Analysis of Diabetes Mellitus and Environmental Tobacco Smoke (ETS) Exposure as Lung Tuberculosis Risk Factors

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ARTICLE INFO

Keywords:
TB
Diabetes mellitus
Environmental Tobacco Smoke (ETS)

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All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/CMEJ.v2i2.116

ABSTRACT

Indonesia, is the country with the second highest lung TB case in the world. Some studies suggest there is a relationship between TB and diabetes. The smoking habit is also linked because it can damage the lung defense mechanism thereby facilitating the entry of TB germs. This research was conducted to analyze diabetes mellitus and exposure to environmental tobacco smoke (ETS) as risk factors for pulmonary tuberculosis. This research is a quantitative analytic study with Case Control conducted in the TB Endemic Region in Palembang, namely the work area of the Kertapati Health Center, Sei Selincah Health Center and 23 ilir Health Center in February to December 2018. Data were obtained from primary data obtained from questionnaires and examinations physical. The data obtained are presented in the form of a master tabulation and processed using the Chi-square test and T-test analysis. In this study showed no significant relationship between blood sugar levels when with tuberculosis status (p = 0.075).

1. Introduction

Infectious disease is one of the main health problems in the world, even in Indonesia. One cause of infectious diseases is the bacterium Mycobacterium. Mycobacterium tuberculosis is a facultative intracellular bacterium that causes tuberculosis (TB). Based on 2015 WHO data, in 2014 there were an estimated 9.6 million TB cases worldwide. Indonesia, is the country with the second highest lung TB case in the world.

The prevalence of TB in Indonesia in 2013 was 297 per 100,000 population. Achievement figures in South Sumatra there are 74 per 100,000 people who have pulmonary tuberculosis. While the prevalence of cases of Pulmonary Tuberculosis in Palembang City is 83.83 per 100,000 population. This figure shows that the city of Palembang is one of the cities in South Sumatra that has problems with transmission of pulmonary tuberculosis.1

There are recent findings that there is a relationship between appetite-related hormones, cytokine inflammation and body mass index (BMI) in TB patients with diabetes. Possible abnormalities in leptin and ghrelin regulation can be related to the development of malnutrition (low BMI) during the inflammatory response in diabetic TB patients. TB patients with diabetes may have more complex and different pathogenesis compared to TB patients alone.1-3

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Diabetic patients have cell mediated immune disorders, kidney failure, micronutrient deficiencies and pulmonary microangiopathies, all of which increase their tendency to develop TB. Low-income countries, most where TB is transmitted, tend to report symptoms of active TB disease and also report ever diagnoses of diabetes.

Factors that influence the occurrence of pulmonary TB disease include socioeconomic conditions, age, sex, nutritional status and smoking habits. Although smoking is not the main cause of pulmonary TB disease, smoking can damage the lung defense mechanism, making it easier for the entry of germs like TB germs.

Smoking causes pathophysiology in the respiratory system including the immune system and the cleansing mechanism of inhaled pathogens. The mechanisms that effect TB infection in response to smoking include mucociliary clearance dysfunction, decreased alveolar macrophage activity, immunosuppression in pulmonary lymphocytes, inactivation of NK (natural killer cells), and pulmonary dendritic cell dysfunction.

Data from the Health Research and Development Agency (Litbangkes) shows that those who smoke (including those who still smoke and who have quit smoking) have a risk of suffering from TB 3 times higher than those who do not smoke. Exposure to tobacco both actively and passively can increase the risk of contracting TB. The risk of contracting TB will increase 9-fold if there is 1 smoker in one house. Therefore this study was conducted to analyze diabetes mellitus and exposure to environmental tobacco smoke (ETS) as risk factors for pulmonary tuberculosis.

2. Methods

This type of research is a quantitative analytic study with Case-Control. Data collected from this study are primary data obtained from questionnaires. Data was collected through a questionnaire carried out in each of the sample’s residence. Information on the address of each sample is obtained through the puskesmas medical record and a visit permit request is made to each sample before visiting the place of residence. The questions on the questionnaire were asked for each sample and the answers were recorded. In addition to asking questions through a questionnaire, data retrieval is also routed through a physical examination. Data of each related variable is obtained by the answers of each sample. After the data is collected then the data is processed and analyzed. Data obtained from the results of the questionnaire were entered into a tabulation master using the Microsoft Excel program. Data is processed descriptively and analytically using the IBM program.

Characteristics of Lung TB Patients in Palembang City Health Center analyzed descriptively and presented in the form of frequency distribution and central distribution tables. Bivariate analysis is performed on two variables that are thought to be related or correlated. The analysis in this study uses the chi square used in ordinal and ordinal scale data to determine whether there is a relationship between the 2 variables, namely the independent variable and the dependent variable. Confidence Interval Calculation (CI) is used at a 95% confidence level. T-test analysis was also used in this study for numerically distributed variables. Confidence Interval Calculation (CI) is used at a 95% confidence level.

3. Results

Based on the results of the research that has been done, the data obtained that of 111 people who became the study sample consisting of 37 patients with pulmonary TB and 74 patients who did not suffer from pulmonary TB (can be diligar in table 1) only 5.4% who have blood sugar levels> 200 mg / dL (can be seen in Table 2). A total of 66.7% of subjects...
with blood sugar levels $> 200$ mg / dL experienced tuberculosis while only $33.3\%$ did not have tuberculosis. Most subjects with blood sugar levels when sewaktu200 mg / dL (68.6\%) did not experience tuberculosis (can be seen in table 2).

The results of the analysis of the relationship between blood sugar levels when with tuberculosis status using the chi-square hypothesis test with a 95% confidence level resulted in a value of $p = 0.075$. This shows that there is no significant relationship between blood sugar levels when with tuberculosis status.

<table>
<thead>
<tr>
<th>Tuberculosis status</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positif</td>
<td>37</td>
<td>33,3</td>
</tr>
<tr>
<td>Negatif</td>
<td>74</td>
<td>66,7</td>
</tr>
<tr>
<td>Total</td>
<td>111</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. Distribution of subjects based on blood sugar levels at a time

<table>
<thead>
<tr>
<th>Blood sugar levels at a time</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$&gt;200$ mg/dL</td>
<td>6</td>
<td>5,4</td>
</tr>
<tr>
<td>$\leq 200$ mg/dL</td>
<td>105</td>
<td>94,6</td>
</tr>
<tr>
<td>Total</td>
<td>111</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3. Relationship between blood sugar levels when with tuberculosis status

<table>
<thead>
<tr>
<th>Blood sugar levels at a time</th>
<th>Tuberculosis Status</th>
<th>Total</th>
<th>Nilai p*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positif</td>
<td>Negatif</td>
<td>n</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---------------------</td>
<td>---------</td>
<td>-----</td>
</tr>
<tr>
<td>$&gt;200$ mg/dL</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>$\leq 200$ mg/dL</td>
<td>33</td>
<td>72</td>
<td>105</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>74</td>
<td>111</td>
</tr>
</tbody>
</table>

4. Discussion

The results of this study are in line with the study of Astrid (2017) who said that there was no relationship between the results of blood sugar tests when pulmonary X-rays in patients with tuberculosis and non-tuberculosis1 ($p = 0.184$). This is also in accordance with Nasution’s research which said that there was no relationship between blood sugar levels while with X-ray images of pulmonary tuberculosis.$^2$

However Ruslami R (2010) in his research stated that DM interferes with the patient’s immunity so that it becomes a free risk factor for infections such as TB. The condition of hyperglycemia in patients with diabetes mellitus will give the effect of low immunity so that it is susceptible to infectious
diseases, especially tuberculosis. This is because hyperglycemia will interfere with the function of neutrophils and monocytes in terms of chemotaxis, attachment, and phagocytosis of these cells. Research by Niazi A.K, & Kalra S (2012) stated that suboptimal diabetes control predisposes to TB.

Weaknesses in this study are the measurement of DM and non-DM only using blood sugar levels at a time, while the more accurate diagnosis of DM is to measure HbA1c levels and consider the risk factors and clinical symptoms that exist. In addition, the age <40 years in this study sample is more than the age> 40 years where the prevalence of DM is more prevalent in the age range> 40 years.

5. Conclusion

Distribution of TB patients in the working area of the Palembang Public Health Center consisting of 16 Positive TB cases from the Kertapati Health Center, 15 Positive TB cases from the Sei Selincah Health Center and 6 Positive TB cases from the Health Center 23 ilir. The results of the analysis of the relationship between blood sugar levels while with tuberculosis status using the chi-square hypothesis test with a 95% confidence level resulted in a value of $p = 0.075$. This shows that there is no significant relationship between blood sugar levels when with tuberculosis status. But in this study there are also weaknesses because the diagnosis of DM should be made by measuring HbA1c levels because it is more accurate than using blood sugar levels and considering the risk factors and clinical symptoms that exist. In addition, the age <40 years in this study sample is more than the age> 40 years where the prevalence of DM is more prevalent in the age range> 40 years.

6. References


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