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EARLY DETECTION OF CHANGES IN BLOOD GLUCOSE LEVELS AS AN EFFORT TO INCREASE SUCCESS FOR THE TREATMENT OF LUNG TUBERCULOSIS

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ABSTRACT

Tuberculosis (TB) is a pulmonary infectious disease which is the main cause of increased morbidity and mortality worldwide. Diabetes mellitus is one of the factors that can increase the incidence of pulmonary tuberculosis. This study aims to determine changes in glucose levels in pulmonary TB patients at the beginning of being diagnosed with pulmonary TB or before receiving OAT therapy and after receiving OAT therapy. This study is an analytical study with a cross-sectional repeated measurement design, namely measuring blood glucose levels repeatedly for 2 times (the initial measurement of treatment before receiving OAT therapy and measurement after receiving OAT therapy). The sample in this study were 107 pulmonary tuberculosis patients who were treated at the Public Health Center in Palembang City. The sampling technique is proportional random sampling. Data analysis in this study was carried out descriptively and analytically using the t-test (Wilcoxon). The results showed that in TB patients with normal initial glucose level status, there was a significant difference in glucose levels before and after receiving OAT therapy (p-value = 0.000) p <α, TB patients experienced binding of glucose levels after receiving OAT therapy while in TB patients with DM status, showed no significant difference in glucose levels before and after receiving OAT therapy (p-value = 0.135) p> α.

Keywords: Pulmonary Tuberculosis, Blood Glucose Levels, OAT Therapy

1. INTRODUCTION

Pulmonary tuberculosis is a contagious disease caused by Mycobacterium tuberculosis. Mycobacterium tuberculosis is an aerobic germ that can live mainly in the lungs or other parts of the body that have high Data from the 2016 Annual Tuberculosis Report, patients with pulmonary tuberculosis in 2014 worldwide were 9.6 million, new cases of pulmonary tuberculosis in 2009 occurred in the Asia region by 50%, where Indonesia ranks fifth oxygen pressure. This germ is in the form of a slender, straight or slightly bent stem with rounded ends, and has a high-fat content in the cell membrane, thus causing acid resistance and slow growth.[1] TB disease is a worldwide health problem because one-third of the world's population is currently infected with tuberculosis. after India, China, South Africa, and Nigeria. Indonesia is also the second-largest contributor to pulmonary tuberculosis cases after India, amounting to 647,000 cases.[1,2]

The high number of pulmonary tuberculosis cases is influenced by the body's immune system, and several cases such as HIV, malnutrition, poverty, and population density. Apart from these factors, several studies have shown that diabetes mellitus can also increase the risk of pulmonary tuberculosis. Diabetes mellitus is a condition characterized by increased blood sugar levels and has long-term complications involving blood vessels, eyes, and kidneys. This disease affects many people who have an unhealthy lifestyle, namely high nutritional intake but low physical activity.

Similar to the prevalence of pulmonary tuberculosis, the annual prevalence of diabetes mellitus is also high. Based on data from the World Health Organization (WHO), Indonesia now ranks 4th in the number of people with diabetes mellitus in the world. In theory, diabetes mellitus affects the body's immune system, so that sufferers are more prone to contracting infections including Mycobacterium Tuberculosis infection. Patients with diabetes mellitus, including tuberculosis, were more common in the low-moderate socio-economic group.

Several studies have shown that diabetes mellitus can cause differences in clinical manifestations and responses to pulmonary tuberculosis treatment, especially when the blood sugar levels in the patient are high.[4] The condition of hyperglycemia is a marker of disease severity and a good predictor in conditions of infection, sepsis, and critical illness.[4] In a case study- Incontrast to other studies that stated that the presence of hyperglycemia in TB patients did not affect treatment outcomes.[6] In a study conducted by José Moreira, et al, it was found that TB patients with HIV coinfection had recently started treatment with hyperglycemic TB. , has a worse TB treatment result than euglycemia. [7]

Based on the background description above, as a basis, the researcher wanted to know the changes in blood glucose levels in pulmonary TB patients as an effort to increase the success of pulmonary tuberculosis treatment.

The formulation of the problem in this monograph is whether there is a change in blood glucose levels in pulmonary TB patients before and after OAT therapy as an effort to increase the success of pulmonary tuberculosis treatment.

The research objectives of early detection of changes in blood glucose levels as an effort to increase the success of pulmonary tuberculosis treatment in this monograph were to determine the blood glucose levels in the early phase of treatment before receiving OAT therapy in pulmonary TB patients, to determine the blood glucose levels of pulmonary TB patients after receiving OAT therapy and to find out changes blood glucose levels of pulmonary TB patients before and after receiving OAT therapy.

2. METHODS

The research design used a cross-sectional repeated measurement design, namely measuring blood glucose levels repeatedly for two measurements. In this study, the initial measurements were carried out in pulmonary TB patients before receiving OAT therapy and three months after receiving OAT therapy. The study was conducted in the Palembang City Health Center Work Area in 2019. The study population was all pulmonary tuberculosis patients in Palembang City. The sample in this study were some pulmonary tuberculosis patients who were treated at the Public Health Center in Palembang City. There were as many as 107 samples. Descriptive analysis in this study is presented in the form of numbers and percentages. Meanwhile, the inferential analysis used Wilcoxon statistical test to determine differences in blood glucose levels before and after

receiving OAT therapy in pulmonary TB patients.

3. RESULTS

The results of the study were collected as many as 107 pulmonary TB patients with pulmonary TB patient age, namely 45 years with a minimum age of 10 years and a maximum age of 85 years. The most age found in this study occurred at the age of 20-59 years, as many as 78 people (72.9%), while those aged> 60 years were 21 people (19.6%) and at least at the age <20 years 8 people (7.5%). Based on gender, pulmonary TB patients in this study were mostly found to be male, as many as 65 people (60.7%) compared to 42 people (39.3%) (Table 1).

Table 1. Frequency Distribution Based on Age and Gender

Characteristics	Total (n)	Percent (%)
Age		
- < 20 year	8	7,5
- 20 – 59 year	78	72,9
- ≥ 60 year	21	19,6
Gender		
- Male	65	60,7
- Female	42	39,3

Results of Measurement of Glucose Levels in Pulmonary TB Patients

Distribution based on blood glucose levels in patients with pulmonary tuberculosis. The results of measuring the initial glucose level of TB patients or before receiving OAT therapy were divided into two categories, namely normal and diagnosed diabetes mellitus. The measurement results of pulmonary TB patients who had normal glucose levels were 86 patients (80.4%) while those diagnosed with diabetes mellitus (blood sugar levels> 200mg / dL) were 21 patients (19.6%). Whereas in the last measurement in pulmonary TB patients with normal initial blood sugar levels and becoming uncontrolled, it increased by 23 people (21.5%) (Table 2).

Table 2. Frequency Distribution Based on the Results of Measurement of Glucose Levels in Pulmonary TB Patients

Measurement Results	Total (n)	Percent (%)
Initial Measurement	86	80,4
- Normal Mean±SD =110±33,17, min=36, max=198		
- DM Mean±SD = 296±75,43, min=209, max=449	21	19,6
Final Measurement		
- Controlled Mean±SD = 121,75±27,64, min = 61, max =200	84	78,5
- Non-Controlled Mean±SD = 261,72±53,28, min= 201, max= 387	23	21,5

Differences in glucose levels before drug therapy and after receiving drug therapy in TB patients

The results of glucose research before and after receiving anti-tuberculosis drug therapy (OAT) were analyzed using the Wilcoxon test. Pulmonary TB patients with initial glucose level status in the normal category were 86 patients and 21 TB patients were diagnosed with DM. The results of the analysis of glucose levels before and after receiving OAT therapy in the group of TB patients who had initial glucose levels showed that there were differences in glucose levels before and after receiving OAT therapy (p value = 0.000) p <α. Pulmonary TB patients who were diagnosed with TB at the start of normal glucose level measurements after 3 months of receiving OAT therapy experienced an increase in glucose levels. Whereas in pulmonary TB patients who had initial glucose levels in the DM category as many as 21 patients, the results of the analysis were no differences in sugar levels before and after receiving OAT therapy (p value = 0.135)p> α.

Table 3. Differences in glucose levels before and after receiving OAT therapy based on glucose status

Normal Glucose Status	Therapy	n	Mean ±SD (Min-Max)	*p value*
Normal	Before OAT therapy	86	110,80±33,17 (36-198)	**0,000**
	After OAT therapy	86	124,95±37,14 (61-329)	
DM	Before OAT therapy	21	296,19±75,43 (209-449)	0,135
	After OAT therapy	21	255,28±55,80 (180-387)	

4. DISCUSSION

Characteristics of pulmonary TB patients mostly occurred in men (60.7%) than women (39.3%). This is consistent with several studies which state that men are indeed more susceptible to infection with M. tuberculosis. This can be related to a greater smoking habit in men, which causes disorders of the immune system of the respiratory tract, making them more susceptible to infection.[16] Disorders of the immune system of the respiratory tract can be in the form of damage to mucociliary clearance due to toxins in inhaled cigarette smoke. Cigarette smoke can also damage phagocyte cells in the respiratory tract and decrease the response to antigens, thereby increasing the susceptibility of pulmonary tuberculosis.[17] WHO (2012) also states that according to several studies, the incidence of pulmonary TB in women is lower than in men because less than women with pulmonary TB go to health care facilities. This happens because

women tend to find it more difficult to access health service facilities. The community's negative stigma about pulmonary TB affects the psychosocial aspects of women more than men so that women tend to choose not to go to health service facilities.[16] The increasing age factor also affects the incidence of TB. In this study, it was found that almost all TB patients were in the age range of 20-59 years (72.9%). This is also in accordance with several other studies. According to Tabrani (2010), patients over 40 years of age are more susceptible to infection with M. tuberculosis. This is due to the biological changes that occur in the patient's body, especially in lung tissue, associated with aging. These changes can damage the barrier system and the microbial clearance mechanism of the respiratory system.[18] The study, which was conducted in Semarang, showed that the results of patients with TB-DM were more common in patients aged 16-50 years, married, middle income. This vast age range suggests that pulmonary TB patients can occur at any age. This is because TB infection is also influenced by the environment and low immunity status. Women of reproductive age are more prone to developing TB than men in the same age range.[25]

The results of the study on differences in blood glucose levels before and after receiving OAT therapy found that pulmonary TB patients with initial glucose level status in the normal category were 86 patients, the analysis showed that there was a significant difference in glucose levels before and after receiving OAT therapy (p value = 0,000). <α, glucose levels in TB patients have increased after receiving OAT therapy.

This research is in line with the results of the Gopathi kk study in 2015 which stated that there was an effect of OAT and tuberculosis on increasing blood sugar levels.[23] TB patients are at risk of experiencing DM, one of which is due to the impact of TB drugs in the pancreas which causes a decrease in insulin levels, which can increase blood sugar. Anti-tuberculosis drugs commonly used are bactericides such as rifampin, isoniazid, pyrazinamide, streptomycin, and bacteriostatic such as ethambutol.[24] Isoniazid and rifampin have a hyperglycemic effect. Pyrazinamide can cause difficult DM control. Rifampin induces metabolism and lowers blood sulfonylurea levels.[12] This drug can induce hyperglycemia in the early phase associated with increased absorption in the intestine, but there have been no apparent cases of diabetes.[23] Apart from the anti-tuberculosis drugs themselves, TB disease can make TB patients susceptible to DM because the inflammation caused by cytokines such as IL6 and TNFα in response to TB infection can lead to increased insulin resistance and decreased insulin production, leading to hyperglycemia.[12] The mechanism of damage to the pancreas due to tuberculosis is probably caused by a mycobacterial attack directly to the pancreas through the spread of bacterial tubercles in the blood or through the penetration of the tissue of the abdominal lymph nodes around the pancreas. It was reported that when the pancreas is calcified there is a 23-50% incidence of DM.[23]

5. CONCLUSION

Based on the results of research on early detection of changes in blood glucose levels as an effort to increase the success of pulmonary tuberculosis treatment, it can be concluded that in patients with normal blood sugar status before OAT therapy there was a statistically significant difference (p value = 0.000) p <α, the patient's glucose level. TB has increased after receiving OAT therapy, while TB patients with DM status showed no significant difference in glucose levels before and after receiving OAT therapy (p value = 0.135) p> α.

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