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Investigating the Predictors of Women's Future Intention to Accept and Use Smartphone Applications for Type 2 Diabetic Self-Management

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Abstract: **To test a theoretical model examining selected predictors (performance expectancy, effortexpectancy, social influence, patient-centered factors) of the future intention to accept and use smartphone applications for Type 2 diabetic self-management among Saudi women. A descriptive, cross-sectional survey was conducted with 98 women with Type 2 diabetes in public primary healthcare centers in Jeddah, Saudi Arabia. Participants were asked to complete a questionnaire including smartphone use, modifiedUnified Theory of Acceptance and Use of Technology Scale, and scales measuring patient-centered factors between October 2017 and January 2018. Participants in this study intended to accept and use smartphone applications for diabetesmanagement in the future. Their current use of smartphone applications in diabetes management influenced their intention to continue using diabetes mobile applications. Testing of the theoreticalmodel found 32% of the variance in participants' intention to accept and use smartphone applications to manage Type 2 diabetes was explained by the six predictors. However, only effort expectancy was a significant predictor in the final model. This study is the first to examine the acceptance of smartphone applications toenhance self-management among women with Type 2 diabetes in Saudi Arabia. The significant contribution of this study was broadening our understanding of the intention of women citizens to use smartphone applications for self-management. The study addressed the intention to use smartphone applications for Type 2 diabetic managementamong Saudi women. The study findings suggest that the ease of using smartphone applications will improve adoption in the future. Therefore, both healthcare providers and Saudi women must be engaged in creating smartphone applications to ensure the development of effective applications for self-management.**

Keywords: **Technology, self-management, women, health, Saudi Arabia, Smartphone, Type 2 Diabetes.**

1. INTRODUCTION

The incidence of Type 2 or non-insulin-dependent diabetes mellitus is rapidly growing in many countries worldwide (Khan et al., 2011). In the Kingdom of Saudi Arabia (SA), 28% of Saudi women have been diagnosed with Type 2 diabetes (Daoud et al., 2016), a rate that ranks high in an international context, particularly among other countries in the Middle East (Control & Prevention, 2014; Mansour et al., 2014; Satman et al., 2013). Suboptimal management of Type 2 diabetes is associated with multiple health problems among Saudi women that are highly preventable (Daoud et al., 2016; Mundi, 2015). However,

Saudi women consistently report receiving less diabetic education for self-management than men (Abdelmoneim & Al Homrany, 2002), resulting in a lack of awareness and adherence to diabetes management (Salam & Siddiqui, 2013). Poor diabetes management is related to many extrinsic factors, including most women having difficulty attending programs due to the previous requirement to be accompanied by a male guardian while driving, according to Saudi law (Rajkhan, 2014). Other personal factors include education, income, duration of diabetes, geographical distance, transportation issues, and age (Alharbi & Alhazmi, 2020). Few studies have examined how such concerns in Type 2 diabetes self-management for women may be addressed in the Saudicontext.

Mobile communication technology, in particular, has changed how people interact with banking, education, and healthcare services. For decades, researchers have sought to understand why people embrace new technologies. The Patient Technology Acceptance Model (PTAM) was used to build a theoretical model for chronically ill patients' views on technology adoption and behavioral intention. The hypothesis implies that chronic illness patients may or may not utilize technology depending on their health, surroundings, personal traits, and healthcare technology aspects (KL & Karsh, 2006). The PTAM is based on the Technology Acceptance Model (Davis, 1989) and the Unified Theory of User Acceptance of Technology, an enlarged version of the TAM (Venkatesh et al., 2003). This study's model uses four PTAM predictor factors that best predict SA women's behavioral intention to embrace and utilize smartphone technology for Type 2 diabetes self-management. The four predictors are performance, effort, social influence, and patient-centred characteristics (healthcare knowledge, health information-seeking preference, and self-management technology reliance) **(Figure 1).**

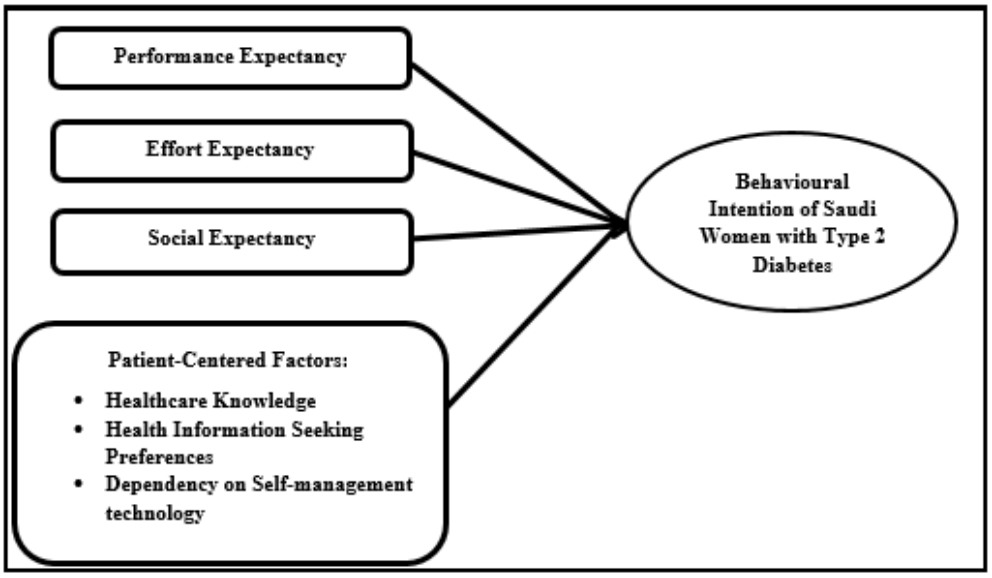

Figure 1: Theoretical Model Used in this Study (adapted from Or & Karsh, 2006)

Behavioral intention is based on the acceptability of behavior, such as using a smartphone (Fishbein & Ajzen, 1977; Taylor & Todd, 1995; Venkatesh et al., 2003). According to the hypothesis, a person with a firm intention is more likely to put in the effort, which increases the probability of really executing behavior (Fishbein & Ajzen, 1977; Taylor & Todd, 1995; Venkatesh et al., 2003). This research defines "behavioral intention" as Saudi women's future intention to utilize smartphone technology to treat Type 2 diabetes. Studies have found that an individual's desire to do an activity was the most significant predictor of their execution (Godin & Kok, 1996). As smartphone-based patient self-management is still in its infancy in Saudi Arabia, this research primarily investigated participants' intention to adopt and utilize smartphone technology for diabetic self-management.

Performance expectation measures people's belief that technology will help them achieve goals. Patients may embrace technology if they think it will help them achieve beneficial results, such as better self-management (KL & Karsh, 2006). Performance expectation predicts patients' behavioral intention to adopt new technology (KL & Karsh, 2006; Kohnke et al., 2014; Venkatesh et al., 2003). In a Saudi study, performance expectations were positively correlated with behavioral intention to embrace smartphones. Smartphones helped participants perform better and complete more tasks (Aldhaban et al., 2016). In this research, performance expectation refers to the degree to which SA women with Type 2 diabetes feel that using smartphone apps in the future would improve their diabetes management.

Effort expectancy is the ease or difficulty of using new technology (Venkatesh et al., 2003). Several studies have found that effort expectancy significantly influenced patients' behavioral intentions to adopt new healthcare systems or technologies (Boontarig et al., 2012; De Veer et al., 2015; Kohnke et al., 2014; Venkatesh et al., 2003). If patients think they can use technology, they'll think it's simple and want to use it (KL & Karsh, 2006). SA women with Type 2 diabetes effort anticipation is their belief that using a smartphone for self-management would be straightforward and involve little effort.

(Venkatesh et al., 2003) define social influence as "the degree to which a person feels that prominent others believe they should utilize the new system" (p. 451). According to the PTAM, people are more (or less) inclined to do a behavior (like embracing technology) if they think significant others (such as visiting nurses, carers, and grandkids) believe they should (or shouldn't). (Thompson et al., 1991) and (Venkatesh et al., 2003) found that social influence significantly influenced behavioral intention to embrace new technology. (Wang & Wang, 2010) discovered that social influence greatly influenced behavioral intention and acceptance and that patients were more likely to embrace technology if they thought others valued it. Social impacts, such as peer or family influence, were significant across all age groups (Slade et al., 2013). People were more likely to embrace technology if influential people had previously accepted it. Due to cultural norms emphasizing communication for family and kinship interactions, cell phones and associated apps are frequently used in SA adopted (Alotaibi et al.). In this research, social influence refers to SA women with Type 2 diabetes perception that key people think they should utilize smartphone technology for self-management.

Patients' healthcare knowledge includes their health condition and illness management (Wilson & Lankton, 2004). Studies have shown that patients with inadequate health management skills are more inclined to seek health services and information (Ferguson, 2000; Fowles et al., 2004). This research suggests that SA women less aware of Type 2 diabetes treatment may be more likely to acquire and utilize smartphone technologies.

Patients believe they should be educated about their health issues and management (Ende et al., 1989; Venkatesh et al., 2003). Technology in healthcare may make health information more accessible for people to access and comprehend (Wilson & Lankton, 2004). In this research, SA women may be more likely to use smartphones if their healthcare providers inform them about Type 2 diabetes.

Patients' dependence on self-management technologies to address chronic conditions is called dependency. (Gitlin, 1995; KL & Karsh, 2006) revealed that patients who often utilized assistive technology the first month after its introduction were likelier to continue using and relying on it. Due to the widespread use of cell phones, over 55% of SA citizens have an internet connection and are increasingly reliant on them for information and communication, particularly for general healthcare (report, 2013). In this research, SA women who use cell phones for general communication and internet access would be inclined to use supporting technology like smartphone apps to manage their Type 2 diabetes.

2. METHODOLOGY

This survey was designed as a descriptive cross-sectional analysis and was carried out in Jeddah, Saudi Arabia. This research examined government-run public PHCs. According to Shafiaah Al-Judeani, the Ministry of Health administers 45 public PHCs in Jeddah (personal communication, March 4, 2017). However, only the 13 class A PHCs (North-central area = 6; Centre region = 5; South-central region = 2) were included to locate more participants in fewer visits. Each PHC includes five primary clinics, including a chronic illness clinic with gender-specific days. At seven PHCs around Jeddah city, 24,501 women and 12,482 men visited (personal communication, December 22, 2017). The remaining PHCs lacked data for this study, including attending the chronic illness clinic on women-only days.

The following hypothesis was tested: Higher levels of performance expectancy, effort expectancy, social influence, health information-seeking preference, dependency on self-management technology, and lower levels of healthcare knowledge will significantly predict higher levels of SA women's behavioral intention to use smartphone technology to manage Type 2 diabetes in the future.

2.1 Participants

This study used a non-probability (consecutive) sampling strategy. The researcher contacted the eligible individual and had an appointment at one of the primary healthcare clinics (PHCs). Participant recruitment continued until the desired number of participants was attained. G-Power (Faul et al., 2009) determined the sample size for multiple linear regression with a fixed model including six independent variables, alpha set at 0.05, power set at 0.80, and a medium effect size of 0.15. It was determined from this that 98 people should make up the sample.

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2.2 Inclusion and exclusion criteria

Patients who met the following criteria were included in the study:

- Participants must be female and 18 years of age or above.
- Independent users of the smartphone.
- Saudi citizens with Type 2 diabetes currently live in SA for no fewer than four months.
- Patients who attended clinics in public PHCs for education on self-management of their diabetes. These last two requirements were included to ensure participants had experience with self-management programs in SA PHCs, which usually require regular visits to the PHC every four to six months.

Exclusions were based on the following criteria:

- Saudi female citizens with Type 1 diabetes or gestational diabetes.
- For individuals under 18, the education for self-management programs in pediatric clinics is quite different from adult programs.
- Saudi women who were diagnosed with Type 2 diabetes while living outside SA would not have the same experience of self-management.

2.3 Data collection

Between October 2017 and January 2018, information was gathered via a questionnaire filled out by the respondent and an interview for those unable to read the questionnaire. The questionnaire was translated from English into Arabic since all participants spoke Arabic. A pilot test with six South African women representative of the target group was done before the Arabic questionnaire was administered to assess its readability and clarity. The pre-test findings showed that the questionnaire required no significant adjustments. An overview of the questionnaire's instruments is provided in **Table 1.**

Table 1: Variables and Questionnaire Instruments

Variable	Items	Instrument (Source)
Sample Characteristics		
Demographics	4	Developed by researcher
Diabetes duration and knowledge	3	Developed by researcher
Accessing PHCs	1	Developed by researcher
Use of Smartphones	8	Developed by researcher
Predictors		
Performance Expectancy	4	UTAUT (Venkatesh et al., 2003).
Effort Expectancy	4	UTAUT (Venkatesh et al., 2003).
Social Influence	3	UTAUT (Venkatesh et al., 2003).
Patient-centered factors		
Healthcare Knowledge	2	Health Knowledge Scale (Wilson & Lankton, 2004)
Healthcare Information Seeking Preference	4	Information-Seeking Preference Scale (Ende et al., 1989); (Wilson & Lankton, 2004)
Dependency on Self-Management Technology	2	Adapted from Or (2008)
Outcome		
Behavioural Intention	3	UTAUT (Venkatesh et al., 2003).

2.4 Data analysis

The collected data was analyzed using Statistical Package for the Social Sciences version 21.00 (Ibm 2012). Descriptive statistical analysis was performed on all study variables with medians, means, and standard deviations calculated for the continuous data and frequencies and percentages for the categorical data. Cronbach's alpha was conducted before performing multivariate analysis.

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Hierarchical multiple regression was used to test the theoretical model and the proposed hypothesis by determining the contribution of the six predictors (independent variables) on behavioral intention (dependent variable). The six independent variables were entered based on the theoretical model being tested **(Figure 1**). A similar hierarchical multiple regression method was used in prior studies (Lim & Ting, 2012; Venkatesh et al., 2003).

3. RESULTS

3.1 Characteristics of the participants

Among the 200 participants who were supposed to visit the 13 PHC clinics chosen for this study, 19 did not show up when they were supposed to, 43 were ruled out as ineligible, and 27 walked out before the researcher could even approach them. Hence, 111 people were contacted at the PHC clinic and included in the research since they met the criteria for participation. Of those determined to be eligible, 13 refused to participate, leaving a total sample size of 98 (88% response rate). The majority of participants were between 50 and 59 years of age (51%), married (75.5%), and worked at home without paid income (74%). Most participants had primary (42%), secondary (22%) school education, or post-secondary (19%). A small percentage had not attended school (8%).

3.2 Participants' Diabetes Duration, Self-Rated Knowledge, and Access to Care

When asked how long they had been diagnosed with Type 2 diabetes, responses ranged from 9 months to 27 years with an average duration of 9.6 years (standard deviation (SD) = 6.8; median

= 8). All participants reported they had attended or were attending education programs in PHCs related to self-management of their Type 2 diabetes. When asked how they would describe their knowledge related to diabetes following the PHC education program, most participants reported their knowledge as good (40%) or moderate (33%), while 28% described it as poor. When asked how distance and lack of transportation affected access to healthcare facilities, participants somewhat agreed they had difficulty accessing primary healthcare facilities (Mean (M) = 4.7, SD= 2.7).

3.3 Participants' Use of Smartphone Applications

During a typical day, the majority of participants reported using mobile smartphones "rarely" (1- 5 times) (40.8%, n=40), followed by "almost always" (>16 times) (21.4%, n=21). The most frequently used applications were social media (94%, n=94), followed by video-sharing media (50%, n=49), and internet browsing and search applications (33%, n=31). Most participants reported regularly using only one (24%, n=23) or two (28%, n=27) applications. Being an independent user of smartphone applications was an eligibility criterion for this study. However, four (4.1%) participants reported that they did not usually use any applications. During recruitment, these participants indicated that they had only recently started using smartphones.

In the survey, the most frequently identified obstacles preventing participants from using smartphones were "difficult to use" (33%, n=32), "short-life battery" (21%, n=21), "smartphones too expensive" (15%, n=15), and "low phone memory" (15%, n=15). Close to 26% (n=25) reported no difficulty using smartphones. When asked how many years they had used smartphone applications, responses ranged from one month to 15 years, with an average of 4.4 years (SD = 2.8). Forty-four percent (n=43) reported perfect knowledge of using smartphone applications, with 28% (n=27) reporting good knowledge, followed by moderate (20%, n=20) and poor knowledge (8%, n=8). As illustrated in **Table 2**, participants in this study 'agreed' using smartphone applications in the future will enhance their performance and effectiveness in managing their diabetes (performance expectancy), will be easy to use and free of effort (effort expectancy), and that others who are vital to them believe they should use smartphone technology (social influence). Regarding patient-centered factors, participants somewhat agreed that they know and understand their diabetes and its management (healthcare knowledge). They decided they should be informed about their health conditions and care for their disease (health information-seeking preference). However, participants reported they were only somewhat dependent on online health applications to manage their disease (dependency on self-management technology). Lastly, participants agreed that they intend to use smartphone applications for self-management of their Type 2 diabetes in the future (behavioral intention).

Table 2: Means and Standard Deviations for Study Scales (n=98)

	M	SD
Performance Expectancy*	6.06	0.99
Effort Expectancy*	5.83	1.17
Social Influence*	5.71	1.12
Patient-Centred Factors		
Healthcare Knowledge*	5.03	1.38
Health Information Seeking Preference*	6.30	1.04
Dependency on Self-management Technology**	1.65	2.12
Behavioural Intention*	6.31	1.02

Note: * Possible range 1-7, ** Possible range 0-6

3.4 Test of Hypotheses

Correlations and one-way analysis of variance (ANOVAs) were performed to assess for potential associations between selected demographic characteristics, diabetes duration, use of smartphone applications, and behavioral intention; these may serve as potential confounding factors that affect the relationship between the independent variable, behavioral intention, and the dependent variable, the theoretical model. There was no statistically significant correlation between the length of time a participant had been diagnosed with diabetes ($r=.1$, $p>.05$) and their future behavioral intention to use smartphone applications, nor was there any significant correlation between the length of time a participant had been using smartphone applications and their future behavioral intention to use smartphone applications ($r=.2$, $p>.05$). So, we did not use them as potential confounding factors.

Two potential confounding factors were identified. Current practices in using smartphone applications to search for diabetes information and the preference for using smartphone applications over visiting a male doctor were significantly related to behavioral intention. Due to the high correlation between the two variables ($r=.70$), only one variable was selected for inclusion in the testing of the theoretical model. SA women's current typical behavior in using their smartphone applications to search for diabetes information was selected for inclusion as a control variable as it was a more general question about current standard practice.

Hierarchical multiple regression was conducted to test the hypothesis. Forced entry was used to assess the ability of six variables (performance expectancy, effort expectancy, social influence, healthcare knowledge, health information-seeking preference, and dependency on self-management technology) to predict behavioral intention after controlling for current practice in using smartphone applications. However, the latter control variable was removed as it did not reach statistical significance ($\beta = .2$, $p=.13$) after adding the first variable, performance expectancy. The test of the hypothesis provided partial support for the theoretical model, with the final model explaining 32% of the total variance in behavioral intention. Effort expectancy was only a significant predictor of behavioral intent ($\beta = .6$, $p<.01$).

4. DISCUSSION

28% of women in SA have Type 2 diabetes, which is greater than the prevalence in other Middle Eastern countries and the US (Control & Prevention, 2014; Kasem & abdulabass Mosbeh, 2014; Satman et al., 2013). Al-Zoubi reported that in 2017, 24,501 women with Type 2 diabetes visited PHCs monthly, over twice the 12,482 males (Personal communication, December 22, 2017). (Bani, 2015) found that Saudi women attending PHCs had a 19% diabetes rate compared to 9% for Saudi males.

In the survey, 51% of SA women were 50–59, and 14% were 60 or older. Almost 35% of under-50s have Type 2 diabetes. This is similar to earlier research that found females less than 50 years old are usually diagnosed with diabetes (Alqurashi et al., 2011), although the prevalence rises with age (Al-Daghri et al., 2011; Bani, 2015; Muhammad Saeed et al., 2014; Tourkmani, 2004). This study's participants also somewhat agreed they had trouble accessing primary healthcare facilities, which is consistent with previous studies that found Saudi citizens, particularly women, had difficulty attending PHCs because they were not allowed to drive and there was no effective transportation system for them (Murad, 2014; Rajkhan, 2014). After PHC diabetes management programs, 40% (n=39) of participants assessed their knowledge as "good" and 33%

(n=32) as "moderate." Nobody rated it as "very good." Smartphone apps that provide SMS messages regarding diabetes treatment, monitoring, complications, and diet have been proven to boost health-related knowledge in various research (Alotaibi et al.; Quinn et al., 2008; Rho et al., 2015; Waki et al., 2014). This suggests that adopting smartphone application systems for self-management of diabetes may improve women's knowledge about their condition.

This research sought to predict diabetes self-management smartphone adoption and usage. The six variables explained 32% of the behavioral intention to accept and utilize smartphone apps to control Type 2 diabetes. When the variables were integrated, only effort expectation predicted future behavioral intent to use smartphone technology for diabetic self-management. Discussed below are these outcomes.

Effort expectancy is based on the user's perception of the level of simplicity or ease of use of the technology (Aldhaban et al., 2016). This research found that SA women with Type 2 diabetes are more likely to use a smartphone app for diabetes care if they believe it's easy to use, straightforward, adaptable, and understandable (Aldhaban et al., 2016). This result is consistent with other studies (Boontarig et al., 2012; De Veer et al., 2015; KL & Karsh, 2006; Kohnke et al., 2014) that showed the impact of effort expectancy on a person's intention to embrace new health technologies or innovations. Smartphone application design should take into account the traits and probable limitations of the patient, such as motor or cognitive (Fisk & Rogers, 2002; KL & Karsh, 2006), and promote the use of the application. According to (Boontarig et al., 2012; Nielsen, 1994)), smartphone apps should have a straightforward Graphic User Interface design to improve their usability, effectiveness, and learnability. The Graphic User Interface should include essential features like 1) using simple language, 2) using the users' language, such as Arabic, 3) reducing the consumers' memory load and usage, 4) offering feedback, and 5) providing technical assistance (Nielsen, 1994).

Performance expectancy assesses the degree to which individuals believe technology will help them enhance their performance and effectiveness in managing their diabetes. While SA women in this study agreed that smartphone applications will enhance their performance and effectiveness in managing their diabetes, this did not predict their behavioural intention to accept and use smartphone diabetes applications in the future. The majority of previous research reportedthat performance expectancy was statistically significant in shaping an individual patient's intention to use new technology (Kohnke et al., 2014; Venkatesh et al., 2003), but one study (Maniam et al., 2015)reported that performance expectancy did not predict the behavioural intention in using a Diabetes Self-Management Application. In the current study, only a small number of participants reported using health or diabetes applications. Therefore, theirprevious experience was limited in using smartphone applications to enhance their performance indisease management. SA women may be looking for alternative methods of diabetes self- management but enhancing their performance and effectiveness in managing their diabetes is nota reason they would choose to use these applications in the future.

Social influence is "the degree to which an individual perceives that significant others believe they should use the new system (Venkatesh et al., 2003) *(*p. 451). While SA women in this study agreed that others who are important to them think they should use smartphone technology, thisdid not predict their behavioral intention to accept and use smartphone diabetes applications in the future. The concept of social influence has been previously shown to indicate a behavioral intention or technology acceptance (Thompson et al., 1991; Venkatesh et al., 2003; Wang & Wang, 2010), while other studies found no direct effect of social influence on behavioral intention (Boontarig et al., 2012; De Veer et al., 2015). The result of this study may bedue to how social influence is operationalized in Saudi society. People (e.g., Saudi Arabian citizens) are often asked what their significant others would do rather than what these significant others would want the respondent to do (De Veer et al., 2015). Participants may have had limited experience thinking about how others would like them to respond to specific actions for their health management. Currently, participants rely on healthcare providers within PHCs for diabetes management and may think they should consider what the healthcare providerswould do for them in their diabetes self-management (Mahomed et al., 2008). Due to the newnessof the technology, significant others may not know the effect of using diabetic applications as a tool in self-management, or may not provide appropriate support or share appropriate expectationsof such tools. This in turn may explain the lack of association between social influence and futureintention to accept diabetic applications in disease management.

Healthcare knowledge is patients' knowledge about their health status andhow to care for their disease. While SA women in this study agreed that they know and understand their diabetes and its management, this did not predict their behavioral intention to accept and use smartphone diabetes applications in the future. This is inconsistent with other research, which

found that patients with little knowledge about managingtheir health are more likely to search for health-related resources and health information to manage their health status (Ferguson, 2000; Fowles et al., 2004). The lack of an association maybe because few women in this study reported having little knowledge about the care for their diabetes and health problems. Therefore, they may have felt they did not need to seek more resources. In addition, they currently rely on in-person visits with their PHC healthcare provider to provide the necessary knowledge required to manage their diabetes. As a result, they may thinkthis a sufficient resource for obtaining knowledge, as well as the provision of knowledge, is thehealthcare provider's role (Mahomed et al., 2008) and that there is no need to use other healthresources for disease management.

Health information-seeking preference refers to patients' belief that they should be informed about their health conditions and care for their disease (Ende et al., 1989; Wilson & Lankton, 2004).While SA women in this study agreed that they should be informed about their health conditions and care for their illnesses, this did not predict their behavioral intention to accept and use smartphone diabetes applications in the future. (Wilson & Lankton, 2004) suggested that employing technology in healthcare can enhance patients' access to health information and therebydecrease the difficulty of obtaining that information. These results highlighted that participants strongly believe patients need more information as they become sicker, more explanations about medical tests, an understanding of possible adverse reactions to medicine, and information from their current doctor about alternative treatments if they are available. This result is consistent witha study on chronic disease which reported that almost 41% of patients with chronic conditions would prefer to have received additional information from trusted healthcare resources (Brom et al., 2014). The availability of smartphone applications in the Arabic language specific to the self-managementof Type 2 diabetes is limited in SA (Almaiman et al., 2014), possibly explaining why SA womenin this study reported they were only somewhat dependent on online health applications to managetheir disease. In addition, the SA women in this study had all attended the education programs within their PHCs. Therefore, they may not have explored the possibility of utilizing smartphone applications to learn more about the management of their diabetes as they were reliant on the PHCsfor their leadership and education. (Alotaibi et al.) found that implementing a smartphone technology system could provide supportive educational materials to help patients with their diabetes self-management. More importantly, such a system would greatly assistpatients in remote regions of Saudi Arabia who currently are faced with an insufficient number ofPHC and a lack of specialist diabetic care by providing effective medical information (Alotaibi et al.).

5. LIMITATIONS

This study was conducted in one country with one gender/disease combination—women with Type 2 diabetes in Saudi Arabia. Therefore, the results are not generalizable to men or other geographic locations, from non-public providers, or in cultures dissimilar to SaudiArabia. This study also only included women attending public PHCs who were users of smartphones. Women who do not participate in such clinics or use smartphones may have different needs/predictors of use.

Participants could complete the questionnaire themselves, or if they could not read it was administered orally; thus, social desirability bias may have influenced the responses of the group who were interviewed. In addition, the assessment of health information-seeking preferences mayhave limitations. The Cronbach's alpha score for the Health Information Seeking Preference scalewas low, with the possibility that the four items did not measure the underlying attribute (Pallant, 2020). However, previous studies have found similar scores, and the low score could be due to the small number of items on the scale. (Nunnally & Bernstein, 1978) Pointed out that Cronbach's alpha could be low if the number of items is ten or less. Although a score of .70 or above is recommended, a lower score may be acceptable (Polit & Beck, 2004).

Lastly, the translation of the original instruments may have affected the essence of some of the questions and, subsequently, participants' responses, internal consistency of scales, and the hypothesized relationships. For example, different words in English have only one equivalent wordin Arabic. The researcher, who is Arabic-speaking, worked closely with the Arabic-language specialists to ensure the translation was as accurate as possible using the process outlined in (Polit & Beck, 2004). In addition, the translated questionnaire was pre-tested to verify the readability and clarity of the questions.

6. CONCLUSION

The incidence of Type 2 diabetes among Saudi women is significant, and an urgent solution is needed to manage this condition. Smartphone applications have been shown to provide substantial support for disease self-management programs via education and communication withhealthcare providers. Before applying such technologies, however, it is crucial to investigate Saudi women's acceptance of and perceptions toward using these technologies. To this end, this study found that effort expectancy was the strongest independent predictor of behavioral intention.

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