

Perception Towards the Use of Smartphone Application (Apps) to Enhance Medication Adherence Among Saudi Pediatrics

ORIGINAL

Abstract

Objectives: The aim of this study was to measure the importance of smartphone applications (Apps) in medication adherence in children to help parents and caregivers in giving medication to children to maintain a good health and quality of life, and to improve current clinical practices in adherence to medications among Saudi pediatrics.

Methods: Cross sectional survey to Saudi Arabia population was conducted from March to April 2017 (n=405). Data were collected, tabulated and analyzed using Survey Monkey. We present design requirements for building medication reminders that support the routine aspect of medication-taking by linking children's concerns, (such as games) on taking medications at time.

Results: Of the 405 survey participants, the majority of participants 72.5% were not aware by applications of smart device that make easier to take medicines regularly. Eighty percent of participants preferred a mobile app to help their children take the medicine easily and regularly, and 39.8% of them thought that the child will interact with this game, the majority of them 88.6% don't have any obstacle hinders the use of these updated applications. Fifty percent of them will encourage young patients, to use such applications (App) to help them in their medication adherence.

Conclusion: Nonadherence to medication is still represents a fundamental health care challenge. The presence of an application makes it easier for parents to give medication to their sick children. Most children love playing games, there is a high probability of their attachment to this application (App) and it will promote children's medication adherence.

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Keywords

Patient Adherence; Pediatric;
Smartphone; Applications;
Apps.

Introduction

'Adherence' is 'the extent to which the patient's behavior matches agreed recommendations from the prescriber' [1]. So, it is more suitable term than 'compliance' because it involves patient in making decision around their medication [2]. Adherence to treatment (or carrying out agreed health care recommendations) is approximately 50% in most chronic diseases and has been described as a "worldwide problem of striking magnitude". Patient adherence to medical therapy is important to prevent worsening of their medical condition [3].

Non-adherence is controversy between patient attitude and medical recommendation; it is a public concern because its significant patient-, family-, and healthcare system- level influences [4]. Medication nonadherence has impact on patient health, negatively influence a patient's relationship with his/her care provider, also will affect the results of clinical therapy trials, and increase health cost [5, 6]. Medication nonadherence remains a common health care problem. Poor adherence causes approximately 33% to 69% of medication-related hospitalizations and accounts for \$100 billion in annual health care costs [7].

Pediatric patients who were not adhere to their long term treatment for chronic medical conditions will suffer from unsuccessful treatment [8]. The cause of medication nonadherence varies among patients and is broadly categorized as unintentional or intentional. Unintentional nonadherence involves intending to take a medication as instructed but failing to do so for a reason (e.g., forgetfulness or carelessness). Unintentional nonadherence is influenced by patient characteristics, treatment factors, and patient-provider issues [9]. In contrast, intentional nonadherence involves making a reasoned decision not to take a medication as instructed based on perceptions, feelings, or beliefs [10].

New technology has resulted in improved clinical and research understanding of adherence behaviors in pediatric chronic illness populations [4]. Smartpho-

nes are mobile phones capable of running software applications, commonly referred to as apps. Apps are already widely used in the healthcare industry, and many experts predict that this trend will continue to grow [11, 12].

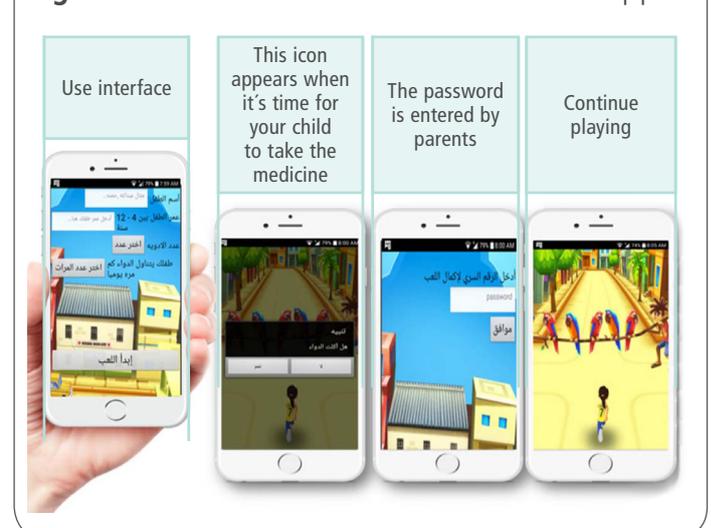
Aim of the work

This study aims to measure the importance of smartphone applications (Apps) in medication adherence in children. Also, to help parents and caregivers' in giving medication to children by linking children's concerns, (such as games) on taking medications at time to maintain a good health and good quality of life, and to improve current clinical practices in adherence to medications among Saudi pediatrics.

Subjects and methods

We present design requirements for building medication reminders that support the routine aspect of medication-taking by linking children's concerns, (such as games) on taking medications at time (**Figure 1**).

Figure 1: Pediatric Medication Adherence App.



Study design

A national cross-sectional survey was conducted on Saudi Arabia population from March and April 2017,

to measure the need of this application in helping their children to adhere to their medication.

Questionnaire

The questionnaire was designed in English and later translated to Arabic by a professional translator and reviewed for consistency by the investigators.

The questionnaire includes socio-demographic characteristics of the participants followed by items related to socio-economic status, the knowledge of Saudi population about use of modern apps in children medicine adherence. Also, the questionnaire includes some items related to the role of this application (App) in adherence and facilitation of the child's taking of medicines and the obstacle hinders the use of these updated applications.

The questionnaire was pre-tested for validity and reliability. It was tested to check if it was easy for the interviewers to understand the instructions and flow of questions. Prior to pre-testing in the field, the interviewers were undergoing training and were provided with instructions about the survey.

Data analysis

Data will be collected, tabulated, analyzed using Survey Monkey.

Results

A total of 405 Saudi participant were participate in this study. This study include Saudi Arabia families who have children (ages 4-12 year). Other population excluded from the study.

Sociodemographic and lifestyle characteristics

The socio-demographic and lifestyle characteristics of the 405 participants in the survey are shown in **Table 1**. Of these participants, 34.8% were aged between (20 to 29), 32.3% were aged between (30 to 39), 24.2% were aged (40 to 49), and 8.6% were aged more than 50 years. More than 85% were female participants and 14.8% were male partici-

Table 1. Sociodemographic characteristics of participants (%) (n=405).

Characteristics	No.	%
Age (years)		
20-29	141	34.8
30-39	131	32.3
40-49	98	24.2
More than 50 years	35	8.6
Gender		
Male	60	14.8
Female	345	85.2
Education		
Uneducated	2	0.5
Secondary school	71	17.5
Undergraduate	308	76
Post graduate	24	5.9
Number of kids		
1-3	260	64.2
3-5	79	19.5
More than 5 kids	66	16.3
Age of kids (years)		
2-4	198	49
5-10	217	53.7
11-12	162	40.1

pants. Only 0.5% of participants were uneducated, 76% had college or university education and 5.9% had completed a degree. Over 64% have from 1-3 kids, 19.5% have from 3-5 kids and 16.3% have more than 5 kids. Regarding the age of the participants kids, 49% the age of their kids between 2-4 years, 53.7% the age of their kids between 4-10 years and 40.1% the age of their kids between 10-12 years.

Attitude toward use of application in smart phone or tablet device in medication adherence

Table 2. shows The attitude of participants toward the use of application in medication adherence. More than 22% of participants always have difficulty in giving medicine to children during illness, 67.2% of participants sometimes have difficulty and

Table 2. Attitude toward use of application in medication adherence, n=405 (%).

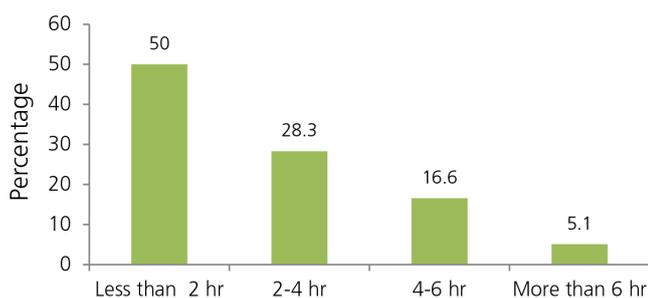
Variable	No.	%
Difficulty in giving medicine to children during illness		
Always	92	22.7
Sometimes	272	67.2
Never	41	10.1
The child has a mobile phone or tablet device		
Yes	287	70.9
No	118	29.1
Parents allow their children to use mobile phone or tablet device		
Yes	301	74.3
No	104	25.7

10.1% of participants never have difficulty in giving medicine to children during illness. Over 70% of participants their children have a mobile phone or tablet device and 29.1% of participants their children do not have a mobile phone or tablet device.

Of 405 participants, 301 (74.3%) allow their children to use their mobile phone or tablet device and 104 (25.7%) did not allow their children to use their mobile phone or tablet device.

Regarding number of hours the child spends on mobile phone or tablet device, 50% of participants their children spend less than two hours, 28.3% of participants their children spend between 2-4 hours, 16.6% of participants their children spend between 4-6 hours and 5.1% of participants their children spend more than 6 hours as shown in **Figure 2**.

Figure 2: Number of hours the child spends on the mobile or tablet device.



The awareness by applications of smart device that make it easy to take medicines regularly

Table 3 shows that (7.9%) of participants were aware by these applications, (19.6%) of participants were aware up to certain extent and the majority of participants (72.5%) were not aware by these applications.

More than 80% of participants preferred a mobile application (App) to help their children to take the medicine easily and regularly and (19.5%) of participants did not prefer that.

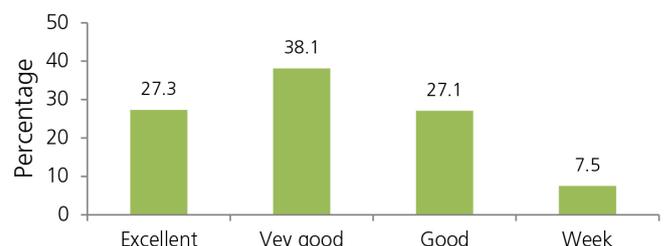
Table 3. Awareness by applications that make it easy to take medicines regularly, n=405 (%).

Variable	No.	%
Level of awareness		
Yes	32	7.9
Up to certain extent	79	19.6
No	293	72.5
Preference a mobile app (game) to help children to take the medicine easily and regularly		
Yes	326	80.5
No	79	19.5

Knowledge about the contribution of this application (game) in adherence and facilitation of the child's taking of medicines

Figure 3 shows that (27.3%) of participants considered the contribution of this application (App) is excellent, (38.1%) of participants considered the contribution of this application (App) is very good, (27.1%) of participants considered the contribution of this application (App) is good and (7.5%) of par-

Figure 3: Knowledge about applications that contribute in medication adherence.



ticipants considered the contribution of this application (App) is weak.

Distribution of participants according to the obstacle hinders the use of these updated applications

Regarding the obstacle hinders the use of these updated applications, the majority of participants 88.6% didn't have any obstacle and 11.4% of participants have obstacle hinders the use of these updated applications as shown in **Table 4**.

Table 4. The obstacle hinders the use of these updated applications, n=405 (%).

There are obstacles	No.	%
No	359	88.6
Yes	46	11.4
Total	405	100

Discussion

Research into promoting treatment adherence has found that the most effective interventions are complex and include combinations of more convenient care, information, reminders, specific behavioral change techniques [13] and involving patients in the decision-making process [14].

The need for patient-centered interventions to improve adherence is apparent and the opportunity for technology in the development of these interventions is increasing [15, 16].

In the present study most of participants (67.2%) have sometimes difficulty of giving medicine to children during illness. This was in agreement with Santer et al., (2014) study that reported the ability to adhere to a treatment regimen depended on several key factors-difficulty associated with its implementation (such as treatment side-effects) and child resistance and the threat that these factors posed to family relationships and 'normal life' for the child and any siblings [17].

This study revealed high percentage of participants (70.9%) their children have a mobile phone or

tablet device. This was in agreement with Lenhart, A. et al., (2010) study which reported 46% of US youth have a cell phone by the age of 12, and the age at which youth receive their first cell phone is lowering each year [18].

This study showed most of participants 74.3% allow their children to use their mobile phone or tablet device which was in agreement with Chiong, C. et al., (2012) study that reported two thirds of parents allowed their young children (ages 4-7 years) to use their iPhones and iPads for children's apps [19].

In the present study (72.5%) were not aware by applications of smart device that make it easy to take medicines regularly. Delpier, T. et al., (2012) founded that the clinical application of the smartphone and use of apps in areas of health wellness is growing, but empirical analyses of patient use of the smartphones with apps as an aid to facilitate adherence are lacking [20].

The present study showed that 27.3% of participants considered the contribution of this application (App) is excellent, 38.1% of participants considered the contribution of this application (App) is very good, 27.1% of participants considered the contribution of this application (App) is good and 7.5% of participants considered the contribution of this application (App) is weak. Mistry, N., et al., (2015) study reported that visual cues might have acted as a persistent reinforcement to the audible reminders. Perhaps the visual dimension might have functioned as direct feedback, potentially adding one more mechanism of action for these interventions. Technology can be used to provide external feedback to help patients achieve positive adherence behavior [21]. Also, Dayer, et al., (2013) reported that many apps possess greater functionality that includes customizable audio and visual prompts capable of providing more robust reminders, the efficacy of apps may be equal to or greater than SMS text messaging [22].

The present study illustrated 6.7% participants did not think the child will interact with this appli-

cation (App), 39.8% thought the child will interact with this application (App) and 53.6% up to certain extent which was in agreement with Jessica R et al., (2014) study that reported that children's apps, stealth interventions were most commonly accomplished through a game format. Children are intrinsically motivated to play games. When health education and/or exercise are built into a game format, children are more likely to enjoy the intervention and, as a result, more likely to engage in target behaviors and reach the target outcome [19]. Also, our results were in agreement with Mistry N, et al., (2015) who report that the current pediatric population can be considered digital natives. As such, novel TMI's) Technology-mediated interventions (e.g., videogame-based interventions, smart-watch interventions, wearable technology) may appeal to their digitally immersive lifestyles, with the potential to be applied across wide spectra of diseases [21].

This study showed most of participants 88.6% didn't have any obstacle hinders the use of these updated applications which were in agreement with Dayer, et al., (2013) who reported that most tasks are performed by specialized applications (Apps) that consumers can easily download and use to assist them in a variety of functions. Adherence apps can be downloaded for little to no cost, and their benefits may be realized by anyone taking prescription medications [22].

Conclusion

Despite decades of research, medication non-adherence still represents a fundamental health care challenge. Adherence apps are inexpensive, scalable, accessible to anyone with smartphones, and do not require separate devices or packaging, which allows them to be easily implemented and could be considered a possible strategy to recommend to non-adherent pediatric patients.

The presence of an application makes it easier for parents to give medication to their sick children to

promote their health, maintain a good health and good quality of life.

Most children love playing games, there is a high probability of their attachment to this application (App) and it will promote children's medication adherence.

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