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Short article

The impact of using electronic applications on controlling the course of diabetes

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Abstract

Physical activity is a fundamental element in managing diabetes. In preventing complications of this condition, along with pharmacological treatment, key factors include an appropriate diet, sports, weight reduction, and the ability to cope with stress. In recent years, the use of mobile applications in the treatment of diabetes has gained significant importance. Research has shown that these applications play a crucial role in improving patients' daily lives by offering features that make it easier to control this disease, such as advice on healthy eating, monitoring physical activity (including adjusting appropriate workouts), and assessing sleep quality and recovery.

This review discusses the current research on the impact of electronic applications used in various aspects of life on health-promoting behaviors and their effectiveness in patients with diabetes.

In summary, studies indicate that the use of these applications often helps participants maintain better self-control and increase self-awareness of the disease. The results of the studies also encourage further development and improvement of new possibilities made possible by the use of electronic applications. Further studies focusing on this topic are also recommended to validate the conclusions and gain new knowledge in this area.

Keywords: Diabetes, electronic applications, self control, physical activity

Introduction and purpose

Diabetes is a lifestyle disease. Changes taking place in societies, such as less exercise and unhealthy eating, are also factors leading to the development of this disease. Just hearing the diagnosis can be overwhelming for the patient (1)

arly recognition and treatment, which include lifestyle changes, engaging in sports (2) and controlling blood glucose levels, lead to a lower chance of developing complications (3). Due to the increasing use of health applications (4) t is worth focusing on leveraging this fact to better control our habits and health behaviors. This article will focus on reviewing scientific literature evaluating the effectiveness of disease self-management in people using electronic applications.

Diabetes is a disease present worldwide. In 2001, about 540 million people suffered from this condition, and it is predicted that by 2045, this number could reach 783 million people(5).

Type 1 diabetes is caused by a combination of genetic, immunological, and environmental factors(6) (7).

The destruction of pancreatic beta cells, caused by antibodies ZnT8A, GADA, IA-2a, and IAA(8) leads to insufficient insulin production, resulting in elevated blood glucose levels.

The basis of type 2 diabetes is either the inefficiency of insulin secretion or decreased tissue sensitivity to insulin(9). The main factor influencing the development of this disease is obesity, but other causes, such as hypertension or uric acid concentration, also contribute to its progression(10,11). A reliable method of assessing blood glucose levels in most people over the last 2-3 months is the measurement of glycated hemoglobin, though it should be noted that it has limitations in patients with conditions like anemia and does not reflect sudden changes in blood glucose levels (12). For this reason, continuous glucose monitoring methods are essential for proper assessment of the patient's condition and treatment modification (13). Various sensors are used for this purpose, along with electronic applications that enable patients to self-monitor and read their results. Additionally, doctors often have direct access to patients' readings, providing them with better knowledge of the patient's health. This article will present the findings from studies on the impact of electronic applications on the control of diabetes, aiming to systematize the knowledge on this subject.

State of knowlage

The study titled "Effectiveness of mHealth Interventions for Patients with Diabetes: An Overview of Systematic Reviews" analyzed 15 systematic reviews (14–28),

Among those presenting the most specific data, a reduction in glycated hemoglobin of up to 0.8% was observed in patients with type 2 diabetes, whereas in type 1, it was a reduction of 0.3% (29).

A systematic review published in Diabetes Care, compiling information from 14 randomized trials (30–43) , involving 1,360 participants (509 with type 1 diabetes and 851 with type 2 diabetes), reported that all studies indicated a reduction in HbA1c levels in patients with type 2 diabetes. Additionally, younger patients using mobile applications achieved greater benefits, and these effects could be enhanced by feedback from medical staff. In patients with type 1 diabetes, the data were insufficient (44).

Another study describes the impact of e-health interventions, including electronic applications, mainly on mobile phones. The authors of the study titled "Effects of E-health-based Interventions on Glycemic Control for Patients with Type 2 Diabetes: a Bayesian Network

Meta-Analysis" argue that these applications significantly increased patients' knowledge. Glycated hemoglobin levels were reduced from 8.62% to 7.12%. A positive impact was also noted due to a reduced need for re-hospitalizations (45).

Electronic applications can also be useful for patients with type 1 diabetes. One of the primary methods of controlling diabetes progression is determining the intake of carbohydrates. Here, electronic applications have also found their use. A randomized study titled "Carbohydrate Counting App Using Image Recognition for Youth With Type 1 Diabetes: Pilot Randomized Control Trial" included 46 participants, of whom 43 completed the entire process. Although the results showed that counting carbohydrates is difficult for patients, and errors in counting can have clinical consequences, the use of the application was rated as easy, and counting carbohydrates became easier (46).

It is also worth considering the analysis titled "Computer-based Diabetes Self-management Interventions for Adults with Type 2 Diabetes Mellitus," in which researchers focused on 16 randomized studies involving 3,578 participants aged 46-67 years.

This study noted a very important aspect differentiating the effectiveness within the group of electronic applications. Computer-based applications showed less effectiveness compared to mobile applications. It is worth noting that no weight loss was observed, and only some studies showed slight improvements in cholesterol levels. The authors conclude that self-management of diabetes using computer-installed applications does not significantly change glycated hemoglobin levels and does not show benefits in behavioral or cognitive functions (24).

A study presenting the findings of a joint report by the European Association for the Study of Diabetes and the American Diabetes Association (47), indicates that electronic applications have enormous potential in controlling diabetes, partly due to the increasing number of smartphone users and their availability, which is expected to grow in the coming years (48). hey also enable easier access to health information.

A study describing the use of the Time2Focus application from 2021 (49), aimed to examine behavioral and cognitive changes in people with type 2 diabetes. Initially, 1,355 people aged 18-89 years with glycated hemoglobin greater than or equal to 8% and less than 12% were qualified. Of these, 201 agreed to participate, but only 100 participants installed the application. The study observed no significant changes in glycated hemoglobin levels among participants. However, the feedback from participants who completed all levels of the application (48 people) indicated a significant improvement in their sense of self-control over the disease and increased satisfaction with using the application. These individuals also stated that they would

recommend it to their family and friends.

Conclusion

The literature on the use of mobile applications in diabetes treatment highlights the significant positive impact of electronic applications on people with diabetes. Studies consistently show that mobile applications for self-management of diabetes lead to improved blood sugar levels, increased sense of disease control, and better metabolic indicators in patients. These applications play a crucial role in facilitating self-care activities, such as adhering to medical recommendations, monitoring blood glucose levels, planning diets, and performing routine exercises. Moreover, mobile applications are considered valuable tools that provide continuous support for daily disease management, promoting lifestyle changes and enabling regular monitoring of the disease to achieve better health outcomes.

Using electronic applications by diabetic patients also brings psychological benefits. These individuals gain peace of mind, feeling safer and more at ease knowing that they can check parameters indicating even slight deviations from the norm related to their condition at any time. This is very important in diabetes treatment because, as scientific studies have shown, patients who are free from negative emotions and have a positive attitude toward the treatment process often experience faster and more effective health improvements. Studies have highlighted the convenience, ease of use, and educational value of diabetes-related mobile applications, which help reduce barriers to disease management. Research has also indicated the need to continue evaluating electronic medical applications to more effectively help diabetic patients choose the right tools to support self-management.

In summary, the literature supports the view that mobile applications play a very important role in improving diabetes care, supporting self-care practices, improving health outcomes, and enabling patients to take control of their health.

Analyses highlight the potential of electronic applications in diabetes treatment by providing patients with personalized, accessible, and effective tools.

Author's contribution

Conceptualization, AK; methodology, AN, JK, OB; software, MK, AK, KR, OK, MS; check, ZS, KP; formal analysis, JK, OB, MK; investigation, AK, KR, OK; resources, MS, ZS, KP; data curation, AK, KR; writing – rough preparation, AN, JK, OB; writing-review and editing, AN, MK; visualization, OK; supervision, ZS, KP; project administration, MS

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