The Effect of Short Message Service Reminders on Self-Management of Type 2 Diabetes Mellitus Patients

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ABSTRACT

Background: Short Message Service (SMS) can be used to increase knowledge of diabetes patients and improve adherence to recommended therapy.

Methodology: The study used a Quasi-Experimental method with a Pretest-Posttest Nonequivalent Control Group design involving 40 Prolanis Diabetes Mellitus Type 2 patients, which were divided into a control group and an intervention group. Data collection used a questionnaire which was analyzed by the Mann Whitney test.

Results: The results showed that there were differences in self-management in dietary adherence ($p=0.008 < 0.05$) and medication adherence ($p=0.031 < 0.05$) before and after being given a short message reminder to patients with type 2 diabetes mellitus at the Kabila Health Center.

Conclusion: There is an effect of short message service reminders on the self-management of type 2 diabetes mellitus patients at Kabila Health Center.

KEYWORDS: SMS reminder, Self management, Diabetes mellitus

INTRODUCTION

Diabetes mellitus is a silent disease characterized by symptoms of high blood glucose levels (hyperglycemia) resulting from defects in insulin secretion, insulin action, or both. Over time, diabetes has an increased risk of causing damage and dysfunction in many organs, such as the eyes, kidneys, nerves, heart, and blood vessels, eventually leading to complications (1). More than 415 million people worldwide have diabetes, representing nearly 9.1% of the global adult population (2).

The World Health Organization (WHO) and the International Diabetes Federation (IDF) also report that the number of diabetes patients worldwide is predicted to increase to more than 300 million people in 2025 and 366 million in 2030 (3). Indonesia is ranked 7th among the 10 countries with the highest number of sufferers, namely 10.7 million. Indonesia is the only country in Southeast Asia on the list, so it can be estimated that Indonesia's contribution to the prevalence of diabetes cases in Southeast Asia (4). Nonetheless, the current condition of diabetes mellitus in Indonesia is like an iceberg phenomenon, where clearly described conditions are only the surface (5).

Almost all provinces in Indonesia showed an increase in prevalence in 2013-2018, except for East Nusa Tenggara Province. The four provinces with the highest prevalence in 2013 and 2018 are DI Yogyakarta, DKI Jakarta, North Sulawesi, and East Kalimantan. Several provinces have the highest prevalence increase of 0.9%, namely Riau, DKI Jakarta, Banten, Gorontalo, and West Papua (6).

Based on data from the Bone Bolango District Health Office, the number of people with diabetes mellitus in 2019 was 2,353, and those who received health services according to standards were 1,321, while in 2020, the number of people with diabetes mellitus was 2,387, and those who received services according to standards were 2,243 people. For the Puskesmas area in Bone Bolango Regency, the Kabila Health Center ranks first out of 20 Health Centers for cases of diabetes mellitus (7). Based on data obtained from the Kabila Health Center, 408 diabetes mellitus patients were members of the Prolanis program at the Kabila Health Center. The large number of patients who become Prolanis members at the Kabila Health Center is because health workers routinely screen in the community so that many cases of diabetes mellitus can be detected.

Prevention and control of diabetes mellitus in Indonesia is carried out so that healthy individuals stay healthy, people who already have risk factors can control risk factors so they don't develop diabetes, and people who already have diabetes mellitus can control their disease so that complications or premature death do not occur (8). The risk factors for diabetes mellitus include unhealthy eating patterns, obesity or overweight, lifestyle, and smoking. These factors can be modified through changes in behavior and environment. Good self-management practices can help maintain normal blood glucose levels in patients with diabetes (1). Self-

management of diabetes can reflect conscious patient behavior and self-will to control type 2 diabetes mellitus. Self-management is an integral part of diabetes control which includes home-based activities such as regulating diet, proper physical activity or exercise, adherence to drug consumption, and blood sugar control (9).

The main pillars of diabetes management are education, diet/nutrition, physical exercise, and medication. Diabetes management needs to be done intensively to get maximum results. However, in reality, many patients still have a low adherence level in carrying out diabetes treatment management programs (10). The failure to achieve the desired goals in the management of chronic diseases such as diabetes has prompted healthcare professionals to come up with new solutions using technology for disease self-management. One of the most promising methods for managing chronic diseases, especially diabetes, is using information and communication technology (ICT) for mobile phones or cell phones.

Data from the Ministry of Communication and Informatics states that the number of cellular telephone subscribers until 2017 reached 435.19 million (11). This figure shows that Indonesian people are already familiar with cell phones or mobile phone technology, and its use has penetrated various elements of society regardless of social status. Thus, mobile phone technology has excellent potential for disseminating health information among the public (12).

Mobile phones have many services, including the most basic Short Message Service (SMS) and internet-based messaging applications. This service has many advantages, such as sending short text messages instantly, quickly, anytime, and anywhere conveniently and straightforwardly and at a low cost (13). SMS is also a documented measure for sending health information, even to the most remote areas of the world. In addition, SMS can be used to increase knowledge of diabetes patients and improve adherence to recommended therapy and better treatment outcomes. Given the chronic nature of diabetes and the importance of patient involvement, the improvement in self-management behavior that can result from texting interventions will contribute to improving patient outcomes and quality of life (14).

METHODS

Location and Research Time
The location of study was carried out at the Kabila Health Center from January 2023 to March 2023.

Study Design
This research is quantitative research with a Quasi-Experimental method with Pretest Posttest Nonequivalent Control Group Design. The control and treatment groups were pretested first to see self-management before being given the intervention. Then the treatment group was assigned the Short Message Service Reminder intervention twice a week for one month. At the same time, the control group only received standard care according to the Puskesmas program. The posttest was carried out in both groups after the intervention was finished.

Population and Sample
1.   Population
The population in this study were Type 2 Diabetes Mellitus patients who were members of Prolanis at the Kabila Health Center.
2.   Sample
The sample in this study was type 2 diabetes mellitus patients who became members of the Prolanis determined by purposive sampling techniques totaling 40 people divided into two groups, namely the control group of 20 people and the intervention group of 20 people. With the following criteria:
a. Inclusion Criteria
   1)   Type 2 diabetes mellitus patients who actively follow Prolanis with long-suffering of more than one year
   2)   Willing to be a respondent
   3)   Patients who have their mobile phones and can operate them
   4)   Patients who can read and communicate fluently
b. Exclusion Criteria
   1)   Patients with physical barriers
   2)   Patients with visual or hearing impairments
3.   Data Analysis
Data analysis in this study used the Mann-Whitney test.

The Effect of Short Message Service Reminders on Self-Management of Type 2 Diabetes Mellitus Patients

RESULTS

Table 1. Frequency Distribution of Respondents Based on Diet Compliance Self Management Before and After Given a Short Message Service Reminder in Type 2 DM Patients at the Kabila Health Center

Treatment Adherence	Before				After			
	Control		Intervention		Control		Intervention	
	n	%	n	%	n	%	n	%
Low Compliance	3	15.0	2	10.0	3	15.0	1	5.0
Moderate Compliance	13	65.0	14	70.0	13	65.0	9	45.0
High Compliance	4	20.0	4	20.0	4	20.0	10	50.0
Total	20	100.0	20	100.0	20	100.0	20	100.0

Source: Primary Data, 2023

Based on table 1 above shows that before the SMR intervention was given in the control group, there were 6 respondents (30.0%) with low dietary adherence, then there were 12 respondents (60.0%) with moderate dietary adherence and 2 respondents (10.0%) with high dietary adherence. Whereas after being given SMR, there were 5 respondents (25%) with low dietary adherence, 13 respondents (65.0%) with moderate dietary adherence, and 2 respondents (10.0) with high dietary adherence. The table above also shows that before being given SMR in the intervention group, there were 7 respondents (35.0%) with low dietary adherence, 11 respondents (55.0%) with moderate dietary adherence, and 2 respondents (10.0%) with high dietary adherence. Then after the SMR intervention for 4 weeks, there were fewer respondents with low dietary adherence, namely 1 respondent (5.0%), 12 respondents (60.0%) with moderate dietary adherence and 7 respondents (35.0%) with high dietary adherence.

Table 2. Frequency Distribution of Respondents Based on Medication Compliance Self Management Before and After Given a Short Message Service Reminder in Type 2 DM Patients at the Kabila Health Center

Treatment Adherence	Before				After			
	Control		Intervention		Control		Intervention	
Low Compliance		5.0		.0		.0		)
Moderate Compliance		.0		.0		.0		.0
High Compliance		.0		.0		.0		.0
Total		0.0		0.0		0.0		0.0

Source: Primary Data, 2023

Based on table 2 above shows that before the SMR intervention was given, in the control group, there were 3 respondents (15.0%) with low medication adherence, 13 respondents (65.0%) with moderate medication adherence, and 4 respondents (20.0%) with high medication adherence. Then after being given SMR in the control group, there were 3 respondents (15.0%) with low medication adherence, then 13 respondents (65.0%) with moderate medication adherence, and 4 respondents (20.0%) with high medication adherence. Before being given the SMR, in the intervention group, it was found that there were 2 respondents (10.0%) with low medication adherence, 14 respondents (70.0%) with moderate medication adherence, and 4 respondents (20.0%) with high medication adherence. Whereas after the administration of the SMR intervention, there were more patients with high medication adherence, namely 10 respondents (50.0%), then 9 respondents (45.0%) with moderate medication adherence, and 1 respondent (5.0%) with low medication adherence.

Table 3. Effect of Short Message Reminder on Diet Compliance Self Management in Type 2 Diabetes Mellitus Patients at the Kabila Health Center

Dietary Compliance	n	Mean	U value	p-value
Control Group	20	16.23	114.500	0.008
Intervention Group	20	24.78		

Description: Analyzed using Mann-Whitney test

Table 3 shows that there are differences in the mean values in the control and intervention groups, where the mean value for the control group is 16.23 and for the intervention group is 24.78. The table above also shows the U value in the Mann-Whitney test of 114,500 and a p-value of 0.008, which means $p < 0.05$ with a significance level of $\alpha = 0.05$. So it can be concluded that H_0 is rejected, which means there are differences in self-management of dietary compliance before and after being given a short message reminder in patients with type 2 diabetes mellitus at the Kabila Health Center.

The Effect of Short Message Service Reminders on Self-Management of Type 2 Diabetes Mellitus Patients

Table 4. The Effect of Short Message Reminder on Medication Compliance Self Management in Type 2 Diabetes Mellitus Patients at the Kabila Health Center

Treatment Adherence	n	Mean	U value	p-value
Control Group	20	17.50	140.000	0.031
Intervention Group	20	23.50		

Description: Analyzed using Mann-Whitney test

Based on table 4, shows that there are differences in the mean values in the control group and the intervention group, where the mean value for the control group is 17.50 and for the intervention group is 23.50. The table above also shows the U value in the Mann-Whitney test of 140,000 and a p-value of 0.031, which means p <0.05. So it can be concluded that H0 is rejected, which means there are differences in self-management of medication adherence before and after being given a short message reminder in type 2 diabetes mellitus patients at the Kabila Health Center.

DISCUSSION

The Effect of Short Message Service Reminder on Self-Management of Diet Compliance in Type 2 Diabetes Mellitus Patients at the Kabila Health Center

Based on bivariate analysis using the Mann-Witney test, it was found that there were differences in self-management of dietary compliance before and after being given a short message service reminder in patients with type 2 diabetes mellitus at the Kabila Health Center with a p-value of 0.008 (p <0.05) and a U value of 114,500.

Further analysis found differences in mean values before and after being given a short message service reminder for 4 weeks in the control group and the intervention group, where the intervention group had a mean value of 24.78 while the mean value for the control group was 16.23. So it can be concluded that there are differences in self-management of dietary compliance before and after being given a short message service reminder in the control and intervention groups.

Dwipayanti (2017) explained that dietary adherence is one factor that influences controlling blood sugar levels in the blood and preventing complications. The importance of compliance with DM sufferers undergoing a diet, so a health system is needed with solutions that can increase dietary adherence for DM sufferers (15). Indonesian people are very familiar with cell phone technology, and the use of cell phones has penetrated various groups of people regardless of social status. Therefore, cell phone or cell phone technology has excellent potential for disseminating health information among the public (12).

Short Message Service (SMS) is one of the features of a cellphone; sending SMS reminders is considered the most feasible and effective strategy for educating and empowering patients to care for themselves, increasing treatment adherence, and fostering patient self-efficacy (16). SMS-based interventions are simpler and safer in protecting user privacy than other m-health applications because they are sent to the target individual's message inbox and can be readily accepted or deleted (17).

This theory is in line with the findings in Damayanti's study (2021), which found that after giving a short message system (SMS)-based intervention, the intervention group showed a significant average change in the general diet domain (p=0.034) while the control group did not experience any changes (18). Another study conducted by Guner et al. (2020) also showed significant differences in self-care behavior in the intervention group who were given an SMS reminder regarding diet (19). The results of Gusdiani's research (2021) also showed a significant effect of giving Android-based reminders on dietary compliance in Type II DM patients (p=0.000) (20).

Another factor that influences dietary adherence in DM sufferers is the level of education; in this study, the majority of respondents, namely 27 respondents (67.5%), had high school/high school/diploma/bachelor education. The level of education affects the individual's ability to understand something new; besides that, the individual will also be better at motivating himself, which causes a behavior change. In this case, the difference in question is adherence to a diet. In line with the research of Isnaeni et al. (2018), which showed that most respondents with secondary/high education levels were classified as adherents of the recommended diet, it can be said that the higher a person's education, the more adherent to the recommended dietary behavior (21).

The Effect of Short Message Service Reminder on Self-Management of Compliance in Treatment of Type 2 Diabetes Mellitus Patients at the Kabila Health Center

Based on bivariate analysis using the Mann-Witney test, it was found that there were differences in self-management of medication adherence before and after being given a short message service reminder in patients with type 2 diabetes mellitus at the Kabila Health Center with a p-value of 0.031 (p <0.05) and a U value of 140,000.

Further analysis found differences in mean values before and after being given a short message service reminder in the control group and the intervention group, where the intervention group had a mean value of 23.50, while the mean value for the control group was 17.50. So it can be concluded that there are differences in self-management of medication adherence before and after being given a short message service reminder in the control and intervention groups.

The Effect of Short Message Service Reminders on Self-Management of Type 2 Diabetes Mellitus Patients

Compliance with treatment is essential in achieving therapeutic success, especially for degenerative diseases such as Diabetes Mellitus. Holcomb et al. (2017) explained that providing SMS interventions can be feasible and effective as one of the efforts in managing DM. Fjeldsoe et al. (2014) also added that the use of SMS as a communication platform is a method of providing health services with fast, adaptable, and widely adopted innovations (22).

Compliance with taking medication can be improved by using short message services (SMS) or text reminders to remind patients to take medication. SMS is a low-cost intervention that can be delivered via a more straightforward mobile phone, allowing access to more patients. SMS reminders are a promising method for promoting patient medication adherence, especially for chronic illnesses requiring them to take medication for a long time (1).

This theory is in line with the findings in a study by Susanto et al. (2017) which found that giving SMS reminders can have a positive impact in the form of increasing medication adherence in Type 2 DM patients (23). Research conducted by Abaza and Marschollek (2017) also found a sizable increase in medication adherence, self-efficacy, and knowledge in patients given SMS interventions (16).

Research by Vervloet et al. (2012) showed that significantly more patients in the SMS group than the control group had a higher awareness of drug use (with a percentage of 42.9% for the SMS group and 18.2% for the control group with a p= 0.041) (24).

Another factor that can affect adherence to treatment of DM patients is the length of suffering, where in this study, the majority of respondents had suffered < 5 years, namely 24 respondents (60.0%). The longer the disease duration, the more frequency and complexity of the drug regimens, and the worse the level of adherence to taking one's medication (25).

Patients with DM are usually followed by other co-morbidities, which will indirectly affect the number of drugs consumed, making treatment more complex (26). In general, if the patient's treatment regimen is more complex, the less likely the patient is to comply with taking medication (Mokolomban, Wiyono, and Mpila, 2019). This is in line with the findings in the study of Jasmine, Wahyuningsih, and Thadeus (2020), which showed a significant influence between the length of suffering and the level of adherence to medication (p=0.042) (25).

CONCLUSION

There are differences between self-management diet adherence and self-management medication adherence before and after SMS reminder is given to type 2 diabetes mellitus patients at the Kabila Health Center.

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