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Assessment of knowledge and challenges toward the use of subcutaneous self-injecting insulin among diabetes patients during COVID-19 pandemic in Saudi Arabia

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ABSTRACT

Background: The COVID-19 pandemic has revolutionized the delivery of chronic health care. For diabetic patients, maintaining regular contact with healthcare providers and visiting healthcare centers are crucial to patients' overall ability to control their glycemic status.

Objective: To assess patients' knowledge regarding the use of insulin injection devices and the challenges these patients face in obtaining medical advice, as well as to suggest alternative solutions for addressing these challenges among diabetic patients self-administering their injections during the COVID-19 pandemic.

Methodology: An observational cross-sectional study was conducted among a sample population (N = 178) of diabetic patients attending Security Forces Hospital–Riyadh, Saudi Arabia, from which the Institutional Review Board (IRB) was granted. Data was collected using a self-administered questionnaire, which was distributed from August to September 2020. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) program (version 21). Significant P-value = < 0.05.

Results: The majority of patients had good knowledge and practice explained with values 73.6% of total population. Sixty-four percent of patients with type 1 diabetes and 59% of patients with type 2 diabetes reported experiencing moderately severe challenges obtaining counseling. There was no correlation between severity of disease and knowledge levels (p-value = 0.36). The most appropriate means of obtaining counseling was determined to be conversations with healthcare providers; this strategy received an overall average score of 4.9 ± 0.4 (p-value < 0.0001).

Conclusion: Regardless of whether knowledge is high among patients with diabetes, continuous support and counseling from healthcare providers is critical. The creation of innovative approaches to facilitate communication between diabetes patients and healthcare providers is recommended for continued patient care during the COVID-19 pandemic.

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1. Introduction

At the end of 2019, the World Health Organization (WHO) Regional Office in China was notified that cases of pneumonia of unknown cause had been identified in Wuhan City, China (WHO, 2020). A new virus, COVID-19, was revealed to be the cause of infection in these cases, with patients' conditions ranging from common cold symptoms to more serious illnesses. In March 2020, Saudi Arabia was recognized as the Gulf country with the largest number of patients infected with COVID-19 (WHO, 2020). As was the case in many other countries, the Saudi government

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implemented a lockdown in response to the COVID-19 outbreak, as it quickly became a global pandemic. Due to this emergency situation, several aspects of individuals' daily lives were affected, including regular medical visits (WHO, 2020).

As a measure of safety, patients suffering from chronic diseases had to postpone their appointments, and providing healthcare to the continuously increasing number of COVID-19 patients was given maximum priority. To overcome these challenges, medications were prescribed to patients with chronic diseases via mail; however, due to government guidelines enforcing social distancing and advising vulnerable people with health issues to stay at home, counseling from healthcare providers was not available to these patients (Koster, Philbert, and Bouvy, 2021). As a consequence, during the COVID-19 pandemic, the delivery of chronic healthcare has been revolutionized, including technology for use in the management of diabetes mellitus (DM). Indeed, the use of telemedicine and online consultations in DM management, as well as the use of anti-diabetic medication for DM in individuals infected with COVID-19, have been considered the most appropriate methods for follow-up care in DM patients (Sadera et al. 2020). Yet, for these patients, maintaining regular contact with healthcare providers and visiting healthcare centers are crucial to their overall ability to control their glycemic status (Zhang et al. 2012). Thorough patient education regarding self-injection strategies and regular follow-ups from healthcare providers guarantee better long-term adherence to treatment and far less readmission to the hospital (Patient Counseling - The Prescription Center n.d.). Moreover, discontinuity of care can pose problems. Strategies are thus needed to ensure that communication and contact is maintained between healthcare providers and patients while patients remain at home. For example, patients may seek guidance via smartphone or online communication for problems related to self-injection. Promoting the successful treatment of chronic conditions through self-injection can also restrict the economic effect of such diseases, while concurrently enhancing treatment flexibility and overall quality of life for the affected patients and households (Boeru et al. 2013). In line with this, notable solutions have been proposed, such as the use of a Chronic Care Model to treat chronic diseases like diabetes (Peterilli et al., (Petrelli et al., 2021). This model allows for both the implementation of healthcare management and improved quality of care, while ensuring that healthcare resources are not diverted from their necessary role in the ongoing crisis of the COVID-19 pandemic.

The international diabetes incidence for all age groups worldwide was estimated to be 2.8% in 2000, with this number projected to reach 4.4% in 2030. In line with this, the overall number of people with diabetes is projected to increase from the reported 171 million in 2000 to 366 million in 2030 (Wild et al., 2004). Saudi Arabia is ranked second highest in the Middle East and seventh in the world for diabetes rates. According to the WHO, an estimated 7 million people in the country are diabetic, and nearly 3 million people have pre-diabetes (Sadera et al. 2020).

Type 1 diabetes mellitus (T1DM), previously known as insulin-dependent, juvenile, or childhood onset, is characterized by deficient insulin production and involves regular insulin administration. Conversely, type 2 diabetes mellitus (T2DM), formerly referred to as non-insulin-dependent or adult-onset, results from inadequate insulin use by the body (Almutairi, 2015). Gestational diabetes appears during pregnancy as hyperglycemia with blood glucose values above normal (fasting blood glucose 95 mg/dL [5.3 mmol/L]) but below the diagnostic levels of diabetes (fasting blood glucose 126 mg/dL [7 mmol/L]).

Insulin is a hormone that permits the body to productively utilize glucose as fuel. Thus, for patients with T1DM, insulin replacement is considered the pillar of treatment; in addition, it is also an effective treatment for T2DM when diet, weight loss, exercise,

and oral medications do not sufficiently regulate blood glucose levels (AlShareef et al. 2017). Subcutaneous (SC) insulin injections are a way to deliver medicine under the skin (Case-Lo, 2017). Patient counseling consists of providing patients or their representatives with oral or written information about medication in terms of course of use, side effects, precautions, storage, diet, and required lifestyle changes (Sanii et al. 2016). It has been well established that counseling patients at the time of discharge and at regular follow-ups improves patients' medication adherence and treatment satisfaction, consequently improving clinical outcomes. A study was published by the University of Medical Sciences including a total number of 154 patients aged 18–65 years. Patients in the intervention group received pharmacist counseling and necessary education about their prescribed medications at discharge. The study showed that medication adherence in the intervention group was 42.9% higher than in the control group, and treatment satisfaction was determined to be 33.5% higher than in the control group (Sanii et al. 2016).

Existing studies have explored the challenges facing diabetes patients during the COVID-19 pandemic and alternative solutions for providing medication counseling under these specific circumstances, but many have significant limitations. For example, results from a study in India (Banerjee, Chakraborty, and Pal 2020) and another from the United States (US) (Garg et al. 2020) could not be generalized to the Saudi population because of the differences in communities, ethnicities, habits, and available healthcare services. Another limitation of the existing research in this area is that assessing the knowledge of diabetic patients regarding the self-administration of insulin injections has not been studied in a pandemic setting—where patients cannot visit hospitals or pharmacies to obtain full medication counseling about the subcutaneous injection of insulin, starting from pulling the cap off the insulin pen to disposal. Furthermore, new ways of easily and quickly delivering information about SC insulin self-administration to patients other than teleconsultation could be explored.

Indeed, the incorrect administration of insulin (e.g., too little, too much, or at the wrong times) can result in both transient and serious hypoglycemia and hyperglycemia, wide glycemic excursions, severe hypoglycemia, and diabetic ketoacidosis (Trief et al. 2016), which should be avoided. The aim of the present study was to assess knowledge related to the use of insulin injection devices among diabetic patients who are self-administering their injections, to evaluate the challenges they face obtaining medical-specific advice, and to suggest alternative solutions to overcome these challenges during the COVID-19 pandemic in Saudi Arabia.

2. Methods

2.1. Study design

This study had a cross-sectional design. It was conducted at Security Forces Hospital in Riyadh, Saudi Arabia, from August to September 2020.

2.2. Procedure

Patients took part in this study only after providing informed consent. The study was approved by the Institutional Review Board at Princess Nourah bint Abdulrahman University and by the Ethical Committee at Security Forces Hospital (H-01-R-069).

As shown in Fig. 1, a total of 253 individuals responded to the questionnaire, and 167 patients were included in the study. The selection criteria included all patients requiring insulin who were diagnosed with type 1 and/or 2 diabetes and gestational diabetes

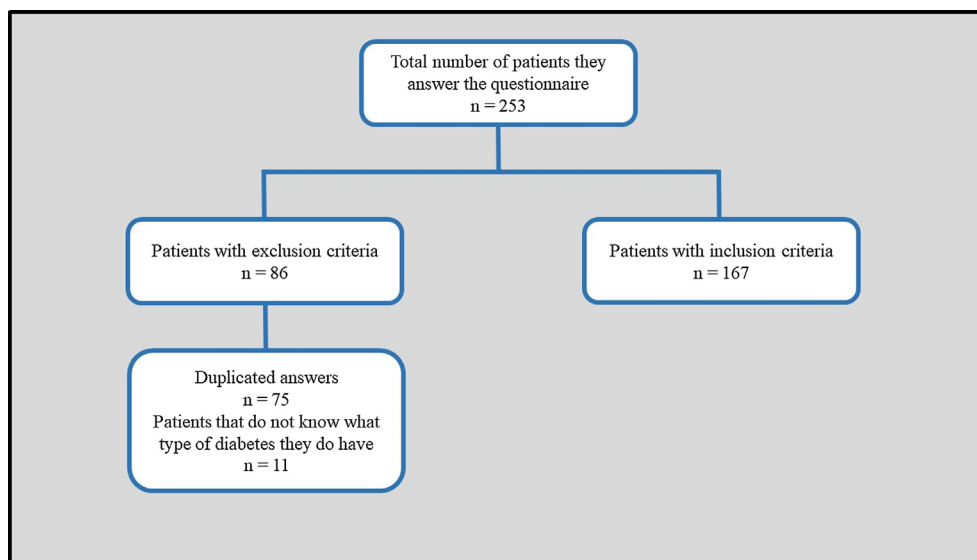


Fig. 1. Sample selection procedure.

based on the diabetes status from each patient's file and who were 12 years of age or older. We obtained the consent of the minor participants from the hospital and their tutors. Patients uneducated regarding insulin injection or using insulin injection pens were included in the study. The exclusion criteria included children under the age of 12, as they were not considered to be responsible enough to administer insulin injections on their own; patients with cognitive impairment, as they were not able to respond to the questionnaire; patients using insulin pumps, as such devices are programmed by physicians; and patients taking oral anti-diabetic medications.

2.3. Research tools

The data was collected by using a self-administered questionnaire. It consisted of four sections. [Section 1](#) included the sociodemographic characteristics and properties of the participants, such as age and gender. The age group classified depend on WHO, type of diabetes and insulin daily dose which classified depend on (Davidson 2015).

The aim of [Section 2](#) was to measure the participants' knowledge related to the use of insulin injection devices and the method of injection. This part of the questionnaire contained 14 questions rated using a 5-point Likert scale (totally agree = 5, agree = 4, neutral = 3, disagree = 2, and totally disagree = 1). The total minimum and maximum scores were 14 and 70, respectively. Accordingly, the participants' knowledge was categorized, and the scores were used to evaluate the participants' knowledge of using insulin injection devices. The results were as follows: poor knowledge = score of 4–32; medium knowledge = score of 33–51; and good knowledge = score of 52–70.

[Section 3](#) aimed to measure the obstacles diabetes patients faced in terms of receiving medical advice during the COVID-19 pandemic. It was composed of 10 questions using a Likert scale of 5 points (totally agree = 5, agree = 4, neutral = 3, disagree = 2, and totally disagree = 1). The total minimum and maximum scores were 10 and 50, respectively. Accordingly, the participants' obstacles were categorized as follows: less obstacle = score of 10–23; medium obstacle = score of 33–36; and great obstacle = score of 37–50).

[Section 4](#) focused on assessing the appropriate means of providing medical advice to diabetic patients during the COVID-19 pandemic. This part of the questionnaire contained 5 questions ranked using a Likert scale (totally agree = 5, agree = 4, neutral = 3,

disagree = 2, and totally disagree = 1). The total minimum and maximum scores were 5 and 25, respectively. The participants' solutions were thus categorized as follows: inadequate solution = score of 5–11; acceptable solution = score of 12–18; and good solution = score of 19–25).

2.3. Statistical analysis

Statistical analysis was performed using the SPSS program (version 21). Results were presented as mean \pm SD and as frequencies and percentages. Chi-squared and Fisher's exact tests were conducted to compare different groups of diabetic patients. The Pearson test was performed to assess the correlation between knowledge and obstacles, and the one-way ANOVA test was used to see the difference between the means of the patient groups. The results were accepted as statistically significant when p -value < 0.05.

3. Results

3.1. General characteristics of the study population

Out of a total of 253 respondents, only $n = 167$ were included in the study after the completion of the full survey. [Table 1](#) summarizes the general characteristics of the study population in relation to classification of type of diabetes, type of insulin used, and amount of insulin doses per day. The majority of the respondents were female (60%), and the rest were male (40%). Out of the 167 respondents, 35.9% fit into the range of middle age (48–64 years old), and 22.8% fit into the range of young adults (12–29 years old). In terms of type of diabetes, 35.9% of the young adults were classified as having T1DM, while 52.9% of the middle-aged patients were classified as having T2DM. Type 1 diabetes usually develops in childhood, and type 2 diabetes usually develops later in life due to unhealthy dietary habits and sedentary lifestyle, thus explaining these percentages. Of the $n = 167$, only $n = 8$ were classified as having gestational diabetes, and 87.5% fit into the range of adults (30–47 years old). Regarding gender, the percentages of males and females were almost equal in T1DM (47.2% and 52.8%, respectively). However, more than the majority of the T2DM respondents were female (65.7%), as females are typically more

Table 1
General characteristics of the study population (n = number of patients; NS = non-significant).

Variables	Total population n = 167		Type 1 diabetes n = 89		Type 2 diabetes n = 70		Gestational diabetes n = 8		P-value
	%	n	%	n	%	n	%	n	
Age (years)									
12–29	22.8	38	35.9	32	7.1	5	12.5	1	
30–47	21.5	36	21.3	19	14.3	10	87.5	7	
48–64	35.9	60	25.8	23	52.9	37	0	0	
≥ 65	19.8	33	16.9	15	25.7	18	0	0	
Educational level									
Primary	28.7	48	25.9	23	35.8	25	0	0	
Secondary	13.2	22	10.1	9	17.1	12	12.5	1	
High school	25.1	42	24.7	22	25.7	18	25	2	
University	32.9	55	39.3	35	21.4	15	62.5	5	
Sex									
Male	39.5	66	47.2	42	34.3	24	0	0	
Female	60.5	101	52.8	47	65.7	46	100	8	
Duration of diabetes disease (years)									
≤5									
>5	19.8	33	20.2	18	10	7	100	8	
	80.2	134	79.8	71	90	63	0	0	
Insulin dose (Unit/day)									
< 20	38.9	65	43.8	39	30	21	62.5	5	
21–50	44.9	75	43.8	39	48.6	34	25	2	
51–70	10.2	17	10.1	9	10	7	12.5	1	
71–100	6	10	2.2	2	11.4	8	0	0	
Schedule (dose/ day)									Chi ²
1	22.8	38	15.7	14	32.9	23	12.5	1	0.0003
2	32.3	54	23.6	21	41.4	29	50	4	
> 2	44.9	75	60.7	54	25.7	18	37.5	3	
Type of insulin used									Chi ²
Injection	12.6	21	9	8	14.3	10	37.5	3	0.05
Pen	87.4	146	91	81	85.7	60	62.5	5	(NS)
City (regions)									
Riyadh	79	132	76.4	68	80	56	100	8	
Dammam	4.2	7	5.6	5	2.9	2			
Mecca	3.6	6	3.4	3	4.3	3			
Jeddah	2.4	4	3.4	3	1.4	1			
Al-Ehssaa	3	5	5.6	5	0	0			
Abha	1.2	2	1.1	1	1.4	1			
M'haeil Assir	1.2	2	1.1	1	1.4	1			
Najran	0.6	1	0	0	1.4	1			
Aflaj	1.8	3	0	0	4.3	3			
Alqaseem	0.6	1	1.1	1	0	0			
Rafahaa	0.6	1	1.1	1	0	0			
Jazan	1.2	2	1.1	1	1.4	1			
Al jubeil	0.6	1	0	0	1.4	1			

P-value calculated using Chi² test.

prone to T2DM, which is also associated with obesity. Of all the respondents, 92.4% indicated that they received a dose of 21 to 50 units of insulin per day; 62.5% of respondents with gestational diabetes reported that they received less than 20 units of insulin per day. There was a significant difference in Chi-squared p-value = 0.0003 among the scheduled insulin doses, as 45% of all respondents divided their daily doses schedule more than twice per day. No significant results were shown related to the type of insulin used, whether injection or pen. However, 87.4% of respondents used pen injections. Of the respondents, 79% were from the central region of Riyadh, as the survey took place in a central location.

3.2. Knowledge and practice of self-administering insulin medication

Fig. 2 summarizes participants' overall knowledge and practice of self-administering insulin injections. Almost three quarters (73.6%) of the total respondents—including 66.3% of those with T1DM, 78.6% of those with T2DM, and 100% of those with gestational diabetes—indicated they had good knowledge and practice of self-administering insulin injections. However, a significant dif-

ference in p-values (0.047) was obtained in medium score knowledge and practice. This was due to the difference % score between T1DM and T2DM patients as the medium knowledge was high in T1DM scored with 33.7%, while for T2DM it was 21.4% only. This can be explained by the long-term practice of insulin injection in T1DM, given that this form of the disease develops in childhood rather than later in life, as with T2DM. Overall, 100% of the respondents reported being familiar with (medium) and having good knowledge and practice of self-administering insulin injections. The effectiveness of educational guidance for insulin administration provided by healthcare providers at all levels may explain this result.

3.3. Severity of challenges faced in obtaining counseling on self-administering insulin medications

Fig. 3 represents the distribution of the results regarding the severity of the challenges and obstacles faced by diabetes patients in terms of receiving medical advice during the COVID-19 pandemic. A significant difference in p-value (0.008) was shown for all challenge levels. More than half of the T1DM (64%) and T2DM

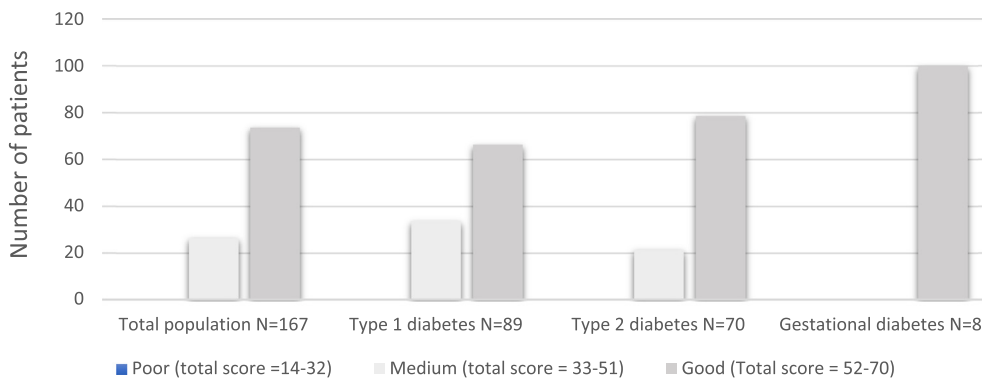


Fig. 2. Knowledge and practice of self-administering insulin medication. P-value (0.047) calculated using Fisher's exact test.

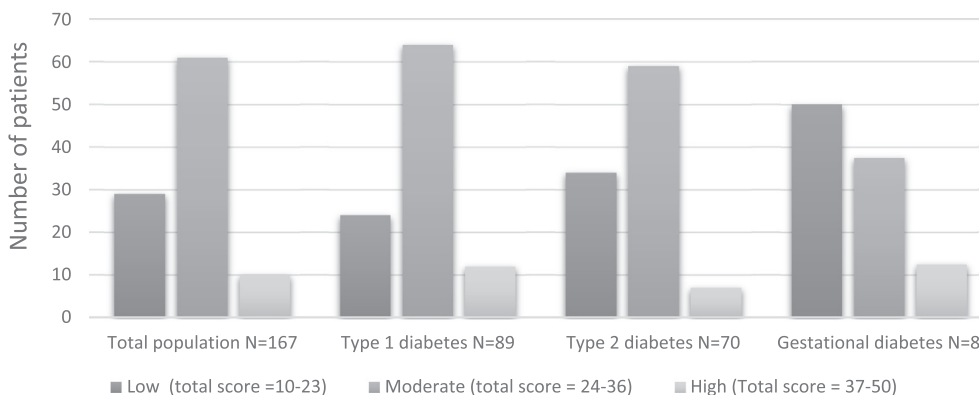


Fig. 3. Severity of challenges faced in obtaining counseling on self-administering insulin medications. P-value (0.008) calculated using Chi² test.

Table 2

Correlation between knowledge and practice and severity of challenges faced obtaining counseling on self-administering insulin injections.

Correlation between knowledge and practice and severity of challenges faced in obtaining counseling on self-administering insulin medications	Total population N = 167	Type 1 diabetes n = 89	Type 2 diabetes n = 70	Gestational diabetes n = 8
R	-0.077	-0.023	-0.0125	-0.053
P-value	0.36	0.83	0.33	0.9

P-value and r-value calculated using Pearson test.

(59%) respondents reported facing moderate challenges in obtaining counseling on self-administering insulin injections during the pandemic. However, 50% of respondents with gestational diabetes reported facing minor or low levels of challenges in obtaining counseling, as patients with gestational diabetes are always considered a priority, with mandatory clinic attendance and monitoring of blood sugar levels.

3.4. Correlation between knowledge and practice and severity of challenges faced in obtaining counseling on self-administering insulin injections

Table 2 shows no significant correlation between the severity of challenges faced in obtaining counseling on self-administering insulin injections and the knowledge and practice of self-

Table 3

Solutions for obtaining counseling on self-administering insulin medications (mean ± SD).

Solution for obtaining counseling on self-administering insulin medications	Total population n = 167	Type 1 diabetes n = 89	Type 2 diabetes n = 70	Gestational diabetes n = 8	P-value
Phone calls	3.6 ± 1.2	3.6 ± 1.2	3.6 ± 1.1	3.9 ± 1.2	0.675
Video calls	3.4 ± 1.3	3.5 ± 1.2	3.3 ± 1.3	3.6 ± 1.3	0.405
Demonstration (videos and images)	3.7 ± 1.1	3.7 ± 1.2	3.8 ± 1.1	4.3 ± 0.7	0.285
Chat conversation	4.3 ± 1.0	4.2 ± 1.1	4.3 ± 0.9	4.9 ± 0.4	0.196
By pharmacist (while receiving medications at home)	4.1 ± 1.0	4.1 ± 0.9	4.0 ± 1.2	4.0 ± 1.1	0.66
P-value	< 0.0001	< 0.0001	< 0.0001	0.149	

P-value calculated using the one-way ANOVA test.

administering insulin injections. This can be explained given that a negative *r*-value was demonstrated in the total respondents; accordingly, this result could also be explained given that there is adequate diabetes education offered by healthcare providers in terms of diabetes management and medication use.

3.5. Solutions for obtaining counseling on self-administering insulin medications

Table 3 summarizes all suggested alternative solutions for patients to obtain counseling on self-administering insulin injections. The results shown in Table 3 were calculated using ANOVA test. All respondents showed similar attitudes toward all solutions, with a significant *p*-value < 0.0001, excluding those with gestational diabetes. This could be explained by the minimum responses (*n* = 8). Of all the solutions mentioned, the most recommended was conversation (4.3 ± 1.0) for several reasons, including cultural perspectives for video calls and busy schedules for phone calls.

4. Discussion

This research study aimed to assess the knowledge and practice of self-administering insulin injection in addition to the challenges and obstacles faced during the COVID-19 pandemic in receiving diabetes medical advice and suggested alternative solutions for diabetes patients. Diabetes is considered one of the most common non-communicable chronic diseases of high prevalence that affects all ages. In Saudi Arabia, the prevalence of T1DM is 33.5% and T2DM 35.37% is considered an economic threat and burden on the health care system (Robert et al. 2018); (Alotaibi et al. 2017).

Accordingly, preventing patients from progressing into more complicated diabetic-related diseases requires the constant monitoring and coordination of medical treatments. A significant impact of the ongoing pandemic on the total population has been the experience of complete isolation during quarantine for more than 30 days. This meant that individuals undergoing a quarantine period did not have access to medical services or outpatient clinics. This caused obvious difficulty in terms of patients accessing direct communication with and examination by physicians. Hence, this study examined and assessed the innovative practices and information gained from delivering services to patients with chronic illnesses during the COVID-19 pandemic. The results of the present study reflect the reality that virtual healthcare systems are also effective in educating diabetic patients regarding self-administering injections. In keeping with this and according to the results shown in Fig. 2, all respondents claimed they were familiar (medium and good) with practicing the self-administration of insulin injections (*P* = 0.047). Comparing this study with a recent similar study conducted in India by Patil et al. (2017) on the assessment of insulin injection techniques among diabetic patients in a tertiary care center before the COVID-19 pandemic, the present study's results revealed multiple malpractice techniques with insulin injections with patient knowledge. The study recommended the importance of focusing on health education related to insulin injection practices and increasing patients' knowledge regarding diabetes medications or the disease itself (Patil et al. 2017). In another study, findings from a survey of 91 diabetic teachers in Al-Khobar showed that understanding of diabetes was low, especially regarding the symptoms of hypoglycemia. Al-Haeyek screened 147 diabetic patients in Riyadh, where uncontrolled glycemic levels were found in patients' adherence to diet and lifestyle plans. Meanwhile, diabetes education programs showed a significant improvement in medication

regimens (*P* = 0.007) and patients' glycemic control (*P* = 0.04) in a study conducted in a tertiary hospital in Riyadh (AlShareef et al. 2017; Patil et al. 2017; Tosun et al. 2019).

People with diabetes appear to be at increased risk of more severe COVID-19 symptoms, with many warnings having been issued around the world regarding precautionary measures when considering the balance between shifting resources toward the acute COVID-19 crisis and maintaining routine care for people who live with long-term conditions, such as those with diabetes. A retrospective study of 451 people with COVID-19 with diabetes hyperglycemia from the US reported that people with uncontrolled hyperglycemia had a longer length of stay and higher mortality compared to people without diabetes or uncontrolled hyperglycemia (Alsmadi n.d.). The study demonstrated significant results of patients with high levels of knowledge about their disease adhering more to their treatment regimen than those with poor knowledge. Our study results support the idea that patients generally have good knowledge regarding the disease and implementation of treatment. This could be explained by the high quality of health education services offered by healthcare providers at the Security Forces Hospital–Riyadh, Saudi Arabia, given that the respondents' data was collected from this hospital. Furthermore, no significant correlation was reported between the severity challenges faced in obtaining counseling on self-administering insulin injections and the knowledge and practice of self-administering insulin injections. This could be due to the overall circumstances related to the COVID-19 pandemic affecting diabetes patients equally. For alternative solutions to obtaining counseling on self-administering insulin injections, there were no differences in suggested solutions, and all patients reported the same attitude with similar *p*-values for all the solutions noted. Nevertheless, the most commonly suggested solution was conversation, which may be due to cultural factors, as it is difficult to have video calls for counseling for all patients or may be for time spent. On the other hand, the intervention tests may not be widely available or may require health care resources to be set up. In addition, the choice of format should be tailored to patient preferences, which may vary according to age and sociodemographic group. In a study involving 230 pregnant Saudi women (ages 21–44 years), findings revealed that 66.1% were diagnosed as gestational diabetics, which represented a high prevalence of gestational diabetes mellitus (GDM) among Saudi women. This is why specific educational campaigns about GDM with nutritionists are highly recommended to provide special dietary strategies for women with gestational diabetes (Mohamed and Ismail 2013). It is important to shed light on the emerging concept of using new technology in educating patients about diabetes treatments. For example, Petrelli et al. (Petrelli et al. 2020) demonstrated that the application of new technologies such as telenursing and telemedicine could guarantee the correct management of diabetes patients even from a distance, particularly in times of healthcare crises, such as the COVID-19 pandemic. Hence, the efficacy and efficiency of telemedicine to manage diabetic patients was discussed, and the authors reported that these techniques could be considered consistent and successful telemonitoring solutions as they provided patients with the possibility of being treated for an emergency condition without being physically present at a hospital (Baldoni et al. 2020). This underlines the importance of promoting such technology not only among patients but also among healthcare providers and pharmacists (Battineni et al. 2021).

In terms of the limitations of our study, due to the convenient sampling technique, findings cannot be generalized to all diabetic patients in Saudi Arabia. However, this study is the first of its kind.

It provides important insight into the knowledge and practice of self-administering insulin injections, as well as the challenges and obstacles faced during the COVID-19 pandemic. Thus, there is a need for future research that extends the present research to cover other cities and primary care services centers. Furthermore, this study may not capture the qualities of all barriers faced by patients during the COVID-19 pandemic, as intervention tests may not be widely available or may require health care resources to be set up. Another limitation of the study is that the survey was only distributed for one month, which limited the number of responses that could be collected. A gap was highlighted in this study in terms of addressing barriers and obstacles that might hinder diabetes management in Saudi Arabia. Addressing this gap will play a significant role in reducing the disease burden on the economy and healthcare system and increasing the quality of life for the Saudi population.

5. Conclusion

Regardless of whether knowledge is high among diabetes patients, continuous support and counseling from healthcare providers are crucial. Health education through good counseling and good communication is key to improving patient outcomes and saving costs. Such knowledge allows patients to play a more active role in healthcare self-management and may encourage behaviors such as correct injection to avoid complications. Consequently, this leads to improved control of blood sugar levels. Creating innovative approaches to communication between patients with diabetes and healthcare providers during the COVID-19 pandemic is critical. Patients should be encouraged to engage in self-management behaviors. This process begins with pharmacists educating patients regarding how to correctly use insulin at appropriate doses and answering patients' questions. With the national transformation and the vision of the Kingdom of Saudi Arabia 2030, Saudi Arabia has been keen on introducing e-technologies in the field of health, which we commend. We also hope for more programs that facilitate communication among healthcare providers and patients to improve the quality of life of diabetic patients. It is necessary to assess the quality of services based on both national and international healthcare standards.

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Data Availability Statement

Data available upon request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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