

The Effectiveness of Dia-Care Telemonitoring on Diabetes Outcome among Type 2 Diabetes Patients

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ABSTRAK

Latarbelakang: Media sosial sangat penting selama wabah Covid-19 untuk memberikan perawatan diabetes jarak jauh secara terus menerus. Tujuan: Penelitian ini menginvestigasi efektivitas Dia-Care Telemonitoring menggunakan WhatsApp terhadap distress psikologi, kadar gula darah puasa, dan pengetahuan diabetes. Penelitian ini merupakan randomized control trial pada pasien diabetes tipe 2 di Puskesmas Kebon Jeruk dan Kalideres. Dalam intervensi 1 bulan, pasien (n= 72) diacak ke kelompok kontrol dan kelompok intervensi. Semua hasil seperti Gula Darah Puasa, Pengetahuan Diabetes, dan Skala Stres Kecemasan Depresi dikumpulkan pada awal dan setelah intervensi secara langsung. Hasil: 30 pasien menyelesaikan penelitian (15 kelompok kontrol, 15 kelompok intervensi). Pada kelompok kontrol dan intervensi, terjadi peningkatan yang signifikan pada pengetahuan diabetes setelah 1 bulan intervensi. Hanya kelompok intervensi yang secara signifikan menurunkan level depresi (rerata= 2.47, SD= 1.59, p= 0.04). Kesimpulan: Dia-Care Telemonitoring menggunakan WhatsApp mendukung perawatan diabetes jarak jauh untuk meningkatkan pengetahuan diabetes, gula darah puasa dan tingkat depresi.

Kata-kata kunci: Perawatan diabetes, Telemonitoring, Diabetes tipe 2, Pengetahuan, Depresi

ABSTRACT

Introduction: Social media is essential during Covid-19 outbreak to deliver tele-diabetes care continuously. Aim: This study investigated the effectivity of Dia-Care Telemonitoring using WhatsApp on diabetes outcomes such as psychological distress, blood glucose level, and diabetes knowledge. Method: Randomized Control Trial was conducted on type 2 diabetes patients in Kebon Jeruk and Kalideres Primary Care. In a 1-month intervention, patients (n=72) were randomized to control and intervention group. All outcomes such as Fasting Blood Glucose, Diabetes Knowledge Test, and Depression Anxiety Stress Scale were collected at baseline and after 1-month intervention. Result: 30 patients completed the study (15 control group, 15 intervention group). Both control and intervention group significantly improved the diabetes knowledge and fasting blood after 1-month follow-up. Only intervention group significantly improved depression (mean= 2.47, SD= 1.59, p= 0.04). Conclusion: Dia-Care Telemonitoring using WhatsApp improved diabetes knowledge, fasting blood glucose and depression level.

Keywords: Diabetes care, Telemonitoring, Type 2 diabetes, Knowledge, Emotional status

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INTRODUCTION

Diabetes mellitus was one of greatest non-communicable disease and rapidly growth in Indonesia and worldwide (1). Diabetes mellitus requires lifestyle modification and lifelong treatment (2). During Covid-19 outbreak, the regulation of lockdown, social distancing, travel restriction affects all aspects, especially health aspects (3). These regulations are challenging diabetes patients to fulfill their diabetes care. Infected by Covid-19 may worsen diabetes

patients' clinical outcomes (4). Therefore, it is a challenge for health care provider to help diabetes patients increasing their health status and maintaining suggested diabetes self-care.

The development of technology integrated with diabetes control has increased rapidly (5,6). Telemedicine had been suggested as viable and effective intervention to facilitate diabetes care during Covid-19 pandemic and national lockdown (7). Chronic care management program, called Prolanis (Program Penyakit Kronis) has reminder

program using short messages service to monitor diabetes patients in primary care (8). However there is no study evaluate the effect of this reminder option. Currently, WhatsApp is one of popular and cost-effective social media and the number of people using WhatsApp increase to keep their social needs during Covid-19 pandemic (9). According to previous studies, delivering diabetes care using mobile phone features had significantly improved blood glucose level, diabetes self-care, knowledge and psychological distress (10,11). Therefore, we developed Dia-care telemonitoring using WhatsApp that adopts American Association of Diabetes Educators (AADE) Self-Care to provide diabetes care information, monitoring patients' condition and build support system. This study aim was to investigate the effectiveness of Dia-care telemonitoring on diabetes outcomes including diabetes knowledge, fasting blood glucose, stress, anxiety and depressive symptoms among type 2 diabetes.

METHOD

Trial Design

This study was a 1-month long, multi-center, randomized controlled trial. Participants were recruited from the outpatient clinic of Kebon Jeruk Primary Care and Kalideres Primary Care, Jakarta Barat from April to July 2020. We were used simple random sampling to recruit and to divide the participants into 2 groups in a 1:1 ratio group A (control group/ usual care) and group B (usual care and Dia-Care Telemonitoring).

Study Patients and Sampling

Type 2 diabetes patients (aged 18-65 years) were recruited who had a smartphone and to be able to use WhatsApp and be willing to visit Primary Care every month. We excluded the patients if the patients were under mental health disease and receiving treatment, severe complications, pregnant, and severing hearing or visual impairment.

There were 72 type 2 diabetes in total and we excluded 3 patients according to the criteria. We divided the patients in 2 group by conducting simple random sampling using card number and asked patients to take one card. The patients with odd number were

Group A (control group) and patients with even number were Group B (intervention group). Only Researcher recognized the sample distribution.

Interventions

In the first phase, we delivered diabetes self-care education for all patients (Group A and B) in their routine visit in the Primary Care. The education of diabetes self-care based on the recommendation of American Association of Diabetes Educators (AADE) including healthy eating, being active, self-monitor blood glucose, weight monitor, taking medication, problem solving, healthy coping, and support (12).

In group A, patients received usual care (routine care from Primary Care). In group B, each patients were asked to install and to share their WhatsApp contact. They were receiving diabetes self-care education, reminder to conduct suggested behavior, self-care behavior monitor, and emotional support. These are delivered by Researcher using 1-month WhatsApp individual massages. Researcher sent the message at least 2-3 times a week and Participants were allowed to contact the Researcher if they had questions to ask.

Data Collection

We conducted 1-month follow-up after the intervention. At baseline all patients were asked to complete questionnaires about characteristics of demography, medical history, diabetes knowledge test, depression anxiety stress scale and current blood fasting level. Blood fasting glucose level was assessed by health care professional in Primary Care. All these informations were collected at baseline and at month 1 after the intervention.

Measurement

Demographics' characteristics

The participants' demographic data (age, gender, educational level, and income) and diabetes history (blood glucose level, diabetes duration and comorbidity) were collected.

The Revised Diabetes Knowledge Test (DKT2)

The DKT2 consists of 14 multiple choice questions of general knowledge test and 9

multiple choice questions for insulin usage test to assess diabetes knowledge levels among diabetes patients (13). Diabetes patients are asked to self-answer 14 items of general test, while patients taking insulin obtained additional 9 items insulin usage test. Each multiple-choice question has one correct answer. The higher the mean score is, the better the knowledge patients have. Both the general and the insulin usage test have previously found to have adequate reliability (Cronbach's $\alpha=0.77$ for the general test and 0.84 for insulin usage test) (13). Previous pilot study among diabetes patients in Indonesia showed good Cronbach's α values of 0.708 and 0.728 for the general test and insulin usage test, respectively (14).

Depression Anxiety Stress Scale (DASS)

This study using The Indonesian version of the DASS (I-DASS) to evaluate psychological distress. I-DASS was translated from the original Lovibond & Lovibond's DASS scale (1995) and had shown good internal reliability for depression, anxiety, and stress level (Cronbach's α values of 0.9053, 0.8517, and 0.8806, respectively) (15). Participants were self-rated 14 items for each depressive symptoms, anxiety and stress for

the past 2 weeks. The score range was 0~42 with a higher score indicating more severity of depressive symptoms, anxiety and stress (15).

Statistical Analysis

We used Chi-square test and Independent t-test to analyze demographics, diabetes history and psychological distress characteristics and to observe the differences characteristics of the sample between control and intervention group. Paired t-test was used to evaluate difference mean at the baseline and month 1 after intervention. SPSS version 21.0 (SPSS) were used to analys the data. A 2-tailed with $p < 0.05$ was considered statistically significant.

RESULT AND DISCUSSION

Of the 72 patients who visiting routine Primary Care, 69 were enrolled and randomized to group A (n= 34) and group B (n= 35). Of these, a total of 30 patients completed the study. See figure 1 to see the history of the participants' flow diagram.

The mean age and diabetes duration of the all patients were 53.66 (SD= 8.57) and 11.8 (SD= 23.6), respectively. The majority of the patients was female (n= 22, 73.3%), senior

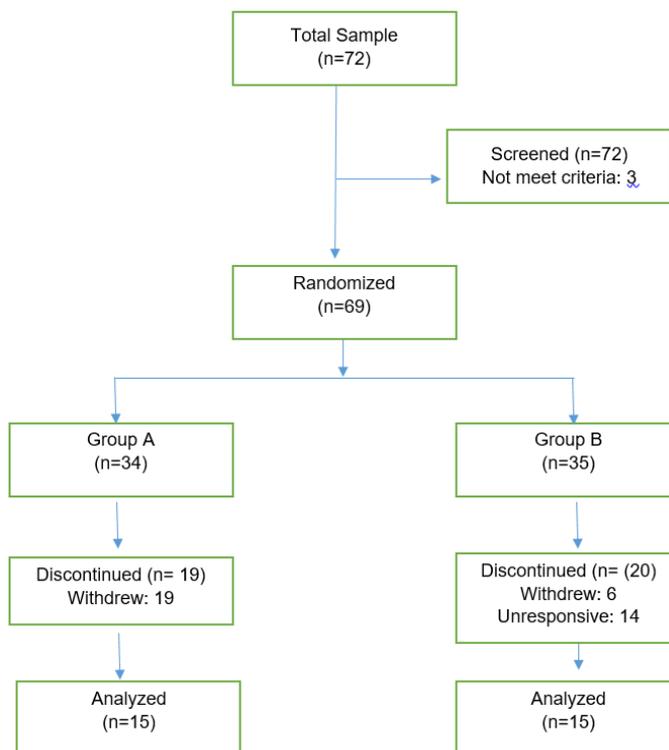


Figure 1 Participants' flow diagram

high school (n= 12, 40%), and having 1 comorbidity (n=13, 43.3%). The characteristics of the participants in group A and group B were statistically significant not different indicating participants characteristics were homogenous ($p > 0.05$) (Table 1). See the table 1 to see the demographic distribution for each group A and group B in detail.

The difference of outcomes at baseline and month 1 follow-up in Group A was presented in Table 2. Our findings found that type 2 diabetes patients receiving usual care significantly reduced fasting blood glucose from 193.13 (SD 68.87) to 132.86 (SD 32.88, $p = 0.001$) and significantly increased diabetes knowledge from 8.33 (SD 2.89) to 9.73 (SD 2.08, $p = 0.03$).

Our findings of the effectiveness of Dia-care telemonitoring using WhatsApp after 1-Month intervention in Group B was shown in Table 3. This study found that providing Dia-care telemonitoring to

intervention group significantly improved fasting blood glucose level from 221.2 (SD 89.27) to 191.73 (83.05, $p = 0.001$), depressive symptoms from 3.8 (SD 3.05) to 2.47 (SD 1.59, $p = 0.04$), and diabetes knowledge from 7.8 (SD 9.43) to 9.43 (SD 2.47, $p = 0.03$).

This study found that both control group and Dia-care telemonitoring group significantly improved in diabetes knowledge and fasting blood glucose level. However, only Dia-care telemonitoring significantly decreased depressive symptoms. Indicating that when type 2 diabetes patients were followed Dia-care telemonitoring, patients were more likely to have benefits on health literacy, clinical and psychological outcomes.

Previous studies have supported that using mobile phone integrated with chronic disease care such as cardiovascular disease, HIV, and diabetes mellitus was feasible, acceptable and cost-effective (5,6,16–18). Patients who completed the study also also reported the satisfaction using mobile phone

Table 1. Demographics, Diabetes History and Psychological Distress Characteristics

Variables	Group A	Group B	<i>p-value</i>
Age ^a	55.93 (8.63)	51.4 (8.17)	0.15 ^a
Gender ^b			1.0 ^a
Female	12 (80)	5 (33.3)	
Male	3 (20)	10 (66.7)	
Education level ^b			0.58 ^a
Illiterate/ elementary school	3 (20)	6 (40)	
Junior high school	4 (26.7)	2 (13.3)	
Senior high school	5 (33.3)	7 (46.7)	
Graduated	3 (20)	0	
Comorbidity ^b			0.25 ^a
None	5 (33.3)	6 (40)	
1	7 (46.7)	6 (40)	
2	2 (13.3)	1 (6.7)	
>2	1 (6.7)	2 (13.3)	
Income ^b			0.73 ^a
< Rp. 1.500.000	8 (53.3)	13 (86.7)	
Rp. 1.500.000- Rp. 3.000.000	4 (26.7)	1 (6.7)	
>Rp. 5.000.000	3 (20)	1 (6.7)	
Diabetes duration ^a (years)	8.53 (20.73)	15.06 (26.48)	0.45 ^b
Fasting blood glucose ^a (mg/dl)	193.13 (68.87)	221.2 (89.27)	0.34 ^b
Stress ^a	11.0 (4.72)	8.33 (2.89)	0.07 ^b
Depression ^a	5.13 (6.04)	3.8 (2.47)	0.05 ^b
Anxiety ^a	7.73 (5.87)	6.53 (3.04)	0.48 ^b
Diabetes knowledge ^a	5.13 (6.04)	7.8 (3.27)	0.14 ^b

Note: ^a mean, standard deviation, Independent t-test Analysis, ^b frequency, percentage, Chi Square

Table 2. The Difference of Outcomes at Baseline and Month 1 follow-up in Group A

Variables	Mean (SD)	95% CI		t	p-value
		Lower	Upper		
Fasting blood glucose ^a (mg/dl)	193.13 (68.87)	14.14	44.78	4.1	0.001**
Pre	132.86 (32.88)				
Post					
Stress ^a	11.8 (7.86)	-2.8	4.13	0.41	0.68
Pre	11.13 (5.01)				
Post					
Depression ^a	5.13 (6.04)	-0.56	5.89	1.77	0.09
Pre	2.46 (1.59)				
Post					
Anxiety ^a	7.73 (5.87)	-0.59	5.65	1.73	0.1
Pre	5.2 (2.04)				
Post					
Diabetes knowledge ^a	8.33 (2.89)	-2.68	-0.11	-2.39	0.03*
Pre	9.73 (2.08)				
Post					

Note: Paired t-test analysis, * $p < 0.05$, ** $p < 0.01$

in their health care than conventional care and suggested to sustain health care using social media in long term care (6,18,19).

Our study successfully improved diabetes knowledge after 1-month intervention. Previous study found that short massage services had significantly greater diabetes knowledge mean from 8.6 (SD 1.5) to 9.9 (SD 1.4) $p = 0.002$ in 6-months follow up (17). Telemonitoring based short massage

could be adjusted and tailored to patients specific needs (18). Therefore, nursing could effectively stimulate patients' health literacy and provide specific health information regularly.

Clinical outcome such as blood glucose level was also observed by previous trials. Using WhatsApp and short massage services in diabetes control effectively reduced HbA1c levels in 3-months (11,20) 6

Table 3. The Effectiveness of Dia-Care Telemonitoring at Baseline and Month 1 Intervention in Group B

Variables	Mean (SD)	95% CI		t	p-value
		Lower	Upper		
Fasting blood glucose ^a (mg/dl)	221.2 (89.27)	29.57	90.95	4.21	0.001**
Pre	191.73 (83.05)				
Post					
Stress ^a	7.6 (2.38)	-0.37	-0.64	-0.56	0.58
Pre	7.4 (2.69)				
Post					
Depression ^a	3.8 (3.05)	-1.14	-1.01	-0.13	0.04*
Pre	2.47 (1.59)				
Post					
Anxiety ^a	6.8 (2.9)	-0.65	2.38	1.22	0.24
Pre	5.93 (3.32)				
Post					
Diabetes knowledge ^a	7.8 (3.27)	-3.15	-0.17	-2.39	0.03*
Pre	9.43 (2.47)				
Post					

Note: Paired t-test analysis, * $p < 0.05$, ** $p < 0.01$

months (17,19) and after 12-month follow-up (11,21). Delivering telemonitoring based WhatsApp or mobile phone features in diabetes control may alert patients to increase their self-care including medication adherence, physical activity, self-monitoring blood glucose and reducing sedentary activity (10,22) which benefit improving patients' blood glucose levels. In this study, we conducted individual chatting using WhatsApp and previous study found that both of mobile phone text or telephones significantly reduce HbA1c levels (20).

Recent study was also consistent with our result in investigating the usefulness of diabetes control based mobile phone and mobile health in psychological distress (10,23). It was found that using mobile phone and mobile health controlling diabetes may facilitate patients' psychological distress including depressive symptoms and diabetes related distress (10,23). On the other hand, the discrepancy was found. Logan et al. (2021) found that telemonitoring support worsened depressive symptoms as the unexpected consequences of reminder.

LIMITATION

There are several limitations in this study. First, it was only 2 study settings and we only observed the outcomes in month-1 after intervention. It may not enough to evaluate the long-term effect of Dia-care telemonitoring. Second, considering of mean age of participants 53.66 years old, indicating

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old adult who may have decreased visual and hearing perception and patients required to fill self-written questionnaire. The result may not fully represent the actual patients' condition. Third, the sample of this study was small and further study may provide detail participants' outcomes.

ETHICAL CLEARANCE

This study was approved by EthicS Committee of the Esa Unggul University. We obtained all patients' written informed consent before enrollment.

CONFLICT OF INTEREST

Authors state no conflict of interest

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We thanks to Kebon Jeruk and Kalideres Primary Care that allow us to conduct research.

CONCLUSION

We found that Dia-care telemonitoring using WhatsApp is beneficial and promising to help nursing to facilitate type 2 diabetes patients' knowledge, blood glucose level and depressive symptoms.

We suggest to recruit more samples and to follow up the outcomes to see the long-term effect for the future study.

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