

Effect of Leaflet Education on Blood Glucose Control and Medication Adherence with Type 2 Diabetes Mellitus Patients at FMC Hospital Bogor

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ABSTRACT

Diabetes mellitus (DM) is a metabolic disorder with high blood glucose caused by decreased insulin sensitivity, decreased insulin secretion, or both. The purpose of this study was to analyze the effect of leaflet education on blood glucose control and medication adherence. The study design was prospective pretest-posttest group. Respondents were given explanation in advance about the objectives and descriptions of the study before collecting data and filling out an informed consent if they agree to participate in the study. The data was collected from September to October 2019 by filling out the MMAS-8 (Morisky Medication Adherence Scale) through interviews and blood glucose control through medical records. MMAS-8 and blood glucose monitoring were carried out twice, before education and 1 month after education. There are total of 50 respondents who met the inclusion criteria and were willing to participate in this study. The Wilcoxon test showed that leaflet education had an influence on blood glucose control and medication adherence ($p = 0,000$). Gender ($p = 0.020$), age ($p = 0.036$), and eating habits ($p = 0.028$) have a correlation to blood glucose control and medication adherence while type of work only has correlation to medication adherence ($p = 0,000$).

Keywords: *Leaflet*, glucose control, adherence, MMAS-8, diabetes

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder characterized by high levels of glucose in the blood (hyperglycemia) associated with metabolic abnormalities in carbohydrates, proteins, and fats caused by decreased insulin secretion, decreased insulin sensitivity, or both and could cause chronic macrovascular, microvascular and neuropathy complication (1). The International Diabetes Federation (IDF) 2014 (2) estimated that 9.1 million people in Indonesia are diagnosed with DM, so that Indonesia ranked 5th in the world. Riskesdas in 2017 stated the national prevalence of people with DM in Indonesia over the age of 15 years was 5.7% (3). The results of a small survey conducted at one of hospital showed that out of 10 people with diabetes mellitus, only 1 person was compliant with the management DM therapeutic regimen (4). The relationship between patients, health care providers, and social supports are fundamental determinants and are closely related to patients medication adherence. Some factors were affecting patient noncompliance with treatment include patient factors, demographic factors, socioeconomic factors, duration of treatments and duration of diseases (5). Research by Perez *et al* (2013) (6) showed that less than 50% of patients achieve therapeutic effect. This proves that the patient's low adherence in treatment so that the therapeutic effect cannot achieve and increase the risk of complications.

The failure of therapy could be caused by several factors, one of which is the lack of information received by the patient or the patient does not get clear and detailed information about the treatment of DM. Research by Hanggara *et al* (2017) (7) stated that out of 39 Puskesmas in Banyumas, there are 33 Puskesmas that have pharmacists, 5 pharmacy service are served by pharmacist assistants and 1 pharmacy service center are served by midwives so that the quality of health services, especially pharmaceutical services, does not work effectively, which caused patients to lack or not get clear and detailed information, so education were needed to be given to patients. Direct education or also called counseling has often been done with several weaknesses, patients usually forget what has been delivered by the pharmacist (4), so we need a media or other educational methods that can improve patient compliance. Previous studies by Dewanti *et al* (2015) (8) showed us that leaflet is a media that has significant influence on medication adherence for patients with DM in providing education and as reminder of treatment. As a result, this research needs to be done in order

to be able to assess how the effect of the leaflet education on blood glucose control and medication adherence to achieve the therapeutic effect.

MATERIALS AND METHOD

Research Design

This study uses a pre-experimental method (pre-experiment design) with one group pretest-posttest design conducted prospectively.

Research Respondent Criteria

Respondents in this study were all outpatient DM in the Pharmacy Installation of the FMC Hospital. The inclusion criteria in this study were respondents with the main diagnosis of type 2 diabetes, getting oral antidiabetic drugs, aged ≥ 25 years, willing to become a respondent and had signed informed consent. Exclusion criteria in this study were patients who were pregnant, getting insulin, had complications of kidney failure and diabetic ulcers and patients who withdrew themselves from the study.

Research Instrument

The instruments used for data collection were the MMAS-8 (Morisky Medication Adherence Scale-8) questionnaire, leaflet, patient data collection sheet, and literature.

Education Process

The first process was namely pretest stage. This stage is carried out using the MMAS-8 by interviewing and collecting respondent identity and blood glucose control through medical records. After that, respondents were given leaflet education. The leaflet material provided includes how to not forget to take medication, what to do if you forget to take medication, how to take the right medicine, the dangers when you do not consume the medicine properly and the side effects of the drug and its handling. After 1 month of education, respondents will come back for re-control. Respondents will be

refilled the MMAS-8 by interviewing and collecting the blood glucose level through the respondent's latest medical record.

Data Analysis

The respondent characteristics was analyzed descriptively. Kolmogorov-Smirnov normality test was conducted first to determine the distribution of the data. The results of the normality test show the data were not normally distributed. Data analysis using Wilcoxon test was used to analyze respondents' MMAS-8 scores before and after education and analyze blood glucose control before and after education. Spearman Rho test data analysis was performed to determine the confounding factors that could affect blood glucose control and medication adherence, such as gender, age, education level, number of drugs other than antidiabetic, eating habits, antidiabetic types, and guarantee status.

RESULT AND DISCUSSION

This study has received ethical approval from the Padjadjaran University Ethics Commission with number 1132 / UN6.KEP / EC / 2019. The number of respondents in this study were 50 respondents.

Respondent Characteristic

Characteristics of respondents can be seen in Table 1. Characteristics of respondents by sex indicate that most respondents were female. Gender is a risk factor for DM associated with physical activity where women have less physical activity compared to men, especially housewives. The results of this study are in line with research by Setyorogo and Trisnawati (2013) (9) the prevalence of type 2 DM in women is higher than men, this is because women physically have a greater chance of increasing body mass index, monthly cycle syndrome, and post menopause that can cause body fat distribution to be easily accumulated due to hormonal processes, so women have greater risk factors than men.

Respondents in most studies at the age range 36-60 years as many as 37 patients (74%). The increased risk of DM, especially over 40 years, is due to the fact that age begins to increase glucose intolerance, as well as the aging process which causes a reduction in the ability of β -pancreas cells to

produce insulin. Patients in this study with age ≥ 60 years were 11 patients (22%) because in the elderly there was a decrease in mitochondrial activity in muscle cells by 35%, causing an increase in muscle fat levels by 30% and triggering insulin resistance. This is in line with research by Sujaya (2009) (10) that the most people with DM from the age group 45-52 years (47.5%).

Respondents who participated in this study experienced both macrovascular and microvascular complications. Hypertension was the most frequent complication of respondents in this study. Increasing of insulin, can cause increasing kidney sodium retention and sympathetic nerve activity which leading to hypertension. Previous research by Tandra (2009) (11) stated that one of the complications of diabetes macroangiopathy occurs because of changes in blood glucose levels, where high blood glucose will stick to the walls of blood vessels. The oxidation process then occurs where blood glucose will react with proteins from the walls of blood vessels, causing AGEs (Advanced Glycosylated End-product), which are substances formed from excess sugars and interlocking proteins. This situation damages the inner walls of blood vessels, and attracts saturated fat or cholesterol to stick to the blood vessels, causing an inflammatory reaction. White blood cells (leukocytes) and blood clotting cells (platelets) and other materials will come together to form a clot forming plaque, thus making the blood vessel walls become hard, rigid, and a blockage results increase blood pressure leading to hypertension.

The most eating habits of respondent in this study are not eating salty or sweet foods or reducing both. Most patients start eating less sweet and salty foods since they have been diagnosed with DM. Food intake such as carbohydrates or sugars, protein, fat, and excessive energy will be an early risk factor for DM. Carbohydrates will be digested and absorbed in the form of monosaccharides, especially sugar. Sugar absorption was increases blood glucose levels thereby an increase of hormone insulin to control blood glucose (12). Patients with DM mostly have hypertension complications, so it is necessary to reduce the intake of salty in food because the increased salt intake causes the body to retain fluids thereby increasing blood volume. The heart must pump hard to push the increased blood volume through narrow spaces so that it causes higher blood pressure (13).

Effect of Leaflet Education on Blood Glucose Controls

Blood glucose controls observed in this study were fasting blood glucose (GDP) and blood glucose 2 hours post prandial (GD2PP). This observation was to see the patient's blood glucose control before and after education and analyze the effect of education on blood glucose control. Observation of GDP and GD2PP was chosen because it is a primary examination of every DM patient in treatment so that it is easily reviewed and not costly. Blood glucose tests are used to diagnose diabetes and detect individuals with symptoms of diabetes. Blood glucose can be identified anywhere in low risk individuals, high risk diabetes individual, and in patients who have symptoms of diabetes (14).

Blood glucose levels of patients in this study were categorized into 2 categories, controlled blood glucose and uncontrolled blood glucose where the controlled with a level of GDP \leq 126 mg / dL and a level of GD2PP \leq 140 mg / dL and blood glucose that was not controlled with GDP levels \geq 126 mg / dL and GD2PP levels \geq 140 mg / dL (14). The results of the study in Table 2 show that at the pretest the controlled blood glucose was 11 respondents (22%) while the uncontrolled blood glucose was 39 respondents (78%), and at the posttest the controlled blood glucose had increased to 34 respondents (68 %) and uncontrolled blood glucose decreased to 16 respondents (32%). Statistical test results showed a significant difference between before and after education ($p = 0,000$). Education through leaflets has an influence on blood glucose control. Education provided can increase patient knowledge about DM, increase knowledge about the treatment, and increase motivation in healthy life so that blood glucose is controlled and prevent complications (15).

Effect of Leaflet Education on Medication Adherence

Leaflet education provided relates to the questions on the MMAS-8. The results showed that at pretest respondents with moderate scores were 11 patients (22%) and respondents with high scores were absent while at posttest respondents with moderate scores had increased to as many as 28 patients (56%), respondents with high scores were 5 patients (10%) and the results of statistical tests showed that there were significant differences before and after education ($p = 0,000$) listed in Table 3. These results indicate that the leaflet education had an influence on medication adherence.

Non-compliance of respondents in treatment is reflected by the irregularity of respondents in taking medicine, almost all respondents do not take medication due to forgetting or forgetting to bring medicine when traveling. This result is similar to the study by Puspitasari (2012) (16) where 73.33% of respondents or almost all respondents did not take medication for reasons of forgetting.

Leaflet education provide information on how to not forget to take medication such as simplifying the daily dosage regimen, using pill boxes or pillboxes according to medication schedule, using alarms and involving families in reminding patients so that patients more obedient to take medication by medication regularly.

Connection of Some Factors to Blood Glucose Control and Medication Adherence

There are several factors that have a correlation to blood glucose control and medication adherence that can be seen in Table 4 and 5. In the sex and age factors towards the correlation where blood glucose control has increased at the posttest and statistically significant. This shows that there is a significant correlation between sex ($p = 0.020$) and age ($p = 0.036$) on blood glucose control. This study is in line with research by Rudi and Kwureh (2017) (17) which there is a correlation between blood glucose on gender ($p = 0.043$) and age ($p = 0.013$). One of the risk factors for DM is gender, where female has a greater risk of DM than men because women have the hormone estrogen and progesterone which can affect blood glucose levels. As we get older, glucose intolerance also increases, glucose intolerance in the elderly is associated with obesity, reduced physical activity, reduced muscle mass, accompanying diseases and taking drugs. Blood glucose was increase related to increasing age. Another factor that has a correlation with blood glucose control was eating habits ($p = 0.028$). Respondents began to reduce eating sweet and salty foods or both after being diagnosed with DM, thus indicating that the patient's lifestyle is regular. This study is in line with research by Bistara and Susanti (2018) (12) that there is a correlation etween diet and blood glucose levels.

Proper diet modification can control blood glucose in DM (3). Blood glucose levels will increase drastically after consuming carbohydrates with or without sugar, DM patients must really manage their diet properly.

In addition to the factors above, there is one factor that has a correlation only with medication

adherence that is work ($p = 0,000$). The correlation between work and medication adherence showed an increase before and after education. This is due to the increasingly dense work of the respondent, the schedule of taking medication will be disrupted because the respondent will delay the time of taking medication and eventually forget to take medicine. The results can be seen in Table 6.

CONCLUSION

Leaflet education has an influence on blood glucose control and medication adherence for patients with type 2 DM ($p = 0,000$) and there is a correlation between gender ($p = 0.020$), age ($p = 0.036$) and eating habits ($p = 0.028$) to the control blood glucose and medication adherence and there is a correlation between work and medication adherence ($p = 0,000$). Leaflet education has a good influence on medication adherence so that it can control the blood glucose levels for the achievement of therapeutic effects.

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TABLE AND FIGURES

Table 1. Characteristic Respondent

Variabel	Frequency (n=50)	Percentage (%)
Gender		
Men	18	36
Women	32	64
Age		
25-35	2	4
36-60	37	74
≥ 60	11	22
Education level		
Low	5	10
Medium	25	50
High	20	40
Type of Work		
Housewives	19	38
Government employee	9	18
Non-government employee	14	28
Entrepreneur	8	16
Complication		
Makrovascular		
Deep Vein Trombosis	1	2
Hypertension	14	28
APS	1	2
Microvascular		
Nefropathy DM	2	4
Neuropathy DM	8	16
Glaucoma	1	2
Amount of non antidiabetik oral		
≤ 5	1	2
≥ 5	41	82
Non both	8	16

Table 2. Data of Blood Glucose Control (Fasting Blood Glucose and Blood Glucose 2 hours Post Prandial)

Blood Glucose	Pretest		Posttest		p-value
	n = 50	%	n= 50	%	
Control	11	22	34	68	0,000
Uncontrol	39	78	16	32	

*p=Wilcoxon

Table 3. Data of Medication Adherence Based On MMAS-8 Score

	Pretest		Posttest		p-value
	Frequency	Percentage (%)	Frequency	Percentage (%)	
Low	39	78	17	34	0,000
Medium	11	22	28	56	
High	0	0	5	10	

*p=Wilcoxon

Table 4. Correlation of Gender and Age To Blood Glucose Control and Medication Adherence

Factors Affecting	Detail	Blood Glucose		<i>p-value</i>	
		Control	Uncontrol		
Gender	<i>Pretest</i>				
	Men	1	17	0,020	
	Women	0	32		
	<i>Posttest</i>				
	Men	4	14		
	Women	18	14		
Age	<i>Pretest</i>				
	25-35	0	2	0,036	
	36-60	1	36		
	≥ 60	0	11		
	<i>Posttest</i>				
	25-35	1	1		
36-60	17	20			
	≥ 60	20	9		

**p*=Spearman Rho

Table 5. Correlation of Eating Habits Respondent To Blood Glucose Control and Medication Adherence

Blood Glucose	Category				<i>p-value</i>
	Salty	Sweetly	Non Both	Total	
Control	2	0	24	26	0,028
Uncontrol	6	2	16	24	

**p* = Spearman Rho

Table 6. Correlation of Type of Work To Medication Adherence

Medication Adherence	Category					<i>p-value</i>
	Government employee	Housewives	Non-government employee	Entrepreneur	Total	
<i>Pretest</i>	Low	7	14	12	6	0,000
	Medium	2	5	2	2	
	High	0	0	0	0	
<i>Posttest</i>	Low	1	0	3	3	
	Medium	7	14	10	3	
	High	1	5	1	2	

**p*=Spearman Rho