Factors affecting the adoption of e-health system in the Kingdom of Saudi Arabia

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Background: The Saudi government is trying to implement the e-health system throughout Saudi Arabia to promote accessible health services for its population. However, adoption of the e-health system has not been effective. Thus the objective of this study was to investigate the factors that influence the adoption of e-health in this country.

Methods: To carry out this research, a questionnaire was designed to obtain information on how people in Saudi Arabia use the e-health system and the problems they face when using this technology. The questionnaire was initially viewed by 438 people and 130 of them answered the survey.

Results: The results of this research on the adoption of the e-health system in Saudi Arabia indicated that the main factors preventing the implementation of this system were mainly related to the lack of a relationship between doctors and patients, fears about the possibility of violating data privacy and a lack of government regulations. In addition, there are certain demographic factors such as age, gender, residence, income, education and culture that create obstacles in the adoption of the e-health system.

Conclusions: This study suggests that professionals should contribute to modifying the e-health system and adding more government regulatory bodies to increase adoption. This will encourage end-users to trust the system. By modifying existing strategies, the results of this study can contribute to the successful implementation of the e-health system in Saudi Arabia.

Keywords: adoption, barriers, e-health technology, electronic health, knowledge of technology, management of technology practices, Saudi Arabia.

Introduction

Poor health services create obstacles to the prosperity of any country and can increase mortality and morbidity rates. For these reasons, all countries in the world, including low-, middle- and high-income countries such as the G7 group (USA, Japan, Germany, UK, France, Italy, Canada), BRICS group (Brazil, Russia, India, China, South Africa) or Next Eleven group (Bangladesh, Egypt, Indonesia, Iran, South Korea, Mexico, Nigeria, Pakistan, the Philippines, Turkey and Vietnam), are making considerable investments in the health field to mitigate the impact of diseases and achieve universal health coverage.[1–8] It is also pertinent to mention that the costs related to maintaining health due to the increasing rate of non-communicable diseases (NCDs) have increased in all countries of the world.[6] In this sense, healthcare organizations worldwide are moving towards the adoption of advanced

technologies such as the e-health system, which is a tool that can promote health services through information and communication technologies.[9] The World Health Organization (WHO) has stated that 'e-health is the cost-effective and secure use of ICT [information and communications technology] in support of health and health-related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research'.[9] Also, the WHO believes that e-health is necessary to achieve universal health coverage.

The e-health system has been progressively being adopted on a global scale in both developed and developing countries due to its potential to provide healthcare services universally to its inhabitants.[8,10] Currently 58% of WHO member states have an e-health strategy. Likewise, it is presumed that in the long term, accelerated innovations in the field of e-health will transform the workflow in the field of healthcare.[11] Also, the adoption of

e-health technology can promote health services, health surveillance, health-related literature and education in an easy and accessible way.[12]

In addition to helping the advancement of technologies, the e-health system promotes a change in perspectives and attitudes towards people and strengthens the commitment to creating global networks to improve local, regional and global health services.[13] According to the Global Observatory Health Survey, e-health technology tools are useful for most of the developed countries.[14] In fact, >70% of the countries are successfully using e-health services and developed countries continue to invest in e-health systems and technologies to improve their quality of healthcare.[14,15]

The number of healthcare professionals demanding to implement e-health systems increases daily. Merging global technologies onto one platform means they can make faster and more accurate diagnoses and treatments, as well as have access to rural areas where there are fewer facilities available than in the cities, thus being able to support these facilities remotely.[16] However, there are certain features that must added to the e-health systems. These include being able to identify and prescribe the proper medicine, discover new drugs, share test data for newly identified drugs, effectively use healthcare records for advancement in the system, provide online registration for patients and utilize social media to publically promote the e-health system.[17]

Regarding the Middle East region, several e-health initiatives have been incorporated in some of its countries, including Saudi Arabia, Jordan, Turkey, Israel, Qatar, Kuwait, United Arab Emirates, Oman, Iran, Bahrain and Iraq.[18,19] In general, the initiatives are varied and progress has been made in most of the region despite differences in economic resources, infrastructure and political situations. In some of these countries, high penetration, diffusion and access to ICT technologies; cell phones; provision of online health services through mobile phones; development of networks to connect hospitals; implementation of electronic health records; electronic transmission of prescriptions between doctors, pharmacists and patients; remote medical treatment and management of healthcare data has occurred.[18,19] However, in several of the countries mentioned, the use of these technologies is very low.[18,19] Also, in some of the countries of the region, the national health information system is weak, the health information governance is almost non-existent, policing development is negligible, the standardization and interoperability of electronic systems is limited and there is a deficiency of experts, a lack of awareness and an absence of education in health information technology.[19]

Concerning the Kingdom of Saudi Arabia (KSA), it is important to mention that this country offers several perspectives of importance for different people around the world. For Muslims, the KSA is considered a holy place where large numbers of people from Muslim countries go each year to perform a Hajj, and for non-Muslim communities it is the land of opportunity. In its 21 150 000 km^2 located in the southwestern corner of Asia, the KSA has large oil reserves and has become the leading oil exporter.[13] In other words, the KSA is a rich and growing country with a population of 28 288 000 and a growth rate of 3.2%. According to the United Nations, the KSA will reach a population of 39.8 million by the end of 2025.[20] It is worth mentioning that rapid population growth increases the demand

for better and more efficient health services. In this regard, KSA has approximately 244 hospitals, including government and non-government run, and around 2037 healthcare clinics. The KSA government has divided healthcare services into primary, secondary and tertiary priorities. The KSA healthcare system is listed as the 26th best healthcare system out of 190 countries worldwide.[21]

Currently the government contributes around 78.9% to the KSA's national healthcare system and around 4 billion Saudi riyals (SAR) is allocated for healthcare facilities.[19] Healthcare services in the KSA began in 1926 when the Department of Health was established with the goal of providing free healthcare to the country's citizens.[22] Healthcare services in the KSA are free for ordinary citizens, government employees and people who deserve them. There are three sources of healthcare providers in the KSA: the Ministry of Health (MoH), government healthcare providers and private healthcare providers.[23]

The Saudi people face certain problems in terms of health-related services, the most important being the low availability of health professionals, which includes nurses, doctors and midwives (<0.94% availability per 1000 people). Despite the great effort to improve their health, the people of KSA have different health complications, such as respiratory tract diseases, musculoskeletal disorders, diabetes, cancer and cardiovascular problems, among other diseases.[24]

The KSA is spending a large amount on health services to provide better services to its citizens. The central health program in the Saudi Vision 2030 project is the e-health system.[25] At present, healthcare providers are adopting e-health services and technologies, including electronic medical coverage (EMC), electronic medical records (EMRs), electronic health records (EHRs), picture archiving and communication systems (PACSs) and telemedicine, among many others.[26] The healthcare providers in the KSA are working diligently to successfully adopt the e-health system, but certain barriers create obstacles to successful adoption, including human barriers, cultural barriers, financial barriers, failure in the adoption of health issuance strategies and a lack of technical and computer expertise.[24] Other challenges in the KSA's adoption of the e-health system are the adequacy of the ICT infrastructure, resistance to change or adopting the new technology, a lack of user acceptability, insufficiency of e-health technology trainers and inadequate policies to implement the system throughout the country.[27]

Based on these considerations, the objective of this study was to investigate the factors that affect the adoption of e-health technologies in the KSA, their acceptance and how people use them. This study will help to uncover the main barriers to the adoption of e-health programs. These findings will help improve existing strategies for adoption of the e-health system.

Methods

Study settings

To carry out this research on the factors that influence the adoption of the e-health system in the KSA, a questionnaire was designed and distributed randomly through the web and social media among KSA citizens. In this study, the quantitative survey-based analysis method was used.[28] The questionnaire

Table 1. Demographic information (N=130)

Variable	n (%)	Mean	Standard deviation
Gender			
Male	49 (37.7)	1.623	0.486
Female	81 (62.3)		
Marital status			
Single	40 (30.8)	1.792	0.655
Married	81 (62.3)		
Divorced	5 (3.8)		
Have children	4 (3.1)		
Age (years)			
16–20	1 (0.8)	3.454	1.086
21–29	22 (16.9)		
30–39	53 (40.8)		
40–49	31 (23.8)		
50–59	17 (13.1)		
>60	6 (4.6)		
Education level			
Less than high school	1 (0.8)	3.769	1.172
High school or equivalent	17 (13.1)		
College degree	21 (16.2)		
Bachelor degree	38 (29.2)		
Other	53 (40.8)		
Employment status			
Employed	102 (78.5)	1.385	0.839
Unemployed	14 (10.8)		
Retired	6 (4.6)		
Student	8 (6.2)		

Table 2. Places of access and hours of daily use of the internet (N=130)

	n (%)	Mean	Standard deviation
Where do you access the internet from?			
Home	111 (85.5)	1.192	0.530
Work	15 (11.5)		
Public place	2 (1.5)		
Internet cafe	2 (1.5)		
No use of internet	0 (0.0)		
How many hours do you use the Internet in a day?			
1	5 (3.9)	3.508	1.021
2	12 (9.2)		
3–5	49 (37.7)		
5–7	40 (30.8)		
7–10	24 (18.5)		

and grammatical improvements were made to optimize the questionnaire. Then a pilot study was carried out with 10 participants to see if the questionnaire was reliable. In this regard, the responses obtained were consistent, which suggested that the questionnaire was reliable.

Data analysis

The information from the questionnaire was analysed using basic descriptive statistics and the data were expressed in percentages. In addition, the mean and standard deviation of the data were estimated.

Results

Demographic information of the respondents

Table 1 shows the demographic information of the 130 participants who completed the questionnaire on the online platform. The results indicated that more than half of the respondents were females (62.3% [n=81]). Also, most of them (82.3% [n=107]) were >30 y of age. Likewise, the majority of the participants (78.5% [n=102]) were employed and with different education levels.

Analysis of respondents' mental and physical health

In the questionnaire, the respondents were asked about their physical and mental health. Such questions were asked to check whether the respondents properly read and understood the survey questions. To evaluate the mental and physical health the following scale was used: extremely healthy, moderately healthy, slightly healthy and not healthy. This procedure was used to avoid bias during the survey. The results indicated that 83 of the respondents (63.9%) were extremely mentally healthy at the time of answering the questionnaire, 30.6% (n=40) were moderately mentally healthy, 3.7% (n=5) were slightly mentally

was developed based on the findings of previous studies and by analysing the current status of e-health in the country. The data were collected using the QuestionPro design tool (QuestionPro, Austin, TX, USA) during March 2020. The questionnaire was initially viewed by 438 people and 130 of them answered the survey, for a response rate of 29.7%. Informed consent was obtained from all the participants and the study was approved by the Institutional Review Board of Imam Abdulrahman Bin Faisal University.

Questionnaire description

The questions were designed to obtain information about the personal profile of the respondents, how they utilize technology, general information regarding e-health technology, its implementation status and the current problems that the respondents face in the use this technology. The questionnaire is shown in Appendix 1.

Pilot study

After designing the questionnaire, it was sent to expert teachers to analyse the final formulation of the questions, identify mistakes and unclear issues and determine the validity of the survey questions. The experts returned their observations and structural

Table 3. Frequency of use of the internet for different purposes (N=130)

Purpose	Often, n (%)	Very often, n (%)	Quite often, n (%)	Not at all, n (%)
Entertainment	50 (38.5)	46 (35.4)	19 (14.6)	15 (11.5)
Mean	1.992			
Standard deviation	1.000			
Education	51 (39.2)	52 (40.0)	27 (20.8)	0 (0.0)
Mean	1.815			
Standard deviation	0.755			
Research	52 (40.0)	50 (38.5)	24 (18.5)	4 (3.1)
Mean	1.846			
Standard deviation	0.830			
Personal finance (banking etc.)	53 (40.8)	34 (26.2)	32 (24.6)	11 (8.5)
Mean	2.008			
Standard deviation	1.000			
Current update (news, sports, weather etc.)	51 (39.2)	42 (32.3)	26 (20.0)	11 (8.5)
Mean	1.977			
Standard deviation	0.968			
Online shopping	46 (35.4)	27 (20.8)	42 (32.3)	15 (11.5)
Mean	2.200			
Standard deviation	1.052			
Updating of health information	43 (33.1)	38 (29.2)	34 (26.2)	15 (11.5)
Mean	2.162			
Standard deviation	1.018			
Finding information of a specific product	56 (43.1)	46 (35.4)	25 (19.2)	3 (2.3)
Mean	1.808			
Standard deviation	0.827			

Table 4. Use of the internet to get information about diseases or health services (N=130)

Reason for use	n (%)	Mean	Standard deviation
Have you ever used the internet for finding the symptoms of illnesses of yourself or any other person?			
Yes	117 (90.0)	1.100	0.301
No	13 (10.0)		
Have you ever used health websites that provide health advice through hospitals, consultants, etc.?			
Yes	86 (66.1)	1.338	0.475
No	44 (33.9)		

healthy and 1.9% (n=2) were not mentally healthy. About their physical health, 47 of the participants (36.1%) were extremely physically healthy, 50.0% (n=65) were moderately physically healthy, 12.0% (n=16) were slightly physically healthy and 1.5% (n=2) were not physically healthy.

General use of the internet by the participants

Table 2 indicates that a high proportion of the respondents (85.5% [n=111]) utilized the internet at home and most of them (86.7% [n=113]) used it >3 h per day. Likewise, Table 3 presents

the frequency of internet use for several purposes, including entertainment, education, research, personal finance, current updates, online shopping, updating of health information and to find information on specific products. A scale of often, very often, quite often and not at all was used to evaluate this item.

Utilization of the internet to get information about diseases or health services

Some questions on the survey, shown in Table 4, asked about internet use to find information related to health issues. The

Table 5. Familiarity of internet users with the e-health system (N=130)

	n (%)	Mean	Standard deviation
Have you ever heard of the term electronic health (e-health)?			
Yes	103 (79.3)	1.207	0.407
No	27(20.7)		
Have you ever used e-health systems via any one of the provided sources?			
Asking health advice using pharmaceutical sites over the internet	29 (22.3)	2.967	1.516
Asking health advice using medical pages on social media	32 (24.8)		
Adhering to health advice using health blogs over the internet	14 (10.7)		
Electronic health devices	24 (18.2)		
Application (apps) downloaded on a mobile device	31 (23.9)		

results revealed that 90.0% (n=117) of the respondents visited health sites to research different disease symptoms. Also, 66.1% (n=86) of the respondents used the internet to get information related to health services in hospitals or consulting institutions.

Familiarity of the respondents with the e-health system

Table 5 shows that most of the participants (79.3% [n=103]) had heard the term electronic health (e-health) through many sources, including medical pages on social media (24.8% [n=32]), pharmaceutical sites (22.3% [n=29]), health blogs (10.7% [n=14]), apps on mobile phones (23.9% [n=31]) and other electronic devices (18.2% [n=24]).

Human behaviour–related barriers to adopting e-health systems

Table 6 shows the results of the barriers that the respondents faced while using e-health systems in different environments. The results indicated that 79.3% (n=103) of the respondents wanted to keep their health-related discussions private. Also, the respondents were concerned about sharing personal information when using online buying services or meeting people on the internet.

Analysis of the patient–doctor relationship

The respondents were asked to describe the patient–doctor relationship in terms of taking any health-related advice, what an appointment was like, obtaining prescriptions and what they knew about the doctor visit schedule and checks. These questions described in Table 7 help to identify the concerns of the patients about the doctor on a scale of strongly agree, agree, neutral, disagree and strongly disagree. It is interesting to observe that 67.6% (n=88, agree+disagree) of the respondents would follow a doctor's recommendation in using the e-health system.

Opinion of the respondents regarding the provision and use of different health services, including online systems

Table 8 shows how participants related to the provision of healthcare services using different settings, including online systems, phones, clinics and hospitals. The responses were expressed using a scale of strongly agree, agree, neutral, disagree, strongly disagree. It can be seen that 79.6% (n=102, strongly agree+agree) of the participants would be happy to receive health advice from doctors online. Also, 68.5% (n=89, strongly agree+agree) thought that it would be easy to access medical lab results online. On the other hand, 71.2% (n=92, strongly agree+agree) of the respondents would prefer face-to-face contact with a doctor rather than an online consultation. Also, 76.0% (n=99, strongly agree+agree) of the participants thought that online sources might provide false medical information to patients.

Factors affecting the adoption of websites

The respondents were also asked about the factors that affect the successful adoption of websites. These questions were asked to formulate different strategies to build trust among users in adopting new technologies. The detailed results are shown in Table 9. This table indicates that participants thought it would be better to interact with a site with the following characteristics: a trustworthy site where patient information is kept private (30% [n=39]), an official government site (29.2% [n=38]), a site with an understandable statement of its privacy policy (23.1% [n=30]) and a reputable and well-known site (29.2% [n=38]).

The results suggested that people will only go to websites or use other electronic services if they are asked for their consent regarding their privacy. The sites that ensured privacy are the most-visited sites.

Involvement of regulatory authorities for successful adoption of the e-health technology

The last part of the questionnaire (see Table 10) was focused on the involvement of regulatory authorities for successful adoption of the e-health technology. According to this table, 81.4% (n=106, agree+strongly agree) of the respondents would like to

Table 6. Behaviour-related barriers to adopting e-health systems (N=130)

Barriers	n (%)	Mean	Standard deviation
Talking about health information, are you concerned with the privacy of your health information?			
Yes	103 (79.3)	1.207	0.407
No	27 (20.7)		
If 'Yes' how concerned are you?			
Low	20 (14.9)	2.436	0.922
Medium	54 (41.5)		
High	37 (28.7)		
Very high	19 (14.9)		
How often do privacy concerns prevent you from buying items online?			
Always	23 (17.7)	2.680	1.241
Most of the time	41 (31.9)		
Rarely	36 (27.7)		
Once in a time	13 (10.1)		
Never	17 (12.6)		
Have you ever been bullied about health matters by someone on the internet?			
Yes	13 (10.1)	2.010	0.460
No	103 (78.9)		
Not sure	14 (10.9)		
If 'Yes' who were they?			
Known to you	7 (79.0)	1.501	0.850
Unknown to you	1 (10.1)		
A member from the organization where you seek advice	2 (20.0)		
How quickly after meeting people on the internet do you share your personal details?			
Very quickly	11 (8.3)	3.301	0.940
Quickly	11 (8.3)		
It takes time	37 (28.7)		
Don't share	71 (54.6)		
How often do you provide correct information on the internet?			
Extremely often	8 (6.5)	3.563	1.217
Very often	23 (17.6)		
Quite often	17 (12.9)		
Not often	51 (38.9)		
Not at all	31 (24.0)		
Do you share your personal details with people you met on the internet?			
Extremely often	3 (1.9)	4.176	1.084
Very often	14 (11.1)		
Quite often	8 (6.5)		
Not often	37 (28.7)		
Not at all	68 (51.9)		

be informed which government organization/department holds their health information. Also, 83.3% (n=108, agree+strongly agree) of respondents thought that citizens should be notified whenever someone accesses their data. Also, 55.5% (n=73, agree+strongly agree) of participants were satisfied with the current protection of their health data.

Discussion

The results of this research on adoption of the e-health system in the KSA indicated that the main factors that prevent the implementation of this system were mainly related to the lack of a relationship between doctors and patients, fears about the privacy of data on patient health, medical customs and behaviours of KSA citizens and a lack of government regulations. Regarding these findings, a recent systematic review of the literature found that, according to various stakeholders, the main factors affecting adoption of e-Health in the KSA were bureaucracy, absence of clear policies, lack of information security, limitations in the operation and maintenance of ICTs and e-health applications infrastructure, lack of technical personnel to operate e-health technology systems efficiently, high operational costs of e-health technology implementation, lack of educational training in new

Table 7. Opinions about the patient–doctor relationship (N=130)

Opinion	n (%)	Mean	Standard deviation
I am strongly satisfied with my doctor and the medical care I receive		2.28	0.884
Strongly agree	25 (19.4)		
Agree	55 (42.6)		
Neutral	38 (28.7)		
Disagree	12 (9.3)		
Strongly disagree	0 (0.0)		
My doctor answers my questions extremely well		2.29	0.897
Strongly agree	23 (17.6)		
Agree	62 (48.1)		
Neutral	29 (22.2)		
Disagree	16 (12.0)		
Strongly disagree	0 (0.0)		
I only visit my doctor when I am ill		1.87	0.996
Strongly agree	59 (45.4)		
Agree	42 (31.5)		
Neutral	20 (15.7)		
Disagree	7 (5.6)		
Strongly disagree	2 (1.9)		
I prefer regular check-ups be done by my doctor		2.360	1.036
Strongly agree	31 (23.1)		
Agree	44 (34.3)		
Neutral	36 (27.8)		
Disagree	17 (12.9)		
Strongly disagree	2 (1.8)		
It is very easy to schedule an appointment with my doctor		2.520	1.054
Strongly agree	23 (17.6)		
Agree	46 (35.2)		
Neutral	36 (27.8)		
Disagree	22 (16.7)		
Strongly disagree	3 (2.3)		
I would follow my doctor's recommendation in using e-health systems		2.112	0.801
Strongly agree	32 (24.1)		
Agree	56 (43.5)		
Neutral	38 (29.6)		
Disagree	4 (2.8)		
Strongly disagree	0 (0.0)		

technologies, limitations in knowledge of the English language, social barriers and cultural beliefs.[29] Analogously, a similar study conducted among healthcare providers in Nigeria found that the main factors impeding the adoption of e-health technology applications were lack of technological infrastructure, lack of national e-health strategies, limited knowledge of ICT technologies, financial barriers, security constraints and administrative deficiencies.[12]

The results of the present study revealed (see Table 7) that more than half of the participants (62.0% [n=80, agree+strongly agree]) were satisfied with their doctors and with the conventional medical treatment they received. Likewise, Table 8 indicates that the majority of respondents (86.2% [n=112, agree+strongly agree]) were happy to provide their medical information to the doctors in clinics or hospitals and preferred

(71.2% [n=92, agree+disagree]) face-to-face contact with doctors instead of online consultations. However (see Table 7), more than half of the participants (67.6% [n=88, agree+strongly agree]) thought that they would follow the recommendations of their doctors to use the e-health system. Similarly, Table 8 shows that 79.6% (n=102, agree+strongly agree) of the participants would be happy to receive health advice online from their doctors and to share medical details with their doctors over the phone (69.4% [n=90, agree+strongly agree]). These results suggest that clinicians can help their patients adopt the e-health system. In other words, doctors can play an important role in adoption of the e-health system in the KSA. Regarding this issue, in Table 7 it can be seen that there is low interaction between doctors and patients, as visits to doctors are usually restricted to cases of diseases, thus 76.9% (n=101, strongly agree+agree) of the

Table 8. Opinions about the provision of health services (N=130)

Opinions	n (%)	Mean	Standard deviation
I am happy to receive health advice from my doctor via online			
Strongly agree	42 (32.4)	1.95	0.880
Agree	60 (47.2)		
Neutral	18 (13.9)		
Disagree	8 (5.6)		
Strongly disagree	2 (0.9)		
I am happy to share my medical details with my doctor over the phone			
Strongly agree	34(25.9)	2.16	0.949
Agree	56 (43.5)		
Neutral	27 (20.4)		
Disagree	12 (9.3)		
Strongly disagree	1 (0.9)		
I am happy to provide my medical information to my doctor in his/her clinic/hospital			
Strongly agree	45 (34.3)	1.84	0.799
Agree	67 (51.9)		
Neutral	14 (11.1)		
Disagree	1 (0.9)		
Strongly disagree	3 (1.9)		
I am concerned there may be online sources that provide false medical information			
Strongly agree	35 (26.9)	2.02	0.809
Agree	64 (49.1)		
Neutral	25 (19.4)		
Disagree	6 (4.6)		
Strongly disagree	0 (0)		
It is easy for me to find the official Ministry of Health website for health information			
Strongly agree	26 (19.4)	2.37	0.972
Agree	48 (37.0)		
Neutral	43 (33.3)		
Disagree	10 (7.4)		
Strongly disagree	3 (2.8)		
I am happy to use an official online health service that may help answer my question about my medical condition, provide medical recommendations or provide a medical diagnosis			
Strongly agree	40 (30.6)	2.10	0.976
Agree	51 (38.9)		
Neutral	29 (22.2)		
Disagree	8 (6.5)		
Strongly disagree	2 (1.9)		
I am happy to use online medical help that redirects me to specialized doctors			
Strongly agree	43 (33.3)	1.97	0.870
Agree	54 (41.7)		
Neutral	26 (19.4)		
Disagree	7 (5.6)		
Strongly disagree	0 (0.0)		
It is easy to book an online appointment to a doctor's office			
Strongly agree	27 (20.4)	2.38	1.039
Agree	50 (38.9)		
Neutral	35 (26.9)		
Disagree	13 (10.2)		
Strongly disagree	5 (3.7)		

Table 8. Continued

Opinions	n (%)	Mean	Standard deviation
It will be easy to access the medical lab results online		2.20	1.100
Strongly agree	39 (29.6)		
Agree	50 (38.9)		
Neutral	22 (16.7)		
Disagree	14 (11.1)		
Strongly disagree	5 (3.7)		
Online medical purchasing is easy		2.56	0.998
Strongly agree	19 (14.8)		
Agree	43 (33.3)		
Neutral	46 (35.2)		
Disagree	18 (13.9)		
Strongly disagree	4 (2.8)		
I would prefer face-to-face contact with my doctor rather than an online consultation		2.06	0.998
Strongly agree	43 (33.3)		
Agree	49 (37.9)		
Neutral	25 (19.4)		
Disagree	10 (7.4)		
Strongly disagree	3 (1.9)		

Table 9. Opinions about the characteristics of websites (N=130)

Question	Response	n (%)	Mean	Standard deviation
It would be better to interact with sites that have the following characteristics (you can choose more than one)	It's a trust worthy site (says your information will be private)	39 (30.0)	2.47	1.209
	Has an understandable statement of its privacy policy	30 (23.1)		
	Reputable and well-known site	23 (17.7)		
	Official government site	38 (29.2)		
While taking any risk, how careful are you?	Very careful	65 (50.0)	1.63	0.705
	Careful	48 (37.1)		
	Neutral	17 (12.9)		
	Risk-taker	0 (0.0)		

participants only visited a doctor when they were ill. Because of the role that doctors can play in the implementation of new technologies, it is important that they develop strategies to improve and increase relationships with their patients. Likewise, they can take advantage of these meetings with their patients to motivate them to adopt the new technologies of the e-health system.

Related to this topic, a comparative study was conducted where a panel of four authors sought out studies related to the factors that affect adopting e-health systems.[30] One important factor they encountered was that people only search online health sites when they are affected by communicable diseases. In case of non-communicable diseases and chronic diseases, they relied only on hospital visits and showed less trust towards online services.[30] In a connected study about the integration of the Remote Monitoring of Rheumatoid Arthritis study (REMORA) technology into the e-health system, the results showed that the patient was more likely to use an e-health system with the REMORA system in which a patient can find the cause of their symptoms by seeing pictures and reading descriptions and can communicate better with his/her doctor.[31] With this technology,

Table 10. Opinions on the involvement of authorities in regulatory policies (N=130)

Opinion	n (%)	Mean	Standard deviation
I would like to be informed about which government organization has my health data information			
Strongly agree	53 (40.7)	1.796	0.783
Agree	53 (40.7)		
Neutral	22 (16.7)		
Disagree	2 (1.9)		
Strongly disagree	0 (0.0)		
I would like to receive a notification every time someone accesses my health information			
Strongly agree	62 (48.1)	1.731	0.849
Agree	46 (35.2)		
Neutral	16 (12.0)		
Disagree	6 (4.6)		
Strongly disagree	0 (0.0)		
Are you satisfied with the current protection of your health data?			
Strongly agree	25 (18.5)	2.370	0.933
Agree	48 (37.0)		
Neutral	45 (35.2)		
Disagree	10 (7.4)		
Strongly disagree	2 (1.9)		

patients can submit a daily health score to their doctor and visit him after a 3-d interval of contacting the doctor for the first time. The results suggested that about 90% of the people used this technology efficiently.[31] That study showed that integrating new systems with e-health would benefit the patient and increase the acceptance of this technology.[31]

Alternatively, Table 9 shows that 87.1% (n=113, careful+very careful) of participants were careful about taking risks that compromise the privacy of their health information and would prefer to interact with sites that ensure the privacy of their data (30.0% [n=39]). Also, as seen in Table 6, 79.3% (n=103) of participants were concerned about the privacy of their health data and Table 10 shows that they are interested in being informed about which government organization keeps their health information (81.4% [n=106, agree+strongly agree]) and when someone accesses their data (83.3% [n=108, agree+strongly agree]). According to these assessments, ensuring the privacy of information about the health of patients is an important factor that must be considered in the implementation of the e-health system in the KSA. It is also necessary to implement government regulations to protect patients' health data.

Regarding this issue, a study showed that confidentiality and privacy are major concerns in adoption of the e-health system. Regulations in this system restrict sharing patients' personal information without their consent. Having these regulations in place will increase the adoption of e-health systems.[32] A study conducted in New York indicated that there was a major gap in the efficiency of implementing the e-health system in hospitals, which included less availability of resources and the lack of federal regulations and documentation.[33] About 40% of the hospitals in New York have been reported as having poor documentation and regulations.[33] Compared with that study, the percentage of adequate regulations in the KSA is still very

low, creating obstacles to the adoption of the e-Health system. Another study conducted in China indicated that trust and satisfaction were two important factors that highly impact the adoption of e-health technology. In e-health systems, the level of user satisfaction reflects the level of expectations.[34]

In a general context, it was observed that the majority of the participants in this study were women (62.3% [n=81]). Also, a similar result was observed in research conducted to identify factors affecting adoption of the e-health system in Bangladesh, where the outcomes indicated that gender played an important role and women were more concerned about exploring and adventuring into new technologies than men.[27] Similarly, in a survey conducted in Sydney, NSW, Australia, there were 83 mothers and 49 fathers.[35] According to the results, mothers were more concerned with electronic websites than fathers. Another important aspect of the survey was that about 81% of the parents visited the websites and found that they were a combination of words, pictures and videos. Parents believed that the images and videos facilitated their understanding of the information and revealed that the integration of new systems with e-health benefits the patient and increases acceptance of this technology.[35]

Regarding utilization of the internet by the participants, it was found that all respondents (100% [n=130]) used the internet daily for different purposes, including entertainment, education, research, to manage personal finances, to keep up to date on different topics, including health topics, and to shop and obtain information on specific products. It is interesting to note that 90% (n=117) of participants used the internet to obtain information about health or about hospitals, clinics and doctor's offices (66.1% [n=86]) (see Table 4). Also, in Table 5, a high proportion of the participants (79.3% [n=103]) had heard the term e-health and had used these systems to obtain health advice on sites related to pharmaceuticals (22.3% [n=29]), medical

pages on social media (24.8% [n=32]), health blogs (10.7% [n=14]) and medical apps (23.9% [n=31]). A similar telephone survey–based analysis was conducted in Hong Kong, in which people were asked about their use of e-health-related information platforms and apps.[36] The results indicated that among the 820 respondents, 47.2% of the respondents regularly used e-health services and apps. Other studies have also investigated how familiar people are with e-health systems and one study reported that language plays an important role in familiarization with e-health systems, as English is considered the standard language for online services.[37] In this sense, individuals who do not understand English have linguistic limitations to access these systems.[37]

The main limitation of this work was the small sample size, which limits the generalization of these results to the KSA. Future studies will be aimed at overcoming this limitation and performing a more complete statistical analysis.

Conclusions

The Saudi government is trying to deliver better health-related services to its people and is providing the health department with a huge budget to improve health issues. The government has also implemented the e-health system throughout the country to promote better and more accessible health services. However, adoption of the e-health system has not been as effective in the KSA as in other countries. Some of the barriers that have affected adoption include human barriers, infrastructure problems, financial issues, low government support, a low level of acceptability due to privacy issues, improper regulations and authorities and poor accessibility to the new technology. Additionally, there are certain sociodemographic factors that also create hurdles in the adoption of the e-health system, including age, gender, residency, income, education, vocational status and ethnicity. Also, many people simply don't know about this technology and people who are familiar with this technology have privacy concerns and do not want to provide their information on a website or app. Poor marketing on social media has also been an important factor that has not helped in adoption of the e-health system. People are unaware of the benefits of this technology or do not know how to use the system effectively. Another major obstacle in adoption of the e-health system has been the lack of a relationship between the patient and doctor. Inadequate regulations and low government involvement are also major barriers to adoption of the e-health system.

In general, the results show that human behaviour and the response towards the acceptability of this technology are main factors for its adoption. Also, the outcomes of this survey suggest that professionals should contribute to modifying the e-health system and add more governmental regulatory bodies to increase adoption. This will also promote confidence in the system and allow patients to communicate with their doctor easily and freely. In addition, facilities must have better communications systems to implement the e-health technology in any community. By modifying existing strategies, the results of this study can contribute to successful implementation of the e-health system in the KSA.

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Appendix 1. Factors affecting the adoption of an e-health system in the KSA

1. Choose your gender
   - Male
   - Female
2. Choose your marital status
   - Single
   - Married
   - Divorced
   - Have children
3. Which category below includes your age?
   - 16–20
   - 21–29
   - 30–39
   - 40–49
   - 50–59
   - 60 or older
4. Specify your nationality (if other than Saudi)
5. Which is your highest level of education?
   - Less than high school degree
   - College degree
   - Bachelor degree
   - High school or equivalent degree
6. What is your employment status?
   - Employed
   - Unemployed
   - Retired
   - Studying
7. Where do you access the internet from?
   - Home
   - Work
   - Public place
   - Internet cafe
   - Do not use internet
8. How many hours do you use the internet in a day?
   - 1 h
   - 2 h
   - 3–5 h
   - 5–7 h
   - 7–10 h

	Often	Very often	Quiet often	Not at all
Entertainment				
Education				
Research				
Personal finance (banking, etc.)				
Current update (news, sports, weather, etc.)				
Online shopping				
Updating of health information				
Finding information on a specific product				

9. How often do you use the internet for the following purposes?
10. Have you ever used the internet for finding the symptoms of illness of yourself or any other person?
   - Yes
   - No
11. Have you ever used health websites that provide health advice through hospitals, consultants etc.?
   - Yes
   - No
12. If yes, how often do you use that?
   - Daily (2–3 times a day)
   - Once in week
   - Once in month
   - Never
13. Have you ever heard of the term electronic health (e-health)?
   - Yes
   - No
14. Have you ever used an e-health system via any of the provided sources?
   - Asking health advice using pharmaceutical sites over the internet
   - Asking health advice using medical pages on social media
   - Adhering health advice using health blogs over the internet
   - Electronic health devices
   - Application (apps) downloaded on a mobile
15. Talking about health information, are you concerned with your health information privacy?
   - Yes
   - No

16. If 'yes' how concerned you are?
   - Low
   - Medium
   - High
   - Very high
17. How often do privacy concerns prevent you from buying services online?
   - Always
   - Most of the time
   - Rarely
   - Once in a time
   - Never
18. Have you ever been bullied by someone on the internet related to your health?
   - Yes
   - No
   - Not sure
19. If 'yes', were they
   - Known to you
   - Unknown to you
   - Member from the organization whom you seek advice
20. How quickly after meeting people on the internet do you share your personal details?
   - Very quickly
   - Quickly
   - It takes time
   - Don't share

21. How often do you provide your personal information on any
    website you generally visit?

	Extremely often	Very often	Quite often	Not very often	Not at all
I provide correct information on the internet					
I share my personal details about myself with the people I met on internet					
I am always concerned when providing the credit card detail when buying something online					
I provide my personal information for a service but sometimes I am not sure if I can trust on the site					
I provide my income information when I need a certain service					
I provide my health information to online trusted health websites that provide healthcare services					

22. How physical healthy are you?
    • Extremely healthy
    • Moderate healthy
    • Slightly healthy
    • Not a healthy
23. How mentally healthy are you?
    • Extremely healthy
    • Moderate healthy
    • Slightly healthy
    • Not a healthy
24. To what extent do you agree with the following statements
    related to patient doctor relationship?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I am strongly satisfied with my doctor and medical care I receive					
My doctor answers my questions extremely well					
I only visit my doctor when I am ill					
I prefer for regular check-up by my doctor					
It is very easy to schedule appointment with my doctor					
I would follow my doctor recommendation in using e-health					

25. To what extent do you agree with the following statements
    regarding the provision and use of different health services
    and online applications?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I am happy to receive health advice from my doctor via online					
I am happy to share my medical details with my doctor on the phone					
I am happy to provide my medical information to my doctor in his/her clinic/hospital					
I am concerned that there may be online sources providing false medical information					
It is easy for me to find the official Ministry of Health website for health information					

I am happy to use an official online health service that may help answer my questions about my medical condition, provide medical recommendations or provide a medical diagnosis

I am happy to use online medical help that redirects me to specialized doctors

It is easy to book an online appointment with a doctor

It will be easy to access medical lab results online

Online medical purchase is easy

I would prefer face-to-face contact with my doctor rather than an online consultation

26. It would be better to interact with a site that has the following characteristics (you can choose more than one)
   - It's a trustworthy site (says your information will be private)
   - Has an understandable statement of its privacy policy
   - Reputable and well-known site
   - Official government site
   - Any other

27. While taking any risk, how careful are you?
   - Very care full
   - Care full
   - Neutral
   - Risk taker

28. To what extent do you agree with the provision and use of your personal information by a government department?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
I would like to be informed which government organization/department holds information about me					
I would like to be informed which government department is responsible for ensuring my data are correct					
I would like to know which government organization has access to my data and on what grounds					
Citizens should be notified whenever someone accesses their data					
Are you satisfied with the current protection of your data?					