Original Article

Telehealth utilization among Egyptian population and health institutional readiness: An exploratory study

ABSTRACT

Objective: This study aimed to assess the public's perspectives and the health institutions' readiness for telehealth utilization in Egypt.

Methods: A cross-sectional study design was employed, and data were collected from a convenient sample of 800 Egyptian citizens and 26 nursing administrators and information technology personnel from 16 governmental hospitals and 10 private hospitals between January and March 2022. The Egyptian community utilization of telehealth questionnaire and the telemedicine hospital readiness assessment were used to collect the data.

Results: The results revealed that 35.1% of the general Egyptian population used telehealth services and 43% expressed willingness to use them in future. As perceived by the general Egyptian population, the most prevalent barriers to telehealth utilization were communication barriers (97.6%), lack of confidence in health professionals (77.6%), technological limitations (72.5%), the need for physical examination (25%), and privacy concerns (10%). Regarding hospital readiness, 42% of governmental hospitals were not taking any initiative to implement telehealth services, and 15.4% were at the beginner level, meaning that some steps had been taken. However, the hospital was still far from being able to implement telehealth services. In contrast, private hospitals were either at the beginner or advanced level.

Conclusion: Although the use of telehealth services in Egypt has increased, there is a need to address the barriers to public utilization and improve hospitals' readiness to implement telehealth services to enhance public usage.

Keywords: Attitude, barriers, hospital readiness, public use, telehealth, nursing practice, nursing administration

INTRODUCTION

The use of E-health is considered necessary to address the challenges facing health-care systems that are experiencing increasing demand due to the aging population, advancements in treatments, and limited resources.[1] Telehealth, which involves providing healthcare services through telecommunications, is one aspect of E-health.[2,3] E-readiness assessments are valuable tools in implementing telehealth services as they provide feedback that can help institutions determine their readiness for adoption. This feedback can be used to customize the implementation process to suit the institution's specific needs and level of readiness. Assessments of an organization's or institution telehealth readiness are crucial during the preimplementation phase, as they can help identify weaknesses and obstacles that must be addressed to ensure successful implementation.[4]

Egypt aims to achieve Universal Health Coverage, which has increased the demand for telehealth in routine healthcare services. However, only minor steps have been taken toward

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implementing telehealth services, and more work is needed to improve telehealth readiness in the country.[2] The urgency of the COVID-19 pandemic resulted in a lack of advanced planning and preparation for telehealth services among health-care practitioners and organizations.[5] This shift toward telehealth was unprecedented, and more research is needed to understand the public's experiences with transitioning to and maintaining telehealth services during and after the pandemic.[6]

The development and implementation of telehealth services in low- and middle-income countries can be challenging for a variety of reasons. Successfully adopting any new technology depends on users' understanding of the technology, acquiring the necessary skills, and creating a suitable working environment. Therefore, these factors need to be considered for telehealth services to be adopted in Egypt.[2] Telemedicine projects in Egypt face common technical, financial, and human resources challenges, which can affect their sustainability. The country is expected to invest significant money in building new hospital beds, presenting opportunities for growth in the telehealth sector.[7] Overall, Egypt needs to improve its health-care infrastructure through government or private sector initiatives. However, challenges related to broadband access, affordability, and digital literacy still prevent certain groups from benefiting from digitalization and telehealth services.[8]

The attitudes of the community toward telehealth are critical for the sustained use of telehealth services both during and after the COVID-19 pandemic. However, little is known about adults' experiences with telehealth in Egypt, which is essential given the country's plans for the nationwide implementation of telehealth. The quality of digital connectivity, digital literacy, and high-quality health care are the essential factors for future development. Therefore, this study aims to assess the public's utilization of telehealth and the readiness of health institutions for telehealth implementation in Egypt. In order to achieve the objective of the study, a set of research questions were formulated: (a) What is the actual public use of telehealth among the Egyptian population? (b) What are the barriers to telehealth utilization among the Egyptian population? (c) What is the public attitude toward the utilization of telehealth in Egypt? (d) What is the current hospitals' readiness for telehealth implementation in Egypt? (e) What is the current hospitals' maturity level for telehealth management in Egypt?

METHODS

Ethical considerations
The ethical committee of the Faculty of Nursing at Cairo University approved the current study on December 19, 2022 (Ethical approval no 00026458). Written informed consent was obtained from all the participants.

Design
The present study was conducted using a research design that is descriptive, comparative, and cross-sectional.

Setting
Regarding the Egyptian population, the online open survey link of the first tool (Telehealth public utilization questionnaire) was distributed to the general population. Regarding the hospitals, the study of institutional readiness was conducted at 16 governmental hospitals and 10 private hospitals located in Giza and Cairo governorates.

Sample
Regarding the Egyptian population, a convenient sample of 800 Egyptian citizens who were adults and could complete the questionnaire without assistance.

Sample size calculation
Referring to a recent national survey conducted to evaluate the knowledge, attitude, and obstacles to telemedicine among the general population in Egypt found that half of the participants reported having used a telemedicine tool.[3] To calculate the sample size, the researchers used the formula:

$n = \dfrac{z^2 \times p \times (1-p)/e^2}{1 + \dfrac{z^2 \times p \times (1-p)}{e^2 \times N}}$ for sample size calculation with a

5% margin of error, z-value of 1.96, 95% confidence level, and $P = 0.5$ based on the previous study. In addition, the population size of Egypt was estimated to be 101,000,000 by the Ministry of Planning and Economic Development in 2021. Based on these parameters, the sample size was determined to be 385.

Regarding the hospitals, a convenient sample (26) of nursing administrators and information technology (IT) personnel from 16 governmental hospitals and ten private hospitals located in Cairo and Giza governorate were selected.

Tools of data collection
For the purpose of the current study, two tools were used for the data collection.

The first tool is telehealth public utilization questionnaire which is a web-based questionnaire created by the researchers, designed to be completed anonymously online. The questionnaire was developed after reviewing relevant literature and based on Isautier *et al.*[9] and Alboraie *et al.*[3] Participants were asked to answer questions related to their experience with telehealth. The questionnaire

included 26 questions, divided into four main sections. The first part was personal characteristics consisted of six questions intended to gather basic demographic data from participants, including age, gender, educational level, marital status, monthly income, and comorbidities. The second part was the experience with telehealth use which included five questions with multiple-choice answers to determine whether participants had used telehealth before. If they had used it, they were then asked about the frequency and purpose of their use, as well as the method of access. The third part was barriers encountered telehealth utilization which consisted of 5 closed-end questions about the barriers facing telehealth users and reasons for not using telehealth among nonusers. The fourth part was the public attitude toward future telehealth utilization scale. It consisted of 10 items and aimed to evaluate participants' inclination toward utilizing telemedicine. The questions were formulated to determine participants' agreement or disagreement with the significance of telehealth, their preference for traditional health-care services, contentment with remote health-care services, and their intent to use telehealth services in the future. Participants rated their responses on a 3-point Likert scale, where 1 indicated disagreement, 2 indicated neutrality, and 3 indicated agreement.

The second tool is Telemedicine Tool which was adapted from COVID-19 and the Telemedicine Tool developed by the World Health Organization[10] and modified by the investigators to evaluate the level of preparedness and capability of health-care organizations in implementing telemedicine services. This section consisted of 69 questions grouped into five sections, including readiness of the organization (23 questions), processes (10 questions), digital infrastructure (20 questions), human resources (10 questions), and regulatory concerns (6 questions).

Scoring system: The responses of nursing administrators and IT personnel in both governmental and private hospitals referred to the level of health institutional readiness for the implementation of telehealth in Egypt as follows: (1) Refer to no level, (2) Refer to beginner level, (3) Refers to advancing level, and (4) Refers to ready level.

Validity: A panel of three nursing community health experts from the Faculty of Nursing at Cairo University was consulted to review both Arabic and English versions of the Telehealth public utilization questionnaire to ensure validity. The experts evaluated the questionnaire for content, clarity, coverage, wording, length, format, and overall appearance. Based on their opinions, some modifications were made to improve the questionnaire. Furthermore, the tool was double-translated from English to Arabic to match the participants' level of education.

Reliability: Cronbach's Alpha coefficient was employed to evaluate the reliability of the two questionnaires. Cronbach's alpha coefficients for the telehealth public utilization questionnaire and the COVID-19 and telemedicine tool were 0.90 and 0.93, respectively, indicating high reliability.

Procedures

The study on the population of Egypt was performed utilizing a survey questionnaire created through Google Forms and distributed through social media channels such as Facebook, Messenger, and Instagram. In order to ensure ethical standards, consent letters were issued to participants beforehand, requesting their permission to be included in the research.

Before contacting the nursing administrators and IT personnel at 16 government hospitals and 10 private hospitals in Cairo and Giza governorate, the researchers requested permission from the hospital directors. Potential participants were informed of the study's objectives, nature, and significance, and they were invited to participate voluntarily by providing formal written consent. The investigators personally distributed questionnaires to each nursing administrator and IT employee while they were at work. Participants were given between 25 and 35 min to complete the questionnaire, which was subsequently reviewed for completeness. The collection of data occurred between January 2022 and March 2022.

Pilot study

Before beginning the actual data collection process, a pilot study was conducted on a sample of 10% of the study subjects, which consisted of 80 Egyptian citizens, two nursing administrators, and one IT personnel. This pilot study aimed to determine the suitability and effectiveness of the study tools and evaluate the feasibility of the research process. In addition, the amount of time needed to complete the three data collection tools was estimated based on the pilot study results. Participants in the pilot study were included in the final analysis without any modifications to the study tools.

Statistical analysis

The collected data were tabulated, summarized, and statistically analyzed using the Statistical Package for the Social Sciences (SPSS), version 25, on an IBM-compatible computer running Windows. Descriptive statistical methods such as frequency, percentages, mean, and standard deviation were employed. In addition, significance tests,

such as the paired *t*-test and correlation coefficient (*r*), were used. *P* <0.05 was considered statistically significant and a *P* < 0.001 was considered highly significant. No statistically significant difference was deemed present if the *P* > 0.5.

RESULTS

Table 1 depicts the characteristics of the participants, where 39.7% were aged between 18 and 24 years, and 2.5% were aged between 45 and 54 years, with a mean age of 25.3 ± 5.6 years. Only 4.1% of the participants could read and write, whereas 37.5% held a university degree. Regarding employment, 31.6% of the participants were employed by the government, while 1.3% worked as office workers, with 64.8% being single. In terms of monthly income, 47.8% had <1200, while 24.4% had more than 2000. In addition, 73.2% of the participants had no chronic diseases, while 26.8% suffered from chronic diseases.

Table 2 provides information on the utilization of telehealth services, where the primary purpose for using telehealth
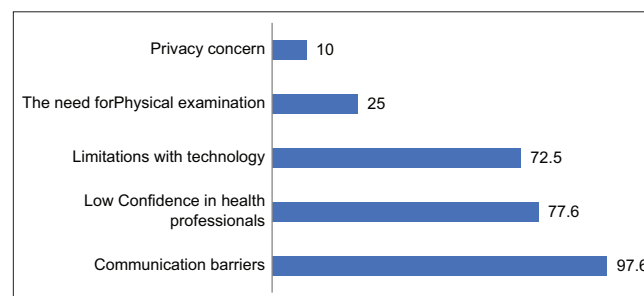
Table 1: Distribution of public participants regarding their demographic characteristics (*n*=800)

Items	Frequency (%)
Age/year	
18–24	317 (39.7)
25–34	310 (38.8)
35–44	153 (19.1)
45–54	20 (2.5)
Education	
Can read and write	33 (4.1)
Basic education	195 (24.4)
Middle education	272 (34.0)
University degree	300 (37.5)
Work	
Student	76 (9.5)
Governmental	253 (31.6)
Nongovernmental	190 (23.8)
Unemployed	247 (30.8)
Freelancers	34 (4.3)
Marital status	
Single	518 (64.8)
Married	276 (34.5)
Widow	2 (0.2)
Divorced	4 (0.5)
Monthly income	
<1200	382 (47.8)
1200–2000	223 (27.8)
>2000	195 (24.4)
Comorbidity	
Absence from chronic diseases	585 (73.2)
Suffering from chronic diseases	215 (26.8)

was to track pandemic news, with a percentage of 35.1%, followed by seeking a physician's advice at 25.6%. Only 6% of participants reported using telehealth for emergency cases, and 0.7% reported using it to seek nursing assistance. In terms of the number of telehealth appointments, 24% of participants had between 1 and 5 appointments, while 5.1% had more than ten appointments. It was found that 27.5% of participants conducted telehealth visits via social media platforms such as WhatsApp or Facebook, while 1.6% used video conferences.

As shown in Figure 1, a large proportion of Egyptians, approximately 97.6%, encountered communication barriers when utilizing telehealth, while 10% had privacy concerns. The public's perspective on telehealth services is depicted in Table 3, where 63.1% of respondents agreed that telehealth services could be helpful during health emergencies, and 56.8% agreed they could save money. Furthermore, 59.1% of participants agreed that consultations using telehealth systems were as efficient as in-person consultations. A total of 38.5% of participants reported being satisfied with their telehealth use and 43% expressed willingness to use the service in future. However, 29.8% of participants agreed that telehealth might jeopardize patient privacy.

The results of a Pearson correlation analysis investigating the relationship between telehealth constraints, telehealth usage, and attitude demonstrated a statistically significant positive correlation between telehealth constraints and attitude (*r* = 0.201, *P* = 0.000), indicating that as the level of telehealth constraints increased, so did the positive attitude toward telehealth services. In addition, there was a statistically significant positive correlation between telehealth use and attitude (*r* = 0.203, *P* = 0.000), suggesting that as the frequency of telehealth usage increased, the positive attitude toward telehealth services also increased. Moreover, the analysis showed a statistically significant positive correlation between telehealth constraints and telehealth uses (*r* = 0.153, *P* = 0.000), indicating that as

Figure 1: Distribution of participants regarding reported barriers to telehealth utilization (*n* = 800)

the level of telehealth constraints increased, the frequency of telehealth usage also increased.

As depicted in Table 4, a significant positive correlation existed between education, age, occupation, income, and

health condition with telehealth attitudes (all *P* < 0.01). However, there was no statistically significant correlation between marital status and telehealth attitudes (*r* = 0.007, *P* > 0.05). Regarding telehealth uses, there was a statistically significant positive correlation between education, age, and the job (all *P* > 0.05).

There was no statistically significant correlation between the utilization of telehealth and marital status, income, or health conditions (all *P* > 0.05). Nonetheless, a statistically significant positive correlation existed between age and income with telehealth constraints (all *P* < 0.05). Conversely, there was no statistically significant correlation between telehealth constraints and education, job, marital status, and health condition (all *P* > 0.05).

Table 5 displays that the organizational readiness dimension had the highest mean score in governmental hospitals (51.1%), followed by the regulatory issues dimension (46.4%), whereas in private hospitals, the digital environment dimension had the highest mean score (61%), followed by organizational readiness (60.2%). The table also revealed that private hospitals scored higher than governmental hospitals in all dimensions of telehealth. In addition, there are significant differences between governmental and private hospitals in all telehealth dimensions (all *P* < 0.05) except the process dimension.

Table 2: Distribution of participants regarding their actual use of telehealth (*n*=800)

Items	*n* (%)
Reasons for telehealth use	
Follow and track pandemic news purposes	281 (35.1)
Seeking a physician's advice	205 (25.6)
Emergency case	48 (6.0)
Getting laboratory results	40 (5.0)
Ordering a nonprescription medicine	35 (4.4)
Seeking a pharmacist's advice about medication	33 (4.1)
Seeking a nurse's help	6 (0.7)
Number of telehealth appointments	
Not using	519 (64.9)
1–5	192 (24.0)
6–10	48 (6.0)
>10	41 (5.1)
Telehealth visit(s) done through	
Telephone	34 (4.3)
Videoconference	13 (1.6)
Mobile applications	14 (1.7)
Social media, e.g., WhatsApp, Facebook	220 (27.5)

Table 3: Distribution of public related to their attitude toward future utilization of telehealth (*n*=800)

Item	Agree, *n* (%)	Neutral, *n* (%)	Disagree, *n* (%)
Telehealth improves access to remote and underserved areas to health care services	344 (42.9)	354 (44.3)	102 (12.8)
The telehealth system can save time	365 (45.6)	396 (49.5)	39 (4.9)
Telehealth services can save money	455 (56.8)	239 (29.8)	106 (13.3)
Telehealth applications are simple and easy to use	470 (58.7)	161 (20.1)	169 (21.2)
Telehealth systems can jeopardize patient privacy	239 (29.8)	292 (36.6)	268 (33.6)
Telehealth services can help in health emergencies	505 (63.1)	195 (24.4)	100 (12.5)
Telehealth services can increase medical errors	239 (29.9)	292 (36.5)	268 (33.5)
Telehealth can improve communication between patients and their doctors or nurse	470 (58.8)	161 (20.1)	169 (21.1)
Consultations using the telehealth system were as efficient as in-person consultations	473 (59.1)	195 (24.4)	132 (16.5)
I am currently satisfied with the telehealth use	308 (38.5)	440 (55.0)	52 (6.5)
I will use the telehealth service in the future	344 (43.0)	354 (44.2)	102 (12.8)

Table 4: Correlation between demographic characteristics and telehealth among Egyptian

Variable	Education	Age	Job	Marital status	Income	Health condition
Attitude						
Pearson correlation	0.119**	0.092**	0.119**	0.007	−0.097**	0.154**
Significant (two-tailed)	0.001	0.009	0.001	0.834	0.006	0.000
Telehealth uses						
Pearson correlation	0.044	0.067	0.054	−0.001	−0.029	0.058
Significant (two-tailed)	0.213	0.057	0.129	0.969	0.418	0.100
Telehealth constraints						
Pearson correlation	−0.012	0.083*	0.056	0.072*	0.102**	0.033
Significant (two-tailed)	0.745	0.020	0.116	0.043	0.004	0.352

**Correlation is significant at the 0.01 level (two-tailed), *Correlation is significant at the 0.05 level (two-tailed)

Table 6 displays that 15.4% of private hospitals did not take the initiative to implement telehealth services, while 15.4% of them were classified as beginner level, indicating that some steps had been taken, but the hospital was not yet capable of providing telehealth services. In contrast, 7.7% were classified as advanced level, indicating that telehealth service implementation was proceeding well. Moreover, 46.2% of government hospitals had not implemented telehealth services, and 15.4% were considered at the beginner level. This result indicated that the hospital had taken some steps but was not yet prepared to offer telehealth services.

DISCUSSION

Telehealth utilization among the Egyptian population
The COVID-19 pandemic increased the use of telehealth and digital health platforms, primarily due to the need to maintain physical separation and restrictions. As a response to this threat, telehealth was rapidly and broadly adopted, developed, and implemented as virtual healthcare facilities through various multi-purpose technology platforms to maintain continuity of care.[11] Regarding telehealth utilization among the Egyptian population, the study found that 35.1% of the population had used telehealth services for appointments within the last 3 months. A similar result was found in a study conducted in the United Arab Emirates by Al Meslamani *et al*.[12] which reported that 31.3% of the population had used telemedicine services during the COVID-19 pandemic. Bhatia *et al*.[11] conducted a study to evaluate the use of virtual care during the COVID-19 pandemic in Canada. The study revealed a significant increase in the use of telehealth services among Canadian citizens, with 70.6% of people using telehealth in Ontario during the second quarter of 2020. Notably, the disparity between the results of the two studies may be attributable to the difference in data collection timing. The Canadian study was conducted at the peek of the pandemic, whereas the current study was conducted at the end of 2021. In addition, the current study showed that 27.5% of participants used social media platforms such as WhatsApp and Facebook for their telehealth consultations. This finding differs from Alboraie *et al*.'s study,[3] which examined knowledge, applicability, and barriers to telemedicine in Egypt and reported that video or phone calls (39.3%) and mobile applications (23.7%) were the most recognized telemedicine tools among participants. The difference in results may be attributed to variations in the characteristics of the study participants.

The barriers to using telehealth among Egyptian citizens
The current study revealed that 97.6% encountered communication barriers, and 72.5% encountered technological barriers when utilizing telehealth. This result is consistent with the findings of Alboraie *et al*.[3] who found that two-thirds of participants strongly agreed that telehealth services could compromise patient confidentiality and lead to miscommunication. The lack of technological infrastructure in developing countries has been identified as a significant barrier to telemedicine. This result may be attributable to the disclosure of medical information to unauthorized parties during telehealth services and the underdeveloped infrastructure (e.g., slow internet speed and fear of technical failures) in developing countries.

Table 5: Mean percent, mean, and standard deviation for governmental and private hospitals regarding telehealth dimensions

Dimensions	Items	Maximum	Governmental hospitals (*n*=16)		Private hospitals (*n*=10)		*t*-test	
			Mean±SD	Mean (%)	Mean±SD	Mean (%)	t	P
Organizational readiness	23	92	47±12.90	51.1	55.40±22.72	60.2	8.76	0.007
Process	10	40	16.5±4.50	41.3	19.20±6.57	48	3.32	0.081
Digital environment	20	80	33.13±9.45	41.4	48.80±22.66	61	20.16	0.000
Human resources	10	40	17.63±4.87	44.1	21.30±8.55	53.3	7.17	0.013
Regulatory issues	6	24	11.13±2.02	46.4	12.20±4.26	50.8	6.74	0.016
Total	69	276	125.38±32.67	45.4	156.90±61.85	56.8	12.59	0.002

SD: Standard deviation

Table 6: Frequency and percentage distribution regarding private hospitals telehealth maturity and readiness level

Telehealth dimensions	Private hospitals (*n*=10)				Governmental hospitals (*n*=16)			
	Non, *n* (%)	Beginner, *n* (%)	Advanced, *n* (%)	Ready, *n* (%)	Non, *n* (%)	Beginner, *n* (%)	Advanced, *n* (%)	Ready, *n* (%)
Organizational readiness	4 (15.4)	2 (7.7)	4 (15.4)	-	12 (46.2)	2 (7.7)	2 (7.7)	-
Process	2 (7.7)	8 (3.8)	-	-	14 (53.8)	2 (7.7)	-	-
Digital environment	4 (15.4)	2 (7.7)	4 (15.4)	-	12 (46.2)	4 (15.4)	-	-
Human resources	4 (15.4)	4 (15.4)	2 (7.7)	-	12 (46.2)	4 (15.4)	-	-
Regulatory issues	4 (15.4)	4 (15.4)	2 (7.7)	-	12 (46.2)	4 (15.4)	-	-
Total	4 (15.4)	4 (15.4)	2 (7.7)	-	12 (46.2)	4 (15.4)	-	-

Confidence in health professionals during telehealth visits

According to the current study, 77.6% of Egyptian citizens reported a decrease in confidence in doctors/healthcare professionals while using telehealth services. This finding is consistent with the study by Kalabikhina and Matyushina[13] which investigated people's attitudes toward telemedicine technologies through online medical consultations. The study found that most participants had two fears during telehealth visits, including the fear of misdiagnosis during online consultation, which was an extension of the mistrust toward the health-care system.

The previously mentioned results could be due to the absence of face-to-face communication between the patients and doctors. Moreover, the lack of physical contact as most individuals believe that the doctor should be able to "feel," "examine," "touch," or "tap" to arrive at an accurate diagnosis. In addition, the inadequate quality of online data transmission causes respondents to perceive online consultations as riskier than traditional visits to a doctor.

Public attitude toward the utility of telehealth

The study's findings indicated that over 50% of the participants agreed that telehealth services have the potential to save time and money. This finding is consistent with the results of Alboraie *et al.*'s study,[3] which found that 73.5% of participants agreed or strongly agreed that telehealth provides faster medical care and can save efforts, money, and transportation costs while reducing hospital waiting lists. These results may be attributable to the fact that telemedicine visits can reduce the number of physicians required per population and alleviate some of the costs associated with maintaining adequate health-care services, particularly in countries with limited health-care funding.

According to the current study, 58.7% of Egyptian citizens found the telehealth system easy and straightforward to use. This result contradicts the findings of Umayam *et al.*[14] who conducted a study on the knowledge, attitudes, and perceptions of adults aged 18–34 in the Philippines toward telemedicine. They found that most of their participants had no experience with telemedicine and found it very difficult to use. The difference in results may be due to the level of education of the participants, as those with lower education levels may have less knowledge and a less favorable attitude towards telemedicine compared to those with higher education levels. In the current study, most of the sample had a university education.

Telehealth reliability

The present study found that 59.1% of participants agreed that telehealth consultations with physicians were just as effective as in-person consultations. This result is in line with the findings of Umayam *et al.*[14] who reported that most respondents had a negative attitude toward the reliability of telemedicine consultations and expressed concerns about medical errors. These findings may be due to the novelty of telehealth, especially in developing countries with different cultural backgrounds and resistance to change.

The current study found a strong positive correlation between public attitudes toward telehealth and its usage in Egypt. These results align with the findings of Albarrak *et al.*[15] who investigated physicians' knowledge, perceptions, and willingness to adopt telemedicine in the Riyadh region of Saudi Arabia. The study found that participants had a positive attitude towards telehealth, and perceived it as applicable and easy to use, indicating high acceptance of the technology. These results could be attributed to the rising trend of using IT in various fields to keep up with rapid global changes.

The current study's results demonstrated a significant positive correlation between the public's attitude towards telehealth and the constraints of telehealth in Egypt. This finding agrees with a study by Almathami *et al.*[16] which demonstrated that patients' acceptance and attitude toward telehealth were positively influenced by its constraints, such as high internet speed. However, poor network services, low internet speed, and limited wireless signal coverage could negatively impact patients' attitudes toward telehealth. These findings suggest that barriers such as poor internet connectivity can affect the quality of telehealth services and may contribute to some patients preferring in-person consultations over telehealth when internet speeds are low.

The present study found statistically significant correlations between public attitude towards telehealth utilization in Egypt and specific socio-demographic characteristics, such as education, employmen't, income, and health status. These findings are consistent with Alboraie *et al.*'s study,[3] which found a positive association between participants' attitudes towards telemedicine and their educational level and employment status, as unemployed and less-educated participants had less favorable attitudes towards telemedicine than other job categories and participants with higher education. These results are also in line with Almathami *et al.*'s study,[16] which found that the complexity of the telehealth system used was related to the complexity of the patient's health condition, meaning that a complex telemedicine system was used for monitoring the health condition of patients with multiple and complex health conditions.

Government and private hospitals regarding telehealth dimensions

The present study revealed that the organizational readiness dimension had the highest mean score in governmental hospitals, followed by the regulatory issues dimension (51.1% and 46.4%, respectively). These findings are inconsistent with those of Coleman and Coleman[17] who identified the main components of the e-health dimension in governmental health institutions in the Northwest province of South Africa as need-change readiness, engagement readiness, technological readiness, and societal readiness. The disparity between the two studies may be attributable to cultural diversity, which may impede the need for change, particularly among older generations, and may necessitate an examination of complex political, organizational, and infrastructural factors, including a readiness factor.

Concerning the telehealth readiness and maturity level of government hospitals, the findings of the study indicate that 46.2% of governmental hospitals are not taking any initiatives towards implementing telehealth services, while 15.4% of them are at the beginner level, meaning that some steps have been taken, but the hospital is still far from being able to implement telehealth services. These results are comparable to those of a study conducted by Aydin and Tasci[18] which demonstrated that government hospitals in Turkey are generally prepared for telehealth but require improvement, particularly in human resources, in order to implement telehealth successfully.

Likewise, Stadelmann[4] identified deficiencies in Cairo University Hospitals in important domains such as human resources, communication and governance, and finance and budget, which impede the implementation of telehealth. These findings suggest that weaknesses in governance, financing, quality, and operational performance may cause barriers to implementing telehealth. Therefore, implementing telehealth could potentially enhance performance in these areas and yield more effective health-care services.

Concerning the differences between governmental and private hospitals regarding telehealth dimensions, the study results indicated significant differences between governmental and private hospitals in Egypt regarding all telehealth dimensions except for the process dimension. However, this finding contradicts the results of a study by Alumran *et al.*[19] in Saudi Arabia, which found that private hospitals had higher scores than public hospitals for all five dimensions. The discrepancy between the two studies could be due to regional differences, as the health-care system in Saudi Arabia is undergoing privatization to improve the quality of health-care services.

CONCLUSION

Over a third of the individuals surveyed from the general Egyptian population reported having used telehealth services and 43% expressed a willingness to use it in future. Nevertheless, there are several barriers to the utilization of telehealth, including communication difficulties, lack of confidence in healthcare professionals, and technological limitations. As for the readiness of health-care institutions for telehealth, less than 50% of the surveyed governmental hospitals had not initiated plans for implementing telehealth services, with only 15.4% of them at a beginner level. In contrast, private hospitals were found to be either at the beginner or advanced level in terms of their telehealth readiness.

Based on the results of this study, the following recommendations are suggested: (1) In order to adopt telehealth successfully among the Egyptian population, it is crucial to address the barriers that challenge its utilization, such as communication barriers, lack of confidence in health professionals, and limitations with technology. (2) Future studies should focus on evaluating the effectiveness of telehealth in improving the quality of healthcare, patient health outcomes, and quality of life. Policymakers should also re-evaluate their commitment to implementing the three strategic objectives of the Global Strategy on Digital Health (2020–2025) and promote global collaboration and knowledge transfer on digital health in Egypt. (3) In order to maximize the benefits of telehealth in Egypt, the telehealth system should be designed in an easy-to-use format, and innovative methods should be implemented to facilitate telemedicine services, especially for patients who are elderly, have low education levels, lack previous telemedicine experience, or reside in remote areas. (4) The existing telehealth network should be utilized more effectively, and there should be an increase in the number of telehealth centers.

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There are no conflicts of interest.

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