Continuum of Care for Diabetic Patients during COVID-19 Pandemic in Primary Health Care, Egypt

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Abstract:

Background: COVID-19 pandemic has severely affected health services for non-communicable diseases (NCDs); especially those vulnerable and requiring regular or long-term care. This study aims to gain insights into the effect of the COVID-19 pandemic lockdown on the accessibility of health services and health care of diabetic patients in primary health care. M**ethods:** A cross-sectional study was conducted in a rural area on 400 diabetic participants. A pre-tested semi-structured multidimensional questionnaire in the Arabic language was utilized in the study. It consists of four parts; the first for the Sociodemographic data, the second for the status of the clinical diabetic investigations during the lockdown, the third was for medication adherence and the fourth entailed questions pertaining to barriers to primary health care visit. **Results:** About half of the participants suffered from difficulty in healthcare service accessibility. The most significant predictors were older age, female gender, lower education level, internet use, low and middle socioeconomic standard, and depending on private healthcare facilities. Costly services followed by limited work hours, fear of infection, and difficulty using the internet were the main challenges they face during their doctor visit. The more difficult the accessibility, the lower the medication adherence. Telemedicine was the adopted alternative during the pandemic. **Conclusion:** Medical health services in primary health care were extremely affected during the pandemic and consequently medication adherence. Telemedicine was used as a coping strategy to overcome limited accessibility to DM-related healthcare services during the COVID-19 lockdown

Keywords: Medication Adherence, Non-communicable disease, Primary health care.

Introduction:

Most countries worldwide declared confinement restrictions (lockdowns) as a preventative strategy against the COVID-19 pandemic and to tackle the pandemic to avoid an overflow of intensive care units in hospitals.(1) With the rapid spread of COVID-19 worldwide, access to a health services was disrupted due to the activation of health emergency state including limitation of medical services to emergencies only, restrictions in public transport hindering access to health facilities, insufficient clinical staff because of their redistribution to cover COVID-19 isolation hospitals and as well as deficiency of essential medicines and services due to resource allocation during the epidemic.(2,3)

In a World Health Organization (WHO) report based on a global survey, 59% of countries reported that access to outpatient services was restricted to some degree (50%

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of countries reported partial disruption and 12% complete disruption).[2,4] The covid-19 pandemic particularly affected health services for non-communicable diseases (NCDs) especially those particularly vulnerable and requiring regular or long-term care.

In a survey conducted by the World Health Organization (WHO), many countries reported that the COVID-19 pandemic had severely disrupted the preventive and treatment services for NCDs.[5]

Due to the chronic and lifelong course of NCDs, they often require continuous follow-up with the health system and healthcare providers. This includes access to essential medicines, investigations, or rehabilitation services. Not receiving such care often has serious health consequences for persons living with NCDs.

With the rapid spread of COVID-19 across the world, the ability of the health care system to respond to NCDs needs has been impacted increasing the burden of NCD on the individual and community levels.[1,6] During the current situation, people living with NCDs are at higher risk of developing severe COVID-19-related illness and death.[7]

In EGYPT, diabetes continues to be a public health problem with a significant burden on the Egyptian economy and represents a growing epidemic where 11% of total healthcare expenditures worldwide are spent on diabetes mellitus.[8]

Access to Primary care services and family health practices is essential for delivering frontline primary care for patients with DM and other non-communicable diseases, especially in low to middle-income countries.[7]

Improving access to medical health services is the main purpose and rationale for all health systems and health policy makers especially during pandemics when primary care services may become overwhelmed, hindering routine care for NCDs management and follow-up. [9]

Factors affecting the access to the health care system and services are based on three key elements of access which include: resources, cost, and the structure of the healthcare system. These key factors have an important impact on access, other researchers added health insurance coverage, family income, and the burden of comorbidities as influential factors affecting access to health care.[10]

Other researchers have summarized the dimensions of access in three following aspects: I- Availability of medical services in the required time and place is most probably affected during pandemics. It

includes the degree to which the health system satisfies the expectations of the patients. II-Affordability: refers mostly to financial access depending on the cost of health services and the ability of the people to afford their treatment. III- Acceptability: this includes social and cultural aspects affecting the relationship between patient and health service provider which influence each other's attitudes and expectations. All components of healthcare accessibility must be considered comprehensively.[11,12]

During COVID-19 pandemic, it is questionable whether access to health care services depended on these factors only whether there were additional factors that hinder access to the healthcare system and services.[13]

Since access to health care is a crucial element of health care services and has an impact on reducing the burden of non-communicable diseases such as DM, therefor this study was conducted to gain insights on the effect of COVID-19 pandemic lockdown on accessibility of health services and health care of diabetic patients in primary health care as no study has been reported from Egypt till this date.

Methods:

Study setting and design: A cross-sectional study was conducted among diabetic chronic patients attending a primary health care center (PHC) in a rural area in Egypt during the nationwide partial lockdown from February to April, 2021.

The selected primary health care center is located in a rural area in Menoufia Governorate, and it is the only PHC affiliated to Menoufia university hospitals. The sampling frame constituted all patients with type 2 diabetes mellitus aged 18 years and above receiving care from the selected PHC.

The sample size was calculated through an Open Epi online software program using a 95% confidence level with a prevalence of 50% (being the highest prevalence to get maximum sample size) with the precision of 5%. The Target population was 9700 diabetic patients registered in the PHC medical records.

Sample size calculation revealed 370 participants and was increased to a round figure. So, 400 patients were estimated to be adequate. The patients were selected by systematic random sampling method from the list of their names in the medical records, where every 10th patient was selected.

The interviews were arranged through a phone call. All participants were informed about the purpose of this study before obtaining their informed digital written consent. The interview with each participant lasted for 12-20 minutes.

Study tool: A pre-tested semi-structured multidimensional questionnaire in the Arabic language was utilized in the study. The questionnaire was designed out of broad literature reviews and discussions with diabetic patients concerning obstacles faced by them during the COVID lockdown.

It composes of four parts; the first part was for the Sociodemographic data, [14] The second part was for status of the clinical diabetic investigations during the lockdown, the third part was for the medication adherence during the lockdown using 8-item Morisky Medication Adherence Scale (MMAS-8),[15] which consists of four items with a scoring scheme of yes=0 and no=1 the items are summed to give a range of scores from 0 to 4.

The higher the score, the more the non-adherence. Moreover, a multiple-choice question about barriers to medication adherence during the pandemic if existing was added. The fourth part entailed questions pertaining to barriers for primary health care visit.

The healthcare service accessibility was assessed through 14 questions answered by 3-likert scale (1= yes, 2=to some extent, 3= no) with a minimum score of 14 and a maximum of 42. The accessibility was classified into easy and difficult based on the mean of the score (the data are normally distributed) which was 32. The Easy access score is less than 32 and the difficult access score was 32 or higher.

A pilot study was conducted with 20 patients to validate the questionnaire for testing feasibility as well as the acceptability of the tools. Based on the pilot study results, the internal consistency between each item in the questionnaire was statistically measured and had a Cronbach's alpha reliability coefficient of 0.823. In addition, patients' medical health records were extracted and revised for confirmation of the medical data and laboratory investigation.

Data mangement:

The results were statistically analyzed statistically using by SPSS version 22(SPSS Inc., Chicago, IL, USA). Two types of statistics were carried out:

(1) Descriptive statistics: in which quantitative data were presented in the form of mean, SD, and range, and qualitative data were presented in the form of numbers (N) and percentages (%)

(2) Analytical statistics: univariate and multivariate logistic regression were used to predict the factors that are associated with difficult healthcare services accessibility. The correlation coefficient was used to study the

association between two quantitative variables. A P value of greater than 0.05 was considered not statistically significant, a P value of less than or equal to 0.05 was considered statistically significant, and P value of less than or equal to 0.001 was considered statistically highly significant.

Results:

The results of this study indicated that health services for diabetic patients remained accessible for almost half of the participants. There was a statistically significant difference among the studied group as regards the accessibility to healthcare services.

Increasing age, female patients, patients with a lower level of secondary education, and with low and middle socioeconomic standards were more likely to suffer from difficult accessibility (P<0.001). Patients who used the internet experienced easier accessibility (P<0.001). Patients who depended on private healthcare facilities suffered more from difficult accessibility during the pandemic (Table-1).

Older age (OR 1.1), female sex (OR 2.4), lower level of education (OR 3.1), using the internet (OR 1.7), low and middle socioeconomic standard (OR 2.4) and, depending on the private healthcare facilities (OR 2.2) were the predictors of the difficult access to healthcare facilities (Table-2). The results of this study revealed a statistically significant relationship between access to healthcare services and the DM related healthcare services as the difficult access was significantly associated with non-adherence to medication use (P<0.001), the occurrence of DM complication (P<0.001) and DM control by HbA1c (P<0.001) (Table-3).

The participants faced difficulties during their doctor visits in the form of costly services (47.3%), limited work hours (45.5%), fear of infection (45%), and difficulty to use internet for scheduling (40.3%) while only 10.5% reported facing no difficulties (Figure-1).

About 82% of the participants were not adherent to their medication. Non-adherent participants reported the following reasons for non- adherence to medication; feeling depressed due to the fear of COVID pandemic (85%), unavailability in dispensing medication (78.5%), financial problems (66.7%), unavailable medical care (53.3%) and changing habits due to lockdown (53.3%) (Figure- 2a).

There was a significant positive correlation between adherence score and healthcare service accessibility score, the more difficult the accessibility, the lower the adherence to medication (r= 0.34, p-value of

<0.001) (Figure-2b). About 38% of the participants used telemedicine as a coping strategy to overcome limited accessibility to DM-related healthcare services during the COVID-19 lockdown.

On investigating the participants' knowledge and practice of telemedicine, 93.5% of the patients gained knowledge about telemedicine from their nurses, 88.9% from the news, 87.6% from their doctors, 72.5% from their families, 71.2% from social media and 69.9% from their friends. About (88%) of the participants used text messages applications and (82.4%) used phone calls.

A total of (66%) of the participants reported the effectiveness of telemedicine while (18.3%) thought that it was ineffective. About (79%) preferred face-to-face visits to telemedicine. The participants suffered from some difficulties while using telemedicine in the form of problems related to communication networks (75.2%), financial problems (66.7%), confidentiality issues (60.8%), and insufficiency for disease management (54.9%).

When inquiring about their desire to continue to use telemedicine after the lockdown, 49% of the participants reported their approval while (51%) refuse to continue telemedicine use (Table-4).

Discussion:

COVID-19 lockdown and the associated measures and restrictions led to a change in health care services availability. In this study, the effect of the COVID-19 pandemic lockdown on the continuum of care for diabetic patients and accessibility of services was examined.

The results of this study indicated that health services for diabetic patients remained accessible for almost half of the participants. This comes in parallel to a study conducted in Singapore where access to health services and medications remained largely undisrupted for most patients with diabetes during the pandemic. [16]

However, an Indian study reported that COVID-19 lockdown affected access to healthcare and health well-being of the participants negatively mainly in areas of the high burden of the pandemic.[17]

This reflects different strategies for managing the pandemic and the level of preparedness in different countries.

Among the sociodemographic characteristics of the studied participants in the current study, aging, female sex, low socioeconomic standard, and lower educational level showed a statistically significant negative effects on accessibility.

There are few studies that analyzed influencing factors on health services accessibility for non-COVID reasons during pandemic, and showed that the probability of lower utilization levels was higher among women [18,19] and people with a low income and limited healthcare coverage who were less likely to access health services [20] with inconsistent results regarding the elderly. [21]

The challenge of the lockdown on services accessibility for diabetic patients was investigated in the current study and revealed that; health services accessibility appeared to be easier among participants who received care from the primary healthcare sector.

On the contrary, a survey of frontline healthcare workers in low- and middle-income countries[22] reported fewer non-communicable disease patients' visits to clinics since the COVID-19 pandemic began. Another online survey[7] reported that about two-thirds (60.0%) of participants had difficulty seeing a family doctor or GP during the COVID pandemic.

However, a study conducted in USA [23] described a drop in the number of in-person visits and an increase in remote care consultations (by telephone or video call).

Controlled diabetic patients based on HbA1c measurement were more significantly prevalent among participants who reported easy access to health care services. This agreed with a study conducted in Dubai [24] where studied patients showed improvement in glycemic control during the pandemic which was explained by the availability of continuous services such as telemedicine, telephone encounter, and home delivery of medications.

In a meta-analysis study [25] on the impact of lockdown on diabetes control, a pooled estimate showed that lockdown did not significantly result in changes to HbA1c. In contrast, another Meta-analysis [26] showed that compared to the time before lockdown, HbA1c values declined and improved significantly due to the lockdown effect which may be associated with positive changes in self-care and digital diabetes management.

However, a study conducted on Indian type 1 diabetic patients[3] clearly demonstrated the negative impact of a pandemic on glycemic control in T1DM, this is attributed to the different disease nature which needs more close supervision than type 2 DM.

In the current study, difficulties in healthcare services accessibility had a detrimental impact on the patient's adherence to their medical care. This comes in concordance with studies conducted in Saudi Arabia and the United Arab Emirates

[27,28] where patients' levels of compliance with antidiabetic regimens and healthy lifestyle habits were significantly reduced after the lockdown.

Also, a longitudinal study conducted in the UK [29] on five age-homogenous British cohorts revealed that the lockdown strategy has greatly impacted the accessibility to healthcare services and, as a result, the adherence of patients with chronic illness to their healthcare-related services.

However, a telephone-based survey in India[30] reported a significant improvement in medication adherence and glycemic control during the lockdown period as compared to the pre-lockdown times.

This was explained by the availability of more time for self-care, adequate counseling about glycemic goals, and knowledge of self-monitoring of blood glucose levels that helped most patients in adopting a healthy lifestyle and achieve better glycemic control during the COVID-19 lockdown.

Among the studied participants, the most frequently reported reasons for non-adherence were feeling depressed due to fear of COVID (85%), unavailability in dispensing medication (78.5%), financial problems (66.7%), unavailable medical care (53.3%) and changing habits due to lockdown (53.3%).

Similarly, Subathra *et al*[31] concluded that the top barriers to medication adherence in their study were non-availability of medication (54.81%), financial difficulties (30.29%), did not feel much improvement with their medication (20.19%).

The studied participants faced difficulties with their routine doctor visits including costly services (47.3%), limited work hours (45.5%) and fear of infection (45%). Whereas Devi *et al* study [7] in low- and middle-income countries reported fear of contracting COVID-19 (36.5%), being told not to attend by the doctor or clinic (33.7%), and being unable to access the clinic due to lockdown or quarantine (27.0%) as the most frequently endorsed reasons for missing a routine visit.

Many countries have implemented telemedicine as a solution to overcome inaccessibility. During the lockdown, nearly a third of the participants in the current study used telemedicine to seek the medical help they needed.

Telemedicine is being viewed as a new approach for the Egyptian community, which has become necessary because of the lockdown. A study was conducted in India on 1170 participants via an online survey to assess their perception regarding telemedicine[32] about 75% of participants used telemedicine during the pandemic.

This discrepancy in telemedicine utilization could be attributed to the Egyptian participants' lack of prior understanding and trust in this new technology but during the pandemic lockdown they were forced to utilize telemedicine to consult their physicians.

Medical personnel, the media, and family and friends were the primary sources of information for the participants. Text messages were the most utilized tool, followed by direct phone conversations.

Agrawal *et al.*[33] in their study on patients with diabetic retinopathy exploring their attitudes toward telemedicine found that telemedicine conducted through phone and video consultation has the potential to improve access to screening programs by increasing compliance with preventive screening and reducing the incidence of vision-threatening complications on a large scale.

They noted that telemedicine was a part of a national screening program for ongoing monitoring of DM complications, which is crucial for chronic care improvement. More than half of the participants reported the effectiveness of telemedicine during the pandemic which is in line with the study of Orange *et al.*[34] that showed 47.4% of the patients were satisfied with using telemedicine.

Conclusion:

Diabetic patients in our study face challenges in receiving routine medical treatments during this COVID-19 pandemic. Patients from marginalized communities and lower socioeconomic strata are particularly vulnerable to medication non-adherence. Healthcare practitioners need to consider innovative maintained Telemedicine strategies to ensure continued care provision and routine medical care during COVID-19.

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Conflict of interest: The authors have no conflict of interest to declare.

Ethics Statement: The study was approved by the Institutional Ethics Committee in Menoufia medical school under the following number (IRB 3/2021FAML9-2). Informed digital written consent was obtained from all participants prior to the study.

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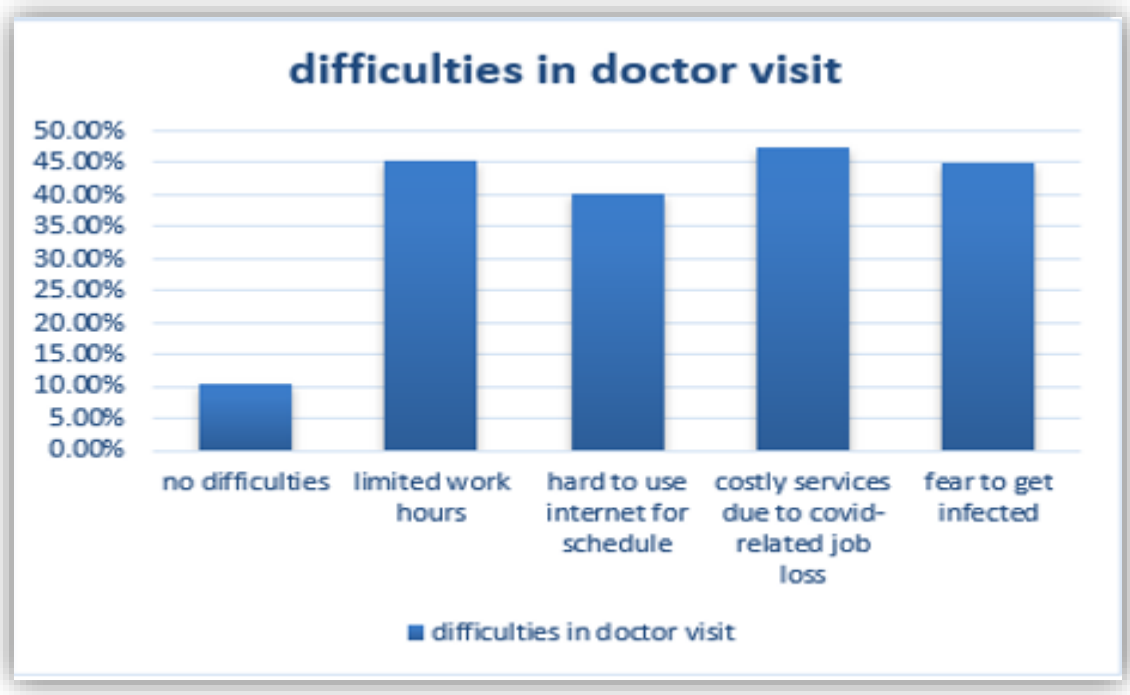


Figure (1): Causes of difficult doctor accessibility during the pandemic

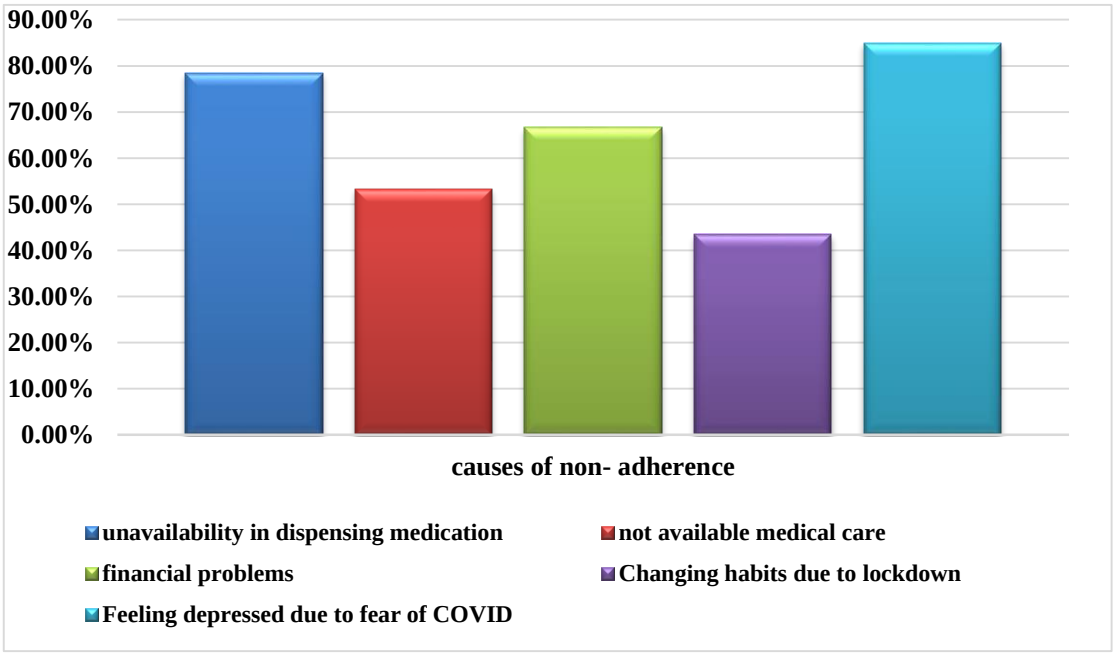
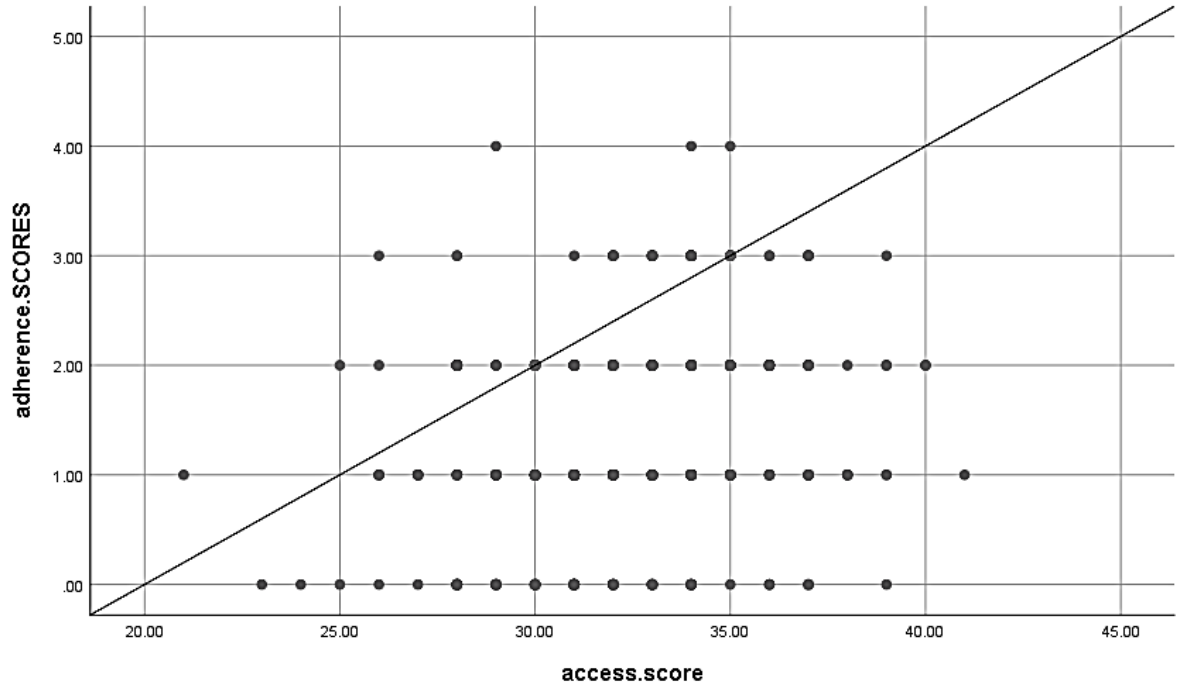


Figure (2a): Causes of non- adherence to DM medication among the studied participants:



r=0.34 p<0.001)

Figure (2b): Correlation between adherence score and healthcare service accessibility

Table (1): Univariate analysis of the healthcare services accessibility determinants among the studied group.

Item	Accessibility No (%)		Total 400 (100%)	X^2	P value	OR (95% CI)
	Easy 206(51.5%)	Difficult 194(48.5)				
Age (mean±Sd) Min-max	46.8±5.5 29-65	49.6±6.5 41-74	48.2±6.2 29-74	4.6	**<0.001**	----------
Sex: ▪ Male ▪ Female	 130(63.1) 76(36.9)	 73(37.6) 121(62.4)	 203(50.7) 197(49.3)	25.9	**<0.001**	2.8(1.9-4.3)
Education: ▪ Basic education or lower ▪ Secondary / higher education	 69(33.5) 137(66.5)	 128(66.0) 66(34.0)	 197(49.3) 203(50.7)	42.2	**<0.001**	1.9(1.6-2.5)
Work: ▪ Not working ▪ working	 64(31.1) 142(68.9)	 57(29.4) 137(70.6)	 121(30.3) 279(69.8)	0.1	0.4	----------
Internet use: ▪ Yes ▪ No	 131(63.6) 75(36.4)	 47(24.2) 147(75.8)	 178(44.5) 222(55.5)	62.6	**<0.001**	2.5(1.9-3.3)
Socioeconomic level: ▪ Low and middle ▪ High	 107(51.9) 99(48.1)	 150(77.3) 44(22.7)	 257(64.3) 143(35.8)	28.1	**<0.001**	1.9(1.5-2.4)
Health services are provided through: ▪ Public health care facilities[$] ▪ Private health care facilities[$$]	 112(54.4) 94(45.6)	 69(35.6) 125(64.4)	 181(45.3) 219(54.7)	14.3	**<0.001**	2.2(1.4-3.2)
Medications received: ▪ Oral drugs ▪ Insulin	 162(78.6) 44(21.4)	 145(74.7) 49(25.3)	 307(76.8) 93(23.3)	0.9	0.2	----------

[$] primary healthcare, public hospitals [$$] private clinics, pharmacies

Table (2): Multivariate logistic regression for predicting personal and disease related factors associated with difficult accessibility to DM related healthcare services during COVID-19 pandemic.

	OR*	95% CI (min-max)	P value
Age	1.1	1.02-1.2	**0.002**
Sex: ▪ Male * ▪ Female	 1 2.4	 1.4-4.1	**0.001**
Education: ▪ Basic education or lower ▪ Secondary education or higher*	 3.1 1	 1.8-5.2	**<0.001**
Internet use: ▪ Yes* ▪ No	 1 1.7	 1.01-2.9	**<0.001**
Socioeconomic level: ▪ Low and middle ▪ High*	 2.4 1	 1.4-4.3	**0.001**
Health services are provided through: ▪ Public healthcare facilities* ▪ Private healthcare facilities	 1 2.2	 1.2-4.8	**0.01**

*OR: odds ratio CI: confidence interval

Table (3): Effect of healthcare facility accessibility on the DM related healthcare services

Item	Accessibility No (%)		Total 400 (100%)	X^2	P value	OR (95% CI)
	Easy 206(51.5%)	Difficult 194(48.5)				
Adherence to medication use: ▪ Adherent ▪ Not-adherent	51(69.9) 155(47.4)	22(30.1) 172(52.6)	73(18.3) 327(81.8)	12.1	**<0.001**	2.6(1.5-4.4)
Occurrence of DM complications*: ▪ No ▪ Yes	104(63.8) 102(43.1)	59(36.2) 135(56.9)	163(40.8) 237(59.3)	16.8	**<0.001**	2.3(1.5-3.5)
DM control by HbA1c: ▪ Controlled ▪ Uncontrolled	139(63.8) 67(36.8)	79(36.2) 115(63.2)	218(54.5) 182(45.5)	28.3	**<0.001**	3.1(2.1-4.5)
Comorbidities**: ▪ No ▪ Yes	92(52.9) 114(50.4)	82(47.1) 112(46.6)	174(43.5) 226(56.5)	0.2	0.4	---------

*Retinopathy, neuropathy, or nephropathy, **cardiovascular, neurological, renal, …

Table (4): Telemedicine use during COVID lockdown

Details of telemedicine use	No (153)	Frequency (%)
Telemedicine use during the pandemic:		
▪ Yes	153	38.2
▪ No	247	61.8
Knowledge about telemedicine is from:		
▪ Social media	109	71.2
▪ News	136	88.9
▪ Family	111	72.5
▪ Friends	107	69.9
▪ Doctor	134	87.6
▪ Nurse	143	93.5
Method used:		
▪ Phone calls	126	82.4
▪ Text messages applications	134	87.6
Effectiveness of telemedicine:		
▪ Effective	101	66.0
▪ Not effective	28	18.3
▪ Effective to some extent	24	15.7
Which is preferred more:		
▪ Face to face visits	121	79.1
▪ Telemedicine	32	20.9
Difficulties in telemedicine use:		
▪ Communication network problems	115	75.2
▪ Financial problems	102	66.7
▪ No assurance of confidentiality	93	60.8
▪ Not enough for disease management	84	54.9
Continue to use telemedicine after lockdown:		
▪ Yes	78	49.0
▪ No	75	51.0

الملخص العربى

استمرارية الرعاية المقدمة لمرضى السكري أثناء وباء كوفيد -19 في الرعاية الصحية الأولية ، مصر

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الخلفية: لقد أثرت جائحة كورونا بشدة على الخدمات الصحية المقدمة للأمراض غير المعدية خاصة التى تتطلب رعاية منتظمة أو طويلة الأجل. الهدف من هذا البحث هو دراسة مدى تأثير الإغلاق المصاحب لجائحة كوفيد 19 على إمكانية الوصول إلى الخدمات الصحية والرعاية الصحية لمرضى السكري في الرعاية الصحية الأولية. **طرق البحث**: أجريت دراسة مقطعية على 400 مشارك مصاب بالسكري. و تم استخدام استبيان باللغة العربية متعدد الأبعاد لجمع البيانات. يتكون الاستبيان من أربعة أجزاء ؛ الجزء الأول لجمع البيانات الديموغرافية ، والجزء الثاني لجمع البيانات الخاصة بالحالة الصحية لمرضى السكر اثناء فترة الإغلاق ، والجزء الثالث يتعلق بالالتزام بالأدوية والجزء الرابع يتضمن أسئلة تعلق بالحواجز التي تحول دون زيارة الرعاية الصحية الأولية. **النتائج**: ما يقرب من نصف المشاركين كانوا يعانون من صعوبة في الوصول إلى خدمات الرعاية الصحية. كان من أهم العوامل المؤديةلصعوبة الوصول للخدمة الصحية هى, كبر السن ، وجنس الإناث ، ومستوى التعليم المنخفض ، واستخدام الإنترنت ، والمعايير الاجتماعية المنخفضة والمتوسطة والاعتماد على مرافق الرعاية الصحية الخاصة. من أهم التحديات الرئيسية التي واجهها المرضى خلال زيارة الطبيب كانت الخدمات المكلفة يليها ساعات العمل المحدودة ، والخوف من العدوى ، وصعوبة استخدام الإنترنت. و كلما زادت صعوبة الوصول للخدمة الصحية، انخفض معدل الالتزام بالأدوية. و أصبح تقديم الخدمة الصحية عن بعد هو البديل المعتمد خلال الجائحة. **الخلاصة**: تأثرت الخدمات الصحية المقدمة في الرعاية الصحية الأولية بشدة أثناء جائحة كورونا وبالتالي مدى الالتزام بالعلاج. و تم استخدام تقديم الخدمة الصحية عن بعد كإستراتيجية للتغلب على إمكانية الوصول إلى خدمات الرعاية الصحية لمرضى السكرى أثناء فترة الإغلاق المصاحبة لجائحة كورونا.