ORIGINAL ARTICLE

THE EFFECT OF SHORT MESSAGE ON MEDICATION ADHERENCE AND BLOOD GLUCOSA CONCENTRATE (BGC) VALUE AMONG TYPE II DIABETES MELLITUS (DM) PATIENTS

Hasana Lisa[1], Kintoko Rochadi[2], Destanul Aulia[2]

Department of Health Promotion and Behavioral Sciences, Master of Public Health, Faculty of Public Health, University of Sumatera Utara, Indonesia

Correspondence: hasanalisa50@gmail.com

Abstract.

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia. Type 2 DM management is education, diet regulation, drug therapy, physical exercise, and routine check of BGC to prevent complications from improving the quality of life of patients. The study aimed to examine the effect of short messages on medication adherence and control of BGC values in type 2 DM patients. This type of research is a quasi-experimental design, pretest, and posttest with a non-equivalent control group that was applied in this study. The research was conducted at Bromo Medan Health Center. Samples were all type 2 diabetes mellitus patients who were controlled to Medan Bromo Puskesmas for 84 people who were divided into two groups, namely the intervention and control groups. The data collection tool uses a questionnaire. The test used was the Wilcoxon test and the Mann Whitney test. The results showed that the short message was significantly ($p < 0.05$), giving a compliant effect on the rules of taking medication and controlling the BGC value compared to patients with type 2 DM who did not send short messages. This study concludes that quick message delivery effectively improves medication adherence and controls BGC values to enhance the quality of life of patients with type 2 diabetes. This study recommended family members to remind for controlling blood glucose levels. An SMS reminder activity program also needs to conduct while implementing the plan.

Keywords: short message, medication adherence, blood glucose concentrate, type 2 diabetes mellitus

International Journal of Nursing and Health Services (IJNHS), December 2019, Volume 2, Issue 4; Page 360-366
Received: 02 October 2019; Revised: 05 November 2019; Accepted: 10 December 2019
DOI 10.35654/ijnhs.v2i4.286

INTRODUCTION

Type 2 diabetes mellitus is one of the degenerative diseases, which related to human behavior. Behavior modifications were effective strategies to reduce mortality and improve quality of life by regular medication adherence, diet regulation, physical exercise, monitoring of blood glucose, and foot care (1).

Adhere in medication is an effective strategy to achieve therapeutic success and maintaining the blood glucose target for DM diseases. Several determinants of medication adherence were associated with healthcare providers' factors, including the level of knowledge, length of work, frequency of counseling conducted (2). The previous study found that health workers have a crucial role in increasing diabetes knowledge to improve patients'

compliance with diabetes regiment (3-4). Health workers also have a positive effect on increasing self-awareness to improve medication adherence in DM care (3).

The Healthy Indonesia Program in 2015 to 2019 period has focused on controlling Non-Communicable Diseases (NCD) by early detection of risk factors as well as integrated with improving the accessibility of NCD services at first-level health facilities (5). Education and counseling also were provided to enhance the knowledge and skill to control blood glucose levels (6).

To effectively monitor and increase the accessibility of health care services, the practical strategy through short Message Service becomes a strategy. High flexibility and accessibility support by using the Message Service (SMS) reminder may improve public health facilities (7).

The previous study showed that intervention using SMS cell phones (8) has a positive effect on improving patients' adherence to Diabetes management. Another study also discussed the importance of the SMS method to improves the self-management of DM patients (9). Even though this strategy is essential for controlling blood glucose levels, a limited number study to examine the actual effect of short Message Service for diabetes controlling. This also occurred at Bromo Health Center. My preliminary survey showed that some of the patients did not take healthcare services and not adhere to attending the diabetes program[10]. Therefore, this study focused on the effect of Short Message on Medication Adherence and Blood Glucose Concentrate (BGC) Value among Type II Diabetes Mellitus (DM) Patients

METHOD

We applied quasi-experimental study design, pre-test, and post-test with the non-equivalent control group. Eighty-four total samples were recruited and divided into an experimental group (n=42) and the control group (n=42). The samples were recruited using a purposive sampling technique. The inclusion criteria of this study as follows: 1) has been diagnosed as type 2 diabetes mellitus by physician, 2) willing to participate in this study, 3) aged range between 40 and 60 years old, 4) patients beyond of Bromo Health Center in Medan, and 4) Own a private cell phone. Patients who develop severe complications were excluded from this study. Moreover, patients who did not complete the intervention were drop out.

The intervention group received mentoring strategies by SMS five times a week. The program consisted of education and counseling sessions regarding diabetes and procedures to control blood glucose levels. Moreover, the researcher also addresses the barriers and helps to solve the problems, whereas the control group received the routine services.

Medication adherence was measured by Medication Adherence questionnaires (11). This questionnaire was developed based on Indonesian Endocrinology Association medication therapy with Cronbach's alpha was 0.851. Therefore, it was considered a reliable questionnaire. The blood Glucose Concentrate (BGC) Value was measured by using a glucometer. This instrument was the standard method for assessing the blood glucose level.

This study has been approved by ethical approval from the faculty of public health Universitas Sumatera Utara. Before data collection, all respondents received information about the research objectives, implementation procedures, time, and benefits of the study. Informed consent should be obtained for patients who willing to participate in this study.

The data were analyzed by using the Wilcoxon test and Mann Whitney test to determine the mean differences within and between groups.

RESULT

Distribution of Patients Based on Drug Compliance Score and BGC Value

Table 1 showed the distribution of Patients Based on Drug Compliance Score and BGC Value Before and After receiving Short Message Delivery among the experimental group and control group. The findings after receiving the program, 78.6% of patients in the experimental group has followed medication adherence. While in the control group showed 69% adhere to medication taking. Regarding the blood glucose level, 38.1% of patients in the experimental group has a normal level of blood glucose. Only 19% of patients in the control group in the regular line.

Table 1. Distribution of Patients Based on Drug Compliance Score and BGC Value Before and After receiving Short Message Delivery among experimental group and control group *(n=42)*

No	Obedience	Before				After			
		Intervention Group		Control Group		Intervention Group		Control Group	
		f	%	f	%	f	%	f	%
1.	Taking Medication								
	1. Obey	10	23,8	10	23,8	33	78,6	29	69
	2. Not Obey	32	76,2	32	76,2	9	21,4	13	31
	Total	42	100	42	100	42	100	42	100
2.	BGC Value								
	.100-199 mg/dl (dbn)	6	14,3	7	16,7	16	38,1	8	19
	. > 200 mg/dl (me ↑)	36	85,7	35	83,3	26	61,9	34	81
	Total	42	100	42	100	42	100	42	100

Mean differences in medication adherence and blood glucose level before and after receiving program among the experiment group and control group

Table 2 showed Mean differences in medication adherence and blood glucose level before and after receiving the program among the experiment group and control group. The results showed that

The intervention group showed that there were differences between before and after health education about DM disease and SMS assistance on drug compliance (difference in mean 1,71; $p < 0.05$) and BCG value (difference in mean 13,6; $p < 0.05$).

The control group showed that there was no difference between before and after health education about DM disease on drug compliance (difference in mean 0,02; $p > 0.05$) and BCG value (difference in mean 4,6; $p > 0.05$).

Table 2 Mean differences in medication adherence and blood glucose level before and after receiving program among the experiment group and control group

No	Obedience	Intervention Group			Control Group		
		Mean		*p*	*Mean*		*p*
		Before	After		Before	After	
1.	Taking Medication	1,60	3,31	0,001	3,21	3,19	0,157
2.	BGC value	239,3	225,7	0,002	238,5	233,9	0,655

DISCUSSION

The difference in Drug Compliance Score and BGC Value Before and After Health Counseling About DM and Short Message Delivery in Intervention Groups and Control Groups

Based on the Wilcoxon test, the intervention group before and after being given health education about DM and short message delivery showed a difference in the mean value of medication adherence 1.60 before sending a short message and a mean value of 3.31 after health education about DM and message delivery short ($p = 0.001$ or $p < 0.05$) with a mean difference of 1.71.

The results were consistent from Adikusuma, and Qiyaam showed the valid SMS sending on medication taking among type 2 DM patients (12). The results of research by Lubis, Harjoko, and Dewi, stated that the use of an SMS reminder system application could be recommended as one of the strategies to improve treatment compliance of DM patients because after the system delivery intervention showed an increase in visiting DM patients to the clinic (13). Consistent with the previous study by Susanto et al. demonstrated the effectiveness of SMS sending was a positive effect on medication adherence among patients with type 2 diabetes. Medicine after the SMS delivery intervention about taking medicine (14).

Based on the
Wilcoxon test, after receiving health counseling and short message delivery, patients in the intervention group was a positive effect than before receiving the program.

This study was consistent with the previous study confirmed that after receiving health counseling and short message delivery, medication adherence and blood glucose level were positive effects than before receiving the program (12). The results of the research by Silina et al. found a statistically significant decrease in BGC after sending SMS about health care (15).

The monitoring of BGC values is useful in controlling blood glucose levels. From the results of this study, it can be concluded that the monitoring of BGC values in someone with DM must be carried out routinely so that it can be prevented from increasing the value of BGC, which can increase at any time.

The difference in Drug Compliance Score and BGC Value After Health Counseling About DM and Short Message Delivery in Intervention Groups and Control Groups

Education and counseling can be improved with mentoring activities supported through the Healthy Indonesia Program with Family Approach in the 2015-2019 period. Mentoring is an activity that is carried out and can mean coaching, teaching, the direction in groups that are more connoted to mastering, controlling, and controlling (6). One method of education is through mentoring models with the use of mobile phones. High flexibility and

accessibility support the importance of cellular phone use in improving public health, especially through Short Message Service (SMS) reminder[s] (16).

Based on the Mann Whitney test, it showed that there were differences after health counseling about diabetes mellitus and short message delivery to medication adherence in the intervention group and after health education about diabetes mellitus in the control group at Bromo Medan Health Center (mean rank after intervention> 10; $p < 0.05$).

Research on the effect of health education through SMS on adherence to taking antidiabetic drugs by Adikusuma and Qiyaam, (12) who took medication adherence measurements in type 2 DM patients who had received oral antidiabetic drug therapy ≥ 6 months by sending SMS every day for 30 days about taking antidiabetic medication, showed a difference in the increase in medication adherence between the intervention group and the control group that did not receive SMS delivery. The results showed similarities with the results of research by wiliyem (17) who measured compliance with oral antidiabetic drugs in type 2 DM patients by sending SMS every day for 30 days about taking medication between the intervention group and the control group , showed that there was a difference in the increase in medication adherence in the intervention group who received an SMS sending about taking medication and a control group that did not receive an SMS sending about taking medication (18).

Based on the results of the study it can be concluded, sending a short message about the regulation of taking medication can help type 2 DM patients to take regular antidiabetic drugs, that is correct medication, correct dose, correct way, right time. and minimize the incidence of forgetting to take medication (19).

Based on the mann whitney test, there were no differences after health education about diabetes mellitus and short message delivery to the control of BGC values in the intervention group and after health education about diabetes mellitus in the control group at Bromo Medan Health Center (mean rank after intervention <10; $p > 0.05$) (20).

Research on the relationship of lifestyle modification and adherence to diabetic drug consumption with Blood Sugar Levels (BGC) by Toharin, Cahyati, and Zainafree, states that the importance of guidance and counseling on DM patients about physical exercise, diet regulation, smoking cessation, drug use antidiabetic and side effects, as well as the importance of controlling blood sugar and increasing information about DM, complications, and countermeasures to achieve optimal health in patients with type 2 diabetes (19,21,22).

The results of this study can be concluded that health education about diabetes mellitus and sending short messages to the decline or control of BGC values will be related to many things, namely management or management of DM disease must all be obeyed without exception by DM patients, where all pillars affect the control of BGC values.

CONCLUSION

In conclusion, there are significant effect of short message on medication adherence and blood glucosa consentrate value among type ii diabetes mellitus patients

REFERENCES

1. Chang L, Chao Y, & Chen. The effectiveness of a diabetes self-management program for diabetes patients in Taiwan**.** International Journal of Research In Medical and Health Sciences. 2014; 4(4). Retrieved from: https://www.semanticscholar.org/paper/THE-

EFFECTIVENESS-OF-A-DIABETES-SELF-MANAGEMENT-FOR-Chang-Lin/a05b71c678d679cefc41c4017942906eb2eddc3d
2. Sarafino PE, & Smith WT. (2011). *Health Psychology; Biopsychosocial Interaction*. Seventh Edition. Wiley.
3. Tera BHA. Determinants of Non-adherence Diet Type 2 Diabetes Mellitus Patients. 2011. http://eprints.undip.ac.id/32591/1/393_Banu_Hanifah_Al_Tera_G2C007014.pdf.
4. Adyani I. Relationship between health locus of control with adherence to the management of the type 2 DM diet in the DM Community Health Center III, North Denpasar. 2017.
5. Ministry of Health of the Republic of Indonesia. (2016). General *Guidelines for the Healthy Indonesia Program with a Family Approach*. Jakarta, Healthy Indonesia Program.
6. Subagyo H. The Influence of the Role of Assistance of Village Midwives on the Development of the Alert Village. 2008. Retrieved from: https://eprints.uns.ac.id/5356/1/7380090720090 4461.pdf.
7. Herlina S, Sanjaya GY, & Emilia O. Utilization of Cellular Phone SMS Facilities as a Media for Promoting Pregnant Women's Health in Remote Areas. National Seminar on Indonesian Information Systems, 2-4 December 2013.
8. Krishna S, & Boren SA. Diabetes Self-Management Care via Cell Phone: A Systematic Review. Journal of Diabetes Science and Technology. 2008; 2(3): 509-517
9. Russel NM, Vess J, Durham C, & Johnson E. Text-Messaging to Support Diabetes Self Management in a Rural Health Clinic: A Quality Improvement Project. Online Journal of Nursing Informatics (OJNI), 2017, 21(2), Available at http://www.himss.org/ojni.
10. Health Insurance Administering Agency. (2014). *Prolanis Practical Guide (Chronic Disease Management Program)*. Jakarta, BPJS.
11. Indonesian Endocrinology Association. (2015). *Consensus Management and Prevention of Type 2 DM in Indonesian*. Jakarta, Indonesian Endocrinology Association.
12. Wood GL, & Haber J. (2006). *Nursing Research : Methods and Critical Appraisal for Evidence-Based Practise.6th*. St. Louis, Mosby Elsiver.
13. Adikusuma W, & Qiyaam, N. The Effect of Education Through Short Message Service (SMS) Messages on Diabetic Patients Adherence. Scientia Pharmaceutica 2017, 85(2), 23; doi: 10.3390/scipharm85020023.
14. Lubis IK, Harjoko A, & Dewi FST. Design of SMS-Based Remembrance System to Improve Treatment Compliance in Patients with Diabetes Mellitus (DM). Journal of Information System for Public Health, Vol. 1, No. 1, April 2016.
15. Susanto Y, Alfian R, Rianal R, & Rusmana I. The Effect of Reminder Short Message Service on Compliance with Drug Consumption of Type 2 DM Patients in Puskesmas Melati, Kapuas Regency. Manuntung Scientific Journal, 3(1), 34-42, 2017. P-ISSN. 2443-115X. e-ISSN. 2477-1821.
16. Silina V, Mesfin K., Tessma, Senkane S, Krievina G, & Bahs, G. Text Messaging (SMS) as a Tool to Facilitate Weight Loss and Prevent Metabolic Deterioration in Clinically Health Overweight and Obese Subjects: a Randomised Controlled Trial. Scandinavian Journal of Primary Health Care. 2017; 35(3):262-270

17. Rahmah PA, Galistiani GF, & Kusuma AM. Short Message Service (SMS) For Treatment and Lifestyle of Diabetes Mellitus Patients in RS.M.D.Ashari Pemalang Hospital. Pharmaceutical Media Vol. 13 No. 1 Maret 2016: 110-121.
18. Wilieyam, & Sevani GN. Short Massage Service (SMS) Based Gateway Patient Medication Reminder Application. INKOM. 2013; 7(1): 11-20
19. Toharin, S.N.R., Cahyati, W.H., & Zainafree. Relationship between Lifestyle Modification and Compliance with Antiiabetic Drug Consumption with Blood Sugar Levels in Type 2 Diabetes Mellitus Patients in Qim Batang. 2013. Hospital. Unnes Journal of Public Health. http://journal.unnes.ac.id/sju/index.php/ujph.
20. Indonesian Ministry of Health. (2011). *Diabetes Mellitus Diet*. Jakarta, Directorate of Nutrition Development for Clinical Nutrition Development.
21. Pamungkas RA, Chamroonsawasdi K. HbA1c reduction and weight-loss outcomes: A systematic review and meta-analysis of community-based intervention trials among patients with type 2 diabetes mellitus. International Journal of Diabetes in Developing Countries. 2019; 1-14
22. Self-management-based coaching program to improve diabetes mellitus self-management practice and metabolic markers among uncontrolled type 2 diabetes mellitus inIndonesia: A quasi-experimental study. Diabetes & Metabolic Syndrome: Clinical Research and Review. 2019