulfilled with an adequate supply of food, or perhaps there is a bias because those respondents are coincidental having normal BMI so they do not represent general character in nutritional status of all TB patients in Jakarta.

Actually, this new result also can be of some consideration to all health workers and society to learn new characteristics of TB patients so it can be more helpful to treat the TB patients faster because obviously, the nutritional status of TB patients has been shifted to normal condition rather than under nutrition. Future studies are needed where confounding factors are controlled and selection bias is omitted.

The second characteristic that we studied is the history of past tuberculosis. The result is that nearly a quarter of the pulmonary TB patients have suffered from extra pulmonary tuberculosis. This recurrence could show that in the quarter of the TB patients, the treatment of primary TB was not done completely or effectively, this is an effect modifier. Incomplete treatment could be the cause of a secondary TB. This result can be used to show the importance of the right treatment and medication for both the patients and the health care providers. However, further research is still required to scrutinize regarding the relation between history of TB and recurrence of secondary TB.

About the third characteristic in history of immunodeficiency, most of them do not have any immunodeficiency condition, such as Human Immunodeficiency Virus (HIV) or another severe pulmonary disease, but we must keep in mind that this result represents TB patients in Jakarta in 2011. The condition can be very different in other country or continent like Africa which also have high prevalence in HIV cases. An epidemiology study in Nigeria shows that 32.8% of HIV-seropositive adults have revealed the clinical manifestations and also positive sign of TB in support examinations, such as chest radiograph. The study also shows that the link between TB, HIV, and also age of infection (the lowest prevalence is for age group 30-39 years). Yet, as we have known before that HIV also becomes

one of the risk factor of TB infection. So, we still have to think about the relation between these two kinds of disease in the future and we can determine the best treatment for the patient later.[8]

The last characteristic is about the existence of another TB patient at home. From the result, around 40% of those TB patients also have another TB patient at their home. That number can show the high number of TB infection, especially of people who live in the same house. From the high number, we came to the suspect that the health promotion for TB patients is not adequate, since the patients are not even aware of the risk of spreading the infection of *Mycobacterium tuberculosis* to people close to them. Since this is a problem of society's education towards understanding diseases, we hope from this research, the government can again be reminded of the importance and urgency of health promotion.

## Conclusion

The characteristic of primary lung TB patients in Jakarta 2011 varies, including bad nutritional status, history of TB during childhood or extra pulmonary TB, history of immunodeficiencies, or existence of source of infection at home. Bad nutritional status is the main characteristic of TB patients. Meanwhile, combination of bad nutritional status and existence of source of infection at home is the most prevalent multiple characteristic.

The limitations of this study are; we do not know the cause effect relationship of each factor because the method of the study is cross-sectional, limited time and which leads to limited sample size and also the specificity of inclusion criteria, which causes the bias and confounding factors to be abundant. Therefore, we suggest further research done in this topic to use case control or cohort study. However, this study is still important to help the government to establish health policy in order to eradicate TB in Indonesia. Besides that, by knowing that nutritional status is the most significant factors in contributing TB cases, we suggest the government to improve health care system, especially regarding nutrition.

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Tables

Table 1 Nutritional Status

|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Severe malnutrition | 18 | 16.5 | 16.5 | 16.5 |
|  | Undernutrition | 39 | 35.8 | 35.8 | 52.3 |
|  | Normal | 49 | 45.0 | 45.0 | 97.2 |
|  | Overnutrition | 3 | 2.8 | 2.8 | 100.0 |
|  | Total | 109 | 100.0 | 100.0 |  |

Table 2 History of Tuberculosis

|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Normal | 85 | 78.0 | 78.0 | 78.0 |
|  | Suffering Pulmonary TB <12 years | 7 | 6.4 | 6.4 | 84.4 |
|  | suffering extrapulmonary TB | 17 | 15.6 | 15.6 | 100.0 |
|  | Total | 109 | 100.0 | 100.0 |  |

Table 3 History of Immunodeficiencies

|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Normal | 93 | 85.3 | 85.3 | 85.3 |
|  | AIDS | 1 | .9 | .9 | 86.2 |
|  | another severe pulmonary disease | 15 | 13.8 | 13.8 | 100.0 |
|  | Total | 109 | 100.0 | 100.0 |  |

Table 4 Existence of another TB patient at home

|  |  | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | No TB patient | 66 | 60.6 | 60.6 | 60.6 |
|  | Sibling suffering TB at home | 31 | 28.4 | 28.4 | 89.0 |
|  | non-Sibling suffering TB at home | 10 | 9.2 | 9.2 | 98.2 |
|  | Sibling and non-sibling suffering TB at home | 2 | 1.8 | 1.8 | 100.0 |
|  | Total | 109 | 100.0 | 100.0 |  |

Table 5 Source of Infection

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| Valid | Normal | 15 | 13.8 | 13.8 | 13.8 |
| | Nutritional Status | 35 | 32.1 | 32.1 | 45.9 |
| | TB | 6 | 5.5 | 5.5 | 51.4 |
| | Immunity | 16 | 14.7 | 14.7 | 66.1 |
| | Nutritional Status and TB | 5 | 4.6 | 4.6 | 70.6 |
| | Nutritional Status and history of immunodeficiencies | 2 | 1.8 | 1.8 | 72.5 |
| | Nutritional Status and another existence | 13 | 11.9 | 11.9 | 84.4 |
| | TB and history of immunodeficiencies | 2 | 1.8 | 1.8 | 86.2 |
| | TB and existence | 5 | 4.6 | 4.6 | 90.8 |
| | Nutritional Status, history of immunodeficiencies, and TB | 1 | .9 | .9 | 91.7 |
| | Nutritional Status, TB, and existence | 5 | 4.6 | 4.6 | 96.3 |
| | Nutritional Status, history of immunodeficiencies, existence | 2 | 1.8 | 1.8 | 98.2 |
| | Nutritional Status, history of immunodeficiencies,TB,existence | 2 | 1.8 | 1.8 | 100.0 |
| | Total | 109 | 100.0 | 100.0 | |

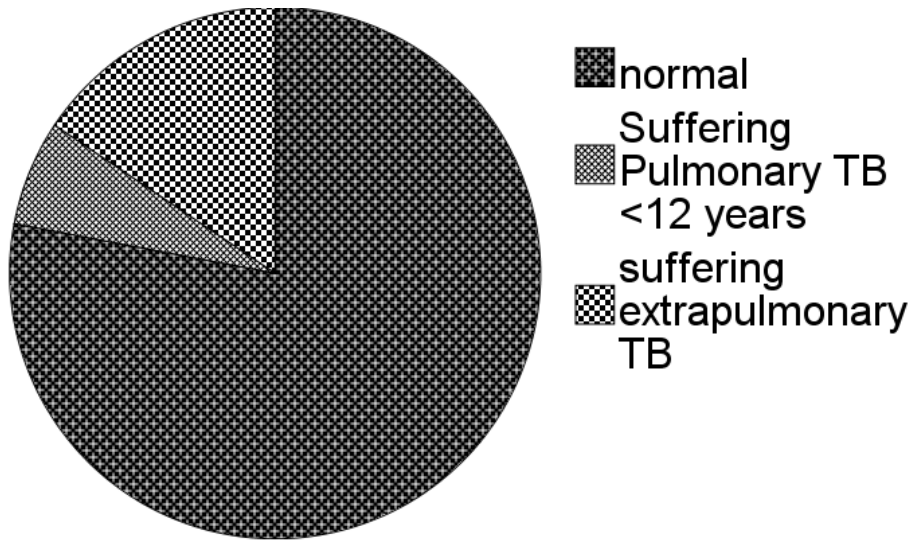Figure 1. Nutritional status of TB patients in Persahabatan public hospital 2011
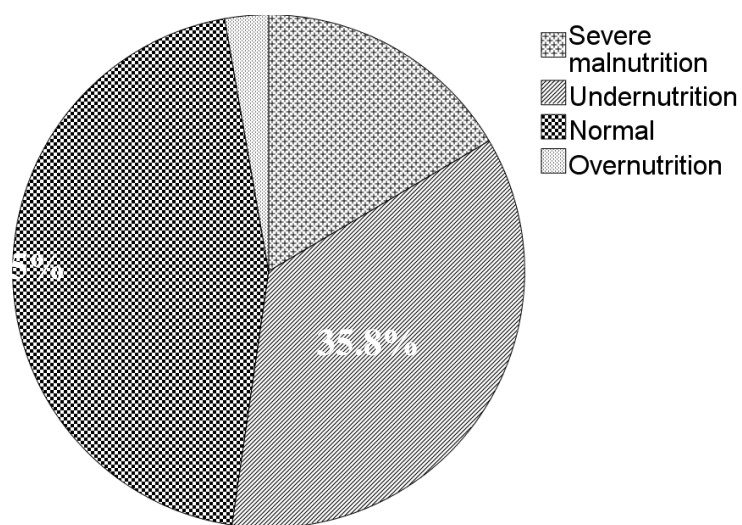
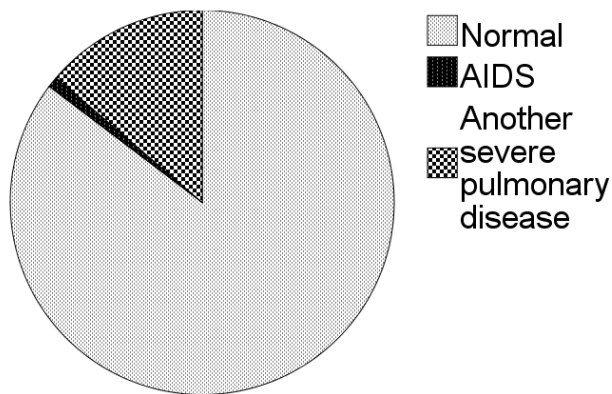Figure 2. History of TB of TB patients in Persahabatan public hospital 2011



Figure 3. History of Immunodeficiencies of TB patients in Persahabatan public hospital 2011
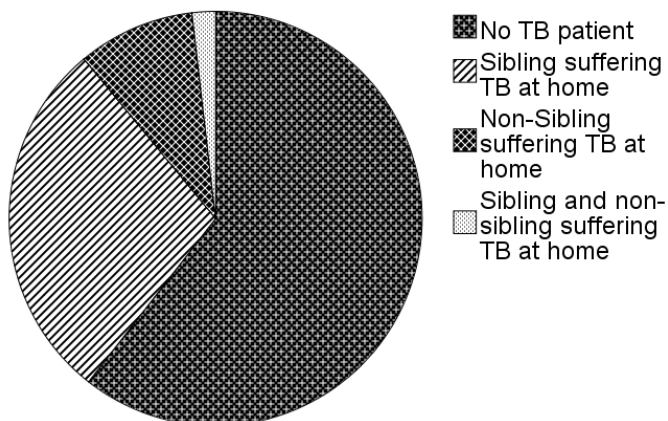


Figure 4. Existence of another TB patients at home of TB patients in Persahabatan public hospital 2011