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Review

Health education via mobile text messaging for glycemic control in adults with type 2 diabetes: A systematic review and meta-analysis

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ABSTRACT

Background: Diabetes type 2 is an increasing problem worldwide that may be managed through education. Text-messaging using a cell phone can assist with self-care. The aim of this study was to systematically review the impact of education through mobile text-messaging on glycemic control.

Methods: The design was a systematic review with meta-analysis. Five electronic databases were searched to access English studies involving a randomized controlled trial design that used text-messaging educational interventions in patients with type 2 diabetes during an 11-year period (2003–2013). Studies were evaluated using a quality assessment scale adapted from Jadad scale and Cochrane handbook. Extraction of data was carried out by two reviewers. A random-effect model with a standardized mean difference and Hedges's *g* indices was used for conducting the meta-analysis. Subgroup analyses were conducted and a Funnel plot was used to examine publication bias.

Results: Ten studies overall were identified that fulfilled inclusion criteria, involving a total of 960 participants. The mean age of the sample was 52.8 years and majority were females. Data were heterogeneous ($I^2 = 67.6$). Analyses suggested a publication bias based on Egger's regression ($P < 0.05$). HbA1c was reduced significantly in experimental groups compared to control groups ($P < 0.001$). The effect size for glycemic control in studies that used text-messaging only was 44%. For studies that used both text-messaging and Internet, the effect size was 86%.

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Conclusion: Mobile text-messaging for educating Type 2 diabetics appears to be effective on glycemic control. Further investigations on mobile applications to achieve educational goals involving other diseases are recommended.

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1. Introduction

Diabetes mellitus (DM) is a prevalent chronic disorder around the world. According to WHO, there are more than 340 million persons affected by DM and it will be 7th leading cause of mortality by the year 2030 [1]. Another estimate suggests that patients with type 2 diabetes (T2D) may double in number between the years 2000 and 2030 [2]. Unfortunately, DM is a relatively latent disease and up to 50% of such patients may be unaware that they have the condition [3]. Sedentary behaviors, obesity, unhealthy dietary and low levels of exercise and physical activity are the most important modifiable risk factors for T2D [4,5]. Therefore, lifestyle interventions including health education programs may be preventive or help in the management of patients with DM or at high risk for it [6]. Education regarding compliance with the treatment regimen is also effective in reducing complications and progression of the disease [7].

Diabetes self-management education (DSME) is a process that helps patients to manage their disease [8]. The goal is to improve metabolic control, prevent related complications, and enhance quality of life [9]. Studies indicated that about 50–80% patients with the DM do not have adequate knowledge or skills necessary to effectively manage their disease [10]. Despite well-defined therapeutic and care guidelines for the medical management of diabetes, their quality of life should be improved by effective self-management [11,12]. Studies show that addressing self-management education is an important aspect of glycemic control and can reduce HbA1C by 30–80% [10]. The DSME has also been shown that is effective to increase diabetes knowledge, improve self-monitoring of blood glucose, promote healthy dietary habits, and reduce physical inactivity [13,14]. Self-care education may also improve adherence to treatment regimens [15].

The DSME is a type of health education (HE) program [6]. Well-structured health education may result in patient empowerment and self-efficacy [16]. According to the philosophy of HE, patient-centered improvement may be obtained by engaging patients in their care plans and self-care through a participatory educational approach [17]. There are various methods used to achieve these goals. Along with traditional methods that emphasize face- to-face and direct education, there are now more options for delivering HE programs. Electronic communications are now being used to convey health massages by many educators and clinicians [18]. This type of application may provide a context to educate on any topic, at any time, and in any place, with an emphasis placed on developing skills rather than only mastering knowledge [19].

The mobile or cell phone is a communication tool that may be used for remote electronic education. Various applications have been included that enable users to communication via text, picture, and multimedia as well as by voice [20]. Short message service (SMS) is a low-cost and efficient application that provides a good accessibility and coverage for majority of users in many countries. For example, more than 73% adult Americans use SMS with a rate of 39 messages daily [21]. Similarly, in Iran as a developing country more than 80% of people with cell phone, use SMS at least one time per day to communicate each other [22]. The popularity of this service enables it to be used as a health messenger device as well. Many studies and systematic reviews support the effectiveness of mobile technology to influencing lifestyle and