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POTENTIAL STUDY OF SALIVARY TOTAL PROTEIN LEVELS IN PATIENTS WITH DIABETES MELLITUS WHO SUFFER FROM PULMONARY TUBERCULOSIS IN JAMBI CITYS

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ABSTRACT

Background: Diabetes mellitus (DM) is one of the priority non-communicable diseases in Indonesia. DM can occur due to a group of metabolic disorders characterized by hyperglycemia accompanied by metabolic disturbances. Hyperglycaemia in DM will affect total protein levels in the body. Laboratory examinations for the diagnosis of DM can be identified through blood serum. Recent studies have found that total protein can also be identified through other biological specimens, one of which is saliva. Many complications can be associated with chronic hyperglycemia one of them is Pulmonary Tuberculosis. This study aims to see the potential of salivary total protein levels as an alternative non-invasive examination in patients with DM-TB.
Method: The study used a case-control and using convenience sampling. The samples of this study were 50 people consisting of 15 DM patients, 20 DM-TB groups, and 15 control. Salivary total protein examination was carried out in Mei-Juni 2024 at Medical Laboratory Technology using a Spectrophotometer (BioSystem BTS New).
Result: The results showed the average total protein level in the three groups is 5.09 mg/dL (salivary) and 7.89 mg/dL (serum). Diagnostic tests carried out by comparing the results of salivary total protein levels in patients with DM-TB with controls showed a sensitivity value of 47% and a specificity of 50%.
Conclusion: Salivary total protein has the potential to be an alternative non-invasive test to differentiate respondents for co-morbidities that as DM-TB.

Keywords: DM, DM-TB, Salivary, Total protein levels

INTRODUCTION

Diabetes mellitus (DM) is one of the four priority non-communicable diseases in Indonesia (Kemenkes RI, 2015). DM can occur due to a group of metabolic disorders characterized by hyperglycemia accompanied by metabolic disturbances of carbohydrates, fats, and proteins caused by abnormalities in insulin secretion, insulin action, or both. DM can affect anyone regardless of age and gender (Association & Diabetes, 2014). Hyperglycaemia in DM will affect total protein levels in the body, where these changes are caused by insulin deficiency. In normal conditions, insulin inhibits protein synthesis to prevent excessive protein breakdown in the liver cells. Whereas in patients with DM who experience insulin deficiency will cause protein synthesis to increase, this is what results in high levels of total protein in patients with DM (Abu-Lebdeh & Nair, 1996).

Laboratory examinations for the diagnosis of DM and others can be identified through blood serum by standard methods that are invasive and traumatic to the patient both physically and psychologically. However, recent studies have found that total protein can also be identified through other biological specimens that can be collected through non-invasive procedures, one of

which is saliva. DM is consistently associated with changes in salivary composition and function (Leite et al., 2013). Parotid gland basement membrane permeability is known to be higher in DM, and this leads to increased percolation of components such as glucose, amylase, and protein from the blood, thereby increasing their levels in saliva (Panchbhai et al., 2010). Total salivary protein is an important component of saliva, with salivary proteins, which consist mainly of proline-rich proteins, mucins, amylases, immunoglobulins, statherins, and antibacterial factors, being responsible for most salivary functions (Dodds & Dodds, 1997; Panchbhai et al., 2010).

Research conducted by Aziz et al (2016) stated that there was an increase in total salivary protein levels in patients with Type 1 DM (177.15 g/dL) compared to the control group (131.6 g/dL). The high level of total salivary protein compared to serum in patients with DM can occur due to additional protein added to saliva from gingival fluid due to periodontal disease activity (Malathi et al., 2013). The above research is inversely proportional to research conducted by Indira et al (2015) which found that there was a decrease in total salivary protein levels in patients with Type 2 DM (91.8 mg/dL) compared to the control group (103.1 mg/dL). This is due to the use of other biochemical metabolic pathways as an overall systemic response to glucose intolerance (Charles F et al., 1994).

Many complications can be associated with chronic hyperglycemia of DM such as organ dysfunction and differentiation failure (eyes, kidneys, nerves, heart, blood vessels) as well as Pulmonary Tuberculosis (Pulmonary TB) (Association & Diabetes, 2014). Patients with Pulmonary TB have a high risk of malnutrition. This is because Mycobacterium tuberculosis (M.TB) infection has an impact on the absorption of nutrients in the body which is less than optimal due to inadequate nutritional intake, so that protein energy malnutrition can occur. Nutritional status can be seen from the measurement of total protein levels (Gupta et al., 2009; Pratomo & Burhan, 2012).

The difference in research results related to total protein levels in patients with DM and Pulmonary TB, and the absence of publications related to total protein levels in patients with DM-TB underlies the research to be carried out.

METHODS

The research to be conducted is an observational study with a case-control approach. Sampling using convenience sampling technique was conducted on 50 people consisting of 15 DM patients, 20 DM-TB groups, and 15 control groups who did not suffer or were diagnosed with DM. The population of this study were all patients with DM who suffered from Pulmonary TB, who were willing to become respondents by signing informed consent. Furthermore, venous blood sampling and saliva specimens were taken. Specimens were examined using a spectrophotometer (BioSystem BTS New). Data were statistically analyzed by the annova test and diagnostic test. This study has received ethical approval from the Ethics Committee of the Jambi Health Polytechnic.

RESULTS AND DISCUSSION

This study was conducted on patients with DM-TB with a total of 50 respondents who live in the Jambi City area. The research was conducted in April-June 2024, which observed the results of salivary total protein examination in patients with DM-TB. Respondents were then grouped based on the characteristics of the respondents sourced from the observation sheet.

Research respondents based on gender were grouped into two categories, namely male and female. The results of the analysis of respondent characteristics, namely gender,

show that the number of female respondents in the three groups of respondents is more than male respondents.

Table 1. Characteristic Respondents

Characteristic	Control		DM		DM-TB	
	n	%	n	%	n	%
Gender						
- Male	5	33,3%	9	60%	10	50%
- Female	10	66,7%	6	40%	10	50%
Age						
- 18-60 years	15	100%	9	60%	16	80%
- >60 years	0	0%	6	40%	4	20%
Smoking habit						
- Smoking	2	13,3%	5	33,3%	2	10%
- No smoking	13	86,7%	10	66,7%	18	90%

Based on age, research respondents were grouped into two categories, namely 18-65 years and >65 years. Analysis of respondent characteristics, namely age, shows that the average age of respondents is dominated by the 18-65 years' age group. Based on their smoking habits, the research respondents were divided into two categories, namely smoking and non-smoking. Analysis of smoking habits, shows the results that the average respondent is dominated by a group that does not smoke.

1. Total Protein levels in patients with DM based on respondent status

Table 1. Comparison of total protein levels based on respondent status

Total Protein (mg/dL)	Variable	n	Mean	Std. Deviation	P. value
Salivary	DM-TB	20	5,34	2,004	
	DM	15	5,26	1,253	**0,544**
	Control	15	4,67	2,162	
Serum	DM-TB	20	7,93	2,634	
	DM	15	7,89	0,453	**0,991**
	Control	15	7,85	0,610	

The table above shows that the highest average salivary total protein level was found in DM-TB respondents (5.34 mg/dL) and the lowest salivary total protein level was found in the control group (4.67 mg/dL). However, this difference was not significant as the P value was > 0.05. These results are in line with serum total protein levels where the highest average total protein level was found in DM-TB respondents (7.93 mg/dL) and the lowest protein level was found in the control group (7.85 mg/dL). This difference is also not significant because P value > 0.05.

The average salivary total protein level in the three variables was lower (5.09 mg/dL) when compared to the average serum total protein level (7.89 mg/dL). These results are in line with research conducted by Ladgotra et al, 2016 which states that there is a significant decrease in salivary total protein levels when compared to serum total protein levels.

Patients with DM experience insulin deficiency which causes high levels of total protein in the body because the process of protein synthesis is disrupted which causes excessive protein breakdown in liver cells. In line with the increase in serum total protein levels, salivary total protein levels also increase in DM cases which are related to salivary composition and function (Leite et al., 2013). The results of this study are supported by research conducted by Prathibha et al (2013) which states that there is an increase in total salivary protein levels of patients with Type 2 DM compared to the control group. The high level of total salivary protein compared to serum in patients with DM can occur due to additional protein added to saliva from gingival fluid due to periodontal disease activity (Malathi et al., 2013).

2. Potential of salivary total protein level as a marker of prognosis for patients with DM-TB

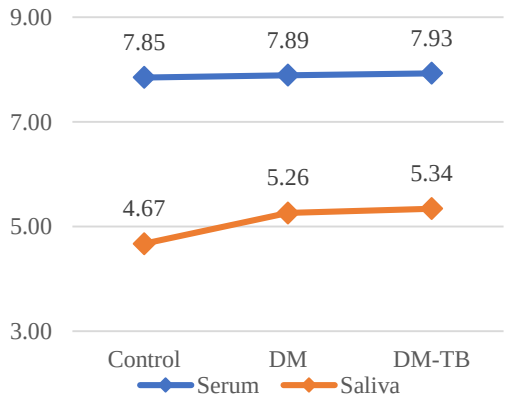

Figure 1. Mean salivary and serum total protein levels by respondent status

Salivary total protein levels can show differences between the control group and the

DM and DM-TB groups. However, salivary total protein levels cannot distinguish between the DM group and the DM-TB group. In serum specimens, total protein levels have not been able to distinguish between the control group and the disease group in this case DM and DM-TB.

Saliva can serve as a reliable diagnostic specimen that can replace blood tests in monitoring several oral and systemic diseases. Several aspects of saliva make this fluid one of the top priorities for biomedicine. Saliva has long been viewed as a unique yet complex body fluid, much like plasma or serum. Saliva is easy to collect and preservation is inexpensive. The diagnostic value of saliva lies in its components, flow, and glandular structure (Hegde et al., 2010).

To determine the potential of salivary total protein levels as an alternative non-invasive examination in patients with DM-TB, a diagnostic test was carried out and presented in an ROC (Receiver Operating Characteristic) curve. Diagnostic tests carried out by comparing the results of salivary total protein levels in patients with DM-TB with controls showed a salivary sensitivity value of 47% and a specificity of 50%.

CONCLUSION

Mean serum total protein levels were higher when compared to salivary total protein levels. Salivary total protein levels were found to be higher in the DM and DM-TB groups when compared to the control group. So, salivary total protein has the potential to be an alternative non-invasive test to differentiate respondents for co-morbidities that as DM-TB.

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CONFLICT OF INTEREST

The author declares there is no conflict of interest.

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