Relationship between Dietary Habit, Physical Exercise and Medication Adherence to Controlling Blood Sugar Levels at Herna Hospital Medan

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Abstract

Diabetes mellitus (DM) is a disease with impaired metabolism, fat and protein caused by reduced insulin secretion or decreased sensitivity insulin. Cases of DM in Herna Hospital in 2017 were 156 cases with condition where the blood glucose levels is abovenormal, namely> 200 ml / dl and eating patterns that were not suitable for DM sufferers, not doing physical exercise, and non-adherence taking medicine. This study aims to determine the relationship of diet, physical exercise, and taking medicineto DM at Herna Hospital Medan. This research is a cross sectional study, with sample 68 DM people. Primary data were obtained using a questionnaire, data analysis was performed using logistic regression analysis. The relationship between diet habit, physical exercise and taking medicine on KGD control, based on the probability value (p) at the significance level $\alpha = 0,05$. The results showed that there was a correlation between calorie intake and *KGD control in DM with RP = 3.12*; 95% CI (1.*0-9.0*) type of food Rp = *4,57; 95% CI (2,1-9,7)*, meal schedule Rp = 4,57; 95% CI (2,1-9,7) and compliance in drug administrator medicines Rp = 2,29; 95% CI (1.0-5.2) is associated with uncontrolled blood sugar levels (KGD> 200 g / dl) in DM. Based on the results of the analysis concluded that there are a number of calories, types of food, meal schedule and taking medicine in DM patients. Sent to Herna Hospital Medan to improve promotion strategies on DM diet, physical exercise and taking medicine, as well as making nutritional counseling.

Keywords: DM, KGD, diet, physical exercise, Taking medicine adherence

Introduction

Diabetes mellitus (DM) is a chronic disease that occurs when the pancreas produces enoughinsulin but the body cannot effectively use the insulin produced. This can result from unhealthy eating habits. If a DM patient experiences insulin resistance so that blood sugar will increase, it will lead to a high risk of complications.

The Indonesian government has made various efforts to improve the health status of the population, but still has not shown maximum results. This can be seen from Indonesia's Human Development Index (HDI) which is still low and population mortality is still high. Based on WHO data, the main causes of death for all ages in Southeast Asia are non-communicable diseases where hyperglycemia is ranked second as the highest risk factor for death (WHO, 2011).

The prevalence of DM in Indonesia is 1.2% -2.3% of the population aged over 15 years. The tendency of increasing prevalence will bring changes in the position of DM which is increasingly prominent, which is marked by changes or increases in rank among the top 10 diseases. Sambo, (2012) states that DM also increasingly contributes to greater mortality (ten diseases leading cause of disease).

Given the high morbidity and mortality associated with the disease, mainly due to macrovascular complications, DM is a major public health concern, in addition to applying a diet that is in accordance with the DM diet as well as adherence to prescribed drugs.

The number of people with DM in North Sumatra is more than other regions due to the lifestyle of the people who tend to consume carbohydrates such as excessive rice. The high trend of DM in North Sumatra is because of the habits of people who consume rice that contains high carbohydrates, the habit of consuming fast food, fried and fatty fries followed by a lack of fruit and vegetables. The increase reaches 20-30 percent per year (Noor, 2013).

Patients with diabetes who are hospitalized in Medan Herna Hospital increase every year, in 2016 there are sixth out of the ten most diseases, while in 2017 the fifth rank with the number of cases from January to December 2017 was 102 cases.

The incidence of hyperglycemia in patients with diabetes is an outcome of an unhealthy diet, physical exercise and is also affected by non-adherence to taking medication. A DM patient who experiences hyperglycemia that has been stated by a doctor who is supported by examination of blood sugar levels regardless of how long he has suffered from DM. Dietary variables, physical exercise and medication adherence are thought to have a relationship with controlling blood sugar levels.

Methods

This type of research is descriptive correlative with cross sectional design to look at the relationship of diet, physical exercise and medication adherence to controlling blood sugar levels in patients with DM which is measured simultaneously at one time. The sampling method in this study is by way of consecutive sampling (non-probability sampling) that is, choosing a sample that fits the criteria for a certain period of time. Sampling was done by means of researchers waiting for the presence of the patient and when the patient was found an interview was conducted using a questionnaire. Data analysis is carried out descriptively by looking at the percentage of data that has been collected and then presented in the form of a frequency distribution table. Then discussed using existing theories and literature

Results

Sociodemographic characteristics explain the description of individual characteristics of hyperglycemic events in Herna General Hospital, totaling 68 respondents. Characteristics of DM patients can be seen as in table 1.

Table 1. Characteristics of DM Patients in Herna Hospital in 2018

Characteristics	n	%
1. Gender		
Man	31	45,6
Woman	37	54,4
2. Age		
30-39 years old	3	4,4
40-49 years old	11	16,2
50-59 years old	11	16,2
≥ 60 years old	43	63,2
3. Education		
SD	3	4,4
SLTP	10	14,7
SLTA/SMK	24	35,3
D3/Sarjana	31	45,6
4. Occupation		
PNS	5	7,4
Private employees	8	11,8
Entrepreneur	26	38,2
Labor / Farmers	10	14,7
Housewife	19	27,9
5. Income		
$\leq 2,5$ Million	11	16,2
$> 2,5$ Million	57	83,8
6. Long suffering		
≤ 5 years old	25	36,8
> 5 years old	43	63,2

This study found 37 (54.4%) of 68 DM patients were women, 43 (63,2)% aged ≥ 60 years, 31 (45,6)% had D3/Bachelor education, 26 (38,2%) Occupation entrepreneur, 57 (83,8)% had income > 2.5 million monthly, and 43 (63,2%) duration of DM> 5 years.

Table 2 Relationship of Calorie Intake According to Blood Sugar Levels Against
Control at Herna Hospital Medan in 2018

Calorie Intake	Controlled Blood Sugar Levels		Blood Sugar Levels Are Not Controlled		Total		Significant
	n	%	N	%	n	%	
Corresponding	21	63,6	11	34,4	32	100	$\chi^2=13,04; p=0,000$
not accordance	8	22,2	28	77,7	36	100	$RP=2,95$
							95% CI (1,5-5,7)

This means that there is a relationship between caloric intake and the control of blood sugar levels marked with blood sugar levels. 200 mg%. This also shows that the estimated risk of getting uncontrolled Blood Sugar Levels in Diabetes Mellitus patients with inappropriate caloric intake is 2.95 times greater than that of Diabetes Mellitus sufferers with appropriate caloric intake.

Table 3 Relationship between Types of Foods According to KGD Status with KGD Control at
Herna Hospital Medan in 2018

Food Type	Controlled Blood Sugar Levels		Blood Sugar Levels Are Not Controlled		Total		Significant
	n	%	n	%	N	%	
Corresponding	26	52	24	48	50	100	$\chi^2=6,75; p=0,009$
not accordance	3	16,7	15	833,3	18	100	$RP=3,12$
							95% CI (1,0-9,0)

From table 3 above it can be seen that 24 (85.7%) of 28 type 2 diabetes mellitus patients whose food is not appropriate experience uncontrolled KGD, higher when compared to patients who experience controlled KGD consuming food types that do not match 4 (14, 3%) and significantly different ($\chi^2=12,26; p=0,000$) with RP = 3.69; 95% CI (1.4-9.3). This means there is a relationship between types of food with the incidence of hyperglycemia in patients with type 2 diabetes. This situation also states that the estimated risk for getting hyperglycemia in patients with type 2 diabetes with food types that are not appropriate is 3.6 times greater than those with type 2 diabetes with the appropriate type of food.

Table 4. Relationship of meal schedule according to KGD status with KGD control
at Herna Hospital Medan in 2018

Meal Schedule	Controlled Blood Sugar Levels		Blood Sugar Levels Are Not Controlled		Total		Significant
	n	%	n	%	N	%	
Corresponding	23	74,1	8	25,9	31	100	$\chi^2=23,18;$
not accordance	6	16,2	31	83,8	37	100	$p=0,000$
							$RP=4,57$
							CI 95% (2,1-9,7)

From table 4 above it can be seen that 31 (83.8%) of the 37 DM patients who experienced uncontrolled KGD had an inappropriate meal schedule, higher than those with controlled KGD with an inappropriate meal schedule of 6 (16.2 %) and significantly different ($\chi^2$23,181; p=0,00) with RP = 4.57; 95% CI (2.1-9.7). This means that there is a relationship between the food schedule with KGD controllers in patients with DM. This situation also states that the estimated risk for getting uncontrolled KGD in DM patients with an inappropriate meal schedule is 4.57 times greater than DM patients with an appropriate meal schedule

Table 5. Relationship between Compliance with Drinking Medication According to KGD Status with KGD Control at Herna Hospital Medan in 2018

Drug Compliance	Controlled Blood Sugar Levels		Blood Sugar Levels Are Not Controlled		Total		Significant
	n	%	n	%	n	%	
Obedient	24	66,0	22	34,0	46	100	χ^2=5,27;
Not obey	5	20,8	17	79,2	22	100	p=0,022
							RP=2,29
							CI 95% (1,0-5,2)

From table 4.11 above it can be seen that 17 (79.2%) of the 22 DM patients who experienced uncontrolled KGD were not adherent to taking medication, higher than those who experienced controlled KGD who were not adherent to taking drugs, namely 5 (20.8%) and significantly differen (χ^2=5,27; p=0,022) with RP = 2.29; 95% CI (10-5.2). This means that there is a relationship between medication adherence and KGD control in people with DM. This also means that the estimated risk of uncontrolled KGD in DM patients who are not adherent to take medication is 2.29 times greater than those who are obedient to take medication.

Table 6. Relationship of Physical Activity According to Status of Blood Sugar Levels with Control of Blood Sugar Levels in Herna Medan Hospital in 2018

Physical Activity	Controlled Blood Sugar Levels		Blood Sugar Levels Are Not Controlled		Total		Significant
	n	%	n	%	n	%	
Regular	23	74,1	8	25,9	31	100	χ^2=23,18;
Irregular	6	16,2	31	83,8	37	100	p=0,583
							RP=0.85
							CI 95% (0,4-1,5)

From table 6. above it can be seen that 31 (83.8%) of 37 DM patients who experienced uncontrolled KGD did not perform irregular physical activity, higher than those who experienced controlled KGD who did not regularly carry out physical activities namely 6 (16, 2%) and not significantly different (χ^2=23,18; p=0,583) with RP = 0.85; 95% CI (0.4-1.5). This means that there is no correlation between physical activity and control of KGD in patients with DM.

Table 7. Results of Unconditional Logistic Backward Selection Regression Analysis

Characteristics	RP	95% CI	B	P-Value
Calorie intake	8,32	1,89-36,6	2,11	0,005
Obedience	21,89	4,64-103,17	3,08	0,000
Food schedule	8,42	1,45-48,6	2,13	0,017
Constants			-2,852	0,000

Likelihood ratio = 97,3 ; p=0,000

This shows that the control of blood sugar levels in people with diabetes mellitus depends on the high calorie intake of patients (p <0.05). In this analysis it was also found that there was a relationship between eating schedule by type-2 diabetes mellitus patients on control of blood sugar levels which was marked by an increase in blood sugar levels> 200 mg% RP = 21.89; 95% CI (4,64-103,17) and p = 0,000, which shows that the control of KGD in people with Diabetes Mellitus depends on the proper schedule / meal time used (p <0.05).

From the regression analysis the constant value is meaningful p = 0,000 (p <0,05) at the significance level α = 0,05. This shows that constants are very good for predicting models. So that the best model of regression equations can be formed with

$P = 1/(1 + e^{-y})$
y = -1,566 + 8,32 (**Calorie Intake**)+21,89 (**meal schedule**)+ 8,42 (Obedient)

y = -1,566 + 1,32 (1) + 21,89 (1) + 8,42(1)
y = 3,03
Then
$P = 1/(1 + 2,71^{-(3,03)})$
P = 1/ (1 + 0,048)
P = 1/ 1,048
P = 0,95

This means that through this model if a DM patient consumes an inappropriate calorie intake, a meal schedule that is not compliant and not compliant with taking the drug, the unexplained chance of KGD occurring is 95%, which is characterized by KGD> 200 mg%

Discussions

Relationship of Diet Pattern with Control of blood sugar levels in people with diabetes miletus in Herna Medan Hospital

From the results of the analysis in this study and there is a relationship of calorie intake with the incidence of controlling blood sugar levels in people with diabetes mellitus. The same thing was also found by Nanri (2008) that eating patterns that prioritize white rice intake are likely to reduce glucose metabolism in men and women thus affecting blood sugar levels.

Parillio (2004) carbohydrate-rich foods can be classified based on their effect on postprandial glycemia which can be expressed as a glycemic index. Glycemic index is an index based on an increase in blood glucose concentration. Foods rich in fiber have a low glycemic

index. Some beneficial effects of low glycemic index high-fiber diet foods have shown increased insulin sensitivity and improved lipid control. There is no exact recommended value from a low or high glycemic index diet. But it seems clear that the lower the glycemic index the better the metabolic effect.

In a prospective Nurses Health Study in Pirallio (2004) found a positive association between high intake of trans fatty acids and the risk of hyperglycemia, a positive relationship between animal fat intake and the incidence of hyperglycemia in diabetes mellitus. In the Professional Study Health in Pirallio (2004) found total fat intake and saturated fat were associated with a higher risk of diabetes mellitus. Increased risk in people with diabetes mellitus will contribute to the occurrence of uncontrolled blood sugar levels.

Waspadji (2007) regulation of diet is intended to make changes in the glucose content in the blood of DM patients so that it is expected that by comparing the amount of food, the right meal schedule, blood glucose levels will remain stable

The results in this study indicate that the uncontrolled blood sugar levels in people with diabetes mellitus also depend on the meal schedule. People with diabetes mellitus with controlled or uncontrolled blood sugar levels adhere more to the predetermined meal schedule.

Relationship between Compliance with Drinking Drugs and Control of blood sugar levels in people with diabetes mellitus at Herna Medan Hospital

This study found that there was a relationship between medication adherence and controlling blood sugar levels in people with diabetes mellitus. This shows that medication adherence contributes to causing hyperglycemic events so that blood sugar levels are not controlled in people with diabetes mellitus.

The high proportion of non-adherence to medication is very dependent on various factors of individual behavior and characteristics of diabetes mellitus. Of the six categories of compliance index contained in this study, the highest disobedience of patients with diabetes mellitus in patients who feel the drug is not useful, and the side effects of drugs that are felt by patients and the lowest is the category of forgetting to take medication and running out of drugs.

Duration or duration of illness also contributes to disobedience in taking medication in patients with DM. This is evidenced in this study where DM patients have an average duration of illness of around 5.92 years, with the largest proportion in pain duration> 5 years compared to the proportion of ≤ 5 years. This is in accordance with the opinion of Tiv (2012) which states the duration of disease has a negative relationship with adherence: the longer the patient has DM, the less likely it is to be obedient to DM management. (Tiv M, 2012)

Compliance with taking drugs is influenced by several factors such as the patient's ability to follow the treatment plan optimally. This is often disrupted because of the barrier associated with different aspects of the problem such as social, economic, health care systems, characteristics of the disease, therapy, and other factors related to the patient. If the patient's adherence to drug consumption will be corrected, solving problems related to each of these factors is needed (WHO, 2012).

Relationship between Physical Activity and Control of blood sugar levels in people with diabetes mellitus at Herna Medan Hospital

The results in this study indicate that the incidence of controlling blood sugar levels in people with diabetes mellitus depends on physical activity. But in this study people with diabetes

mellitus who experienced controlled blood sugar levels and were not controlled more did not perform physical activities which is one of the management for diabetics. The mechanism of the absence of physical activity relationship with controlling blood sugar levels in this study is that people with diabetes mellitus more than 60 years old complain of musculoceletal disorders, so that they do certainly experience limited activity this tends to affect blood sugar levels.

Conclusion
1. Estimated risk for uncontrolled KGD in patients with DM at Herna Hospital Medan 2.95 times greater than inappropriate calorie intake
2. Estimated risk for uncontrolled KGD in DM patients at Medan Herna Hospital is 3.6 times greater with inappropriate food types.
3. Estimated risk for uncontrolled KGD in DM patients at Medan Herna Hospital 2.29 times greater who do not adhere to taking medication
4. Estimated risk for uncontrolled KGD in DM patients at Medan Herna Hospital 2.29 times greater who do not adhere to taking medication
5. The uncontrolled occurrence of KGD in DM patients at Medan Herna Hospital was 95% due to a diet that included the number of calories, the type of food and an inappropriate meal schedule and not adhering to taking medication.

Suggestion
1. It was suggested to the institution of Medan Herna Hospital to improve promotional strategies in the form of leaflets, brochures, posters about diet, medication adherence and physical activity in patients with DM so that the hyperglycemic incident that caused uncontrolled KGD in DM patients could be reduced.
2. To doctors and other medical staff (nutritionists) in order to improve communication through counseling to people with DM about the importance of patient compliance in terms of following the standard calorie intake, type of food and meal schedule used, and adherence to taking medication, so the hyperglycemic incidence in DM patients can lowered
3. It is recommended for the provision of nutritional counseling clinics for patients who need information about nutrition, especially for people with DM

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