



The Influence Of Reminder Sms Intervention In Improving Drug Compliance In The Review Of Glycated Hemoglobin Levels (Hba1c) And Morisky Medical Capabilitiescale (MMAS) -8 Dm Type 2 Patients In Community Health Centers Of Semarang City

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Diabetes mellitus (DM) is one of the major health problems and is a cause of death. Assessing DM patient compliance in controlling blood glucose can be done by measuring the patient's glycated hemoglobin (HbA1C) levels. Compliance with taking medication is very important in DM patients so it needs supporting interventions namely short message services such as SMS. This study aims to analyze the effect of reminder SMS interventions as a medium for improving medication adherence and diet for type 2 DM patients in terms of HbA1c levels

and MMAS-8 values in Pandanaran Health Center and Srandol Health Center in Semarang City.

This research is a quantitative study, with a research design using the Quasi Experiment Control Group Design method. The samples used were 30 samples at the Pandanaran Health Center and 30 samples at the Srandol Health Center using the consecutive sampling method.

Statistically the results of this study indicate that variables in the case group such as the use of herbal medicines ($p = 0,000$), dietary patterns ($p = 0.008$), exercise patterns ($p = 0.024$), and side effects ($p = 0.013$), while the variables in control groups such as work ($p = 0.022$), Education ($p = 0.011$), and dosage regimen ($p = 0.016$) have a relationship to medication adherence. In the multivariate test results found that age, education, and occupation together play a role in influencing HbA1c levels with a strength of 84.7%. In addition, variables of age, gender, and occupation both played a role in influencing MMAS scores with a strength of 74.7% relationship in type 2 DM patients.

Health institutions should actively socialize and develop SMS reminder applications as patient reminders, to control medication adherence for Type 2 DM patients.

Keywords : Reminder SMS, Medication Compliance, HbA1C, MMAS-8, Type 2 Diabetes Mellitus Patient

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INTRODUCTION

Diabetes mellitus has become the cause of 4.6 million deaths. The number of people with diabetes mellitus worldwide reached 382 million in 2013 and is predicted to increase to more than 592 million in 2035. Diabetes mellitus (DM) is a collection of symptoms that arise in a person caused by an increase in blood glucose levels due to a progressive decrease in insulin secretion motivated by insulin resistance (Soegondo, 2011). WHO predicts an increase in the number of people with DM in Indonesia from 8.4 million in 2000 to around 21.3 million in 2030. This report shows an increase in the number of people with DM as much as 2-3 times in 2035. Indonesia's position is ranked 7th with 8.5 million people. In addition, spending on health costs for Diabetes Mellitus has reached 465 billion USD. (International Diabetes Federation, 2013)

The International Diabetes Federation (IDF) estimates that as many as 183 million people are unaware that they have DM. 80% of people with DM live in low and middle income countries. In 2006, there were more than 50 million people suffering from diabetes in Southeast Asia. The largest number of DM patients is between 40-59 years. (International Diabetes Federation, 2012)

Data from the results of the Basic Health Research (Riskesdas) in 2013 showed that the national prevalence of DM based on the results of blood sugar measurements in people aged > 15 years who lived in urban areas was 5.7%. This research also shows that the prevalence of impaired glucose tolerance (TGT) in the population aged > 15 years who live in urban areas is 10.2%. (Research and Development Agency. 2008)

Diabetes mellitus is usually called the silent killer because this disease can affect all organs of the body and cause various kinds of complaints. Diseases that will be caused include eye vision disorders, cataracts, heart disease, kidney pain, sexual impotence, wounds difficult to heal and rot / gangrene, lung infections, blood vessel disorders, strokes and so on. Not infrequently, DM patients who have severe amputations of limbs due to decay (Department of Health. 2008)

Parameters for assessing DM patient compliance in controlling blood glucose can be done by measuring the patient's glycated hemoglobin (HbA1C) levels. HbA1C can describe the average blood glucose concentration during the previous 8-12 weeks period. HbA1C levels of more than 7% indicate DM patient compliance in controlling blood glucose is not good so that it can increase the risk of diabetic complications, both microvascular and macrovascular complications. Morisky Medication Adherence Scale (MMAS) questionnaire -8. The MMAS-8 questionnaire is a validated assessment tool from WHO and is often used to assess the compliance of treatment of patients with chronic diseases, such as diabetes mellitus (Pratita, 2012)

DM treatment aims to prevent complications and improve the quality of life of patients. Prevention of complications is done by maintaining blood sugar stability with regular routine treatment for life because DM is a lifelong disease that cannot be cured permanently so that many patients are saturated and are not compliant with treatment. (Obreli and Paulo, 2011) The



administration of drugs aims to achieve results that can improve the quality of life of patients. The success of the treatment improves the quality of life of DM patients. The causes of suboptimal treatment outcomes generally include inaccurate prescribing, patient non-compliance, and inaccurate monitoring. (Endocrinology Association of Indonesia, 2015) Quality of life shows health outcomes that have important value in a treatment intervention. The quality of life of DM patients is related or dependent on good glycemic control (BPOM, 2006)

One of the most important things for people with DM is controlling blood sugar levels, so patients need to understand about things that affect blood sugar control. Control of blood sugar levels in people with DM associated with dietary factors or meal planning, because nutrition has a relationship with DM. Given the importance of medication adherence for DM patients, a health system is needed that can find solutions to improve medication adherence using supportive interventions. One technology-based strategy to improve patient behavior in medicine is to provide controlled treatment services to patients at home using mobile technology. Short message services such as SMS Reminders can be used to maximize the efficiency, effectiveness and equity of health services through improving health communication. In addition, the SMS reminder service can be used to monitor and provide information on taking Medication compliance. An SMS-based reminder system has been tested in the Netherlands to determine the effect of SMS reminders on patient adherence to antidiabetic oral drugs using real time medication monitoring (RTMM). The results of this study prove that SMS reminder is effective in improving the adherence of type 2 DM patients and sending SMS is well received by patients. (Kun and Hee, 2008)

Based on the description above, research is needed that focuses on increasing medication adherence in patients with Type 2 diabetes in Community Health centers of through SMS Reminder interventions. This research is expected to be an initial intervention for further research on health care media and as a baseline in the health service strategy in Semarang Regency.

METHOD

This research is a quantitative study, with a research design using the Quasi Experiment Control Group Design method, and the research design used is a pre test and post test group design with a control group without randomization. This study uses two groups of patients, the first group that was given SMS intervention Reminders that contain reminders to take medication and diet patterns, and the other group was not given an intervention. In the initial and final stages of the study, the two groups of research subjects were given a questionnaire designed to measure the level of patient compliance, the MMAS-8 questionnaire and measured HbA1C levels.

The study population was all patients with diabetes mellitus who came for treatment at Pandanaran Health Center and Spondol Health Center in Semarang City. The sample of this study was patients with type 2 diabetes mellitus who came for treatment at Pandanaran Health Center and Spondol Health Center in Semarang City. Samples were taken by consecutive sampling method, ie every subject that met the inclusion criteria would be included in the study



until a certain period of time so that the number of research subjects needed was met. The sample size used was 30 samples at the Pandanaran Health Center and 30 samples at the Spondol Health Center. The number of samples is taken based on a minimum number of samples that can still be analyzed statistically.

RESEARCH RESULT

This study aims to analyze the effect of reminder SMS interventions as a medium to improve medication adherence and diet of type 2 DM patients in terms of HbA1c levels and MMAS-8 values. The statistical test used to analyze the data from the results of this study used the chi square test. The results of the study will be described as follows:

A. Characteristics of Treatment Groups (Community Health centers of Pandanaran) and Control Groups (Community Health centers of Spondol)

Table 1.1

Descriptive of Diabetes Mellitus Patient Age

Variable	Group		P
	Treatment	Control	
Gender			
Male	10 (33,3%)	7 (23,3%)	0,390 [¥]
Female	20 (66,7%)	23 (76,7%)	
Age	63,27 ± 8,14	57,47 ± 8,11	0,008 ^{§*}
Education			
No school	0 (0%)	2 (6,7%)	0,055 [¥]
Primary	3 (10%)	7 (23,3%)	
Junior high school	8 (26,7%)	13 (43,3%)	
Senior High School	12 (40%)	5 (16,7%)	
College	7 (23,3%)	3 (10%)	
Profession			
housewife	13 (43,3%)	24 (80%)	0,034 ^{¥*}
entrepreneur	11 (36,7%)	4 (13,3%)	
government employees	4 (13,3%)	1 (3,3%)	
retired	2 (6,7%)	1 (3,3%)	
Regimen and dosage			
1 regimen	13 (43,3%)	4 (13,3%)	<0,001 ^{¥*}



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Variable	Group		P
	Treatment	Control	
2 regimen	9 (30%)	25 (83,3%)	
> 2 regimen	8 (26,7%)	1 (3,3%)	
Side effects			
Experience	9 (30%)	9 (30%)	1,000 [¥]
Do not experience	21 (70%)	21 (70%)	
Sports			
To do	9 (30%)	9 (30%)	1,000 [¥]
Do not do	21 (70%)	21 (70%)	
Diet			
To do	7 (23,3%)	5 (16,7%)	0,519 [¥]
Do not do	23 (76,7%)	25 (83,3%)	
Duration DM			
< 1 year	8 (26,7%)	5 (16,7%)	0,146 [¥]
1 – 5 years	16 (53,3%)	12 (40%)	
> 5 years	6 (20%)	13 (43,3%)	
Herbs			
Use	12 (40%)	11 (36,7%)	0,791 [¥]
do not use	18 (60%)	19 (63,3%)	

Based on this research, the results showed that in the sex group in Pandanaran Community Health Center and Spondol Health Center, most of the women were 20 patients (66.7%) and 23 patients (76.7%) with $p = 0.390$ meaning that there were no significant differences between the sexes. The age group in Pandanaran Community Health Center and Spondol Health Center has an average of 63.27 ± 8.14 and 57.47 ± 8.11 with $p = 0.008$ meaning that there is no significant difference between sexes. The education group in Pandanaran Community Health Center and Spondol Health Center were mostly high school, 12 patients (40%) and junior high school (13 patients) (43.3%) with $p = 0.055$ meaning that there were no significant differences between education. Occupational groups in the Spondol Community Health centers of and Pandaran Community Health centers of have the majority of IRT jobs namely 13 patients (43.3%) and 24 patients (80.0%) with $p = 0.034$ meaning that there are significant differences between jobs. Regiment and sausage groups in Pandanaran Health Center and Spondol Health Center were mostly 1 regimen of 13 patients (43.3%) and 2 regimens were 25 patients (83.3%) with $p = 0.001$ meaning that there was a significant difference between the regimen and dose. The side effects group at Pandanaran Health Center and Spondol Health Center were mostly not experienced (70%) with $p = 1,000$ meaning that there was no significant difference between the regimen and dosage. Most of the sports groups in Pandanaran Health Center and Spondol Health Center did not do that is 21 patients (70%) with $p = 1$ meaning that there were no significant differences



between sports. Most of the Diet Groups in Pandanaran Health Center and Spondol Health Center did not do 23 patients (76.7%) and 25 patients (83.3%) with $p = 0.519$ meaning that there were no significant differences between diets. The duration of DM in Pandanaran and Spondol Community Health centers of is mostly 1-5 years and > 5 years, that is 16 patients (53.3%) and 13 patients (43.3%) with $p = 0.146$ meaning that there is no significant difference between duration of DM. The use of herbal medicines in the Pandanaran Community Health centers of and Spondol Community Health centers of mostly did not use herbal medicines, namely 18 patients (60%) and 19 patients (63.3%).

B. Analysis of Dependent Variables

1. HbA1c levels

Table 1.2.

Changes in HbA1c Levels Before and After Treatment in the Treatment and Control Groups

HbA1c	Group		P
	Treatment	Control	
Pre	7,53 $\pm$ 1,80	8,91 $\pm$ 1,80	0,002 ^{‡*}
Post	7,28 $\pm$ 1,77	8,96 $\pm$ 1,74	<0,001 ^{‡*}
P	0,098 [‡]	0,546 [¶]	
Difference	-0,26 $\pm$ 1,44	0,05 $\pm$ 0,42	0,020 ^{‡*}

Note: * Significant ($p < 0.05$); ¶ Paired t; ‡ Wilcoxon

Based on statistical tests of HbA1c levels in the treatment group before the treatment was given an average of 7.53 g / dL while after treatment decreased to 7.28 g / dL and the difference of -0.26 g / dL with p value 0.002 $< \alpha$ (0.005) which meaning that there are significant differences before and after treatment in the treatment group. In the control group before treatment an average of 8.91 gr / dL while after treatment increased to 8.96 gr / dL and a difference of 0.05 g / dL with p value-0.001 α (0.005), which means there were no significant differences before and after treatment in the control group. It was concluded that there was a decrease in hemoglobin A1c lower in the treatment group compared with the control group.

2. MMAS-8 score

Table 1.3.

Changes in MMAS Scores Before and After Treatment in the Treatment and Control Groups

Scor MMAS	Group		P
	Treatment	Control	
Pre	1,77 $\pm$ 1,17	3,10 $\pm$ 0,92	<0,001 ^{‡*}
Post	2,83 $\pm$ 1,09	3,03 $\pm$ 1,07	0,421 [‡]
p	<0,001 ^{‡*}	0,623 [‡]	
Difference	1,07 $\pm$ 0,87	-0,07 $\pm$ 0,79	<0,001 ^{‡*}



MMAS scores in the treatment group before the treatment were given an average of 1.77 while after the treatment increased to 2.83 and the difference of 1.07 with a p value of 0.001, which means there are significant differences before and after treatment in the treatment group. the average treatment was 3.10 while after the treatment was 3.03 and the difference was -0.07 with a p value of 0.623, which means there were no significant differences before and after the treatment in the control group. It was concluded that an increase in MMAS scores was higher in the treatment group compared to the control group.

C. Analysis of the Effect of HbA1c Levels and MMAS Scores on Confounding Variables

Table 1.4

Table of Factors that Influence HbA1c Levels on Confounding Variables in the Treatment Group

Variable	Partial SS	Df	MS	F	p	Information
Age	137,1315	25	5,48526	9,74	0,000	Significant
Geder	2,102501	1	2,102501	3,73	0,058	Not significant
Education	10,5485	4	2,637125	4,68	0,002	Significant
Profession	17,56264	3	5,854213	10,39	0,000	Significant

Based on table 4.6 the results obtained variables age, education, and work together play a role in influencing the HbA1c levels that is as much as (84.7%), while 15.3% can be influenced by other factors. Age variable is the most dominant variable in influencing medication adherence in patients with type 2 diabetes mellitus seen from HbA1c levels.

Table 1.5

Table of Factors that Influence MMAS Scores on Confounding Variables in the Treatment Group

Variable	Partial SS	df	MS	F	p	Information
Age	44,00354	25	1,760142	4,53	0,0000	Significant
Gender	2,25	1	2,25	5,79	0,0194	Significant
Education	2,1	4	0,525	1,35	0,2624	Not significant
Profession	4,214506	3	1,404835	3,61	0,0184	Significant

Based on table 1.5, the results of age, sex, and occupation variables together play a role in influencing MMAS score, which is as much as (74.7%), while 25.3% can be influenced by other factors. Age variable is the most dominant factor in influencing medication adherence in patients with type 2 DM seen from MMAS scores.

DISCUSSION



Based on the results of the study, the discussions in this study include:

a. Age

The patients who had diabetes mellitus in this study were from the early adult to the elderly category and the most had diabetes mellitus in the Pandanaran Community Health Center, average age 63 years to above (old age) and a minimum age of 48, while in the Spondol Community Health Center the average patient average at age 57 years up and at least age 32.

When compared with Mareeya Jilao's research (2017) with the title "The level of adherence to the use of oral antidiabetic drugs in diabetes mellitus patients in the koh-libong health center", the results showed that the patients with the most diabetes mellitus were age 63 and above according to the results of research in the Pandadar Community Health Center the average age of the patient is 63 years old. The differences in the results of this study are caused by differences in the sample, the sampling method, and the place of research. (Jilao, 2017)

b. Gender

Of the 60 outpatient diabetes mellitus patients at the Spondol Community Health centers of and Pandanaran Community Health Centers, patients can be grouped by sex to determine the ratio of the number of male and female patients.

This can be due to the fact that women have LDL (Low Density Lipoprotein) or bad cholesterol triglyceride levels are higher than men, and there are also differences in doing all activities and daily lifestyle that greatly affect the incidence of a disease, and this is one of the risk factors for diabetes mellitus. The amount of fat in adult men on average ranges between 15-20% of total body weight, and in women around 20-25%. So an increase in lipid levels (blood fat) in women is higher than in men, so the risk factors for diabetes mellitus in women 3-7 times higher than in men is 2-3 times. (Basuki, 2009)

c. Education

From 60 outpatient diabetes mellitus patients in Spondol health center and Pandanaran Community Health Center, patients can be grouped based on education to determine the average education of diabetes mellitus patients. The results obtained by patients who have the most diabetes mellitus with junior high school education in Spondol Community Health Center and high school patients in Pandanaran Community Health Center. The results of the comparison are more diabetes mellitus patients in Spondol community health center with the most junior high school education, diabetes mellitus patients in Pandanaran community health center with the most high school education.

The results of this study based on education there is a difference with Sativa's research, 2015 the results of his research in terms of the highest percentage of education level that is elementary school at 23.4%.

d. Profession

From 60 outpatient diabetes mellitus patients in Spondol health center and Pandanaran Community Health Center, patients can be classified based on the work done to find out what



work is most common in patients with diabetes mellitus. The results obtained by comparison of patients who have the most diabetes mellitus is a job as a housewife.

According to the PDCI program expert team, DR. dr. Em Yunir, Sp.PD-KEMD, most Indonesian women do not work alias housewives who are at risk of type 2 diabetes. Women who are at home every day, physical activity is relatively not as much as men who work. Women, there is a tendency for hormonal factors which influences the risk of diabetes. Hormonal is when women are menopausal, estrogen production which is protective against blood vessels in the body is reduced so that health problems such as diabetes and hypertension can occur. (Aprilianti, 2015)

e. DM Duration

The results of the study are based on the grouping of the long duration of suffering from Diabetes Mellitus outpatients in Spondol Community Health centers of and Pandanaran Community Health Centers in January 2019 using oral antidiabetic drugs, most of the melitus with > 5 years (43.3%) in Spondol Community Health Centers while in Pandanaran Community Health Centers with categories 1- 5 years (50%). The results of this study are in line with Aini (2017) which states that the average duration of diabetes is 1-5 years. The duration of diabetes indicates how long the patient has diabetes melitus type 2 since the diagnosis of type 2 diabetes mellitus is established. The duration of diabetes mellitus is associated with the risk of complications of diabetes mellitus. The main factors that trigger complications in diabetes mellitus are the duration and severity of diabetes. (Basyiroh, 2011)

Duration of DM did not significantly affect the level of compliance of respondents. Based on the literature, generally the level of adherence to treatment is higher in patients who have just been diagnosed and will decrease after the first 6 months of the therapy program. The level of adherence to the duration of the disease tends to have a negative relationship. The longer the patient has diabetes, the less likely it is to be compliant with treatment (Jilao, 2017)

f. Use of Herbs

The results of the study are based on grouping the use of herbs suffering from diabetes mellitus in outpatients in the Spondol Community Health centers of and Pandanaran Community Health Centers for the period of January 2019 Spondol Community Health Centers patients and Pandanaran pukesmas patients on average do not use herbal medicines.

This study is in line with the research of Wulandari (2017) using herbs as much as 2 (14.3%), while not using herbs as much as 12 (85.7%). (Wulandari, 2017)

g. Diet pattern

The results of the study are based on the grouping of dietary patterns of patients suffering from outpatient diabetes mellitus. On average Spondol community health care patients and Pandanaran patients do not go on a diet.

These results contradict Wulandari's research (2017). The results of his study show that patients go on a diet of 12 patients (85.7%). (Wulandari, 2017)

h. Sports pattern



The results of the study are based on the grouping of outpatient sports patterns in the Spondol Community Health Centers and Pandanaran Community Health Centers not doing sports.

The results of this study contradict the Wulandari study (2017). The results of the study were that more patients were exercising as many as 11 patients (78.6%). (Wulandari, 2017)

i. Dosing Regimen

The results of the study were based on grouping the characteristics of oral antidiabetic drugs of patients suffering from outpatient diabetes mellitus in the Spondol 2 Community Health centers of regimen of 25 patients (64.1%) and Pandanaran Community Health Center, 1 regimen of 13 patients (33.3%).

The results of this study for Pandanaran patients are in line with the study of Wulandari (2017) patients using more drugs 1 regimen of 8 patients (57.4%). (Wulandari, 2017)

j. ADO Side Effects

The results of the study are based on the grouping of ADO side effects of patients suffering from Diabetes Mellitus and the pathway, the average Spondol Community Health Center and Pandanaran Community Health Center are experiencing no side effects.

This study is in line with Wulandari's research (2017), the results of the study showed that the average patient did not experience side effects as much as 13 (96.3%). (Wulandari, 2017)

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the study can be concluded as follows:

1. There is an effect of giving SMS to the decrease in HbA1c levels
2. There is an effect of giving SMS to the increase in MMAS Score
3. There is an influence between age, education, and occupation on the adherence of type 2 DM patients as seen from the decrease in HbA1c levels.
4. There is an influence between age, sex, and occupation on the adherence of type 2 DM patients as seen from the increase in MMAS score.

Suggestions of this research are:

1. For Community Health centers after related to this SMS, it can be continued to be applied at the Community Health centers of to make health promotion efforts in order to reduce the number of complications in DM patients and is expected to optimize in providing socialization about good dietary patterns to reduce blood sugar levels in DM2 patients and Spondol Community Health Center. and Pandanaran Community Health Centers need special medical personnel to apply SMS as a patient reminder, the goal is to control compliance with taking medication for Type 2 DM patients.
2. For the development of science, this research is developed into qualitative research to explore the potential contained in health services to determine the model of efforts to



tackle various complications of DM disease also does not aggravate the client's disease as well as and develop methods of promotion that are more effective, applicable and sustainable

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