



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.3750773>Available online at: <http://www.iajps.com>

Research Article

Assessment of Diabetic Smartphone Application in Diabetic Patients¹Teekam Das, ²Ratan Kumar, ³Abdul Sattar Narejo¹Department of Anesthesia, Amiri Hospital, Ministry of Health, Kuwait²Department of Internal Medicine, Primary Health Care Centre, Kuwait³Department of Anesthesia, King Saud University Medical City, Riyadh, Saudi Arabia**Article Received:** February 2020**Accepted:** March 2020**Published:** April 2020**Abstract****Objective:** To evaluate the barriers which are affecting the usability of diabetic applications (apps).**Method:** The present study was conducted in a healthcare setup of Abu-Halifa, Kuwait. Randomly the author recruited 10 diabetic patients from age range between 20 - 40 years with an equal number of both genders. Each patient was given a demonstration of managing the applications using smart technology. The features explained to the patient begin from smartphone app installation, recording the blood sugar level, analyses of the input data, reminders to medicinal reminder and monitoring blood sugar levels.*In the next follow-ups, the patients were asked to record their feedback regarding the usability and features of the application Ontrack. The collected data were analysed through SPSS 21 using mean and standard deviations.***Result:** The data collected from questionnaires displayed that 70% of patients had a clear idea of using the applications on smartphones whereas out of this 60 % demonstrated confidence and frequency in using them. Out of 10, only 5 patients reported that they effectively used the diabetic app for recording their blood sugar level whereas 7 patients found it efficient.**Conclusion:** For better access and usability of the apps, the patient requires guidance and understanding. The apps designed should focus more on the desires and needs of the patient for a better approach.**Keywords:** Diabetes, management, Ontrack, smartphones, mHealth.**Corresponding author:****Teekam Das,**

Department of Anesthesia,

Amiri Hospital, Ministry of Health, Kuwait

E.Mail: teekam72@yahoo.com

QR code



Please cite this article in press Teekam Das et al, *Assessment Of Diabetic Smartphone Application In Diabetic Patients*, Indo Am. J. P. Sci, 2020; 07(04).

INTRODUCTION:

Diabetes is a chronic disease that is prevalent among older age people for many decades(1). According to world statistics, the number of diabetic patients expected to rise until 2030 is 54%(2). The incidence of diabetes (type 2 diabetes and type 1 diabetes) is expected to rise more than 54.9 million Americans from 2015 to 2030 with deaths associated with 38% to 385,800(2). These chronic diseases impose a financial burden of about 53% to more than \$622 billion estimated up to 2030(2). Adults who are suffering from diabetes have a 50% higher risk of mortality(3). This leads to a huge negative impact on the social and financial conditions of the countries. There are two types of diabetes, type 2 is the most prevalent among the many countries especially developed. As per the clinicians, it can be easily controlled through physical Workout and nutritional planning assuming as the best navigation tool in diabetic management(4). The initial step for diabetic management is the blood glucose monitoring that indirectly helps in the regulation of exercise and diet(4). Thus, it especially essential for Insulin dependent type 2 diabetes to monitor their sugar level compared to type 1 diabetes.

With modernization and development in technology, diabetic management has become easier. Smartphones are considered as a device that assists them in recording and analysing the collected data in the application thus reduces the clinic and hospital visit unless necessary(4). Currently, smartphones are offering a plethora of applications that aid the diabetic patients to easily cope with a daily routine for diabetic people. The fast-growing mobile application has led to hosting a diverse range of options from novice start up software to programs designed for professional use(4). Certain critical factors are necessary to be taken into consideration while launching such applications.

To reduce the disease burden many efforts are required to create community awareness, thus, encouragement of such an application will be beneficial to target the savvy user of smartphones. every year CDC reports the surveys informing the statistics of the diabetic patient to take necessary steps and measures to control it accordingly(2). These applications play a pivotal role in empowering each individual to take control of their health with the help of the app. However, for appropriate use of the application it necessary to educate the people about pragmatic technological resources for diabetes management. Kuwait has shown 51% of people benefiting from this application with more than half using English as the preferred language(5). Until 2018 only 1-2 % of the total diabetic patient used the application. It is predicted that via creating awareness the percentage initially will increase to 7-8%(6). Recent health care

management focus is not limited to the temporal and geographical component, which allows the development of doctor-patient relation digitally(7).

The medication management strategies were developed to assist the diabetic patient in medical management. The strategies pointed out necessary components for medicine adherence such as education on disease management, simplification of dosing regimen, counselling, reminders, or a combination of these methods(3, 8). Digital strategies have proven to be beneficial for adherence to medicine in chronic disease, develop better relations with the doctor and allows two-way communications tailored to each patient's needs(1). With time these smartphone apps have received widespread acceptance. These apps easily allow pill organization, track of medicine timing and graphical assessment(4). There is an increased number of users and apps; however, still, the apps are not approachable for all due to lack of understanding or lack of appropriate features. Therefore, the present study was conducted to evaluate the barriers which are affecting the usability of diabetic applications.

MATERIAL AND METHODS:

The present study was conducted in a healthcare setup of Abu-Halifa, Kuwait. Randomly the author recruited 10 diabetic patients from age range between 20 - 40 years with an equal number of both genders. The selected patients were all educated as per the set inclusion criteria. Each enrolled patient was explained about the smartphone technology and informed consent was taken for future follow-ups.

Each patient was given a demonstration of managing the applications using smart technology. The features explained to the patient begin from smartphone app installation, recording the blood sugar level, analyses of the input data, reminders to medicinal reminder and monitoring blood sugar levels. Each patient was instructed to record their blood sugar readings in the app and monitor them regularly. In the next follow up all the patients were gathered and delivered additional information about the applications, technique to use them and benefits. Following that, a questionnaire was distributed among the patients and they were guided to answer them using the survey monkey. A second follow up was conducted to record the feedback of the user. This follows up engaged the patient individually with a questionnaire that assessed the usability and benefits of smartphones. The selection of the app was based on the price, knowledge of the patient and user reviews and usability.

One of the simple app used is the Smartphone app OnTrack. The patients were given a demonstration of a diabetic app such as its usage, benefits (free of cost), and uniqueness. The patients were guided to record their blood sugar level, calculate the average

blood glucose levels, medication time, etc. The usability of the application was assessed by determining the effectiveness and frequency of the patients use the apps. The patient report related to the task efficiently handled, the easiness to run the app satisfaction level and confidence developed using them. Patients were encouraged to check their blood sugar level and take medications by using the reminder alarm on the Smartphone apps

RESULTS:

The data collected highlighted the ease in the usability of the apps in smartphones. The normality of the data was evenly distributed as per the Kolmogorov-Smirnov test. Out of 10 patients, only 5 patients reported feedback on the survey monkey. However, in the questionnaires, all the questions were answered by the patients. Data collected on the survey monkey was not analysed due to the lack of response however positive response was recorded in written form.

The data collected from questionnaires displayed that 70% of patients had a clear idea of using the applications on smartphones whereas out of this 60 % demonstrated confidence and frequency in using them. Out of 10, only 5 patients reported that they effectively used the diabetic app for recording their blood sugar level. Almost all the patients claim that they used the app atleast as a reminder to take their medicine and monitor their sugar level, regularly. Only 7 patients found the app efficient and effective while all patients found the graphics of blood sugar recording and representation on chart comprehensible.

DISCUSSION:

The present study conducted displayed positive results in the assessment of the usability of the diabetic application in diabetes management. Usability had a direct relationship with the management of diabetes. The present study displayed that guiding the patients and teaching them the basics for installing and using an application plays an important role in motivating them and allowing them to confidently use the app. Many patients had prior knowledge regarding the installation and running of the app; however, not everyone is adapted to run every feature of the app unless there is proper guidance given. The multitude of explanations was sorted after comparison with previous studies.

With new technology and awareness in diabetic management, the statistics of previous years have shown a decrease in the mortality rate and increase chances of improvement(4). Studies indicated that the prevalence of the disease can be controlled through focused management of glucose, blood pressure (BP), and lipid levels in diabetes type 2(6, 11). In 2010, the US presented with recommended

guidelines, HbA1C) <7.0%, BP <130/80 mmHg, low-density lipoprotein (LDL) cholesterol <100 mg/dl and an annual foot exam who evidently presented with improvement 7.9%, 11.7%, 20.8% and 6.8% , respectively(11).The studies later performed displayed that no improvement in the patient's conditions, failing to conform by the guidelines set(8, 12). Moreover, only 14.3% fulfilled the designated recommendations for the test (HbA1c, BP, and LDL cholesterol) besides adapting no smoking(12). People have shown limited adherence to the medication regimen in the past.

Therefore, to aid the people in diabetes management and avoid the rise in the incidence of death, diabetic applications were created. Diabetic management is not related to taking the medicines on time and monitoring the sugar level. It is defined as the strategy applied to counteract the problem and reduce dependency on the medication. This could play an essential role for those people also who are prediabetic if it incorporates such features, which motivates for a better lifestyle. This diabetes self-management includes blood glucose monitoring, physical activity, and diet alteration. The present study has shown that Ontrack is not a popularly used application to track the blood sugar level. Among the diabetic patient, glucose monitoring is easily managed through the applications. Previous studies displayed that the diabetic people who kept track of their sugar level displayed a better level of self-care compared to those who did not use, independent of key confounding variables such as age, sex, and educational status. Many respondents expressed that the constant reminder from the app helped them to keep track of sugar level, diet and medication, which regulated their system efficiently.

The comparison of the previous studies and present collected data provides an insight related to the problem or disease thriving currently in the nation that indicates prospects. Previous researches defined that the incidence of diabetes has leveled down in the 2000s; however, another rising cause associated was obesity(9, 10). National Health and Nutrition Examination Survey presented in recent times that the rate of obesity has risen from 35% to 38% from 2011 to 2014(9). This increases the risk of not only heart-related disorders but also chances of diabetes. This often led to a controversial debate between the authors on this topic. Nevertheless, the IAF Diabetes 2030 Model demonstrated a constant incidence reporting to avoid miscalculating prevalence growth(9).

One of the studies evaluated the total number of most used apps on the google play and apple store. Among the top 20 apps, glucose tracking and physical activity as the most common features of the apps. Furthermore, the results showed that the presence of apps does not fulfil all patient's

expectations associated with a self-management tool. Despite the shortcomings, the patients continue using the applications. The analysis of the application presented that most of the functions of apps were according to the demands of the patients; however, some expressed existing apps were missing important functions. Nevertheless, the use of the application depends upon the perspectives of the patients individually(13). The app's creation must take into consideration patients' desires and preferences that are necessary to engage the patient in self-care and management. The majority of them just have a medication adherence feature. A large proportion of the apps did not display some of the basic features such as continuous reminders, medication instructions, and medication adherence review. These apps fail to devise a strategy that would help them regulate their lifestyle changes and adhere to medication.

According to a literature review, the current applications only focused on the maintenance of nutritional diet, physical activity and medication timings that are not the only components essential for managing diabetes(14). Ontrack diabetes app; however, demonstrates an array of benefits such as reminder information tracking of food and medication and graphical representation for sharing with doctors. Even though when an application such as Ontrack mostly fulfils the demand of the patient the lack of knowledge to run the application is another barrier that reduces usability. The study trained and guided enrolled patients. The end assessment showed positive results indicating sometimes the cause for the ignorance is lack of knowledge and awareness; therefore it can be recommended at the time that doctors should play an important role at this stage to engage the patient and motivate them to connect to such app and extract benefits out of them.

Many types of research indicated that the mobile applications are not available to all the patients globally, due to lack of advancement in the underdeveloped country(10, 14). Apart from the limited availability of the applications, relevant education related to the use of diabetic self-management applications(15). The present study followed a pattern to observe the usability of the application, starting from educating them until the regular use of the application. The result coincides with previous research that reported these variables to be underutilized (15). The lack of knowledge regarding the use of the app often creates a barrier for the patient to acquire full benefits.

Another possible factor that contributes to limited use of the application is certain apps are not able to connect and synchronize with a glucometer or insulin pump. Researches stated that insulin – associated patients face challenges during physical

activities while holding on to phones and the insulin pump(13, 16). In such a situation the lack of interoperability is one of the main concerns of patients. Moreover, some of the applications on the app store are paid apps; therefore, many users avoid spending on such applications because they don't feel it is worthy. Nevertheless, many people expressed that they would be interested to invest if the application provided the desired results and demonstrated technological adaptability. Most of the free downloaded apps presented with standard tools for data logging and sugar level tracking features; however, some lacked that basic feature to engage the patient with medication adherence and safety

Besides, it was further assessed that less than 10% of the apps provided adequate information related to diabetes medication and a digital connection with the healthcare professional(3). This type of information is necessary for people to adjust to new medicinal therapy. Enlisting adequate information creates awareness and increases the doctor-patient bond as the patient is assured related to the medication taken. (1). Many apps had features that engaged the user for a long period such as activities, creating awareness, medication adherence. Less than 4 % of the apps have shown that activities are designed to motivate the user. Lastly, in 40% of the apps data export is not a feature that is necessary for reviewing the treatment plans and goals by the doctor and patient(13).

In many cultures, complementary medicine is supported; however, these are contraindicated due to any complications. It was identified that only two iOS apps presented and provoked the patients to use complementary medication(8). Even though the premature stoppage of medicine can also result in adverse effects. It essential for every app developer should add a cautionary message to aware them regarding the contraindications. moreover, allergies should also be documented for an indication of any food-related or medicine related allergies; however, only 3.5 % of the apps have such capacity(1).

Another possible explanation for the drawback of the apps is that it does not involve a healthcare provider that guides them towards evidence-based practice.13.6% of the app developed was in collaboration with a health care provider whereas 1 % were created using evidence-based app(1). Ineffective features and apps usually result in intermittent use. Such as although the app continuously reminds regarding the medication intake but lacks basic medicine reminders and does not align evidence-based recommendations. Further investigation is necessary for the inclusion of such features.

Furthermore, a regular quality check is an important step in regulating such apps. The features of the app

are necessary to be evaluated for the measurement of app quality. The apps are approved by the FDA; therefore, quality assurance should be conducted under the play store and FDA on regular bases to update them despite the flaws present in them that fail to fulfil some patient and doctor's needs. Thus, apps developers should remain upto date and try in cooperating with the basic needs of the patient and collaborate with the health care providers for co-designing.

Nevertheless, some limitations are associated with the study despite the efforts to minimize the bias. Firstly, the study lacks generalisability. The study was conducted on limited patient thus the results could not be easily validated. To assess the usability different population should be included. Secondly, only a single app assess ability was performed that is Ontrack and was unable to cover a broad spectrum of medical applications. Diabetes was chosen because of the chronic prevalence. The study assessed that usability depended upon the former knowledge and awareness that displayed is necessary to increase the usability. In underdeveloped countries, this is a thriving problem. The questionnaire had a limited assessment criterion and it should have covered the questions regarding the features, contraindication, activities, and presence of information related medicines in further investigations.

CONCLUSION:

These smartphone applications are thus beneficial especially for elderly people who find difficulty in interpreting their sugar level and managing their diabetes. The study successfully showed that for better access to such apps basic knowledge of the features is essential; hence, eases usability and acceptance.

REFERENCES:

- Demidowich AP, Lu K, Tamler R, Bloomgarden Z. An evaluation of diabetes self-management applications for Android smartphones. *Journal of telemedicine and telecare*. 2012;18(4):235-8.
- Edelman SV, Polonsky WH. Type 2 diabetes in the real world: the elusive nature of glycemic control. *Diabetes care*. 2017;40(11):1425-32.
- Garabedian LF, Ross-Degnan D, Wharam JF. Mobile phone and smartphone technologies for diabetes care and self-management. *Current diabetes reports*. 2015;15(12):109.
- Wang J, Wang Y, Wei C, Yao N, Yuan A, Shan Y, et al. Smartphone interventions for long-term health management of chronic diseases: an integrative review. *Telemedicine and e-Health*. 2014;20(6):570-83.
- Kasap S, editor *Developing a Mobile Application and Six Sigma for Health Awareness Improvement regarding Diabetic Students in Kuwait*. 2018 6th International Conference on Future Internet of Things and Cloud Workshops (FiCloudW); 2018: IEEE.
- Breland JY, Yeh VM, Yu J. Adherence to evidence-based guidelines among diabetes self-management apps. *Translational behavioral medicine*. 2013;3(3):277-86.
- Bradway M, Årsand E, Grøttland A. *Mobile Health: empowering patients and driving change*. *Trends in Endocrinology & Metabolism*. 2015;26(3):114-7.
- Alhuwail D, editor *Diabetes Applications for Arabic Speakers: A Critical Review of Available Apps for Android and iOS Operated Smartphones*. *Nursing Informatics*; 2016.
- Karduck J, Chapman-Novakofski K. Results of the Clinician Apps Survey, how clinicians working with patients with diabetes and obesity use mobile health apps. *Journal of nutrition education and behavior*. 2018;50(1):62-9. e1.
- Thomas JG, Wing RR. Health-e-call, a smartphone-assisted behavioral obesity treatment: pilot study. *JMIR mHealth and uHealth*. 2013;1(1):e3.
- Huang Z, Soljak M, Boehm BO, Car J. Clinical relevance of smartphone apps for diabetes management: A global overview. *Diabetes/metabolism research and reviews*. 2018;34(4):e2990.
- Bakker D, Kazantzis N, Rickwood D, Rickard N. Mental health smartphone apps: review and evidence-based recommendations for future developments. *JMIR mental health*. 2016;3(1):e7.
- Brandell B, Ford C. Diabetes professionals must seize the opportunity in mobile health. *Journal of diabetes science and technology*. 2013;7(6):1616-20.
- Sieverdes JC, Treiber F, Jenkins C, Hermayer K. Improving diabetes management with mobile health technology. *The American journal of the medical sciences*. 2013;345(4):289-95.
- Fitzner K, Moss G. Telehealth—an effective delivery method for diabetes self-management education? *Population health management*. 2013;16(3):169-77.
- Shah VN, Garg SK. Managing diabetes in the digital age. *Clinical Diabetes and Endocrinology*. 2015;1(1):16.