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Factors Related to Blood Glucose Levels among Type II Diabetes Mellitus Patients (A Cross-Sectional Study in *Kedungmundu* Public Health Center, Semarang)

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ABSTRACT

Diabetes mellitus (DM) is a disease that require continuous treatment and management in order to prevent complication. The aim was to determine DM in adult outpatient and to analyze correlation between some factors with blood glucose level in diabetes mellitus patient. The method was observational with cross-sectional study design. The amount of sample was 200 subject, all adult outpatient of *Kedungmundu* Health Center from May-August 2018 and willing to be tested and interviewed, selected by total sampling. Data were collected through interview with questionnaire and measurement of fasting blood sugar. We conduct univariate, bivariate and multivariate analysis. The result of research showed that 173 out of 200 respondents were diabetes mellitus, 60% respondents had an uncontrollable blood glucose level. Furthermore multivariate analysis showed that there was correlation between duration of diabetes, medication adherence, physical exercise level, type of physical exercise, duration of physical exercise and family supports with blood glucose level. It is suggested to give education not just for diabetic patients but also to the closest family of diabetes mellitus patient. DM patients suggested to do regular physical exercise with duration more than 90 minutes/weeks and increase the medication adherence to prevent the complication of the disease.

***Keywords**: diabetes mellitus, medication adherence, physical activity, blood glucose level*

INTRODUCTION

Diabetes Mellitus (DM) is a chronic disease that occurs when the pancreas does not produce enough insulin or alternatively when the body cannot use the insulin effectively. Type 2 diabetes mellitus is the effect of impaired insulin secretion.[1] Results of Basic Health Research, Ministry of Health of the Republic of Indonesia in 2007 stated that 6.9% of the Indonesian population suffered from Diabetes Mellitus, 69.6% of which were undiagnosed. While in 2013 there were 5.7% of patients but the increase of undiagnosed DM patients become 73.7% were happened.[2] The prevalence of Type 2 DM in Semarang was 27%. [3] *Kedungmundu* Health Center is one of the health centers with the largest DM cases in the city of Semarang with a proportion of cases of 30.3% in 2015.

The proportion of DM in *Kedungmundu* Health Center is higher than the proportion of cases of DM in the city of Semarang. DM is characterized as chronic hyperglycemia which is drag the patient to the vasculature injury.[4] Management of blood glucose level is known to play important role in preventing diabetes complications.[5] Although the management of blood glucose levels has proven to be a factor that prevents complications of DM patients, previous studies reported that 60% of DM patients had poor blood glucose control.[6] This research wants to know the contributing factors related to the management of blood glucose

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levels among DM Type 2 patients in *Kedungmundu* Health Center, Semarang.

METHOD

This research is a quantitative research with observational analytic type. The study design used in this study is a cross sectional study design. This research was conducted from May to August 2017 in the work area of *Kedungmundu* Health Center Semarang. The population in this study were all outpatients who visited the *Kedungmundu* Health Center from May to August 2018 and willing to be tested and interviewed as much as 200 subjects. The sampling technique used is total sampling technique. Then, subject with positive DM result for blood glucose screening interviewed using questionnaire (173 subject). Variable dependent consist of the blood glucose levels, while independent variable consist of the duration suffered diabetes, obesity, physical activity, frequency of physical exercise, dietary compliance, medication adherence, family support, and motivation levels. The data obtained were then analyzed univariate, bivariate and multivariate to know the contributing factors of blood glucose levels.

RESULTS AND DISCUSSIONS

From 200 person who visited *Kedungmundu* Health Center, 173 of them diagnosed as DM Type 2. The results showed that most of the respondents are female (76.9%), aged 50-64 years (64.7%), working as housewife (66.5%). This result is in line with the study conducted by Ruhembe et al in Tanzania, found most of the respondents are female (60.8%), not working (38.93%), aged 30-40 years (43.84%).[7]

Table.1 The characteristic of the respondents (n=173)

Characteristic respondents	f	%
Sex		
Female	133	76.9
Male	40	23.1
Age		
36-49 years	29	16.8
50-64 years	112	64.7
>64 years	32	18.5
Occupation		
Retired	21	12.1
Housewife	115	66.5
Non-government employee	10	5.8
Entrepreneur	11	6.4
Labors	5	2.9
Others	11	6.4

Our study revealed that most of the respondents have uncontrolled blood glucose level (60.1%), more than half of them are diagnosed DM for less than 2 years ago (50.3%), obese (51.4%), and take the medication regularly (50.9%). There are 70.5% of them have mild psychical activities, usually they are walking (43.4%) with the frequency within 1 weeks <90 minutes (62.4%). They have high motivation levels (54.3%), more than half of them get family support (54.3%), and about three quarters of them (77.5%) are not adhere to do healthy DM diet.

This result is line with previous study conducted in Saudi Arabia found that 80.6% respondents are not following the meal plan, 69.1% high adherence in taking medication, 58% high adherence to do exercise.[8] While study conducted in Brazil found that 55.8% respondents don't get insulin treatment, with irregular dietary control (74.4%), and 82.2% of them are don't have dietary guidance.[9]

Table.2 The distribution of variables in DM patient (n=173)

Characteristic respondents	f	%
1. Blood glucose levels		
Controlled	69	39.9
Uncontrolled	104	60.1
2. Duration of suffered DM		
>2 years	86	49.7
<= 2 years	87	50.3
3. Obesity status		
Obese	89	51.4
Overweight	37	21.4
Normal	47	27.2
4. Medication adherence		
Adhere	88	50.9
Not adhere	86	49.1
5. Physical activities level		
Low	30	17.3
Mild	122	70.5
High	21	12.1
6. Type of physical activities		
Inactivity	57	32.9
Walking	75	43.4
Gymnastic	34	19.7
Jogging	2	1.2
Cycling	5	2.9
7. Frequency of physical activities 1 week		
<90 minutes/ week	108	62.4
≥90 minutes / week	65	37.6
8. Family support		

Cont... **Table.2 The distribution of variables in DM patient (n=173)**

Supported	92	53.2
Not supported	81	46.8
9. Motivation levels		
Low	79	45.7
High	94	54.3
10. The adherence of diet		
Adhere	39	22.5
Not Adhere	134	77.5

From table 3 revealed that the duration of DM, medication adherence, physical activities level, type of physical activities, frequency of physical activities in one week, and the family support were significantly associated with the levels of blood glucose among type 2 DM patients (p value <0.05).

Table 3. The contributing factors associated with blood glucose levels among patients type 2 DM in *Kedungmundu* Health Center

Variables	Blood glucose status				P value*
	Uncontrolled		Controlled		
	f	%	f	%	
Duration of suffered DM					
>2 years	53	61.6	33	38.4	0.030
<= 2 years	51	60.1	36	41.4	
Obesity status					
Obese	44	49.4	45	50.6	0.252
Overweight	34	91.9	3	8.1	
Normal	26	55.3	21	44.7	
Medication adherence					
Adhere	68	52.7	61	47.3	0.000
Not adhere	36	81.8	8	18.2	
Physical activities level					
Low	23	76.3	7	23.3	0.000
Mild	78	63.9	44	36.1	
High	3	14.3	18	85.7	
Type of physical activities					
Inactivity	29	50.9	28	49.1	0.007
Walking	56	74.7	19	25.3	
Gymnastic	14	41.2	20	58.8	
Jogging	0	0.0	2	100	
Cycling	5	100	0	0.0	

Cont... **Table 3. The contributing factors associated with blood glucose levels among patients type 2 DM in *Kedungmundu* Health Center**

Duration of physical activities 1 week					
<90 minutes/ week	62	57.4	46	42.6	0.003
≥90 minutes / week	42	64.6	23	35.4	
Family support					
Supported	31	33.7	61	66.3	0.000
Not supported	73	90.1	8	9.9	
The adherence of diet					
Adhere	79	45.7	55	31.8	0.157
Not adhere	25	14.5	14	8.1	
Motivation levels					
Low	48	60.8	31	39.2	0.780
High	56	59.6	38	40.4	

This results are similar with the previous study, found that the duration of diabetes is strongly associated with the glycemic control in patients living with type 2 DM.[10] Another study conducted by Rasheed et al revealed regular exercise is significantly related to the decrease of blood glucose level into normal range among DM patients.[11] Type of aerobic exercise such as cycling, walking and jogging affect the blood glucose, it tends to decline and increase the sensitivity of insulin.[12] The intensity and duration of physical exercises play important role on the glycemic control through glucose production shifts from hepatic glycogenolysis to enhanced gluconeogenesis as duration increase.[13] Support family is also related with glycemic control for people living with diabetes. This result is similar to those reported by Strizich who found that people with low family support are likely to have uncontrolled diabetes (OR =2,31; 95%CI:1,17-4,55).[14] Medication adherence also play important factors in glycemic control, the previous study revealed those with high adherence to oral hypo-glycemic medications were less likely to have poor glycemic control (OR=0,54; 95%CI;0,50-0,59).[15,16]

CONCLUSIONS

From 173 of 200 adult outpatient of health center were diabetes mellitus, 60% respondents of DM subjects had an uncontrollable blood glucose level and there was

correlation between duration of diabetes, medication adherence, physical exercise level, type of physical exercise, duration of physical exercise and family supports with blood glucose level

Conflict of Interest: The author reports no conflicts of interest in this work.

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Ethical Clearence: Ethical clearance was obtained from Ethic Commission of Health Research, Faculty of Public Health UNDIP (094/EC/FKM/2018). All subjects signed informed consent to join the study.

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