

ORIGINAL RESEARCH

Prevalence of diabetes mellitus with pulmonary tuberculosis in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia 2016Heronimus Hansen Kaware¹, Deby Kusumaningrum^{2*}, Arief Bakhtiar³¹Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia.²Department of Microbiology, Faculty of Medicine, Universitas Airlangga; Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.³Department of Pulmonology, Faculty of Medicine, Universitas Airlangga; Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.**Article Info****Article history:**

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***Corresponding author**

Deby Kusumaningrum

deby-k@fk.unair.ac.id

ABSTRACT

Background: Diabetes Mellitus is a type of disorder where the patients' blood sugar is above average. Diabetes Mellitus can cause an abundance of comorbidities, from viral infection until metabolic abnormalities. The increased risk of infections is mostly because diabetes mellitus changes how the body works. The changes range from changes in mechanical barriers (humoral immunity) and cellular changes (cellular immunity), the changes of the humoral immunity that can increase the chance of protracting pulmonary tuberculosis. **Objective:** The purpose of this study was to describe the characteristics of diabetes mellitus in pulmonary tuberculosis in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia from January to December 2016. **Materials and Methods:** The research method used was an observational study using a cross-sectional design conducted in Central Medical Record for hospitalized patients, Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. The diabetes mellitus patients' data collected from the medical records of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia in 2016 were 1,410 and 11 of them were also diagnosed with pulmonary tuberculosis. The final data taken were from 67 out of 115 patients due to the incomplete medical record. **Results:** According to the data, the most of the diabetic patients with pulmonary tuberculosis were male, age of 51-75 years old, and worked in private sector. **Conclusion:** There was a significantly higher number of diabetes mellitus with pulmonary tuberculosis patients in older age, males, and private-sector workers. Diabetic patients with pulmonary tuberculosis were mostly male, aged 51-75 years old, and worked in private sector.

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BACKGROUND

Diabetes mellitus is a type of disorder where the patients' blood sugar is above average, either due to an abnormality in the secretion of insulin or an abnormality in insulin absorption (PERKENI, 2015). The cutline for diabetes mellitus varies from other country, but the cutline used in this research was as follow: fasting plasma glucose of >125 mg/dL, 2-hour post-prandial blood sugar of >199 mg/dL, HbA1c $>6,5\%$, positive signs of hyperglycemia, and having hyperglycemia crisis with fasting plasma glucose of >199 mg/dL (Ministry of Health, Republic of Indonesia, 2011).

Tuberculosis is a disease that is caused by the bacteria *M. tuberculosis*, whose main focus is the lungs (World Health Organization, 2017). It has been known diabetes mellitus can cause an abundance of comorbidities, from viral infection to metabolic abnormalities. The increased risk of infections is mostly because diabetes mellitus changes how the body works. The changes range from changes in mechanical barriers (humoral immunity) and cellular changes (cellular immunity). The changes of the humoral immunity that can increase the chance of protracting pulmonary tuberculosis are as follows: prolonged inflammation that can destroy the original pulmonary cells; the inhibited regeneration of the inflamed cells thus causing progressive destruction; the cells replacing the original pulmonary cells are not as good as the original cells, thus causing the decrease of pulmonary functions such as lung elasticity and compliance. While the cellular dysfunctions may vary from person to person, the main cellular immunity dysfunctions that can increase the chance of protracting pulmonary tuberculosis are mainly: the dysfunction of the neutrophils' functions, phagocytosis dysfunctions, and the cytokines dysfunctions. All these humoral dysfunctions will eventually cause *M. tuberculosis* to thrive within the host's body as the body is already exposed to the bacteria without any means of self-defense (Nathella, 2017).

The prevalence of pulmonary tuberculosis with diabetes mellitus was so common that in 2014 the number of pulmonary tuberculosis and diabetes mellitus increased simultaneously (World Health Organization, 2017). According to Wijaya (2015), the number of tuberculosis and diabetes mellitus comorbidity in 2011-2005 was around 40% of total pulmonary tuberculosis cases. The incidence risk of pulmonary tuberculosis was affected by diabetes mellitus patients. The signs and symptoms shown by pulmonary tuberculosis patients with diabetes mellitus do not differ from the patients who only have pulmonary tuberculosis (Wijaya, 2015).

OBJECTIVE

Due to the increased concern of the increasing number of diabetes mellitus and pulmonary tuberculosis comorbidity, this research was conducted to find out the characteristics of the largest diabetic patient population who were infected by pulmonary tuberculosis with the hope to prevent the increasing number of the disease. The purpose of this research was to raise awareness of the prevalence of pulmonary tuberculosis in type 2 diabetes mellitus and to be a reference for further study.

MATERIALS AND METHODS

This was an observational study using cross-sectional design. The study was conducted at Central Medical Record for hospitalized patients of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. The total sample of diabetes mellitus patients were 1,410 samples. As many as 115 samples were suspected of pulmonary tuberculosis. In the end, the total sample size was 67 since the rest of the records showed false positive. The sampling technique used was consecutive sampling, covering all patients who suffered from pulmonary tuberculosis and diabetes mellitus without any other comorbidities. The data were gathered from medical records of Dr. Soetomo General Academic Hospital, Surabaya, Indonesia from January-December 2016. Data were analyzed with descriptive statistics and presented in tables.

RESULTS

Table 1. Results of the comparison between the prevalence of diabetic male and female patients with pulmonary tuberculosis.

Sex	Number
Male	70.1%
Female	29.9%

The result showed that out of the 67 samples taken from the medical records, the dominant sex group was the male group (Table 1).

Table 2. Results of the comparison between the age group of diabetic patients with pulmonary tuberculosis

Age Groups (Years)	Number
26-50	28.4%
51-75	70.1%
>75	1.5%

Data showed that the highest group of diabetic patients who suffered pulmonary tuberculosis was the 51-75 age group (Table 2).

Table 3. Results of the comparison between the occupations of diabetic patients with pulmonary tuberculosis

Occupation	Number
Private sector workers	46.3%
Public sector workers	23.9%
Pensionaries	0.6%
Housewives	16.4%
Undocumented jobs	7.5%

From the results above we found that there are some. Thus, it was concluded that some of the prevalence of pulmonary tuberculosis with diabetes mellitus were highest within males, of 51-75 years old and those who worked in private sectors.

DISCUSSION

Diabetes mellitus destroys the ciliary bodies within the airway, thus causing the airway clearance to be decreased exponentially (Wijaya, 2015). In the Guideline on How to Handle Pulmonary Tuberculosis by the Ministry of Health, Republic of Indonesia (2011), diabetes mellitus is one of the most common and most dangerous comorbidity that needs proper monitoring and special therapy to cure. Another study by Dobler et al (2012) explained that diabetes mellitus patients with HbA1c > 7.5% would get a higher chance of getting pulmonary tuberculosis.

In our study, we found that the prevalence of diabetic patients with pulmonary tuberculosis was dominant in male group. The study of Alavi & Khoshkhoy (2012) was similar to our study, that the number of diabetic males with pulmonary tuberculosis was 38.8%, higher than diabetic females. Another study by Horton, et al., (2016) explained that the number of diabetes mellitus with pulmonary tuberculosis patients amongst people of working-age were mostly males because males rarely go to the doctor despite showing symptoms of pulmonary tuberculosis.

In this study, we found that the age group of diabetic patients with pulmonary tuberculosis was 51-75 years old. This was similar to the results of Khalil & Ramadan (2016) study that the mean age of the DM-TB group was around fifties (52.9±11.2 years old). Wijaya (2015) reported that the higher age group of diabetes mellitus with pulmonary tuberculosis patients in Indonesia was the 55-74 years old. Indonesia is one of the most burdened countries with private-sector workers as the highest group of TB patients due to the high workload and no time for proper treatment (Wells, et al., 2011).

Several studies that explain the correlation between pulmonary tuberculosis and diabetes mellitus were Restrepo's paper (2016) that explained the pathophysiology of diabetes mellitus and pulmonary tuberculosis, and another study by Paralija (2018) explained how pulmonary tuberculosis present itself in diabetic patients. However, in this study, there were some limitations that could influence the results, among others, were the number of false-positive results within the medical record center, the incomplete documentation of the medical records, and the time consumed during data collection.

CONCLUSION

There was a significantly higher number of diabetes mellitus with pulmonary tuberculosis patients in older age, males, and private-sector workers. Diabetic patients with pulmonary tuberculosis were mostly male, aged 51-75 years old, and worked in private sector.

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