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Diabetes Applications for Arabic Speakers: A Critical Review of Available Apps for Android and iOS operated Smartphones

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Abstract. Today, 415 million adults have diabetes; more than 35 million of diabetic adults live in the Middle East and North Africa region. Smartphone penetration in the region is high and applications, or apps, for diabetics have shown promising results in recent years. This study took place between September and December 2015 and reviewed all currently available smartphone diabetes apps for Arabic speakers in both the Apple App and Google Play stores. There were only few diabetes apps for Arabic speakers; only eighteen apps were discovered and considered for this study. Most apps were informational. Only three apps offered utilities such as glucose reading conversion. The apps had issues related to information quality and adherence to latest evidence-based medical advice. There is a need for more evidence-based Arabic diabetes apps with improved functionality. Future research of Arabic diabetes apps should also focus on the involvement and engagement of the patients in the design of these apps.

Keywords. Diabetes; Arabic; mHealth; Mobile Devices; Healthcare Applications; Apps; Health Informatics

1. Introduction

Diabetes is among the top common chronic conditions globally [1]. Today, 415 million adults have diabetes; this number is expected to rise to 642 million by 2040 [2]. There is an increasing concern about diabetes and its associated complications in the Middle East and North Africa (MENA) region [3]; more than 35 million (9%) of adults aged 20-79, live with diabetes in this region [4]. Additionally, smartphone adoption has been on the rise in the MENA region. For instance, recent reports estimate that 86% of Kuwait's entire population owned smartphones [5]. Moreover, healthcare applications, or "apps", on smartphones have been on the rise with more than 100,000 apps [6], [7]; Diabetes apps have a fair share of the apps market [8]–[11]. Diabetes apps enable their users to learn about diabetes and its effects on other organs and body systems. Users can also track their glucose readings, note their dietary intake, record their activity level, and calculate the recommended insulin dosage [12]. Given the rising numbers of diabetics in the MENA region, the growing number of smartphone users in the same region, and the paucity of studies investigating diabetes apps for Arabic speakers, this study was critical. This application review study investigated all currently available

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diabetes apps for Arabic speakers that were available for smartphones operating with the iOS and Android operating systems. Results will provide insights and direction for future research and development of mHealth and diabetes apps targeting Arabic speakers.

2. Methods

A systematic and exhaustive critical review of all currently available diabetes apps for Arabic speakers was conducted between September and December 2015. Both iOS and Android operating systems were included. Only apps catering to the Arabic language speakers, or apps that have an Arabic interface were considered. In the first step, Arabic keywords were identified; the following words were used: (Sukkar-سكر; Alsukkar-السكر; Sukkari-سكري; Alsukkari-السكري) To search for the relevant apps, both the Apple App and the Google Play Stores were searched using both the web interface as well as the respective stores on android and iPhone devices. Detailed information on each app were extracted and reviewed including description, functionality, and price. All free apps were downloaded and their functions were examined closely.

Table 1. Diabetes apps for Arabic speakers available for Android and iOS smartphones

App	Arabic Name	Platform†	Type‡	Cost
Diabetes and Fasting	رمضان وداء السكري	A	I	Free
Best Fruit for Diabetics	أفضل الفواكه لمرض السكر	A	I	Free
Diabetes News and Advice	أخبار ونصائح مرض السكري	A	I	Free
Treatment for High Blood Glucose	ما علاج السكر المرتفع	A	I	Free
Sugar Test Converter	N/A	A	U	Free
Alsukari	السكري	A & i	S	Free
Diabetes Aid by KFH	N/A	i	U	Free
About Diabetes App	عن مرض السكري	i	I	Free
Children's Diabetes	سكري الأطفال	i	I/U	Free
My Life is Diabetes	حياتي سكر	i	I	Free
Advice for Diabetes	نصائح لمريض السكر	i	I	Free
Diabetes – Alsukari	السكري	i	I	Cost
Webteb	ويب طب	A & i	I	Free
Health Encyclopedia by HON	N/A	A & i	I	Free
How to Stay Healthy	طرق الحفاظ على صحتك	i	I	Free

† Platform: (A) Android – (i) iOS ‡ Type: (I) Informational – (U) Utility – (S) Social Network

3. Results

3.1. Android Apps

A total of eight Android apps were identified on the Google Play Store (refer to Table 1). *Alsukari* app enabled diabetics to signup for a social network targeting diabetes management and awareness. The app claimed its ability to connect users with a large number of diabetics and diabetes nurses. The *Diabetes News and Advice* was a news app that offered the latest news in diabetes management, interventions, and studies. *Treatment for High Blood Glucose* was an informational app that offered static advice

for diabetics on how to manage hyperglycemia. Other similar informational apps included *Webteb, Health Encyclopedia, Diabetes and Fasting,* and *Best Fruit for Diabetics*. The only utility app for Android smartphones was the *Sugar Test Converter* app; it enabled users to convert their blood glucose readings in either mg/dl or mmol/l, which is helpful when using different devices requiring different measurement scales.

3.2. iOS Apps

A total of ten apps were identified on the Apple App Store (refer to Table 1); some apps had a similar version for Android devices. The *Diabetes Aid* app offered the most functions and utilities among all diabetes apps for Arabic speakers. Users were able to keep track of their blood glucose readings, medications, and body mass index (BMI). Users were also able to keep notes in a journal and get access to educational information about diabetes. The *Children's Diabetes* app was designed for young users and allowed its users to keep track of their insulin intake, read stories and play diabetes-related games. Users were also able to get access to educational information about diabetes such as the difference between type 1 and type 2 diabetes. The other apps were informational in nature offering general advice and information about diabetes and its prevention. These apps were namely: *About Diabetes, Advice for Diabetics, and Alsukari*. *My Life is Diabetes* app on the other hand offered users access to embedded and pre-selected YouTube videos explaining diabetes in Arabic. Although not specific for diabetes, the *Webteb* and the *Health Encyclopedia* apps offered good coverage of diabetes-specific information and advice in Arabic for their users.

4. Discussion

4.1. Availability and Function

As evident from the results, there were few diabetes apps for the Arabic language speakers. Only eighteen apps in total were discovered in both the Apple App and Google Play stores. This number is quite low when compared with the English language diabetes apps, which exceed nine hundred apps [13]. All the apps reviewed in this study, with the exception of four, were educational and informational in nature offering information about diabetes or news articles related to it. Only three apps offered utilities that helped their users with glucose reading conversion, or keeping track of glucose readings for example. Only one app offered a social network platform that connected diabetics with fellow diabetics as well as diabetes nurses.

4.2. Health Information Quality

An alarming and critical problem with all the reviewed apps, and many other health apps in fact, is the absence of a quality assurance and safety certification of their contained information; many apps were available without medical review or endorsement and may not have followed evidence-based medical advice [14]. Health apps should be routinely monitored and continuous quality reviews should be enforced [15]. None of the reviewed apps provided information regarding the sources of information or any assurance of their app's information quality or medical endorsement.

Currently, it is not known if there are any regulatory bodies in the MENA region that govern diabetes and other healthcare apps and review them. Moreover, there were two apps, not included in the study, that were "prank" apps. The user was presented with a picture of a fingerprint, instructed to place their finger on the screen, and a false reading of their glucose level was displayed. Such hoax apps can be dangerous if the user did not recognize them as a game-like apps and considered the feedback as a real reading.

4.3. Opportunities

The results clearly demonstrate the scarcity of diabetes apps for Arabic speakers. There are opportunities for smartphone app developers, health informatics professionals, and healthcare providers to bridge the gaps and build more evidence-based diabetes apps. Governing bodies and health authorities in the MENA region should also consider taking a more active role and offer direction and governance over healthcare and medical apps development. In concordance with recent evidence [16], future research of Arabic diabetes apps should also focus on the involvement and engagement of the patients in the design of these apps. Additionally, patient generated data from these apps should be integrated into the current health information technology systems, e.g. electronic health records [17].

4.4. Study Limitations

Like other studies, this study has limitations. First, only the Android and iOS operating systems were investigated; Microsoft and Blackberry operating systems were not investigated due to limited adoption and use in the MENA region. Another limitation stems from the focus of the study. There were other apps available for related conditions or relevant to lifestyle changes suggested for diabetics (e.g. nutrition apps) that were not included. Only apps that focused on diabetes and in the Arabic language were studied, because such apps offered the most functions and were most likely to be adopted by diabetics. In spite of these limitations, this study successfully uncovered the paucity of diabetes apps for the Arabic speakers, therefore highlighting opportunities for future research and development.

5. Conclusions

This critical review investigated the availability and functionality of diabetes apps for Arabic speakers that were available on the Apple App and Google Play stores. The number of diabetes apps for Arabic speakers was low; the majority of the currently available apps were educational and informational in nature. There are opportunities for health informatics professionals, app developers and healthcare providers to collaborate to increase the availability and functionality of apps for Arabic speaking diabetics. Patients should be an integral part of any diabetes app development. Future research should investigate how to best engage the patients in the care plan using these apps and making use of patient-generated data. There is also a need to establish mechanisms in the MENA region to ensure that all apps adhere to standards of information quality, and based on the latest evidence-based medical advice.

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