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Effectiveness of short message service-based intervention (SMS) on self-care in type 2 diabetes: A feasibility study



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ABSTRACT

Aim: The objective of the current study is to assess the effectiveness of Mobile Short Message Service (SMS) intervention on education of basic self-care skills in patients with type 2 diabetes. Moreover, we aimed to determine whether delivering individually-tailored educational messages can be more effective than general educational messages.

Methods: A total of 150 patients with diabetes type 2 were randomized into three groups: tailored SMS group, non-tailored SMS group, and the control group. Biochemical parameters including HbA1c, FBS, lipid profile were evaluated for the three groups at baseline and after 12 weeks. Moreover, self-care Inventory (SCI), Diabetes Management Self-Efficacy Scale (DMSES) and Diabetes Self-Care Barriers assessment scale for Older Adults (DSCB-OA) were completed. In the tailored SMS group, each person received 75% of their messages based on the top two barriers to adherence that they had experienced and reported in their scale. In the non-tailored SMS group, random messages were sent to every patient.

Results: After 12 weeks, although HgA1c levels did not significantly change, significant decline was observed in FBS and mean BMI in both intervention groups. Mean SCI-R scores significantly increased and mean DSCB and DMSES scores significantly decreased in both tailored and non-tailored SMS groups. In the control group, mean SCI-R scores decreased and mean DSCB and DMSES scores significantly increased ($P < 0.001$).

Conclusion: Sending short text messages as a method of education in conjunction with conventional diabetes treatment can improve glycemic control and positively influence other aspects of diabetes self-care. According to our findings, sending SMS regularly in particular times appears to be as effective as sending individually tailored messages.

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1. Introduction

Diabetes mellitus is a globally widespread chronic and progressive metabolic disorder which is considered as a well-documented health problem, especially in the developing countries [1,2]. World Health Organization estimates that there are more than 220 million diabetic patients in the world and this number will rise to 366 million by 2030 [3].

Past research has been found that recommended self-care activities in diabetes and adherence to these tasks are highly important for glycaemic control. Therefore, it can be concluded that patients' active participation in their plan of care can play a key role in predicting favorable outcomes of the disease [3,4]. The main objective of patient education is to change the patient's behavior or helping patients to modify old behaviors. This leads to the positive behavioral changes in patients and encourages them to get actively involved in their treatment plan. Therefore, it can be concluded that effective patient education that provides adequate information, support and monitoring can improve adherence, which in turn, can reduce the burden of diabetes chronic complications as well as providing a better quality of life for diabetes patients [5-8].

Despite the benefits of diabetes self-management education being supported by literature [9-11]. It is imperative to develop novel diabetes patient education programs and to assess the effectiveness of them in order to ensure that limited health resources are being spent effectively. In this sense, it seems that mobile phone-based educational interventions as relatively new methods, offer potential to shift the focus away from the clinic towards patients' daily lives, where behavior and attitude change is actualized [12,13]. So this can be translated into more favorable clinical outcomes and better self-care skills, as well as reducing costs involved and patient referral to specialists.

Mobile telephones and SMS are becoming integrated into virtually all aspects of society. National statistics indicate that the number of mobile phone subscribers in Iran has sharply increased since its introduction two decades ago. Among different mobile services available in Iran, the text messaging is increasingly popular, reportedly reaching a peak of 50 million messages per day [14]. This service allows for instantaneous delivery of short messages directly to individuals at any time, place, or setting. Customized SMS messages can be tailored to individuals, which is important given that personally tailored messages are more effective for health behavior changes than untailored messages. Communication with SMS is also very affordable and cost effective. All these features have led to the increasing popularity of this service [15], and subsequently, it has been focus of attention of many researchers and a considerable number of studies have been carried out regarding utilization of this technology for improving the quality of care for diabetic patients [16]. For example, a study in United Kingdom has developed a novel support network, based on a unique text-messaging system designed to deliver individually targeted messages and general diabetes information [17]. Another study in Korea has assessed the impact of a nurse short message service intervention on HbA1c levels and adherence to treatment control recommendations in

patients with diabetes [18]. Moreover, results of a study carried out in Bahrain demonstrated effectiveness of mobile phone short message service on diabetes mellitus management [19]. In addition, a study was done by Mulvaney et al. in the USA to determine whether a tailored messaging system according to individually-reported barriers to diabetes self-care would be effective on glycaemic control [4]. It is noteworthy, moreover, that another study done by Ramachandran et al. assessed effectiveness of mobile phone messaging in prevention of type 2 diabetes by lifestyle modification in men in India [20]. However, there are few studies regarding use of this service as an educational method in Iran [5,13].

In the latest guideline developed by the Endocrinology and Metabolism Research Institute which is to be followed by Iranian general practitioners, a comprehensive approach to diabetes care is to be implemented with a particular emphasis on diabetes education. With the view of this potential and intention for implementation of future SMS-based diabetes care interventions in Iran, author conducted a feasibility study to assess the efficacy of an SMS-based education to support patients with diabetes type 2 and educate them about the four main areas of self-care skills which are useful in the management of their condition. Another goal of this study was to determine whether delivering individually-tailored educational messages can be more effective than general educational messages. So individually tailored SMS messages were sent to patients according to the barriers to diabetes self-care adherence they had reported. It is noteworthy, however, that the main objective of this study was to assess the efficacy of this educational method for implementation in the form of instructions across the entire country where possible by the Diabetes Research Network.

2. Materials and methods

2.1. Study design and sample size

This study is a three-arm randomized controlled trial. 150 patients with diabetes type 2 were recruited through an outpatient diabetes clinic of the Endocrinology and Metabolism Research Institute affiliated to Tehran University of Medical Sciences. Patients referred to the clinic were screened for eligibility (Fig. 1). The inclusion criteria were as follows: owning a mobile phone, consenting to receive text messages, and ability to read text messages. Patients were excluded if they had a positive clinical history of a serious disease such as renal insufficiency with a creatinine level >1.5 mg/dl, hepatic insufficiency, severe visual impairment due to diabetes complication or psychiatric diseases.

Based on the results of a previous study [21], we expect effect size of at least 0.4 in the HbA1C level between tailored SMS group and the control group. A sample size of $n=48$ in each study group would reveal 80% power to detect this difference based on calculations performed with G-Power software and the significance level of the test was targeted at 0.05. Thus, we recruited a total of 50 study participants in each group.

A total of 150 subjects were randomly assigned to the study groups, the randomization was performed by means of permuted block randomization method with a block size of three

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