The Effect of Education via Mobile Text Messaging on Self-care amongst Patients with Type 2 Diabetes

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Abstract

Aim: The most important factor underlying the mortality of patients with diabetes is the lack of self-care. This study aimed to determine the effect of education via mobile text messaging on the self-care of patients with type 2 diabetes.

Methods: This semi-experimental controlled study was carried out on 74 patients with diabetes in Chabahar, Iran. They were selected using convenience sampling in the health care centers, and were randomized into two control and intervention groups of 37 subjects each. The tools to collect data were questionnaires containing demographic profiles and self-care questionnaire. For each group, the questionnaires were completed, and educational SMS (short message service) was sent to the intervention group for four weeks. The post-test questionnaire was completed by both groups two months after educational intervention. Data were analyzed using SPSS16 and appropriate statistical tests.

Findings: Before the intervention, the mean scores of all self-care dimensions between the two groups did not differ significantly but after that, the mean of total scores of self-care and some of its dimensions (adherence to diet, blood glucose self-monitoring and foot care) were positive, and significantly increased in the intervention group versus the control group (P□;The mean scores for the dimensions of physical activity and taking medication regularly after intervention were not different significantly between the two groups (P>0.05).

Conclusion: Considering the effectiveness of sending SMS educational method (SSEM) in improving the self-care of patients, it is necessary to further consider and use this method.

Keywords: Diabetes mellitus, Self-care, Cellphone, Text messaging

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Introduction

Diabetes is threatening the global health day by day. Demographic changes and cultural transition of societies along with the aging phenomenon in the developing countries have converted the diabetes into the global epidemics [1]. Diabetes has been known as the main cause of 1.5 million deaths each year, and accompanying with cardiovascular diseases (CVDs) has had 89 million years of disease-associated burden [2]. The most recent report of the International Diabetes Federation (IDF) indicates the existence of 415 million patients suffering from diabetes throughout the world, and based on the prediction of this organization, the number of these patients will reach to about 642 million people in 2040, and more than 80% of them live in countries with low and average incomes [3]. This disease requires specific self-care behaviors during the whole life [4]. In fact, the successful control of diabetes depends on the self-care of patients, because more than 95% of diabetes-related care is done by the patient [5]. A person with diabetes can control this disease by having self-care behaviors such as taking prescribed medications, adherence to diet and nutrition, self-monitoring and daily activities [6]. To do all these correctly, education is required, which can be applied in different ways. One of the modern methods of education is to use cellphones. The use of cellphones in the field of health care has been dramatically increased [7]. This communication device has changed the traditional way of in-person training, and has provided a new definition of training. Also in terms of time and place, it has provided the context of learning for learners at home, workplace and during travel. It has further resolved many limitations and inefficiencies [8]. Several studies have been carried out on the effect of SSEM in diabetic patients, including Yoon's study in South Korea [9] and Hussain's study in Bahrain [10] that have indicated the positive effect of this type of education. In Iran, SSEM has been carried out by Parizad in Urmia [11], Baghiani Moghadam in Birjand [12] and Goudarzi in Karaj [13]; in all cases, the effectiveness of this type of education has been proven. At current conditions that costs of health care are increasing, SSEM should be considered as an effective and efficient method to train patients with similar educational requirements [14]. It seems that health efforts focusing on endemic diseases such as malaria in Sistan and Baluchestan Province have caused less attention to be paid on non-communicable diseases including diabetes. On the other hand, the relatively low population density, vast area of the studied province, long distance between human populations and health care centers and subsequent problems such as time-consuming and costly visits to these centers, as well as the

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spread of cheap and accessible means of communication including cellphones made us plan our study with SSEM; so we designed this study to determine the effect of SSEM on the self-care behaviors of patients with diabetes that living in the County of Chabahar, Iran.

Methods

A control group, pre-test/post-test, design was used in this study. Participants were recruited from the health care centers of Tis, Negour and Polan of Chabahar County located in the southeastern of Iran, on the coast of the Gulf of Oman.

For ethical considerations, the research protocol was approved by the Medical Research Ethics Committee of the Faculty of Medical Sciences, Tarbiat Modares University (IR.TMU.REC.1394.225). Participants were selected purposefully after reviewing the list of patients served by the mentioned centers and taking into account the inclusion criteria. They were invited to participate in the study via SMS. Inclusion criteria were: informed consent to participate in the study, the history of type 2 diabetes at least since a year ago, aged 30 to 60 years, having a cellphone with enough signal coverage in residency and the ability to send and receive messages in Persian, the ability of patient or one of the family members to read and write text messages, and lack of complications of diabetes including retinal hemorrhage, diabetic foot, diabetic nephropathy and diabetic neuropathy. Exclusion criteria were lack of desire to continue participating in the study, being hospitalized, developing the complications of diabetes including retinal hemorrhage, diabetic foot, diabetic nephropathy, diabetic neuropathy and diabetic ketoacidosis, and changing residency. Only 81 patients from three health centers were eligible for inclusion in the study, who were invited via SMS to participate in the study. Invitation message was sent to all participants twice for more emphasis and with few hours interval. 58 participants were present on specific date and time in the mentioned centers, and they were informed about the details of the research to be carried out by the researcher and colleagues. After taking informed consent, questionnaires were completed by the researcher and colleagues for them. The remaining 23 subjects were invited again via a phone call, and eventually, 16 of them were included and responded to the questionnaires. The total number of participants reached to 74. The questionnaire was set in two parts. The first part included 8 questions about the demographic profiles and general specifications of the patients. The questioned specifications were: age, gender, literacy level, employment status, marital status, duration of suffering from diabetes, type of treatment, and

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favorite methods of educational intervention based on cellphone technology. Before the start of the study, three cellphone-based educational methods, including interactive application software, Telegram messenger and SSEM had been predicted, so the last question of the first part was: "Which method does the participant prefer?" and eventually, due to the answers and low level of literacy of most of the participants, SSEM was selected.

The second part of the questionnaire contained 10 questions related to self-care behaviors; it was designed in order to determine the prevalence of these behaviors during the last week before the test. The score of each response was considered as equal as the number of days of the week doing those behaviors and a number between zero and seven. For questions 3 and 4, which were associated to the number of days of consumption of sweets and high fat food, in order to reverse the scoring, it was considered as equal as seven minus the number of days of prevalence of those behaviors. After completing the scores of questionnaires, their information was extracted.

For confidentiality, the names of patients were not recorded in the questionnaires, and each person was assigned a specific code. By using these codes and the drawing method with the similar chance, the participants were divided into control and intervention groups, 37 members in each group. The educational program, which was designed as short text message, was sent every day to the intervention group at 10 am for four weeks. These messages contained the issues such as adherence to diabetic diet, encouragement for doing physical activity as an effective factor in controlling disease, emphasis on taking prescribed medications as one of the requirements to control the disease, doing blood glucose self-monitoring, and educating suitable range of fasting and non-fasting blood glucose and foot care methods. After that and until the second stage (post-test), a reminder message was sent every week. In addition to sending the above messages, and in the intervening period, the poster designed by the researcher was provided to the intervention group as an educational supplement. In this poster, by attracting the attention of participants to number five in an illustration of a hand in the center with five fingers all wide open, which was surrounded by the ring of diabetes, five key diabetes-related self-care behaviors were included:

- ✓ Daily measurement of blood glucose
- ✓ Adherence to diet
- ✓ Doing physical activity
- ✓ Foot care
- ✓ Regular medication

With small icons of counting with fingers and an appropriate picture showing that behavior in

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the green background (as a sign of health), below this picture in the red background (as a sign of danger), there were five disabling complications of diabetes that may appear in patients with failure in self-care with appropriate pictures. As it was presumed that advertising messages might be blocked by some participants and in order to establish two-way communication, where necessary, texting was done only by the researcher's cellphone and no bulk SMS service was applied. During the intervention, 28 messages were sent to the participants in the intervention group; samples of those messages that were prepared based on the related textbooks and under the supervision of professors and specialists are as follows:

1- Check your blood glucose every day. Fasting glucose should be 80-120.

2- Go walking at least half an hour every day in order to regulate blood glucose better.

3- Consumption of fruits and vegetables every day helps to control blood glucose.

4- Eat meal with salad in order to regulate blood glucose better.

5- Take care of your feet. Wash your feet every day and dry them.

During the intervention, patients in the control group did not receive any training by the researchers. About two months after the four-week intervention, both groups were invited to do post-test; so again the same questionnaires were completed by all subjects in the two groups. Data analysis was done using SPSS16 at the significance level of 95%.

Results

Table 1 shows the comparison results of the two groups in terms of demographic profiles. The statuses of two groups were compared in terms of gender composition of the participants using Chi square test, and the difference of mean age and mean of disease duration of the two groups using independent t-test. Also marital status, employment and type of treatments for the two groups were compared using Mann-Whitney's test. The results showed no significant difference between the two groups (intervention group versus control group) in terms of demographic profiles.

The results of independent t-test and t-paired test comparing the two groups in different dimensions of self-care such as diet, physical activity, blood glucose self-monitoring, taking regularly medication and foot care before and after the educational intervention are presented in Table 2. Before the educational intervention and during the pre-test, they did not differ significantly in mean scores in various dimensions of self-care ($P>0.05$), but after the SSEM intervention and during the post-test, the means scores of diets and blood glucose self-monitoring and foot care of the intervention group increased significantly compared to the control group and to the

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period before training them (P<0.05) The mean scores of physical activity and taking regularly medication in the intervention group did not differ significantly with the before intervention (pre-test versus post-test) and with the control group (intervention group versus control group) (P>0.05). The mean of total scores of self-care variables in the intervention group during the post-test increased significantly in compare to the pre-intervention period (P<0.001) and the control group (P<0.001) (Tables 2 & 3).

Table 1: Comparing the demographic profiles of the participants in the two groups of intervention and control

Characteristics	Control		Intervention		P value
	Number	Percent	Number	Percent	
Gender					
Male	14	37.8	13	35.1	**0.991(χ^2)**
Female	23	62.2	24	64.9	
Marital status					
Single	2	5.4	1	2.7	**0.317 (M-W)**
Married	33	82.2	32	86.5	
Widow	2	5.4	4	10.8	
Education					
Low	29	78.4	25	67.6	**0.303(M-W)**
Moderate	6	16.2	9	24.3	
High	2	5.4	3	8.1	
Employment status					
Unemployed	3	8.1	3	8.1	**0.829(M-W)**
Employed	11	29.7	10	27	
Housewife	23	62.2	24	64.9	
Treatment method					
Insulin	2	5.4	2	5.4	**0.481(M-W)**
Pill and insulin	5	13.5	2	5.4	
Pill	27	73	30	81	
Diet	3	8.1	3	8.1	
Age(Mean± SD)	43.5±7.4		43±8.5		**0.828 *(t –test)***
Diabetes duration(Mean± SD)	5.05±2.99		4.22±3.19		**0.248 *(t –test)***

Table 2: Comparing total scores of self-care and its dimensions in the intervention and control groups before and after education

Variable	Control		P value	Intervention		P value
	Pre-test	Post-test		Pre-test	Post-test	
Diet	18.19±2.7	18.46±2.61	**0.115**	18.46±2.2	21.45±1.95	**<0.001**
Physical activity	2.51±0.731	2.69±0.639	**0.512**	2.68±1.056	2.7±0.967	**0.906**
Self monitoring of blood glucose	0.35±0.633	0.32±0.626	**0.711**	0.3±0.571	1±1.225	**<0.001**
Regularly medication	6.88±0.537	6.94±0.239	**0.422**	6.97±0.171	6.91±0.288	**0.325**
Foot care	8.11±1.4	7.89±1	**0.282**	7.86±1.4	10.84±1.4	**<0.001**
Total score of self-care	36±2.9	36.4±3.2	**0.258**	35.9±2.6	42.6±2.7	**<0.001**

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Table 3: Comparing the total scores of self-care and its dimensions in the intervention and control groups before and after education

Variable	Pre-test		P value	Post-test		P value
	Control	Intervention		Control	Intervention	
Diet	18.19±2.7	18.46±2.2	**0.637**	18.46±2.61	21.45±1.95	**<0.001**
Physical activity	2.51±0.731	2.68±1.056	**0.445**	2.69±0.639	2.7±0.967	**0.672**
Self monitoring of blood glucose	0.35±0.633	0.3±0.571	**0.701**	0.32±0.626	1±1.225	**0.004**
Regularly medication	6.88±0.537	6.97±0.171	**0.366**	6.94±0.239	6.91±0.288	**0.672**
Foot care	8.11±1.4	7.86±1.4	**0.459**	7.89±1	10.84±1.4	**<0.001**
Total score of self-care	36±2.9	35.9±2.6	**0.896**	36.4±3.2	42.6±2.7	**<0.001**

Discussion

In this study, various dimensions of self-care were examined. According to the performance in adherence to diet, the results of this study were found to be consistent with the results of Zakeri Moghadam and colleagues [15], who indicated the positive effect of SSEM.

Another dimension of self-care (studied in this research) was the physical activity performance of participants and the effect of SSEM on it. The obtained results showed good consistency with the findings of Kim [16] but not with the results of studies by Sacco et al. [17] and Parizad et al. [11]. The reasons for the lack of score upgrade about physical activity in this study can be the change of season and exhausting heat in the post-test stage because the second stage of the study was conducted during the height of the summer heat when weather conditions were not suitable for physical activity and doing exercise.

In terms of blood glucose self-monitoring performance, the obtained results were consistent with the results of Lorig and colleagues [18] and Prizad [11]. In this study, despite a significant positive change in the blood glucose self-monitoring scores, the number of people taking care of this dimension of self-care compared to the whole population was low because it is costly.

Another self-care dimension studied in this research was the performance of regular medication. The mean scores of regular medication in both groups did not differ significantly before and after using SSEM (P=0.672). The findings of Parizad and colleagues [11] and Turner et al. [19] are in contrast with the results of this study in this regard. The reason for the lack of significant difference between the two groups in terms of taking medication after intervention in this study is that the mean score of this dimension was high before the intervention, and practically, there was no possibility to increase it. The high score of this dimension and taking medication regularly can also be due to this

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fact that people with diabetes believe in their treatments by adhering to medication, and most patients adhere to the prescribed drug(s) accurately.

The foot care in order to prevent diabetic foot ulcers was another dimension of self-care studied in this research. The results showed that there was a statistically significant difference in the mean scores of foot care between the two groups after training (intervention group versus control group). Parizad et al. [11]and Haj Bagheri et al. [20] reported similar results. The distance training in the study by Chan [21] also resulted in improving foot care.

The mean of total self-care scores was increased after training in the intervention group compared to the control group. Parizad and colleagues [11], Lorig and colleagues [18], and Dale and colleagues [22] found the same effect.

Conclusion

The results of this study showed that SSEM increased the mean scores of self-care in the areas of adherence to diet, blood glucose self-monitoring, foot care and general self-care in patients with type 2 diabetes. These findings can be used by researchers in larger communities, by conducting more comprehensive studies and tests in order to courage the managers and planners to provide more effective and cost-effective programs to the patients with diabetes and other diseases, and most importantly change their lifestyle for the prevention of diseases.

The low level of literacy of the majority of the participants was one of the limitations of this study; by accompanying of literate family members, it was tried to resolve this limitation. Other restrictions included relatively high distance of the health care centers and the patients' problems to attend the centers to fill in the questionnaires; all these were resolved with the participation of the researchers and colleagues at the Health-Home (The smallest unit of health network in the village). We suggest that all stages of the study including pre-test, education and post-test be conducted by SMS in future studies.

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