Effect of COVID-19 Pandemic on Patient Utilization of the Telemedicine Services in Dubai

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Abstract

Introduction: Telemedicine was launched in Dubai in December 2019. The service provided live interaction between patients and physicians through videos simulating a consultation in a clinic. Methods: This study is a multicenter comparative cross-sectional retrospective study that included 13 health centers in Dubai. The data in this study were taken before and during the coronavirus (COVID-19) pandemic retrospectively. All patients from both telemedicine and primary health care (PHC) clinic visits were included. Results and Discussion: A total of 121,035 patients were involved in this study; there were 55,622 patients before COVID-19 and 65,413 patients during the COVID-19 pandemic. During the coronavirus pandemic, patient utilization of telemedicine increased significantly in comparison to patient visits to the PHC centers. Before the COVID-19 pandemic, only 104 (0.2%) patients used telemedicine, while during the pandemic, the utilization of telemedicine increased to 9,183 (14%). More females than males preferred telemedicine use over visiting the PHC center. With the pandemic, elder patients used telemedicine more than the younger age groups. Telemedicine was used for different types of consultations such as acute, chronic, and COVID-19 related. The most common type of consultation in telemedicine during the pandemic was for chronic diseases (67.7%). Conclusion: In this comparative study, more patients used telemedicine in the time of COVID-19 pandemic whether it was for acute, chronic, or COVID-19-related consultations. Telemedicine proved to be a very useful tool at the time of disasters such as the COVID-19 pandemic.

Introduction

In the emerging world of technology, telemedicine is an innovative new technology that arose in the high technology era. Telemedicine is the use of electronic information and telecommunication technology for patient consultation where health care providers provide teleconsultation to patients virtually using any smart device as...
simple as a smart phone. This process does not need the physical presence of the patient in the health care facility [1]. Studies have shown that it is as effective as a physical consultation, and it is cost effective at the same time [2–4].

Telemedicine consultations were launched in Dubai on December 17, 2019. It is the first of its kind in the region as a virtual clinical consultation, which was named “Doctor for Every Citizen.” This smart technological service was started to fulfill Dubai’s “Fifty-Year Charter,” declared by H. H. Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai. The service stated “We aim to provide citizens with medical consultations 24/7 with hundreds and thousands of doctors, specialists, and consultants across the globe.” This was facilitated by the smart government application. Dubai’s goal was to transform the medical system by bringing doctors closer to their parents, and this service was created to enhance awareness while utilizing top medical minds globally to serve the health of our citizens [5].

In December 2019, the coronavirus (COVID-19) outbreak had emerged in the city of Wuhan, China. Severe acute respiratory syndrome caused by SARS-CoV-2 then spread to more than 100 countries. WHO announced COVID-19 as a pandemic on 11 March 2020 [6].

Governments around the world then announced partial and total lockdowns to prevent the further spread of the disease. On 29 January 2020, the first confirmed COVID-19 case was announced in the UAE, and it was the first confirmed case in the Middle East [7].

COVID-19 changed the face of health care and especially the use of telemedicine consultations because it became a vital part of the health care system. Telemedicine had a rapid expansion during the COVID-19 pandemic for urgent as well as non-urgent cases [8]. As the COVID-19 spread throughout the world, countries had to implement partial and total lockdowns and people had limited accessibility to the health care systems, hence telemedicine was the best alternative for many patients. Also, as hospitals were occupied by COVID-19 patients, the priority and availability of service was shifted toward COVID-19 patients, and it was challenging for patients to access hospitals and clinics. Nonetheless, many countries started using telemedicine to provide patient care without endangering patients of getting in contact with COVID-19 patients.

Telemedicine allowed greater continuity of care by allowing easy access to health care from the comfort of one’s home [9]. Telemedicine consultations were proven to be very effective in improving the quality of service while promoting a more efficient usage of the health care system [4, 10, 11]. Moreover, to minimize the patient risk of exposure to the COVID-19 virus, reduce the burden on outpatient services, maintain patient and staff safety, and maintain the continuity of care to those who have a chronic conditions, telemedicine had to be put in priority among medical services [12].

Many reports and studies have shown an increase in the utilization of telemedicine consultations by different medical specialties during the COVID-19 pandemic. The use of telemedicine was very convenient and accepted by most of the population in a variety of circumstances [13].

Patients with chronic illnesses seemed to be stimulated to keep a closer control of their disease and its complications using telemedicine, especially in rural areas where access to health care may be difficult [14, 15]. Moreover, in many cases, the control of chronic illness also showed marked improvement while improving cost-effectiveness [3, 16, 17]. Furthermore, telemedicine is improving emotional and educational needs of patients and family members of patients while allowing quicker discharge from the hospital since there is a closer contact of providers with their patients [18]. Telemedicine was introduced to provide different services such as medication refill, follow-up, education, and COVID-19-related inquiries, as well as many non-emergency consultations; thus, this technology became an asset for health care providers and patients [2, 8].

This study was conducted to study the effect of the COVID-19 pandemic on the utilization of telemedicine consultation by patients in Dubai. This is the first service where the telehealth consultation not only included audio but also included a live video consultation with the patients as well [19], making this study the first to be conducted for such a service in the primary health care (PHC) centers in the region. The secondary objective is to know the factors related to the use of telemedicine and the show up rate. The study included patients from 13 PHC centers and patients who used the telemedicine service who had a Dubai Health Authority (DHA) medical record number. Telemedicine was integrated in the electronic medical system and DHA application. To ensure patient identification, patient can only access the service after verifying the account by both the unique national ID number and patient health card number. Moreover, to ensure patient confidentiality, the doctor can only access the telemedicine consultation through the electronic medical system by a unique patient medical number. All consultations are documented in a patient file in the electronic system.
A total of 121,035 patients were involved in this study, and there were 55,622 patients before COVID-19 and 65,413 patients during COVID-19. There were less males before COVID-19 (46%) compared with (54.8%) during COVID-19 (p value <0.001), while there were more UAE nationals before COVID-19 (71.4%) compared with (47%) during COVID-19 (p value <0.001). Moreover, the median patients’ age was 26 years before COVID-19 compared with 36 years during COVID-19 (p value <0.001). As for the primary objective of this study, the utilization of telemedicine during the COVID-19 pandemic increased significantly in comparison to the PHC. In the period before the COVID-19 pandemic, only 0.2% used telemedicine, while during the pandemic, the utilization of telemedicine increased to 14% with a p value <0.001 (Table 1). When comparing the characteristics of patients using telemedicine to the patient attending the PHC during the pandemic, it was found that 20.9% of the UAE nationals used telemedicine and only 8% were non-UAE nationals who used telemedicine with a p value <0.001.

Also, the show up rate for UAE nationals is 94.9% compared with 96.3% for non-UAE nationals (p value <0.001). In addition, 17.2% of females used telemedicine during the pandemic compared to 11.4% of males who used telemedicine during the pandemic with a p value <0.001. Moreover, the median age of patients attending the PHC during the pandemic was 35 years (26, 47) compared with 36 years (26, 50) for telemedicine patients (p value <0.001). Regarding complaints during the pandemic, only 5.8% of patients with COVID-19-related complaints and 8.8% of patients with acute complaints used telemedicine, compared with 20.3% of patients with chronic complaints who used the telemedicine (p value <0.001).

### Results

| Characteristics | Before COVID-19 (n = 55,622) | During COVID-19 (n = 65,413) | p value |
|-----------------|-----------------------------|-----------------------------|---------|
| Gender          |                             |                             |         |
| Male            | 25,606 (46.0)               | 35,862 (54.8)               | <0.001  |
| Female          | 30,016 (54.0)               | 29,547 (45.2)               |         |
| Nationality     |                             |                             |         |
| UAE             | 39,622 (71.4)               | 30,671 (47.0)               | <0.001  |
| Non-UAE         | 15,888 (28.6)               | 34,582 (53.0)               |         |
| Mode            |                             |                             |         |
| Telemedicine    | 104 (0.2)                   | 9,183 (14.0)                | <0.001  |
| PHC             | 55,518 (99.8)               | 56,230 (86.0)               |         |
| Age             | 26 (11, 40)                 | 36 (26, 48)                 | <0.001  |

Categorical variables are presented as count (%). Age is presented as median (first quartile, third quartile).

### Methodology

This study is a multicenter comparative cross-sectional retrospective study, and it included 13 health centers in Dubai as well as all patients who scheduled an appointment for the telemedicine service. The data in this study were taken before and during the COVID-19 pandemic. The duration before the pandemic was from January 2020 to February 2020, and all patients from both telemedicine and primary health care clinic visits were included. In addition, the period during the COVID-19 pandemic was from May 2020 to June 2020 that also included all patients from both telemedicine and PHC clinic visits. The patients who attended in March and April were excluded from the study as it was the period of lockdown in the UAE. Only patients’ most recent visit was included in the study after removing duplicated appointments for the same patient. This was done for both the telemedicine appointment and PHC appointment.

In this study, a total of 121,035 patients were included. The first group included 55,622 patients before the pandemic, while the second group included 65,413 patients during the pandemic. Patients’ data were extracted from the electronic medical system. The variables collected included age, nationality, gender, show or no show to appointments, and complaints whether acute, chronic, or COVID-19 related. The conditions were based on the ICD coding used by the physician for the visit. Moreover, ICD codes related to COVID-19 included all acute and post-COVID-19 health-related issues.

### Statistical Analysis

SPSS 24 was used for statistical analysis (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 24.0; IBM Corp. Armonk, NY, USA). Age is presented as median (first quartile, third quartile) because it is a skewed variable, and categorical data are presented as count and percent. A χ² test was used to compare the categorical variables between the PHC and telemedicine patients, and between the before and during COVID-19 patients. Mann-Whitney test was used to compare the age between the before COVID-19 patients and during COVID-19 patients and between the PHC patients and the telemedicine patients during COVID-19. All tests are two-tailed tests and a p value <0.05 indicates statistically significant results.
When dividing the patients into telemedicine patients and PHC patients, we found in the telemedicine patients, before the COVID-19 pandemic, 62.5% of patients were females, and during the pandemic, 55.3% were females. There was a decrease in female usage of telemedicine, while there was an increase in use by males, but it was not statistically significant ($p$ value = 0.142). Also, before the pandemic, all patients who used telemedicine were UAE nationals (100%), while during the pandemic, only 69.8% of patients who used telemedicine were UAE nationals. The difference in before and during the pandemic was statistically significant with a $p$ value <0.001. Moreover, prior to the COVID-19 pandemic, 25.9% of patients who used the telemedicine service, had acute illnesses, 67.9% had a chronic illness, and 6.2% were COVID-19-related consultations. Correspondingly, during the period of the COVID-19 pandemic, 8.8% of patients who used the telemedicine service had acute illnesses, 67.7% had a chronic illness, and 23.6% were COVID-19-related consultations. The difference in before and during the pandemic was statistically significant with a $p$ value <0.001. The show up to appointment in telemedicine before COVID-19 was 77.9% which increased to 81.2% during the pandemic which was not statistically significant with a $p$ value of 0.384 (Table 2).

As for the patients who attended the PHC center, before the pandemic, 71.3% of the patients where UAE nationals, while during the pandemic, 43.3% of patients were UAE nationals with a $p$ value <0.001. Also, before the COVID-19 pandemic, 53.9% of patients who attended the PHC centers were females and, during the COVID-19 pandemic, 43.5% of patients were females, which is a significant decrease ($p$ value of <0.001). Furthermore, prior to the COVID-19 pandemic, 48.5% of patients had acute illnesses, 50% had a chronic illness, and 1.5% were COVID-19-related consultations. Correspondingly, during the period of the COVID-19 pandemic, 12.3% had acute illnesses, 36.1% had a chronic illness, and 51.7% were COVID-19-related consultations. The difference between the types of visits before and during the pandemic was statistically significant with a $p$ value of <0.001 (Table 2).

The show up rate in the PHC group before the pandemic was 97%, while it was 98% during the pandemic, which was statistically significant with a $p$ value <0.001. The trend of utilization of telemedicine by months was as follows: January (0.15%), February (0.2%), May (16.4%), and June (12.1%) (Fig. 1).

### Table 2. Comparisons of patients’ characteristics between before and during COVID-19 for both telemedicine and PHC patients

| Variables                  | Telemedicine, n (%) | PHC, n (%)                  |
|----------------------------|---------------------|----------------------------|
|                            | before (N = 104)    | during (N = 9,183)         | before (N = 55,518) | during (N = 56,230) |
| Gender                     |                     |                            |                     |
| Female                     | 65 (62.5)           | 5,077 (55.3)               | 29,951 (53.9)       | 24,470 (43.5)       |
| Male                       | 39 (37.5)           | 4,102 (44.7)               | 25,567 (46.1)       | 31,760 (56.5)       |
| $p$ value                  | 0.142               | <0.001                     | <0.001              | <0.001              |
| Nationality                |                     |                            |                     |
| UAE nationals              | 104 (100)           | 6,400 (69.8)               | 39,518 (71.3)       | 24,271 (43.3)       |
| Non-UAE nationals          | 0 (0)               | 2,766 (30.2)               | 15,888 (28.7)       | 31,816 (56.7)       |
| $p$ value                  | <0.001              | <0.001                     | <0.001              | <0.001              |
| Complaint                  |                     |                            |                     |
| Acute Illness              | 21 (25.9)           | 654 (8.8)                  | 26,137 (48.5)       | 6,754 (12.3)        |
| Chronic Illness            | 55 (67.9)           | 5,049 (67.7)               | 26,942 (50)         | 19,876 (36.1)       |
| COVID-19 related           | 5 (6.2)             | 1,757 (23.6)               | 782 (15)            | 28,455 (51.7)       |
| $p$ value                  | <0.001              | <0.001                     | <0.001              | <0.001              |
| Show up                    |                     |                            |                     |
| Yes                        | 81 (77.9)           | 7,460 (81.2)               | 53,861 (97.0)       | 55,085 (98.0)       |
| No                         | 23 (22.1)           | 1,723 (18.8)               | 1,657 (3.0)         | 1,145 (2.0)         |
| $p$ value                  | 0.384               | <0.001                     | <0.001              | <0.001              |

There are missing values for gender, nationality, and complaints.
Discussion

The COVID-19 pandemic has transformed the approach of the health care system. Many health care systems were using telemedicine at the time of the pandemic. The pandemic shaped and shifted the future of the health care system [20]. A cross-sectional study that was conducted in the USA to study the trends in the use of telehealth during the emergence of the COVID-19 pandemic showed a significant increase in telemedicine visits at the time of the pandemic compared to the time before the pandemic [12]. Similarly, our study showed a significant surge of patient utilization of telemedicine during the COVID-19 pandemic.

Also, we studied patient utilization of telemedicine before and during the pandemic in comparison to a group who attended the PHC. We also examined the factors that affected patient utilization of telemedicine. Remarkably, we found that more females than males preferred to use telemedicine. This finding is unlike what other studies have reported that females are less likely to use telemedicine [21, 22].

Observing the age, we found that the mean age for patients using telemedicine is higher than those patients who attended the PHC. This is different from what other studies have found that older patients were less likely to use telemedicine [21, 22]. Thus, it can be explained that older people were encouraged to stay at home and use telemedicine. Moreover, telemedicine was made very easy to use for them [23].

Telemedicine exhibited its effectiveness in the care of patients in different settings. In addition, it was shown to be as beneficial as face-to-face care [9, 13, 15]. In our study, we noticed the most common type of consultations in telemedicine were of patients with chronic illnesses. Studies have shown that the use of telemedicine for chronic disease management has been well established by different subspecialties as well [3, 15, 16].

Additionally, in our study, we found that patients with acute complaints used telemedicine. Likewise, a study that used telemedicine for urgent and non-urgent health care delivery in NYU Langone Health USA, at the time of COVID-19, showed a significant and rapid expansion for telemedicine visits in time of the COVID-19 pandemic for both urgent and non-urgent cases [8].

The Dubai government had emphasized on providing health care to all citizens 24 h a day, 7 days a week, especially during the difficult times of COVID-19 pandemic. During the pandemic, telemedicine consultations were free of charge. This was done mainly to reduce patient visits to the health care center as our study has shown the drop in patient visits to the PHC centers. Furthermore, the importance of telemedicine was to maintain social distance and ensure continuity of care to those patients in need and to help soothe patients’ fears and anxiety. Scheduling an appointment for a doctor consultation via telemedicine was open for all citizens of the UAE. The burden on telemedicine increased from an average of 52 consultations per month to 4,592 consultations per month during the pandemic. Our study showed that telemedicine is a useful tool at the time of the pandemic. The ongoing pandemic modified the care and improved the approach of patients to health care.

Conclusion

In this comparative study, more patients used telemedicine at the time of COVID-19 pandemic whether it was for acute, chronic, or COVID-19-related consultations. Nonetheless, the most common type of consultation was for chronic illnesses. Furthermore, more females used telemedicine than males. Telemedicine proved to be a very useful tool at the time of disasters such as the COVID-19 pandemic.

Limitation

As telemedicine was launched just prior to the beginning of the pandemic, the time period that we classified as before the COVID-19 pandemic for comparison was short and the number of cases was limited and only a few reported cases of COVID-19 were included. Nevertheless, it really did not affect the outcome due to the massive
sample size. Regrettfully, we could only study some factors that affected patient utilization of telemedicine such as age, nationality, and gender. Other factors should have been considered such as the education level which could not be obtained in this study.

**Statement of Ethics**

Ethical approval was obtained from the Dubai Scientific Research and Ethics Committee, Number DSREC 12/2020_5, dated December 10, 2020. The data (de-identified) were obtained from the electronic medical system (SALAMA) in Dubai Health Authority and the whole process complied with the provisions of the Declaration of Helsinki. Patients treated in Dubai Health Authority care facilities provided written informed consent for their de-identified data to be used for research and the study was done accordingly.

**Conflict of Interest Statement**

The authors have no conflicts of interest to declare. All authors declare that they have no relevant or material financial interests that relate to the research described in this paper.

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**Author Contributions**

A.S. and N.A.A obtained all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. M.Z.: statistical analysis. A.S., N.A.A., N.E., H.A., and E.M.: analysis and interpretation of data. A.F, A.F., and J.A.M: drafting of the manuscript. A.K and L.A.M: revision of the concept and design. The manuscript was approved by all authors.

**Data Availability Statement**

The data that support the findings of this study are not publicly available due to privacy and security reasons which might affect the research participants. However, data are available from the corresponding author upon reasonable request.
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