



Research Paper

Profile of α -Tocopherol and Lymphocyte Levels in Type 2 Diabetes Mellitus Patients at Jetis 1 Community Health Center (Puskesmas) Bantul Yogyakarta.

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ABSTRACT

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia with the potential for complications. The main cause of complications is the presence of oxidative stress conditions, so that it can reduce antioxidant activity in the body. The α -tocopherol is an antioxidant compound that can help improve the integrity of cell membranes and help helper T cells activate macrophages and antibody production by lymphocytes in the body. This study aims to determine the differences in levels of α -tocopherol and lymphocytes based on demographic characteristics and lifestyle of patients with type 2 diabetes mellitus at Jetis 1 Community Health Center (Puskesmas) Bantul Yogyakarta. The research method is analytic observational with a cross sectional study design that uses 99 type 2 diabetes mellitus patients who are at the Jetis 1 Community Health Center who meet the inclusion and exclusion criteria. Parameters measured were levels of α -tocopherol and lymphocytes. The α -tocopherol was measured using HPLC (High Performance Liquid Chromatography) and lymphocytes were measured using a hematology analyzer. The data obtained were analyzed using the Independent t-test. The results obtained were the profile of the average level of α -tocopherol in the plasma of patients with diabetes mellitus was $59.70 \pm 6.00 \mu\text{g/mL}$ and the average plasma lymphocyte level was $17.94 \pm 1.80\%$. The conclusion is that there is a significant difference in the exercise status of type 2 diabetes mellitus patients with α -tocopherol, because exercise status affects the absorption of nutrients/nutrients in the body and there is no significant difference between the demographic characteristics and lifestyle of type 2 Diabetes Mellitus patients with lymphocytes in the body blood plasma.

Keywords: Community Health Center (Puskesmas), Yogyakarta, type 2 diabetes mellitus, α -tocopherol, lymphocytes.

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I. INTRODUCTION

Diabetes is one of the four non-communicable diseases where the number of cases and prevalence of diabetes continues to increase¹. Based on the 2013 Indonesian Basic Health Research Data, the highest prevalence of diabetes diagnosed by doctors was in Yogyakarta (2.6%), Jakarta (2.5%), and North Sulawesi (2.4%)². The number of diabetics at the Jetis 1 Community Health Center in 2016 was relatively high, namely 2.466 people³.

Diabetes can affect many different organ systems in the body which can lead to complications such as impaired vision, kidney disorders, foot ulcers⁴. Complications in diabetes appear to be related to blood glucose concentrations so that excess glucose can cause damage to body tissues⁵. Damage to body tissues is characterized by the presence of an inflammation that will stimulate an immune response and trigger oxidative stress⁶.

One way to avoid oxidative stress is to consume antioxidants⁷. Antioxidants can capture free radical molecules thereby inhibiting oxidative reactions in the body⁸. One of the antioxidants that has unreactive radicals so that it can function as a quencher is vitamin E⁹. Vitamin E (α -tocopherol) is abundant in cell

membranes which can scavenge free radicals and increase cell membrane integrity which then affects the function of the immune system¹⁰. Lymphocytes are an indicator of the immune response that can trigger the work of the immune system and can affect the body's resistance or health¹¹.

Based on the research findings described above, the researcher is interested in conducting a study to determine the profile of α -tocopherol and lymphocyte levels in patients with type II diabetes mellitus at Jetis 1 Community Health Center, Bantul, Yogyakarta.

II. METHOD

The research design is observational with a cross sectional research design. This study meets the feasibility of research ethics. This research was conducted at the Jetis 1 Community Health Center. The Parahita Diagnostic Center Laboratory and the Integrated Research Laboratory of Ahmad Dahlan University, Yogyakarta in November-January 2019.

Subsequently, an analysis of the relationship between α -tocopherol and lymphocyte levels was conducted in patients with type 2 diabetes mellitus at the Jetis 1 Community Health Center, Bantul, Yogyakarta with total of 99 patients. The results were statistically analyzed using the univariate/descriptive test analysis method for demographic data and patient characteristics data. Bivariate test/relationship test on the characterization of patients with diabetes mellitus with α -tocopherol and lymphocyte levels. The results are significant if the value of the independent t-test ($p < 0.05$) with a 95% confidence level.

III. RESULTS AND DISCUSSION

Based on the age in the table of characteristics of patients who participated in research activities at the Jetis 1 Community Health Center, Bantul, Yogyakarta, the age of the patients was divided into two, namely patients under 55 years old with 35 people, and patients over 55 years old with 64 people. Patients with type 2 diabetes mellitus are mostly aged 55-64 years¹². The higher a person's age, the faster the decline or physical and psychological changes that occur¹³.

The number of female patients was 72 people more than the male patients were 27 people. These results are in accordance with the prevalence of diabetes mellitus based on WHO in 2016 with type 2 diabetes mellitus, the majority of which were female than male¹.

Based on employment status, there were 55 working patients, more than 44 non-working patients. Diabetes mellitus increased in the diabetes mellitus group who did not work¹².

Patients who often do exercise are also high as many as 72 people and those who don't exercise often are 27 people. People who do regular exercise will have a lower risk than people who don't/rarely do sports¹⁴. Based on smoking habits, there were 14 patients who smoked and 86 people who did not smoke. Poor smoking can worsen the prognosis of patients with type 2 diabetes mellitus compared to nonsmokers, resulting in complications¹⁵.

Based on the habit of taking vitamins, the number of patients who took vitamins were 13 people and those who did not take vitamins were 87 people. Vitamins are very important for the body and one of the benefits is to inhibit the process of oxidative occurrence⁶. Patients who consume vegetables and fruits are quite high, namely as many as 80 people than those who do not consume vegetables and fruits. Nationally, the average of people who do not consume vegetables and fruit is greater than those who consume vegetables and fruit².

The next category is comorbidities, with 54 patients having comorbidities and 45 people without comorbidities. Comorbidities can be in the form of complications that can occur such as hypertension, cataracts, gangrene which are factors that can affect the quality of life of patients with diabetes mellitus⁵.

Table 1. Characteristics of Patients Participating in Research Activities at Jetis 1 Community Health Center Bantul, Yogyakarta, Indonesia.

No	Variable	(n=99)	Percentage (%)
1	Age	< 54 years old	35
		> 55 years old	64
2	Gender	Man	35
		Woman	64
3	Work	Work	55
		Does not work	44
4	Sports habits	Exercise often	72
			27

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	-	Don't exercise often	27	27.3
5	Smoking habit			
	-	Yes	14	14.1
	-	No	85	85.9
6	Take vitamins			
	-	Yes	13	13.1
	-	No	86	86.9
7	Consumption of vegetables and fruit			
	-	Yes	80	80.8
	-	No	19	19.2
8	co-morbidities			
	-	There are co-morbidities	54	54.5
	-	There are no co-morbidities	45	45.5

Table II. Profile of tocopherol and lymphocyte levels in plasma of Type 2 Diabetes Mellitus patients at Jetis 1 Community Health Center Bantul, Yogyakarta, Indonesia.

No	Parameter	Range	Mean± SD	Minimum	Maximum
1	Lymphocyte Level	188.7	17.94096±1.80313	4.3	193
2	Tocopherol levels	489.1	59,70351±6,00043	10.42	499.52

Table Profile of Tocopherol and Lymphocyte Levels in Plasma in Patients with Type 2 Diabetes Mellitus at Jetis 1 Community Health Center, Bantul, Yogyakarta shows the average profile of α -tocopherol levels in patients, which is 59.70 ± 6.00 g/mL. Plasma α -tocopherol levels in diabetic African-American adults of 20.54 nmol/L–49.8 nmol/L increased plasma α -tocopherol concentrations associated with a reduced risk of diabetes¹⁷. The mean level of α -tocopherol in plasma was 28.2 ± 1.21 mol/L¹⁸. The α -tocopherol as an antioxidant can prevent the oxidation of important cell components and prevent the formation of toxic oxidation products¹⁹. The α -tocopherol in diabetic conditions works by increasing the free radical defense system and has a beneficial effect in increasing glucose transport²⁰.

The patient's mean lymphocyte percentage profile was 17.94 ± 1.80 . The absolute number of leukocytes, neutrophils and lymphocytes in patients with controlled and uncontrolled type 2 diabetes mellitus obtained the mean number of lymphocytes in patients with controlled type 2 diabetes mellitus (11.47 ± 1.6), and uncontrolled type 2 diabetes mellitus. (10.02 ± 1.36)²¹. Normal lymphocyte level is 15%-45%, if lymphocyte level $<500/\text{mm}^2$ indicates the patient is in danger and susceptible to infection¹¹. An increase in leukocytes can be an indication that infection or inflammation is present²². Leukocytes include the immune system that can detect infection by bacteria or viruses²³. Leukocytes can phagocytize all foreign bodies in the body that result in an infectious process²⁴.

Table III. The differences in demographic characteristics and lifestyle on α -tocopherol and lymphocyte levels in plasma of type 2 Diabetes Mellitus patients.

No	Variable	Σ n=99	Tocopherol		Lymphocytes	
			Mean±SD ($\mu\text{g/mL}$)	Value <i>p</i>	Mean ± SD (%)	Value <i>p</i>
1	Age	35	12.33±0.66	0.782	36.22±28.05	0.125
	< 54 years old	64	12.30±0.61		28.99±7.57	
2.	Gender			0.422		0.197
	Man	35	12.33±0.57		33.77±28.30	
	Woman	64	12.36±0.65		30.33±8.00	
3.	Work			0.444		0.245
	Work	55	12.27±0.58		33.95± 22.99	
	Does not work	44	12.36±0.69		28.54± 7.28	
4.	Sports habits			0.020*		0.363
	Exercise often	72	12.33±0.52		32.69±20.51	
	Don't exercise often	27	12.28±0.86		28.50± 7.12	

5.	Smoking habit					
	Yes	14	12.33±0.52	0.461	40.43±44.27	0.17
	No	85	12.31±0.64		30.08±7.54	
6.	Take vitamins					
	Yes	13	12.39±0.57	0.384	29.35±5.22	0.462
	No	86	12.30±0.63		31.88±19.14	
7.	Consumption of vegetables and fruit vitamins					
	Yes	80	12.28±0.62	0.814	31.83± 19.49	0.795
	No	19	12.46±0.63		30.34± 9.09	
8.	co-morbidities					
	There are no co-morbidities	45	12.25±0.66	0.329	32.83±25.44	0.132
	There are co-morbidities	54	12.37±0.56		30.47± 7.44	

*=Significant (p<0.05)

There is a significant difference in the exercise status of type 2 Diabetes Mellitus patients with α -tocopherol, because exercise status affects the absorption of nutrients/nutrients in the body²⁵ but no significant difference between the demographic and lifestyle characteristics of type 2 Diabetes Mellitus patients with lymphocytes in blood plasma.

IV. CONCLUSION

The conclusion is that there is a significant difference in the exercise status of type 2 diabetes mellitus patients with α -tocopherol, because exercise status affects the absorption of nutrients/nutrients in the body and there is no significant difference between the demographic characteristics and lifestyle of type 2 Diabetes Mellitus patients with lymphocytes in the body blood plasma.

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