

## Analysis of the Effect of Modification of Blood Sugar Control Models in Diabetes Mellitus Patients on KGD at Puskesmas Mulioorejo, Sunggal District, 2021

Megawati

Soep

### ABSTRACT

Background: Diabetes mellitus is a serious and chronic disease in which the pancreas does not produce insulin in sufficient quantities to regulate blood sugar in the body. (WHO, 2016).

Problem : How is the effect of modification of the model of controlling blood sugar levels in patients with diabetes mellitus on KGD when.

Objective: To analyze the effect of modifying the blood sugar level control model in patients with diabetes mellitus on blood sugar levels at any time

Method: Quantitative research with quasi-experimental method pre post test control group design.

Population: The population is the entire research subject. With type II DM who experienced and who did not DM as many as 638 people.

Sample: The number of samples is 30 people in the intervention group and 30 people in the control group. So the total sample for both groups is 60 people

Result: There is a significant relationship between age, history of DM, behavior, smoking, obesity and hypercholesterolemia on KGD seen from p-value <0.05.

Conclusion: There is a difference between age, history of DM, behavior, smoking, obesity and hypercholesterolemia on KGD before and after the intervention.

Suggestion: To respondents aged > 50 years to carry out sports activities, jogging, jogging, exercise, healthy lifestyle and diligently drinking water, control blood sugar levels and for people with diabetes do not forget to take medication regularly and control regularly.

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Megawati<sup>1</sup>, Soep<sup>1</sup>

<sup>1,2</sup>Nursing Major, Politeknik Kesehatan Medan, Indonesia.

<sup>1</sup>hj.megawati1963@gmail.com

## Abstract

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**Suggestion:** To respondents aged > 50 years to carry out sports activities, jogging, jogging, exercise, healthy lifestyle and diligently drinking water, control blood sugar levels and for people with diabetes do not forget to take medication regularly and control regularly.

**Keywords:** Blood Sugar Levels, Diabetes Mellitus, KGD While.

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## PRELIMINARY

Diabetes mellitus is a serious and chronic disease in which the pancreas does not produce enough insulin to regulate blood sugar in the body. This problem is an important public health issue and is one of the four targets for handling non-infectious diseases in the world. The prevalence of diabetes mellitus has steadily increased over the last few decades. {WHO, 2016}.

In Indonesia, the prevalence of diabetes mellitus has increased significantly. The prevalence of diabetes mellitus based on a doctor's diagnosis in the population aged 15 years experienced a significant increase from 1.5 percent in 2013 to 2 percent in 2018. North Sumatra Province also experienced a significant increase from 2013 by 1.8%, increasing to 2% in 2018 year 2018. {Ministry of Health RI,

2013; Ministry of Health RI, 2018}.

Blood sugar control in patients with diabetes mellitus is one of the emphasis on standard diabetes management. Good blood sugar control can change the condition of diabetes mellitus for the better by evaluating blood sugar levels from time to time. {ADA, 2019}.

In Indonesia, the proportion of Temporary Blood Sugar or Impaired Glucose Tolerance in the population aged 15 years experienced a significant increase when viewed from the ADA and Perkeni 2015 consensus. – 20.2%. This shows that controlling blood sugar levels is a central point in controlling diabetes mellitus. {Ministry of Health RI, 2018}.

Controlling diabetes mellitus requires systematic and planned steps. As the first step that must be done is non-



pharmacological management in the form of meal planning, physical exercise {Soegondo et al, 2015}, monitoring blood sugar levels {Smeltzer & Bare, 2002; Susanto, 2017}.

In order to control blood sugar levels in patients with diabetes mellitus, it is necessary to modify planning in the non-pharmacological field, namely food planning, physical exercise and monitoring blood sugar levels. If the modified steps have not been achieved, it can be continued with the next step, namely the use of drugs or pharmacological management. {Soegondo et al, 2015}.

## RESEARCH METHODS

### Research Design

Quantitative research, quasi-experimental method pre-post test control group design. Pre-post test control design because this study compares before and after being given treatment. The research method was used to determine the effect of Analysis of the Effect of Modified Control of Blood Sugar Levels in Diabetic Mellitus Patients on KGD while at the Muliorejo Health Center, Sunggal District.

### Research Location and Time

This research will be carried out at the Muliorejo Health Center which is located on Jl. Development No. 13, KM. 12, Ds. Muliorejo, Kec. Sunggal, Kab. Deli Serdang in 2021. Implementation time in April 2021.

### Population and Sample

#### 1. Population

According to Reegu et al, (2022), the population is the entire research subject. In this study, the population was all clients with type II DM who experienced and who did not have DM at the Muliorejo Health Center, where in 2021 there were 638 people.

#### 2. Sample

According to Ali et al, (2022), the sample is part or representative of the population being studied. In this study, the sample was part of the client population with type II DM who experienced and who did not experience DM. Sampling was done by accidental sampling technique, namely taking samples that happened by chance in the Muliorejo Health Center room in 2021. The number of samples was 30 people in the intervention group and 30 people in the control group. So the total sample for both groups is 60 people.

## RESULTS AND DISCUSSION

### 1. Univariate Analysis

Table 1: Description of the Characteristics of Research Subjects

Characteristics	Respondent Category				Total	
	Intervention		Control		n	%
	n	%	n	%		
<b>Age</b>						
Middle Ages (45-59 Years Old)	23	76.7	22	73.3	45	75
Old Age (60-74 Years Old)	7	23.3	8	26.7	15	25
Total	30	100	30	100	60	100
<b>Gender</b>						
Male	5	16.7	8	26.7	13	22
Female	25	83.3	22	73.3	47	78
Total	30	100.0	30	100	60	100
<b>Job</b>						
PNS	1	3.3	0	0	1	2
IRT	16	53.3	13	43.3	29	48
Wiraswasta	8	26.7	11	36.7	19	32
Peg. Swasta	2	6.7	2	6.7	4	6
Etc	3	10.0	4	13.3	7	12
Total	30	100.0	30	100.0	60	100
<b>Education</b>						
SD	1	3.3	5	16.7	6	10
SMP/Sederajat	2	6.7	2	6.7	4	6
SMA/Sederajat	23	76.7	21	70.0	44	74
D3/Sarjana	4	13.3	2	6.7	6	10
Total	30	100.0	30	100	60	100
<b>Long Suffering DM</b>						
2 Tahun	2	6.7	3	10.0	5	8
3 Tahun	10	33.3	11	36.7	21	35
4 Tahun	7	23.3	7	23.3	14	24
5 Tahun	2	6.7	3	10.0	5	8
6 Tahun	9	30.0	6	20.0	15	25
Total	30	100.0	30	100	60	100

Based on Table 1, it is known that the characteristics of respondents based on age are known in the intervention category, seen by respondents with middle age (45-59 years) as many as 23 people (76.7%) while old age (60-74 years) as many as 7 people (23.3%). While in the control category, respondents with middle age (45-59 years) were 22 people (73.3%) and elderly people (60-74 years) were 8 people (26.7%).

Based on gender in the intervention category, respondents with male sex were 5 people (16.7%) and female sex was 25 people (83.3%). Based on the control category, there were 8 men (26.7%) and 22 women (73.3%).

Based on the type of work seen in the intervention category, respondents with civil servant jobs as many as 1 person (3.3%), IRT jobs as many as 16 people (53.3%), self-employment jobs as many as 8 people (26.7%), private employees as many as 2 people (6.7%), other work as many as 3 people (10%). While in the control category, respondents with IRT jobs were 13 people (43.3%), self-employed jobs were 11 people (36.7%), private employees were 2 people (6.7%) and other jobs were 4 people. (13.3%).

Based on education seen in the intervention category, respondents with primary education were 1 person (3.3%), junior high school education/equivalent were 2 people (6.7%), high school education/equivalent were 23 people (76.7%), and education D3/Bachelor as many as 4 people (13.3%). While in the control category, respondents with elementary education were 5 people (16.7%), junior high school education/equivalent were 2 respondents (6.7%), high school education/equivalent were 21 respondents (70%), and D3/Bachelor education was 2 people (6.7%).

Based on the duration of suffering from DM in the



intervention category, it is known that respondents with DM for 2 years were 2 people (6.7%), for 3 years as many as 10 people (33.3%), for 4 years as many as 7 people (23.3%), for 5 years as many as 2 people (6.7%), for 6 years as many as 9 people (30%). While in the control category, respondents with DM for 2 years were 3 people (10%), for 3 years as many as 11 people (36.7%), for 4 years as many as 7 people (23.3%), for 5 years as many as 3 people (10%), for 6 years as many as 6 people (20%).

## 2. Blood Sugar Level

Table 2: Distribution of Blood Sugar Levels Before and After Intervention

Variable	Intervention	Mean	Median	Standar Deviasi
Blood Sugar Level	Sebelum	90.7667	88.5000	14.14524
	Sesudah	87.2333	85.0000	81.4389

Table 2 above can illustrate that there is a decrease in blood sugar levels before and after the intervention. This can be seen from the average blood sugar level before the intervention was 90.7667 mg/dl while the average blood sugar level after the intervention was 87.2333 mg/dl. For the median value of blood sugar levels before the intervention was 88.500 and after that it became 85.000 while the standard deviation before the intervention was 14.14524 and after it became 81.4389.

## 3. Bivariate Analysis

Bivariate analysis was conducted to determine the relationship between the independent variable and the dependent variable. Test the research hypothesis that is the difference before and after the intervention. The analysis was carried out to determine between the independent variables and the dependent variable, namely the difference in the mean value in type II DM patients. By using the statistical test T-test. The T-test was used because the researcher wanted to compare the mean in the two groups. T-scores were calculated to determine that there was a difference between the two groups studied. The results of statistical analysis were considered significant if the p value <0.05.

Table 3: Comparison of Blood Sugar Level Control in Diabetes Mellitus Patients with KGD

	Mean	Std. Deviation	T-hitung	P-value	N
Age - KGD Check Before-After	,26667	,69242	3,128	,003	60
DM_History - Pre-After KGD Check-up	5,80000	2,54319	17,665	,000	60
Behavior - KGD Check Before-After	2,86667	1,28177	17,324	,000	60
Smoker - Before-After KGD Check	,31667	,94764	2,588	,012	60
Obesity - KGD Examination Before-After	1,86667	1,03280	14,000	,000	60
Hypercholesterol - Check KGD Before-After	1,70000	,82954	15,874	,000	60

Table 3 shows that the average value and standard deviation of age on blood sugar levels before and after are -0.26667 + 0.66042 with a t-count value of 3.128 > 1.671 and a p-value of 0.003. This means that there is a difference between age and blood sugar levels before and after the intervention.

Based on the history of DM the average value and standard deviation of blood sugar levels before and after were 5.80000 + 2.54319 with a t-count value of 17.665 > 1.671 and a p-value of 0.000. This means that there is a difference between the history of DM and blood sugar levels before and after the intervention.

Based on the behavior of the respondents the average value and standard deviation of blood sugar levels before and after were 2.86667 + 1.28177 with a t-count value of 17.324 > 1.671 and a p-value of 0.000. This means that there is a difference between the respondent's behavior and blood sugar levels before and after the intervention.

Based on the category of smokers, the average value and standard deviation of blood sugar levels before and after were 0.31667+0.94764 with a t-count value of 2.588 > 1.671 and a p-value of 0.012. This means that there is a difference between smokers and blood sugar levels before and after the intervention.

Based on the category of Obesity, the average value and standard deviation of blood sugar levels before and after were 1.86667+1.03280 with a t-count value of 14.000>1.671 and a p-value of 0.000. This means that there is a difference between the category of obesity and blood sugar levels before and after the intervention.

Based on the hypercholesterol category, the average value and standard deviation of blood sugar levels before and after were 1.70000+0.82954 with a t-count value of 15.874>1.671 and a p-value of 0.000. This means that there is a difference between the hypercholesterol category and blood sugar levels before and after the intervention.

## 4. Multivariable Analysis

Multivariable analysis was performed to analyze risk factors simultaneously. The variables included in this multivariable analysis were independent variables which were statistically significant to the incidence of DM patients in the bivariable analysis. Simultaneous test results can be seen in the following table.

Table 4: Omnibus Tests of Model Coefficients

Omnibus Tests of Model Coefficients				
	Chi-square	df	Sig.	
Step 1				
Step	13,308	6	,038	
Block	13,308	6	,038	
Model	13,308	6	,038	

Based on Table 4, it can be seen that the chi-square value obtained is 13,308 with degrees of freedom = 6, p value = 0.038. Because the p value > 0.05, it can be concluded that



there is a simultaneous significant effect between the independent variables Control of Blood Sugar Levels in Diabetes Mellitus Patients on the dependent variable of KGD While at the Muliorejo Health Center, Sunggal District.

Table 5: Multivariate Table

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
Step 1 <sup>a</sup>							Lower	Upper
Umur	.335	.824	.165	1	.683	1.408	.278	7.843
Riwayat_DM	-.477	.147	10.463	1	.001	.621	.465	.828
Perilaku	.120	.292	.168	1	.682	1.127	.536	1.998
Perokok	-.227	.409	.308	1	.579	.797	.357	1.778
Obesitas	.274	.366	.560	1	.454	1.315	.842	2.095
Hypercolesterol	.218	.458	.227	1	.634	1.244	.597	3.049
Constant	1.308	2.692	.252	1	.616	3.692		

a. Variables entered on step 1: Umur, Riwayat\_DM, Perilaku, Perokok, Obesitas, Hypercolesterol

Based on the results of the analysis, it is known that from 6 (six) independent variables the most dominant is the history of DM with a sig value. 0.001. If the number of history of DM patients is more dominant, 0.828 tends to increase KGD to 0.828 times.

## Discussion

### 1. Relationship of Age with Control of Blood Sugar Levels in Diabetes Mellitus Patients on the dependent variable KGD

When viewed from the test results between age and KGD examination before and after it appears that the t-count value is  $3.128 > 1.671$  and the p-value is 0.003. This means that there is a difference between age and blood sugar levels before and after the intervention which means that this study shows that respondents who are 45 years old are the respondents with the largest percentage. This is in line with the results of Awad's (2011) study which showed an increase in the number of Type 2 DM patients in patients older than 50 years. The results of Riskesdas 2007 also show that the number of people with DM in Indonesia is increasing with increasing age.

### 2. Relationship of DM History with Control of Blood Sugar Levels in Diabetes Mellitus Patients on the dependent variable KGD

People who have one or more family members, either parents, siblings, or children who have diabetes, are 2 to 6 times more likely to have diabetes compared to people who do not have family members who have diabetes (CDC, 2011). ). This means that people who have a family history of DM have a 5 times greater risk of developing Type 2 DM compared to people who do not have a family history of DM. This condition is in line with the results of a study conducted by Wicaksono (2011) on 30 outpatients at the Internal Medicine Polyclinic of Dr. Kariadi Semarang, where a family history of DM is a risk factor for Type 2 DM which is statistically significant and has an influence on the incidence of Type 2 DM by 75%. However, the presence of a disease with a clear lineage is only a level of risk in the family which is influenced

by living habits, family social status and environment (Noor, 2008). Family history of suffering from DM is not the only factor associated with the incidence of Type 2 DM. Although heredity has an influence in determining whether a person is at risk of developing diabetes or not, lifestyle also has a major role in the risk of developing Type 2 DM. Kariadi Semarang shows that one of the factors associated with the incidence of Type 2 DM is physical activity (Wicaksono, 2011). Therefore, diabetes prevention for those at risk can be done by getting used to a healthy life and exercising regularly (Adib, 2011).

### 3. Behavioral Relationship with Control of Blood Sugar Levels in Diabetes Mellitus Patients on the dependent variable KGD

Based on the results of the study, the t-count is  $17.324 > 1.671$  and the p-value is 0.000. This means that there is a significant relationship between the regular behavior of blood glucose examination in health services and the respondent's blood glucose condition. Complete blood glucose control efforts and respondent's compliance in carrying out the recommendations given by the doctor.

### 4. The Relationship of Smokers with Control of Blood Sugar Levels in Diabetes Mellitus Patients on the KGD dependent variable

Postprandial blood glucose levels also provide an overview of the sensitivity of body tissues to insulin. When compared with the cutpoint values of fasting blood glucose levels and HbA1c, postprandial blood glucose levels can diagnose more people with diabetes mellitus (American Diabetes Association, 2017).

The normal value for postprandial glucose levels is below 140 mg/dl (PERKENI, 2015). Increased postprandial blood glucose levels indicate the inability of tissues to take up glucose in the blood to be used as an energy source or stored as energy reserves. This is mainly due to tissue resistance to insulin, so that glucose and various other metabolic raw materials that cannot enter the cells remain in the circulation. In addition to an increase in postprandial blood glucose levels, in conditions of insulin resistance, an increase in basal insulin levels and glucose stimulated insulin secretion was also found as a form of compensation for the increase in glucose levels (Zaccardi et al., 2015; Guyton and Hall, 2010). The findings in this study are in accordance with the research conducted by Vu, et al.

### 5. The Relationship of Obesity with Control of Blood Sugar Levels in Diabetes Mellitus Patients on the KGD dependent variable

According to Guyton's theory (2007) which says that obesity is a predisposing factor for the emergence of increased blood sugar levels, this is due to several things, namely, the beta cells of the islets of Langerhans become less sensitive to stimuli or due to increased sugar levels and obesity will also



suppress the number of receptors. Insulin in cells throughout the body.

Today fat tissue is known not only as a storage area for energy reserves but as a dynamic tissue with various functions. No fat tissue causes hyperlipidemia, insulin resistance, and type 2 diabetes mellitus. Excess fat tissue (obesity), a condition that is increasingly common in modern society is also associated with insulin resistance and diabetes (Ganong, 2008). A good, correct, regular and measurable exercise program helps stabilize blood sugar levels, reduce the need for insulin and drugs and maintain body weight (PERKENI, 2011).

#### 6. Relationship of Hypercholesterolemia with Control of Blood Sugar Levels in Diabetes Mellitus Patients on KGD dependent variable

Based on the hypercholesterol category, the average value and standard deviation of blood sugar levels before and after were  $1.70000 \pm 0.82954$  with a t-count value of  $15,874 > 1,671$  and a p-value of 0.000. This means that there is a significant relationship between the hypercholesterol category and blood sugar levels before and after the intervention.

#### 7. Dominant influence between variables of age, history of DM, behavior, smoking, obesity and hypercholesterolemia on KGD

Based on the results of the analysis, it is known that from 6 (six) independent variables the most dominant is the history of DM with a sig value. 0.001. If the number of history of DM patients is more dominant, 0.828 tends to increase KGD to 0.828 times. This is because the dominant factor is that people who have a family history of DM have a 5 times greater risk of developing Type 2 DM compared to people who do not have a family history of DM.

## CLOSING

### A. Conclusion

Based on the results of research conducted by researchers to respondents in the Mulyo Rejo Health Center Work Area, Sunggal District, Deli Serdang Regency January 2021 regarding the Analysis of the Effect of MODEL Modification of Blood Sugar Level Control in Diabetic Mellitus Patients on KGD While at the Mulioorejo Health Center, Sunggal District, it can be concluded as follows:

1. From the results of research that has been done there is a difference between age and blood sugar levels before and after the intervention.
2. From the results of research that has been done there is a difference between a history of DM and blood sugar levels before and after the intervention.
3. From the results of research that has been carried out there are differences between the behavior of respondents and blood sugar levels before and after the intervention.

4. From the results of research that has been done there are differences between smokers and blood sugar levels before and after the intervention.
5. From the results of research that has been done there is a difference between the category of obesity and blood sugar levels before and after the intervention.
6. From the results of research that has been done, there are differences between the category of hypercholesterolemia and blood sugar levels before and after the intervention.

### B. Suggestion

It is recommended to respondents aged > 50 years to carry out sports activities, jogging, morning jogging, gymnastics, healthy lifestyle and diligent drinking of water, control blood sugar levels and for people with diabetes do not forget to take medication regularly and control regularly.

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