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Original Article

Survey the Effect of Educational Intervention Based on Mobile Short Message Service (SMS) on Self-Care in Patients with Type 2 Diabetes Referring to the Diabetes Clinic in Khorram Abad City

Elnaz Ashrafi[1], Farnoush Bazvandi[1], Fatemeh S. Izadkhah[1], Tahereh Dehdari[2], Bahare Izadi[3], Omid Safari[4], Morteza Mansourian[3]

[1] Department of Health Education and Promotion, School of Public Health, Iran University of Medical Sciences, Tehran, Iran
[2] Health Education & Promotion Department, School of Health, Iran University of Medical Sciences, Tehran, Iran
[3] Health Promotion Research Center, Iran University of Medical Sciences, Tehran, Iran
[4] Department of Pediatrics, School of Medical, Alborz University of Medical Sciences, Karaj, Iran

Correspondence: Morteza Mansourian, mansourian55@gmail.com

Abstract: *Introduction: Self-care behaviors are very important to control type 2 diabetes. The current study was conducted aiming at determining the effect of the educational intervention based on mobile short message service on the self-care behaviors in patients with type 2 diabetes in Khorram Abad. Methods: This study was a semi-experimental study on 191 patients with type 2 diabetes (45case and 45 controls). Data collection tools included a demographic information form, International Physical Activity Questionnaire, Self-Care Scale, and Self-Efficacy Scale. Three to four educational messages were sent daily through mobile phones as an educational intervention. Data were analyzed with SPSS V24 at a significance level of 0.05. Findings: The data analysis indicated that the average score of self-care, self-efficacy, and blood sugar was significantly higher in the case group than in the control group before and after the intervention (P<0.001). However, in terms of the physical activity variable, this relationship was not statistically significant in the case and control groups. Conclusion: Educational interventions to empower diabetic patients by strengthening their self-care can be an effective way to improve the health of diabetic patients. Therefore, it is suggested to use patient empowerment programs, especially with a self-care approach, to improve the health of patients.*

Keywords: *self-care, self-efficacy, physical activity, blood sugar, type 2 diabetes*

INTRODUCTION

Diabetes is the most common disease caused by metabolic disorders, which is mainly characterized by a chronic increase in blood sugar and disturbed carbohydrate, fat, and protein metabolism. In general, diabetes is a multifactorial disorder diagnosed by a chronic increase in blood sugar or hyperglycemia (according to diagnostic criteria) and is caused by a disorder in insulin secretion or function or both [1]. Retinal damage and blindness, peripheral neuropathy, leg pain, stroke, peripheral vascular problems, end-stage renal disease, and limb amputation are among the most serious complications of diabetes [2]. The most common type of diabetes is type 2 diabetes, which accounts for approximately 90-95% of diabetes cases and is usually associated with metabolic disorders, weight gain, and physical inactivity [3]. About 422 million people worldwide suffer from diabetes, the majority of whom live in low- and middle-income countries, and in 2019, diabetes was introduced as the direct cause of 1.5 million deaths [4]. According to the International Diabetes Federation (IDF), the number of diabetic patients will reach 439 million people in 2030, and the prevalence of diabetes in developing countries will be 69% [5]. More than 3 million people with diabetes live in Iran [6]. By 2030, Iran will be one of the most prevalent regions in the world in terms of diabetes [7]. Paying attention to the chronic and costly nature of this disease for the general health of society and the creation of a large financial burden, it is essential to pay serious attention to this problem and its consequences [8]. According to the results obtained from the studies, the long-term complications of this disease, including neuropathy, nephropathy, and retinopathy can be prevented, or at least the occurrence of these complications can be postponed if blood sugar is controlled [9,

10]. Many studies have found physical activity and exercise to be effective in reducing blood sugar levels and controlling diabetes [11,12]. The World Health Organization considers education to be the basis of diabetes treatment. Therefore, self-care is one of the important topics of diabetes treatment. Self-care is a learned regulation function in humans, which is based on the ability of people to perform care actions on themselves [13]. It includes the behaviors of following a proper diet, taking medicine on time, self-monitoring of blood sugar, performing regular physical activity, and physical care of the feet [14]. Studies show that 67% of patients with type 2 diabetes do not monitor their blood sugar according to the recommendations. Also, only 19-30% of diabetic patients use the recommended physical activities and compliance with nutritional behaviors in these patients is 65%, and only 7% of diabetic patients fully adhere to all aspects of self-care behaviors [15, 16]. Self-efficacy is also known as a strategy to improve self-care in diabetic patients, which results in self-confidence and adherence to care recommendations to control blood sugar in these patients [17].

Nowadays, to follow up and educate diabetic people, new communication systems are required to direct the focus of care and treatment from the clinic to the patient's daily life. Researchers have pointed out the use of mobile phone service as a method of education and follow-up in chronic diseases, that short message is one of the main functions of mobile phone in the education of diabetic patients [18,19].

Considering the importance of self-care in controlling the blood sugar of diabetic patients and the value of self-efficacy as one of the self-care approaches, it seems necessary to design educational interventions on the platform of mobile phones and in the form of short messages as a relatively new educational method in controlling the disease of diabetics. Thus, the present study was conducted to determine the effect of the educational intervention based on mobile phone short messages on self-care in patients with type 2 diabetes referred to the diabetes clinic in Khorramabad.

MATERIALS AND METHODS

The present study was a semi-experimental intervention research with a pre-test and post-test design. The sample size was specified as 90 people who were selected from the research population of patients with type 2 diabetes referring to the diabetes clinic in Khorramabad, Lorestan province. The participants were selected according to the inclusion criteria using random sampling. Then, they were divided into case and control groups using a simple randomization method (45 ones in each group). The inclusion criteria include informed consent to participate in the research, having a minimum level of literacy and understanding of the content sent through text messages, having a fixed personal mobile number to receive educational SMS, lack of any serious diabetic complication, and not having special diets because of specific diseases or physical problems limiting physical activity. Exclusion criteria include suffering from serious complications of diabetes during the study, suffering from diseases that limit physical activity or nutrition, and the patient's unwillingness to receive educational messages.

Data collection tools in this study included a demographic information form, International Physical Activity Questionnaire (IPAQ), a Self-Care Scale developed by Tubert, and Self-Efficacy Scale. Demographic information included: age, height, weight, gender, educational level, employment status, marital status, and type of treatment. The IPAQ with seven items measured the duration of physical activity in the last week in four categories: moderate physical activity, intense physical activity, walking, and sitting activities. According to the scoring protocol in this questionnaire, the intensity of physical activity based on the ratio of energy consumption in terms of metabolic equivalent of task (MET) in the last seven days is classified into three levels: low, medium, and high. It was proposed by the World Health Organization and the Centers for Disease Control and Prevention in 1998 to measure the physical activity of people aged 15 to 69 years and its validity and reliability have been confirmed in 12 countries worldwide, including Iran [20,21]. A self-care questionnaire was used in this study that included 15 items in the areas of diet compliance, physical activity, blood sugar monitoring, insulin injection or diabetes pill consumption, foot care, and smoking, which was translated and standardized by Hamdzadeh [22,23]. The self-efficacy questionnaire, which is one of the constructs of the standard Health Belief Model Questionnaire, validity and reliability of which have been confirmed [24].

After presenting a letter of introduction from the Iran University of Medical Sciences and obtaining the necessary permits, the researcher referred to a diabetes clinic in Khorram Abad and selected 90 people from among 200 eligible people using random sampling. People who were willing to participate in the study and met the inclusion criteria were assigned to the case and control groups (45 in each group) using a simple randomization method. After random allocation, blood sugar samples were taken in all groups four days before the start of the intervention. In the first session, the researcher explained the purpose of the meeting to the participants, and written informed consent was obtained. Then, the personal information form and questionnaires were completed by the case and control groups. The case group received an educational program in the form of short educational messages via mobile phone, for four weeks and on average, at

least three to four messages per day related to the educational content, including exercise, self-monitoring of blood sugar, diet, insulin therapy, medication use, and foot care. For example, short messages about physical activity and blood sugar monitoring were "for people with diabetes, walking is the best exercise" or "it is better for people with diabetes to measure their fasting blood sugar after waking up". To improve self-efficacy, encouraging messages about adherence to self-care were used.

Finally, after two months, the same questionnaires (demographic, physical activity, self-care, and self-efficacy scales) were distributed and completed by the participants, and the blood sugar levels of the two groups were measured again. During this period, the control group did not receive any educational intervention.

However, to comply with the ethical principles, an educational CD containing self-care training was given to the control group after completing the research. The data of the two groups before and after the intervention were entered into SPSS version 24 software and analyzed using Wilcoxon, Mann-Whitney, Chi-square test, independent t-test, and paired t-test at a significant level of 0.05.

RESULTS

The participants' average age was 51.01 ± 0.967, and the average height and weight were 164.57 ± 1.031 and 75.69 ± 1.101, respectively.

Before the implementation of the educational program, the case and control groups were matched in terms of demographic variables, including age, height, weight, gender, education, employment status, marital status, and type of treatment, and no statistically significant difference was observed between the two groups (Table 1).

Table 1: Comparison of the absolute and relative frequency distribution of demographic variables in case and control groups

Variable		Case		Control		P value
		No.	%	No.	%	
Gender	Female	31	69	26	57/7	0.796
	Male	14	31	19	42/2	
Employment	Unemployed	5	11	2	4	0.686
	Housewife	26	58	24	53	
	Self-employed	9	20	9	20	
	Public	5	11	10	22	
Education	Illiterate	5	11	4	9	0.479
	Primary school	17	38	10	22	
	Secondary school	9	20	5	11	
	High school	4	9	11	24	
	High school diploma	4	9	10	22	
	Higher education	6	9	5	11	
Marital status	Single	2	4	1	2	0.800
	Divorced	1	2	0	0	
	Widow	9	20	5	11	
	Married	33	73	39	87	
Type of treatment	Insulin	21	47	21	47	0.920
	Oral medication	20	45	22	49	
	Diet	4	9	2	4	
	Exercise	0	0	0	0	

As observed in Table 2, there is no statistically significant difference in terms of the average score of physical activity, self-care, self-efficacy, and blood sugar between the case and control groups before the intervention, while after the intervention, the average scores of these variables, except for physical activity (P=0.8), was significantly higher in the case group compared to the control group (P<0.001). In the control group, before and after the intervention, no significant difference was observed in the average scores of physical activity, self-care, self-efficacy, and blood sugar (P>0.05).

Table 2: Comparison of the average scores of physical activity, self-care, self-efficacy, and blood sugar, before and after the intervention in case and control groups

Scale	Group	Case	Control	p-value
		Mean ± SD	Mean ± SD	
Physical activity	Before intervention	677.5±954.938	307.5±461.75	0.6
	After intervention	903.75±973.125	655±925.625	0.8
	p-value	0.8	0.4	_
Self-care	Before intervention	2.31±0.813	2.38±0.844	0.12
	After intervention	3.38±0.688	2±0.906	0<0001
	p-value	0<001	0.22	_
Self-efficacy	Before intervention	2.7±0.4	2.7±0.3	0.15
	After intervention	3.7±0.7	2.7±0.7	0<0001
	p-value	0<001	0.286	_
Blood sugar	Before intervention	180±80.5	185±51	0.8
	After intervention	170±87.5	180±70.5	0<001
	p-value	0.009	0.491	_

Table 3: Comparison of blood sugar scores before and after the educational intervention in the case group

Method of treatment	Blood sugar level before the intervention	Blood sugar level after the intervention	Level of change
Insulin	227.09	217.92	-9.17
Oral medicine	173.48	170.65	-2.83
Diet	181	180.44	-0.56
Exercise	194	194.5	0.5
Medium	193.89	190.88	-3.02

Table 3 indicates that the blood sugar level in all patients with different treatment methods (insulin, oral medication, diet) in the case group reduced after the educational intervention compared to before intervention, except for the patients who only used exercise to control their blood sugar.

DISCUSSION

The present study was conducted aiming to determine the effect of the educational intervention based on mobile phone short messages on self-care in patients with type 2 diabetes referred to the diabetes clinic in Khorramabad. The research findings suggest that the educational intervention through mobile phone short messages improved self-care in the case group, which is consistent with findings by Abaza et al. [25] and Agbede et al. [26] on the effect of the intervention based on mobile phone short messages in the self-care of diabetic patients and the findings by Yari et al. [27] and Rahnavard et al. [28] concerning SMS-based and self-care education of diabetic patients. Krishna et al. [29] reported that technologies such as mobile phones and text messages, which are currently part of people's daily lives, have the potential to influence self-care and improve people's health. The approach of health education through SMS to promote self-care in diabetic patients is more welcomed than traditional approaches that require reading pamphlets or attending lectures [25,30].

In this study, self-efficacy also there was a significant difference in the case group in terms of self-efficacy after the educational intervention. Katz and Nordwall [31] and Peymani et al. [32] also found that interventions based on mobile phone messages improve self-efficacy and self-care. Similar studies [33,34] regarding the self-care of diabetic patients also indicate a significant difference in the average score of self-efficacy and self-care in the case group compared to the control group after the educational intervention. These studies are consistent with our work in that increasing self-efficacy causes the adoption of self-care behaviors in diabetic patients. Self-efficacy is an important prerequisite for behavior change [35]. An individual with low self-efficacy is less likely to make an effort to perform a new health behavior or to change the behavior he is used to [36]. Researchers believe that self-efficacy has a suitable framework for understanding and predicting and patient's commitment to self-care behavior in the treatment of diabetes [37].

The results of the present study showed that education through mobile phone short messages does not affect increasing physical activity in the case group, which is in line with the findings by Bakhshian et al[38] regarding the effect of education through mobile phone short messages on self-care of patients with type 2 diabetes. It is also in agreement with the findings by Kim et al. [39] on adherence to diabetes control recommendations, while our findings are not consistent with the study of Paul et al. [40] regarding the use of software that can be installed on mobile phones to improve the amount of daily walking in patients with a history of stroke and the study Martha et al.[41] concerning mobile phone SMS intervention on diabetes self-care activities, cardiovascular disease risk awareness, and food choices among type 2 diabetic patients. This discrepancy can be due to the lack of sports facilities and parks in the current study or the addition of chronic diseases to the patients participating in this research, as well as social and cultural factors that prevent people from doing physical activities in public environments. In the present study, since the number of women is more than men, the problem of social and cultural factors could be more marked.

The use of mobile phone messages in the current study showed a significant positive effect on the reduction of blood sugar in the case group after the educational intervention, which is consistent with the findings of similar studies in this field [42,43,44]. In patients suffering from diabetes, education is as valuable as medicine, exercise, and diet, because the treatment will never be effective unless the patient is well aware of the nature of his disease and takes positive steps to deal with it.

CONCLUSION

The results of this study demonstrated that educational interventions based on mobile phone short messages can be effective in enhancing self-care in patients with diabetes. Educational interventions aimed at empowering diabetic patients by strengthening self-care in them can be an effective way to improve the health of patients with diabetes. Therefore, it is recommended to use patient empowerment programs, especially with a self-care approach, to improve the health of patients.

Conflicts of interest and sources of funding

The personal interests of the authors were not related to the results of this research.

The authors declare that they have no competing interests. This study did not receive any grant from funding agencies.

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Authors' contribution

All authors were responsible for the study. EA, MM, and TD were accountable for the study Conceptualization and led the writing of the paper. BI conducted the Literature review and assisted in writing the paper. MM and OS performed the Statistical analysis, assisted in interpreting the data, and wrote the paper. OS, FSI, and EA assisted with the interpretation of the results and drafting of programmatic Implications. FB and MM were responsible for data collection and coordination of the study. TD co-led the conceptualization, supervised all aspects of writing the paper, and provided extensive comments on the manuscript. All the authors have read and approved the final manuscript.

Ethics approval and consent to participate

This study was approved by the Research Ethics Committee of the Vice President of Research and Technology of Iran University of Medical Sciences with code IR.IUMS.REC.1397.501. Informed consent was obtained from all individual participants included in the study before conducting.

Consent to publish

All participants consented verbally to the publication of the interview data.

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