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Willingness of diabetes mellitus patients to use mHealth applications and its associated factors for self-care management in a low-income country: an input for digital health implementation

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ABSTRACT

Background Although mHealth applications are becoming more widely available and used, there is no evidence about why people are willing to use them. Therefore, this study aimed to assess the willingness of patients with diabetes to use mHealth applications and associated factors for self-care management in Ethiopia.

Methods An institutional cross-sectional study was conducted among 422 patients with diabetes. Data were collected using pretested interviewer-administered questionnaire. Epi Data V.4.6 for entering the data and STATA V.14 for analysing the data were used. A multivariable logistic regression analysis was carried out to identify factors associated with patient's willingness to use mobile health applications.

Results A total of 398 study participants were included in the study. About 284 (71.4%) 95% CI (66.8% to 75.9%)). Of participants were willing to use mobile health applications. Patients below 30 years of age (adjusted OR, AOR 2.21; 95% CI (1.22 to 4.10)), urban residents (AOR 2.12; 95% CI (1.12 to 3.98)), internet access (AOR 3.91; 95% CI (1.31 to 11.5)), favourable attitude (AOR 5.20; 95% CI (2.60 to 10.40)), perceived ease of use (AOR 2.57; 95% CI (1.34 to 4.85)) and perceived usefulness (AOR 4.67; 95% CI (1.95 to 5.77)) were significantly associated with patients' willingness to use mobile health applications.

Conclusions Overall, diabetes patients' willingness to use mobile health applications was high. Patients' age, place of residence, internet access, attitude, perceived ease of use and perceived usefulness were significant factors concerning their willingness to use mobile health applications. Considering these factors could provide insight for developing and adopting diabetes management applications on mobile devices in Ethiopia.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Ethiopia faces obstacles in adopting a sustainable mobile health application due to a lack of top-level commitment to using the system for managing chronic disease.
⇒ Mobile health application allows users to store their health-related data, provide medical references and support clinical decision-making.
⇒ For the adoption of mHealth interventions, considering users' willingness is crucial.

WHAT THIS STUDY ADDS

⇒ This study assessed the willingness of patients with diabetes mellitus (DM) to use mhealth apps in Ethiopia, which aided in the development of mobile health technology for the advancement of Ethiopia's healthcare system.
⇒ The results of this study were used as input to design and test the effectiveness of a mobile health application for reducing the burden of DM in Ethiopia.
⇒ The study provides potential solutions for the identified barriers to the willingness of using mobile health applications.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ There is limited evidence on the willingness to use mobile health applications to manage diabetes and it serves as a baseline for researchers in a resource-limited setting.
⇒ Practically, this study offers insights for policymakers, developers, managers and decision-makers in the healthcare industry to improve the use and willingness of mobile health applications for self-care management based on the findings.
⇒ The study serves as a foundation for more interventional research that can create and evaluate mobile health applications as interventions and as a tool for enhancing Ethiopia's DM prevention programme.

INTRODUCTION

According to the International Diabetes Federation 2019, diabetes mellitus (DM) is a

serious public health issue that affects 463 million people worldwide as of 2019 and is expected to affect 578 million people by 2030 and 700 million people by 2045.[1] It is also a prevalent, costly, chronic metabolic condition that is defined by elevated blood glucose levels brought on by either an inability to produce insulin (type 1 diabetes) or an inability to produce enough insulin and insulin resistance (type 2 diabetes).[1 2] Despite the WHO's attempts to reduce the strain of diabetes, its prevalence is rising and might lead to more early deaths and an estimated US$2.1 trillion (2.2% of the global gross domestic product) in economic impacts by 2030.[3]

Ethiopia is 1 of the 48 nations in the International Diabetes Federation's African region (AFR), and currently, 24 million individuals in the AFR region and 537 million people worldwide have diabetes; by 2045, those numbers will rise to 55 million, and 3.3% of adults have the disease.[4] Diabetes can lead to a variety of consequences, including retinopathy, hypertension, cardiovascular, nephropathy and macrovascular disorders, all of which lower patient quality of life, reduce rates of economic growth, reduce labour productivity and raise healthcare costs. It is critical to achieve optimal glycaemic management to avoid and reduce problems.[5] Consequently, digital health solutions, such as mobile health technologies, are essential for overcoming time and geographical constraints through mobile applications, and remote monitoring of data at home, such as blood glucose levels.[6]

Mobile health applications use the internet to support medical and health activities, offer tools for tracking consumers' health states, storing their health-related data, providing medical references and supporting clinical decision-making.[7] A self-contained programme or piece of software with a specific purpose is referred to as an 'application' or 'app' and is typically customised to run on mobile devices, including smartphones, tablets and wearable technology.[8]

Consumers are using mobile health applications more frequently as a result of the global proliferation of mobile device technology.[9] More than 2.5 billion individuals will own smartphones by the year 2019, and by 2017, more than 50% of them will have mobile health applications installed.[10] More than 60% of people in the USA use digital devices and mobile health apps to manage their health.[11] In China, the most popular mobile health applications had over 10.5 million active users as of January 2020.[12] In a study done in Japan, although only 51 (16%) people currently use information communication technology (ICT)-based self-management tools, 157 people (50%) said they would be willing to use them.[5] Patients with diabetes have access to mobile applications that have increased their physical activity and hypoglycaemia control.[5 13] As a result, mobile health applications are becoming a crucial part of managing personal health.

To use mHealth technologies for managing and caring for diabetics, it is critical to assess the level of the patient's willingness and identify factors for using mobile health applications. Accordingly, factors were identified, such as sociodemographic factors (age, gender, educational status, place of residence).[1 5 6 8 14–17] The technology acceptance model; and the theory of reasoned action, state the adoption of new technology is dependent on the user's willingness or intention, which is influenced by attitude, perceived ease of use and perceived usefulness.[14 16 17]

The findings may have implications for practice, policy and upcoming researchers. The main beneficiaries of this study, which is useful as input for common practices, are the patients, health professionals, regional health bureau and non-government organisations. According to our review of the literature, there is no evidence of research exploring how willing Ethiopian patients with diabetes are to use mobile health applications to manage their health. This study aimed to assess the willingness of patients with DM to use a mobile health application and its associated factors in southwest Ethiopia.

METHODS

Study area and period

The study was carried out in public facilities in Ilu Abba Bor and Buno Bedelle Zones, Oromia Regional State, southwest Ethiopia. Ilu Abba Bor Zone and Buno Bedelle Zone are two of the Oromia regional state situated southwest of the region and located at a distance of about 600 km and 483 km from the centre of the region, respectively. In the two zones, there are five public hospitals, namely: Bedele hospital, Darimu hospital, Dembi hospital, Metu Karl hospital and Chora hospital. The study was conducted from 12 November 2022 to 21 December 2022.

Study design

An institution-based cross-sectional study was carried out among patients with diabetes who were followed up in public hospitals.

Study population

All adult patients with DM who attend public hospitals in the Ilu AbaBor and Bunno Bedelle zones are used as the source population. All adult (>18-year-old) patients with DM at public hospitals in the Ilu AbaBor and Bunno Bedelle zones were included in the study, whereas patients who are seriously ill and unable to give a response during the study period were not included.

Study variables and measurements

The outcome variable was the willingness to use a mobile health application and its associated factors for self-care management. Perceived usefulness, perceived ease of use, attitude, sociodemographic characteristics, clinical and behavioural attributes, and mobile device utilisation patterns were considered as predictor variables for the outcome of interest in this study.

Willingness to use a mHealth app was defined as the user's likelihood to use a computer program or software health application designed to run on a mobile device for self-care management to measure willingness,

respondents were asked whether they would be willing to use mobile phone-based diabetic health applications. Thus, it was measured by the median score. If the score was above the median, it was considered as willing to use mobile health applications, else not willing to use it. Whereas, items for the composite variables were scored on a Likert-type scale with a maximum score of 5 and a range of 1 for 'strongly disagree' to 5 for 'strongly agree'. To produce a composite variable scale (ranging from score 1 to 5) for data analysis, item scores for each composite variable were added and divided by the number of items. Finally, depending on the final result, the composite variable score was dichotomised as 'yes' or 'no'. Accordingly, final scores of 3 or below (strongly disagree, disagree and neutral) were classified as '"no', while final scores of three or above (agree and strongly agree) were classified as 'yes'.[16 18]

Sample size determination and sampling procedure

The sample size was determined using the single population proportion formula by the following assumptions.

$n = \frac{(Z\alpha/2)2\times p(1-p)}{d^2}, = \frac{(1.96)2\times 0.5(0.5)}{(0.05)^2}, = 384$, then after we consider non-response rate 10%.

Finally, 384+384 (0.1)=422, where n=estimated sample size; p=single population proportion (50%); because willingness of patients with DM to use mobile applications in Ethiopia was not investigated, Z/2=95% level of CI; d2=5% margin of error. A total of 422 patients with diabetes who participated in this study were recruited using a systematic random sampling technique. To select the participants, first, the entire sample size was proportionally allocated according to the number of patients with DM in each hospital, resulting in 1874 eligible participants in the study. Then, a sampling interval of four was computed after the total sample size was determined. As a result, every fourth patient who visited the specified hospitals for diabetes follow-up included in this study.

Data collection tool, data quality control and procedure

Data were gathered using standardised, pretested, interviewer-administered questionnaires that were adapted from available research.[1 5 6 8 14–17] The questionnaire contains sociodemographic characteristics, clinical and behavioural characteristics, mobile pattern utilisation and perceived ease of use, perceived usefulness, attitude and willingness to use mHealth applications, which were adapted from Davis's study.[19] For ease of data collection, an English version of the questionnaire was created and translated into an Amharic version. The Amharic version was translated back into English by a language expert to ensure that the meaning was consistent.

To evaluate the validity and reliability of the data collection instrument before the actual data collection, a pretest study outside of the study area was conducted in Jimma Hospital with 10% of the total sample size, and necessary modifications were made accordingly. Cronbach's alpha was used to evaluate the internal consistency for each aspect of the data collection instrument, and it scored on attitude (Cronbach's alpha=0.78), perceived usefulness (Cronbach's alpha=0.82), perceived ease of use (Cronbach's alpha=0.87) and willingness to use mHealth applications (Cronbach's alpha=0.91). Finally, for the actual data collection, 2 days of training were provided for four nurses, two health informatics professionals who were data collectors and three onsite supervisors.

Data processing and analysis

Data entry was done by using Epi Data V.4.6, and analysis was done by using STATA V.14. For descriptive statistics, frequencies and percentages were determined and presented using graphs and tables. A candidate for multivariable, binary logistic regression analysis with a p<0.2 at 95% CI was applied using bivariable binary logistic regression. After that, using the backward technique to enter candidate variables into a multivariable logistic regression model, it was possible to adjust for potential confounders and determine which components were statistically significant for the outcome variable. The adjusted OR (AOR) and its 95% CIs, p<0.05 were used to summarise the findings.

The variance inflation factor was used with a cut-off point of 10 to determine whether multicollinearity existed among independent variables, and there was no evidence of it. Finally, the model fit was examined using the Hosmer and Lemeshow goodness of fit test, and the result showed good goodness of fit for the data (p=0.706).

RESULTS

Sociodemographic characteristics of patients with DM

A total of 398 study participants were included in the study, with a response rate of 94.3%. Of the 398 respondents, 224 (56.3%) were male, 155 (38.1%) were between the ages of 30 and 45, and the mean age was 43+14.6 years. More than half of the 276 respondents (69.3%) lived in urban areas. In addition, 249 (62.6%) of the respondents were married (table 1).

Clinical and behavioural characteristics of the patients

The majority of patients, 249 (62.6%), had type 2 DM. Almost half of the participants 193 (48.5%), had comorbidities. A total of 175 (44%) of these patients were diagnosed 3 years ago or more. A total of 108 (27.1%) of patients were educated by healthcare providers during the follow-up period. Seventy-five (21.4%) of patients had used substances, 156 (39.2%) had a weekly habit of physical exercise, 302 (75.9%) of patients obtained diabetes medication regularly and 113 (28.4%) of patients had a habit of excessive sugar consumption (table 2).

Mobile device utilisation pattern

About three-fourth, 298 (74.9%) of patients with DM had a mobile device, and 216 (57.2%) were using a smart mobile phone. Fifty-two (13.1%) of respondents used mobile applications for disease management, and 271 (68.1%) of them did not understand or use mobile

Table 1 Socio demographic characteristics of diabetes mellitus patients in a low-income country, 2022 (n=398)

Variables	Category	Frequency (N)	Percentage (%)
Age (year)	<30	91	22.9
	30–45	155	38.9
	>45	152	38.2
Gender	Male	224	56.3
	Female	174	43.7
Place of residence	Urban	276	69.3
	Rural	122	30.7
Educational status	Unable to read and write	56	14.1
	Informal educational	109	27.4
	Primary school	27	6.8
	Secondary school	66	16.6
	Higher education and above	140	35.2
Marital status	Single	48	12.1
	Married	249	62.6
	Separated	58	14.6
	Others	43	10.7
Occupational status	Housewife	59	14.8
	Government employed	97	24.4
	Non-government employed	38	9.5
	Farmer	45	11.3
	Merchant	103	25.9
	Student	31	7.8
	Others*	25	6.3
Religion	Muslim	102	25.6
	Protestant	103	25.8
	Orthodox	168	42.3
	Catholic	25	6.3
Time to reach the health facility	<1 hour	306	76.9
	≥1 hour	92	23.1
Income status (ETH Birr)	<1500	20	5.0
	1500–3000	103	25.9
	>3000	275	69.1

Others: separated and divorced.
*Daily labourer and unemployed.

applications easily. A total of 247 (67.1%) of the patients used the internet on mobile devices (table 3).

Willingness to use mHealth applications

A total of 284 (71.4%) of respondents were willing to use mobile health applications with a 95% CI (66.8% to 75.9%). A total of 209 (52.5%) respondents had a favourable attitude towards using mobile health applications, and 293 (73.6%) of the participants perceived the usefulness of mobile health applications for self-care management. Moreover, 281 (70.6%) of the participants perceived the mobile health application to manage DM as easy to use (figure 1).

Factors associated with willingness of patients with DM to use the mHealth application

Results of the bivariate analyses showed that age, place of residence, time to reach the facility, use of the internet on mobile devices, substance use, time to reach the health facility, own mobile device, diabetes follow-up time, obtained education during follow-up, obtained medication at any time, attitude, perceived ease of use and perceived usefulness were associated with willingness to use mHealth applications at a p<0.2. All of these associated factors were entered in the multivariable logistic regression analysis model to control for the effect of confounders (table 4).

Table 2 Clinical and behavioural characteristics of patients with diabetes mellitus (DM) in a low-income country, 2022 (n=398)

Variables	Category	Frequency (N)	Percentage (%)
DM types	Type 1	149	37.4
	Type 2	249	62.6
Have comorbidity	Yes	193	48.5
	No	205	51.5
Comorbidity type	Hypertension	53	27.5
	Cardiovascular	71	36.8
	Kidney failure	26	13.5
	Neuropathy	30	15.5
	Others	13	6.7
Route of medication	Pill	236	59.3
	Injection	162	40.7
Time since diagnosis	<1 year	70	17.6
	1–3 years	153	38.4
	>3 years	175	44.0
Diabetes follow-up time	<1 year	88	22.1
	1–3 years	108	27.1
	>3 years	202	50.8
Obtained education during follow-up	Yes	108	27.1
	No	290	72.9
Obtained medication regularly	Yes	302	75.9
	No	96	24.1
Substance use	Yes	85	21.4
	No	313	78.6
Type of substance use	Alcohol	18	21.2
	Khat	43	50.6
	Cigarette	24	28.2
A habit of excessive sugar consumption (per week)	Yes	113	28.4
	No	285	71.6
A habit of physical exercise (per week)	Yes	156	39.2
	No	242	60.8
Frequency of physical exercise (per week)	Once	77	49.3
	Twice	58	37.2
	Three times	12	7.7
	Every day	9	5.8

Others: cancer, retinopathy and stroke.

The multivariable logistic regression model identified the age of patients, place of residence, use of the internet on mobile devices, attitude, perceived ease of use and perceived usefulness as being associated with willingness to use mHealth applications at a p<0.05 (table 4).

As the result summarised in table 4 shows, patients with DM below 30 years of age were 2.21 times more likely to be willing to use mobile health applications (AOR 2.21; 95% CI 1.22 to 4.10) than those who were 35 years of age or older after controlling other variables. Patients who were urban residents were 2.12 times more likely to be willing to use mobile health applications (AOR 2.12; 95% CI 1.12 to 3.98) than those who lived in rural areas, keeping other variables constant. Patients who accessed the internet on mobile devices were 3.91 times more likely to be willing to use mobile health applications (AOR 3.91; 95% CI 1.31 to 11.5) as compared with their counterparts. Similarly, patients who had a favourable attitude towards mobile health applications to manage DM were 5.20 times more likely to be willing to use mobile health applications (AOR 5.20; 95% CI 2.60 to 10.40).

In addition, patients who perceived mHealth applications as easy were 2.57 times more likely to be willing to use mobile health applications (AOR 2.57; 95% CI 1.34 to 4.85) as compared with patients who did not perceive ease of use. Similarly, patients who perceived mHealth

Table 3 Pattern of mobile devices utilisation among patients with diabetes mellitus in a low-income country, 2022 (n=398)

Variables	Category	Frequency (N)	Percentage (%)
Own mobile device	Yes	298	74.9
	No	100	25.1
Type of mobile device	Regular/standard	104	27.5
	Smartphone	216	57.2
	Tablet	27	7.1
	PC	31	8.2
The mobile app used for disease management	Yes	52	13.1
	No	346	86.9
Can you understand how to use the mobile app easily	Yes	127	31.9
	No	271	68.1
Use the internet on mobile devices	Yes	247	62.1
	No	151	37.9

PC, personal computer.

applications as useful were 4.67 times more likely to be willing to use mobile health applications (AOR 4.67; 95% CI 1.95 to 5.77) as compared with patients who did not perceive the usefulness of the mHealth applications (table 4).

DISCUSSION

The purpose of this study was to assess willingness of patients with DM to use mobile health applications and associated factors for self-care management. The result showed that willingness to use mHealth applications among patients with DM in the Oromia region was high (71.4%, 95% CI (66.8% to 75.9%)). This result was in line with the willingness to use mHealth services in Ethiopia.[1] However, This finding was higher than London (63.9%),[20] USA (66.9%),[21] China (66.1%).[22] This difference might be due to sample size, data collection technique (the self-administered method in China), study period and

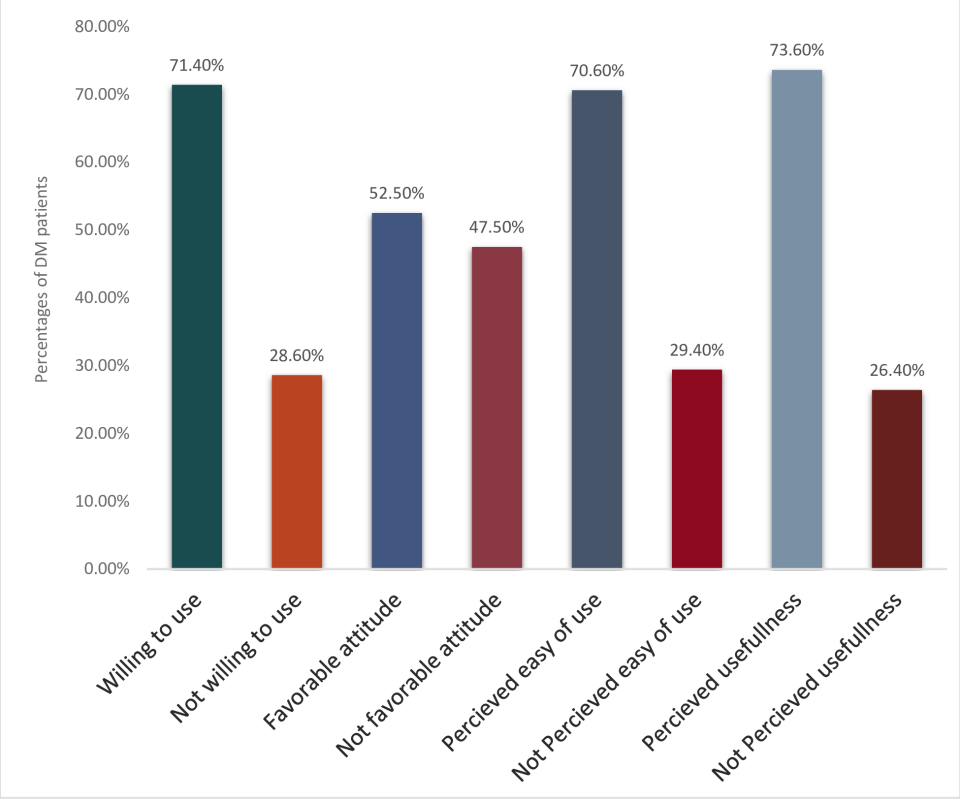

Figure 1 Willingness to use mobile health applications among patients with diabetes mellitus (DM) in southwest public hospitals, Ethiopia, 2022. n=(398).

Table 4 Bivariable and multivariable binary logistic regression analysis of factors associated with willingness of patients with DM to use mHealth application in a low-income country, 2022

Variable	Category	Willingness		Crude OR (95% CI)	Adjusted OR (95% CI)	P value
		Yes	No			
Age (year)	<30	59	32	0.70 (0.04 to 0.94)	2.21 (1.22 to 4.10)	0.03*
	30–45	115	40	1.10 (1.03 to 3.59)	1.51 (0.80 to 2.81)	0.43
	>45	110	42	1	1	
Place of residence	Urban	189	87	0.62 (0.34 to 2.64)	2.12 (1.12 to 3.98)	0.02*
	Rural	95	27	1	1	
Time to reach the facility	<1 hour	226	80	1	1	
	>1 hour	38	54	4.01 (3.21 to 5.85)	0.60 (0.31 to 1.10)	0.61
Own mobile device	Yes	226	72	2.30 (1.61 to 4.22)	1.07 (0.44 to 2.60)	0.32
	No	58	42	1	1	
Internet access	Yes	164	83	0.51 (0.28 to 2.66)	3.91 (1.31, 11.5)	0.03*
	No	120	31	1	1	
Substance use	Yes	45	40	1	1	
	No	239	74	0.35 (0.21, 0.57)	1.63 (0.98 to 2.70)	0.77
Obtained education during follow-up	Yes	60	48	0.37 (0.14 to 5.64)	2.74 (1.25 to 6.04)	0.34
	No	224	66	1	1	
Obtained medication regularly	Yes	204	98	1.92 (0.23 to 2.59)	1.06 (0.49 to 2.26)	0.11
	No	50	46	1	1	
Diabetes follow-up time	<1 year	62	26	1	1	
	1–3 years	63	45	1.71 (1.10 to 2.90)	1.29 (0.71 to 2.40)	0.72
	>3 years	139	63	1.10 (1.59 to 4.21)	2.03 (0.94 to 4.34)	0.21
Attitude	Favourable	166	43	2.32 (2.90 to 5.50)	5.20 (2.60 to 10.40)	0.01*
	Not favourable	118	71	1	1	
Perceived ease of use	Easy	223	58	3.53 (2.26 to 6.25)	2.57 (1.34 to 4.85)	0.002†
	Not easy	61	56	1	1	
Perceived usefulness	Useful not	220	73	1.93 (1.24 to 7.18)	4.67 (1.95 to 5.77)	0.001†
	Useful	64	41	1	1	

*Statistically significant at p<0.05,
†Statistically significant at p<0.01.
CI, Confidence Interval; DM, diabetes mellitus; OR, Odd Ratio.

sociodemographic differences between patients. It is also lower than studies about willingness or intention to use mHealth services among reproductive women done in Ethiopia (78.9%),[16] China (79.5%), USA (80.6%).[23] The discrepancy might be the result of the socioeconomic differences between the participants, or the differences in the ICT development and study period.

Moreover, this study identified numerous factors, including age, place of residence, intermate usage, attitude, perceived usefulness and perceived ease of use that were associated with willingness to use a mHealth app in southwest Ethiopia.

Patients with DM below 30 years of age were associated with a willingness to use mobile health applications. This finding was in line with different studies.[20 22] The possible reason for this is that young person is close to new technologies and accept them easily. Furthermore, a mobile health app that would be crucial for the young age group rather than the older age. As was to be expected, there was high usage of technology and mobile devices, which confirms the potential for and necessity of creating interventions that make use of smartphones as a platform for young people's health. Younger people can explain why they use particular apps, why they manage them, and what qualities and features health apps should have.

Patients who were urban residents were 2.12 times more likely to be willing to use mobile health applications (AOR 2.12; 95% CI 1.12 to 3.98) than those who lived in rural areas. This finding is consistent with different study settings.[24 25] This finding could be explained by the fact that urban residents were more likely than rural residents to have access to mobile health devices, internet access and interactive new technology. Moreover, in rural areas, the challenges range from the high price of mobile

devices, lack of knowledge about their use, a lack of infrastructure or both.

Patients who access the internet on mobile devices were 3.91 times more likely to be willing to use mobile health applications (AOR 3.91; 95% CI 1.31 to 11.5) as compared with their counterparts. This finding is consistent with different study settings.[22 25] This could be due to patients' increased use of the internet on their mobile devices, improved access to health information and increased awareness of the use of mobile health applications for self-care management. Therefore, expanding internet connectivity and infrastructure is necessary for the effective distribution of mHealth applications for diabetes patients' self-care management.

Patients who had a favourable attitude towards mobile health applications to manage DM were 5.20 times more likely to be willing to use mobile health applications (AOR 5.20; 95% CI 2.60 to 10.40). This finding is consistent with the findings of other studies.[26 27] This demonstrates how patients' attitudes towards mobile health technologies influence their willingness to use them positively. Patients' intentions to use mobile health applications also increase as they view these technologies as a tool to improve their health management. The probable cause of this is that patients with DM who have a settled, positive attitude towards mobile health applications will be extremely incensed by new solutions. Therefore, a strong emphasis should be placed on activities that improve attitudes, such as computer access, ongoing training and support, and knowledge sharing on mobile health technology for self-care management.

Patients who perceived mHealth applications as easy were 2.57 times more likely to be willing to use mobile health applications (AOR 2.57; 95% CI 1.34 to 4.85), as compared with patients who did not perceive ease of use.[16 28 29] Users tend to focus more on a system's usability when they have no or little prior experience with it. This suggests that if a new mHealth service is perceived as being difficult to use, users will not use it, regardless of how valuable the system may be. Users will stop using mHealth solutions that are not user-friendly, according to research. If a person believes that a new system will benefit them, any difficulty with using it may be resolved. Deploying mHealth applications may, therefore, need further education on how to use and manage the new system for better adoption.[16]

Patients who perceived mHealth applications as useful were 4.67 times more likely to be willing to use mobile health applications (AOR 4.67; 95% CI 1.95 to 5.77) as compared with patients who did not perceive the usefulness of the mHealth applications.[28 29] This showed that no matter how simple or complex the mobile health application is to use, patients will not use it if they do not believe it will be valuable to them. As a result, it is important to make sure that the system will enhance the desired health results when developing it.

Limitations of the study and future research

The study has some limitations, the study was interviewer based, so the responses might have been affected by bias introduced by the interviewers, the study did not include private hospitals; and the study used quantitative approaches, which may affect the generalisability of the findings. Hence, future research studies could include patients with diabetes from private hospitals, support the finding with a qualitative study and use a health information technology acceptance model, so that the results could be generalisable.

CONCLUSION

Overall, this study showed that the proportion of willingness of patients with DM to use mobile health applications for self-care management was high. The willingness of patients with DM to use mobile health applications was influenced by their age, place of residence, internet access, attitude, perceived ease of use and perceived usefulness. Considering these factors could provide insight for designing and implementing diabetes management applications on mobile devices in Ethiopia.

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