

Challenges of Telemedicine Implementation in Patients with Cardiovascular Diseases: Insight from a Single Center during COVID-19 Lockdown

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Keywords

Telemedicine · Cardiovascular disease · COVID-19 · Lockdown · Obstacles

Abstract

Introduction: Telemedicine is a desirable option for health-care in Saudi Arabia. The challenges of telemedicine in cardiovascular care in Saudi Arabia are not known. The COVID-19 pandemic offered an unprecedented opportunity to identify real-life challenges of telemedicine in Saudi Arabia. We sought to identify the challenges of telemedicine among patients with cardiovascular diseases using the experience of the COVID-19 pandemic. **Methods:** This is a cross-sectional survey-based study through a self-filled questionnaire. The questionnaire included demographic data, type of cardiovascular disease, and difficulties faced by the patients during the COVID-19 lockdown. **Results:** 394 (60% male, mean age 51.4 ± 19.3 years) participated in the study. 30.3% had valve diseases, 26.4% had heart failure, and 24.1% had coronary artery disease. 45.6% reported difficulty with telemedicine during COVID-19 lockdown. Among those who have difficulties, almost half of the participants had difficulty with the cancellation of telemedicine appointments, and

15.5% had difficulty in getting medications. **Conclusion:** Cancellation of telemedicine appointments and getting the medications were cardiovascular patients' main challenges during the COVID-19 lockdown. Telemedicine is a feasible option for the follow-up of chronic cardiovascular diseases. Therefore, it should be implemented to increase the availability of specialized cardiovascular care over a wide geographical area.

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Published by S. Karger AG, Basel

Introduction

Telemedicine refers to providing medical care such as diagnosis, treatment, and follow-up remotely through telecommunication. Telemedicine will likely play a significant role in healthcare delivery in the future, particularly in remote, underserved communities [1]. Nowadays, medical advice available only in highly specialized centers can be extended to patients who need it anywhere in the world through telemedicine. Telemedicine is a desirable option for healthcare in Saudi Arabia due to its large geographical area and many remote communities. However, telemedicine in cardiovascular care may face a

Table 1. Baseline characteristics of patients with and without telemedicine-related difficulties

	Total (n = 394)	Any difficulties during COVID-19 pandemic		p value
		no (n = 214; 54.31%)	yes (n = 180; 45.69%)	
Gender (male), n (%)	239 (60.66)	149 (69.63)	90 (50.00)	0.001
Age, mean ± SD, years	51.54±17.7	51.38±19.3	51.73±17.7	0.854
Level of education, n (%)				0.075
Elementary	42 (10.66)	21 (9.81)	21 (11.67)	
High school	43 (10.91)	19 (8.88)	24 (13.33)	
High education	68 (17.26)	48 (22.43)	20 (11.11)	
Illiteracy	111 (28.17)	59 (27.57)	52 (28.89)	
College	89 (22.59)	47 (21.96)	42 (23.33)	
Middle school	41 (10.41)	20 (9.35)	21 (11.67)	
Cardiovascular risk factors, n (%)				
Smoker	72 (18.27)	46 (21.5)	26 (14.44)	0.071
Diabetes	200 (50.76)	118 (55.14)	82 (45.56)	0.058
Hypertension	235 (59.64)	143 (66.82)	92 (51.11)	0.002
Dyslipidemia	184 (46.70)	98 (45.79)	86 (47.78)	0.694
Cardiovascular diseases, n (%)				
Heart failure	104 (26.40)	66 (30.84)	38 (21.11)	0.029
Valve disease	121 (30.71)	71 (33.18)	50 (27.78)	0.247
Congenital heart diseases	36 (9.14)	21 (9.81)	15 (8.33)	0.612
Arrhythmia	81 (20.56)	52 (24.30)	29 (16.11)	0.045
Coronary artery disease	95 (24.11)	52 (24.3)	43 (23.89)	0.924

few challenges, especially in older patients with a high prevalence of cardiovascular diseases. In addition, older patients have relatively high illiteracy rate (30% in people >65 years old) [2]. The challenges of telemedicine in cardiovascular care in Saudi Arabia are not known. The coronavirus disease 2019 (COVID-19) pandemic has led to a mandatory lockdown and subsequently necessitated the initiation of telemedicine. The lockdown provided an unprecedented opportunity to evaluate the challenges of implementing telemedicine in cardiovascular care in Saudi Arabia. Therefore, we sought to identify the challenges of telemedicine in the follow-up with cardiovascular patients in our center during the COVID-19 pandemic to help optimize cardiovascular telemedicine in the future.

Methods and Materials

We did a cross-sectional survey among patients with cardiovascular diseases, using a questionnaire distributed to participants. The patients were recruited from the outpatient clinic. We included patients above the age of 18 years who had regular follow-up in the clinic during and after the pandemic. Patients who did not have follow-up during the pandemic were excluded. A hard copy of self-filled questionnaire was distributed to participants who agreed to participate in the study. A surveyor filled out the questionnaire if the participant was illiterate. The surveyors were also available to

answer any questions of the participants who filled out the questionnaire. The investigators developed the questionnaire and validated it through a pilot survey to test reliability and internal consistency before conducting the study. The surveyors explained the research to potential subjects and obtained signed informed consent. The variables in the questionnaire included demographic data, education level, type of cardiovascular disease and questions about difficulties and barriers faced by the patients during COVID-19 follow-up through telemedicine. In this paper, we report the findings from the survey on the challenges of being a patient when telemedicine was the primary way of engaging with a clinician. Raosoft sample size calculator calculated the sample size as 377 subjects with a 95% level of confidence and a margin of error of 5% [3]. We add 18 patients expecting a 5% non-responding rate. The final sample size was 395 subjects.

The study was conducted in the outpatient clinics of King Abdulaziz Cardiac Center at King Abdulaziz Medical City in Riyadh, Saudi Arabia. Cardiac patients more than 18 years of age were included in the analysis. Patients younger than 18 years, new patients, and patients who did not have telemedicine follow-up during the COVID-19 lockdown were excluded from the study. Our research Institutional Review Board, King Abdullah International Medical Research Center, approved the study. Descriptive statistics were used for baseline demographics. Results were expressed as mean ± standard deviation for continuous variables and frequencies and percentages for categorical variables. *t* test was used to compare continuous variables and Fischer's exact test and Pearson χ^2 test were used to compare categorical variables. All the analyses were conducted using Stata 16.1 MP software (StataCorp, College Station, TX, USA).

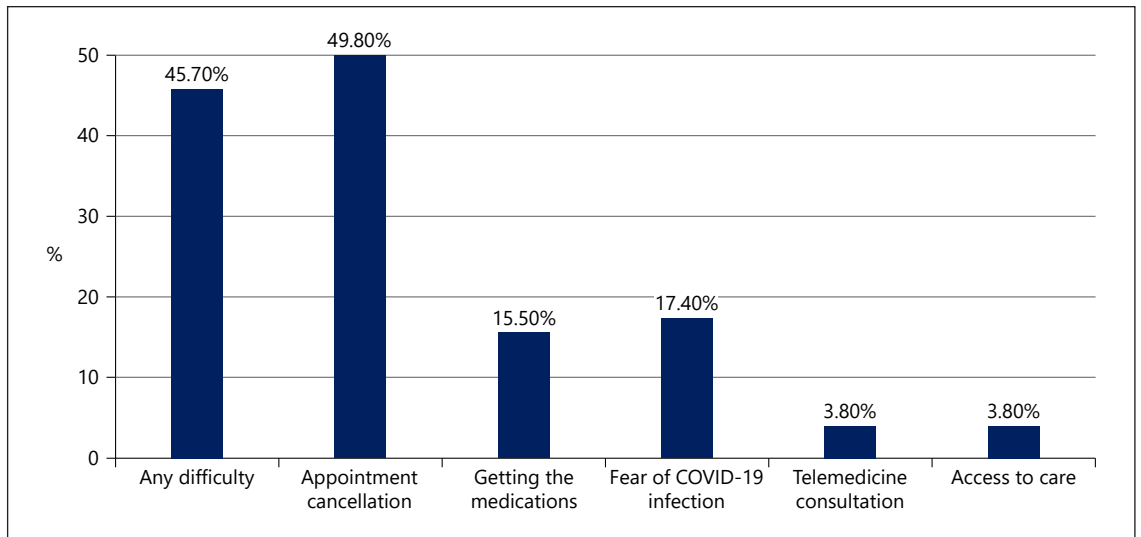


Fig. 1. Challenges of telemedicine during COVID-19 lockdown.

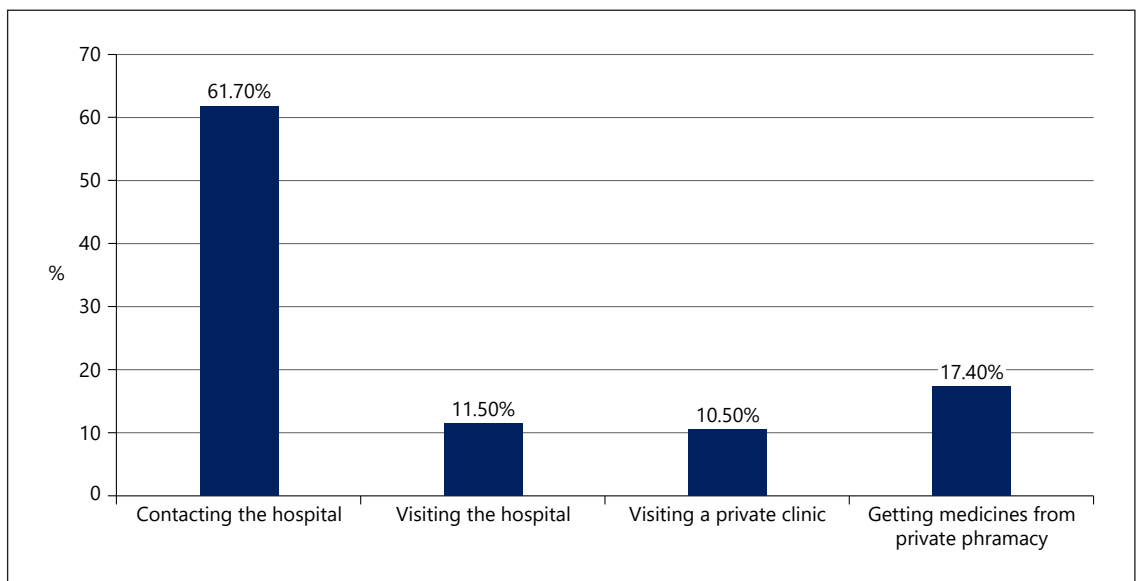


Fig. 2. Solutions to overcome the difficulties of telemedicine.

Results

Over 3 months (November 2021–January 2022), 394 valid responses were obtained. Almost 60% of the participants were male with an average age of 51.4 ± 19.3 years. This study also showed that 30.3% of the participants had valve diseases, almost 26.4% had heart failure, 24.1% had coronary artery disease, 20.6% had arrhythmia and 9.1% had congenital heart diseases. Diabetes, hypertension, and hypercholesteremia were prevalent among

the participants, as most of cardiovascular patients have a concomitant metabolic disease. Also, 28.2% of the participants in the survey were illiterate.

It was also reported that 45.7% of participants had a health-care-related difficulty during the COVID-19 lockdown. Those who reported difficulty are more likely to be females and have heart failure. There were no statistically significant differences between those who reported having difficulties and those who did not have difficulties regarding age, level of education and most of the comorbidities (Table 1).

Almost 50% of the participants have difficulty with the cancellation of telemedicine appointments, and 15.5% of participants have difficulty in getting their medications. Almost 4% reported difficulty with a telemedicine consultation. 17.4% reported worries about being infected with COVID-19 during the lockdown (Fig. 1). There were no statically significant differences among these reported difficulties in age, gender, comorbidities, or reasons for cardiology follow-up. Almost 62% of the participants contacted the hospital to answer their worries, while 22% had to visit the hospital or go to a private clinic to overcome their difficulties (Fig. 2).

Discussion

Our study showed that 45.7% of cardiac patients reported healthcare-related difficulties during the COVID-19 lockdown. Those who reported difficulties were more likely to be females and have heart failure. The top difficulties faced by participants were cancellation of the telemedicine appointment (50%), followed by worries about being infected with COVID-19 (17.4%) and difficulty in getting the medications (15.5%). In addition, 4% of participants reported difficulties with the telemedicine consultation. To overcome these difficulties, almost two-thirds of the participants contacted our hospital to answer their worries. In addition, a fifth visited our hospital or a private clinic during the lockdown. About 18% of the participants had to buy their medicines during the lockdown due to difficulty getting them. Close to a third of the patients had valvular diseases, above a quarter of the patients had heart failure and 24% had coronary artery disease.

The importance of telemedicine was first brought to global attention during the Ebola epidemic [4]. However, the infrastructure for telemedicine was not mature enough to deliver care on a large scale. COVID-19 lockdown was associated with a massive shift toward telemedicine [5]. Many healthcare systems adopted telemedicine for follow-up of patients with chronic diseases and to ensure continuity of care during the pandemic [6, 7]. In addition, some hospitals used telemedicine to reduce emergency department visits during the pandemic [8, 9]. The implementation of telemedicine is associated with several challenges. These can be categorized into challenges related to the technology, challenges related to the patients, and challenges related to accessibility. Multiple studies reported patients' related challenges including obtaining vital signs, performing a clinical examination and diagnostic procedures [10].

Prior local studies reported healthcare providers' perspectives on telemedicine. The major findings of these studies are the low rate of implementation of telemedicine among healthcare providers, lack of knowledge about telemedicine, and inability to perform a physical examination [11–13]. In this study, the main challenges from patients' perspectives were cancellation of telemedicine appointments and difficulty in getting the medications. Only 4% of the participants reported difficulty with telemedicine consultations. Interestingly, none of the participants reported issues with conducting the telemedicine visits. This is likely because all the telemedicine visits were conducted through phone calls. Mobile phones are widely used among Saudis, and therefore, it is easy to contact patients for telemedicine follow-up. To overcome these challenges, most of the patients contacted the hospital call center to answer their worries and 20% had to visit a hospital, half of which visited private clinics. This highlights the importance of maintaining contact channels with the patient to answer the patient's concerns. The main reasons for the cancellation of the appointment were the inability to reach the patient during the telemedicine appointment. Some of the patients could not receive the phone calls because of weak network coverage in the patient's residence, while others did not answer the phone because they could not read the messages that were sent to set the appointment. The mediation delivery during the pandemic was mostly done through a courier service. There was a major paucity in the number of drivers allowed to drive during the pandemic which resulted in a significant delay in the delivery of medications.

The telemedicine service was limited during the pandemic. It mainly consisted of telephone calls with the patients and delivery of medications through courier services. The healthcare providers had neither received training nor had a prior experience with telemedicine prior to the pandemic. In addition, the patients did not have any tools for receiving telemedicine at home. Since the pandemic, there have been significant strides in telemedicine delivery in Saudi Arabia. The ministry of health started the biggest virtual hospital in the world providing specialized care to all the country's remote areas. Our institution has also provided physicians with training and advanced communication tools to provide telemedicine more effectively.

To the best of our knowledge, our analysis is the first to examine the challenges of telemedicine from the patient's perspective. The findings of this analysis are crucial for the comprehensive evaluation of telemedicine. It is vital to ensure that the telemedicine service is equitable

to regular office-based visits during regular times and health crises. Telemedicine is likely to play a more significant role in treating chronic diseases.

Our study has a few limitations. First, the analysis included patients from a single center. Our center is a tertiary care center, and therefore, the findings may not apply to other centers. The survey was conducted over 3 months, hence, may not have captured all the challenges faced by the patients. Finally, we only included adult patients in our analysis. The families and children with cardiovascular diseases may have different challenges not necessarily seen in adult patients.

Conclusions

In this survey, 45.7% of the participants reported difficulties with telemedicine. The main challenges of telemedicine faced by patients with cardiovascular disease were cancellation of telemedicine appointments and getting the medications. Telemedicine is a feasible option for the follow-up of chronic cardiovascular diseases. Therefore, it should be implemented to increase the availability of specialized cardiovascular care over a wide geographical area.

Statement of Ethics

Written informed consent was obtained from participants to participate in the study. This paper was reviewed and approved prior to conduction by King Abdullah International Medical Research Center (KAIMRC), approval number (RC20/463/R).

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Conflict of Interest Statement

The authors of this study declare no conflict of interest and have no disclosures.

Funding Sources

This study received no specific grant from any official funding agencies.

Author Contributions

Dr. Ahmed Aljizeeri: created the study idea, reviewed and re-drafted the manuscript, and supervised the study conduction process; Mr. Mohammed Abdulaziz Alfurayh, Ms. Ghadah Saad Al-duhaimi, Ms. Ghadah Ibrahim Alhussin, Ms. Malak Emad Alabdulkareem, Mr. Ahmed Ali Sharahili, and Mr. Mouath Ahmed Alturaymi: participated in proposal creation, data collection, and manuscript writing; Dr. Sarah Mohammed Alyousif, Dr. Mousa Alali Alfari, Dr. Amjad Ahmed, and Dr. Ahmed Alsaileek: participated in data analysis process and reviewing the manuscript.

Data Availability Statement

All data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author (Dr. Ahmed Aljizeeri).