Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

Assessment of the Satisfaction on Implementation of a Diabetes Type 2 Virtual Clinic during the Coronavirus Disease Outbreak in Makkah Al-Mukarramah Saudi Arabia 2022

Hanaa Besheit Almatrafi[1], Bayan Adil Ghabashi[2], Turkiah Jilani Almuwallad[3], Aeshah Abdullah Momen[3], Saadah Hamied Mohammad Alfahmi[4], Rupaiya Essa Mohammedtaqroni[5], Raid Obaid H Almuqati[6], Sultan Olaywi Aali Altalhi[7], Hanaa Mostafa Felemban[8], Amnah Ali Ahmad Bargi[9], Ali Mohammed Safar Alzahrani[10], Mohammad Shuail A Alsolmi[11], Rawan Hashim Bakr[12], Adel Dakhel Alotaibi[13]

[1]Consultant family medicine, Primary health care, the health gathering in Makkah, Saudi Arabia.

[2]family medicine specialist, Primary health care, the health gathering in Makkah, Saudi Arabia.

[3]Staff nurse, Makkah Health cluster, Saudi Arabia.

[4]Doblom of Nursing, Primary Health care Alhajj street, Makkah, MOH, Saudi Arabia.

[5]Dental technician, Hera Hospital Makkah, Saudi Arabia.

[6]Health administration specialist, King faisal hospital in Makkah, Saudi Arabia.

[7]Senior Specialist-Health, Administration, Public Health Department, Directorate of Health Affairs in Taif, Saudi Arabia.

[8]Midwife, Maternity and Children hospital, Saudi Arabia.

[9]Nursing technician, Aladel Primary health care, Saudi Arabia.

[10]Health services pharmacy technician, support management, Kudai and Alhijra Primary Health Care Centre in Makkah Al-Mukarramah, Saudi Arabia.

[11]Nursing technician, School Health, Saudi Arabia.

[12]Dietitian, Makkah Health cluster, Saudi Arabia.

[13]Social Worker - Health Affairs in Makkah Al-Mukarramah, Saudi Arabia.

Abstract:

Background:

During the coronavirus disease 2019 (COVID-19) outbreak, novel approaches to diabetes care have been employed. Care in both the inpatient and outpatient setting has transformed considerably. the coronavirus disease (COVID-19) pandemic has presented unique challenges for people with diabetes, in addition to their high-risk stratification for infection. Supporting people with diabetes to self-care has been critical to reduce their risk of severe infection. This global pandemic has presented an opportunity to digitalize diabetes care and rapidly implement virtual diabetes clinics, of optimizing diabetes management and well-being, while keeping patients safe. Driven by the need

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

to reduce the use of personal protective equipment and exposure for patients and providers alike, on Implementation of a Diabetes Type 2 virtual clinic During the Coronavirus disease outbreak the diabetes management has been transferred services to largely "virtual". We performed a rapid review of the literature to evaluate the feasibility and effectiveness of virtual clinics in diabetes care before and during the COVID-19 pandemic and have combined these findings with our own

Aim of the study: To Assessment of the Satisfaction on Implementation of a Diabetes Type 2 virtual clinic During the Coronavirus Disease Outbreak in Makkah Al-Mukarramah Saudi Arabia 2022.

Method: cross sectional study conducted about Implementation of a Diabetes Type 2 virtual clinic During the Coronavirus Disease Outbreak Our total participants were (200) patients with Type 2 Diabetes attending a virtual clinic During the Coronavirus Disease Outbreak**.**

Results: distribution of the participant with satisfaction and heave a significant relation between the satisfaction and frequency while P-value <0.001 and X^2 95.47, participant toward Satisfaction study results show the majority of participant had High Satisfied were(64.0%) while average satisfied were(27.5%) but weak were (8.5%), while Range were(34-91) while Mean + SD(73.01±11.754)**.**

Conclusion: Automatic consults for Implementation of a Diabetes Type 2 virtual clinic During the COVID-19 Disease Outbreak, COVID-19 patients ensure that patients with serious illness receive specialized diabetes care. Transitioning to virtual care models does not limit the glycemic outcomes of diabetes care and should be employed to reduce patient and provider exposure in the setting of COVID-19.

Keywords: Assessment, Satisfaction, Diabetes Type 2, virtual clinic, Coronavirus disease, outbreak, Makkah.

Introduction

We are in the midst of the coronavirus disease (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which has resulted in thousands of deaths worldwide [1]. Increased age and underlying health conditions, including diabetes, cardiovascular disease, obesity, and hypertension, significantly increase the risk of COVID-19 infection [2]. Similarly, disease severity may be worsened, and deaths are over represented in people with diabetes [3]

A global pandemic has been declared by the World Health Organization after cases of coronavirus disease 2019 (COVID-19) were confirmed throughout the world.[4] To mitigate the spread of the virus, many countries implemented a shelter-in-place order and suspension of

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

operations in nonessential businesses.[5] Routine clinic appointments, including those for patients with diabetes, were cancelled with a short notice, and due to the lack of well-established telemedicine systems in many countries, a large number of patients with diabetes quickly found themselves with little to no medical support during this pandemic virtual clinic during the Coronavirus Disease Outbreak .[6]

Though virtual clinic is a useful tool to maintain communication between people with diabetes and their HCPs during pandemics, millions of people with diabetes live in developing countries where virtual clinic does not exist.[7,8] As the COVID-19 outbreak escalated rapidly, patients and HCPs in many countries were forced to navigate temporary tools to virtual clinic.[9] Despite the lack of telemedicine infrastructure in areas of the world where diabetes is highly prevalent (eg, the Middle East and South Asia), the wide availability of technological resources such as smartphones in these same countries provides an opportunity to quickly adopt a relatively simple virtual clinic that could serve the purpose during pandemics without adding a significant burden on patients and health systems.[10] virtual clinic is the technology utilized to enhance patient outcomes by improving accessibility to healthcare and medical knowledge [11]. Before the pandemic, a Cochrane systematic review on 21 studies that compared telemedicine to typical healthcare in patients with diabetes revealed that telemedicine could be associated with better health outcomes in terms of glycated hemoglobin (HbA1c) reduction, decreased low-density lipoprotein, and improved blood pressure reduction [12]. At King Abdulaziz Medical City, Jeddah, Saudi Arabia, virtual clinic were implemented for the first time to serve as the primary means of delivery of regular outpatient care during the COVID-19 pandemic. Patients with diabetes successfully communicated with their healthcare provider without the need to come to the clinic, which helped reduced risk of contracting the virtual clinic [13].

During the week of March 13, 2020, everything changed for the Diabetes Type 2 . The threat of COVID-19 had increased in Saudi Arabia and some of the outpatient consult services were changing to virtual clinic models to reduce PPE use and decrease potential exposures. The division of endocrinology followed suit. We also limited potential provider exposures by rounding away from the patients' bedside.[14] On March 22, 2020, the service went completely virtual clinic. We aimed at limiting PPE use as well as limiting patient and provider exposures, but we also wanted to offer expertise in diabetes management to all patients infected with COVID-19 and all patients under investigation (PUI) for COVID-19 with automatic consults to the diabetes management service.[15]After multiple weeks of implementation, we reviewed how implementing virtual clinic has affected glycemic control at the Saudi Arabia. We report our experience with inpatient and outpatient diabetes management through virtual clinic during the COVID-19 crisis and compare it

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

with data before the pandemic as well as with data both before and after transition to virtual clinic.[16]

Literature Review

There have been recent reports of using virtual clinic successfully in new-onset patients with type 1and type 2 diabetes and keeping patients away from the hospital admissions even in the presence of DKA.[17,18]

The open-access web-based global survey of Scott et al. also reported that 85% of T1DM patients feel good-to-excellent with their pre-existing health status when used virtual clinic[19].

Literature reports state that the observed data imply a significant decrease in the global physical activity levels during the period of lockdown to contain the spread of COVID-19, which resulted in the deterioration of cardiovascular health especially among the patients with T2D[20,21] the authors are trying to develop several indoor exercise programmes that can be performed at home, to improve the adherence to exercise programmes through virtual clinic[22]. The patients with diabetes involved in this study understood that uncontrolled diabetes is associated with an increased risk of worse outcomes. In addition, the patients were worried about not being able to manage diabetes in case of infection, high mortality rates associated with the infection and uncertainty regarding the future. The aforementioned concerns are concurrent with previous reports of studies involving patients with diabetes.[23,24]

Though most of our patients have not used telemedicine prior to this time, the extremely high use of smart devices and wide availability of access to the internet, including in remote areas in Saudi Arabia, made our transition to virtual clinic a relatively smooth one.[25] Moreover, diabetes care is an area that is well suited to the use of virtual clinic ,[26] especially with the evolving advances in glucose monitoring devices and remote glucose data sharing features. Prior studies have shown similar high patients' satisfaction with virtual clinic,[27]

Multidisciplinary programmes have been proven to provide a framework to achieve positive outcomes in patients with various diseases.[28] The challenging times associated with the pandemic have forced other multidisciplinary programmes to adapt to the situation and incorporate advanced technology and innovative techniques into the process of treatment with feasibility and good acceptance from patients[29]

In Saudi Arabia, a study assessing the use of the Seha application that provides virtual clinic services in the country, revealed that older adults, women, and people living in regions with inadequate internet services were less likely to use the application [30]

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

Several previous studies have evaluated the application of telemedicine and virtual clinic in the treatment and follow-up of patients with diabetes with good metabolic control, compared with the conventional mode of treatment.[31] Furthermore, previous studies have assessed the patients' satisfaction and preference regarding the application of telemedicine for the management of their condition.[32]

However, only limited literature is currently available on the telemedicine effectiveness of telemedicine for diabetes care.[22]

Though most of our patients have not used telemedicine prior to this time, the extremely high use of smart devices and wide availability of access to the internet, including in remote areas in Saudi Arabia, made our transition to telemedicine a relatively smooth one.[30] Moreover, diabetes care is an area that is well suited to the use of virtual clinic [28]

some problems were also reported, including the lack of continuity of care provided through telemedicine, variation in the quality of care and poor communication among team members.26 This study demonstrated the feasibility of a virtual multidisciplinary programme and patients' satisfaction and acceptance of the same.[31]

A limited-scale study including 25 physicians in two hospitals in Taif, Saudi Arabia, showed that 16 of them had fair to good knowledge about telemedicine [33]. Although only 19 physicians reported that their hospitals provided information and training on telemedicine, all participating physicians have used sorts of telemedicine services during the COVID-19 pandemic (14 telephone, 12 video, 11 social media, 4 text messages, and 3 e-mails) [29].

More than a third of physicians praised the advantages of telemedicine in the form of reducing time, saving money, and enhancing the quality of healthcare. Most physicians held a belief that telemedicine services should be continued in the Saudi healthcare settings after the COVID-19 pandemic [17].

The impact of virtual clinic care on improving the outcomes of patients with DM is consistent with other studies reported in the literature.[31] The study participants in this project showed improvements in glycaemic control, blood pressure readings and cholesterol levels after following the participants for 1 year.[33]

Rationale:

The virtual comprehensive care programme for the management of patients with diabetes is a feasible approach that allows healthcare professionals to provide an adequate care during the COVID-19 pandemic, the researcher found that patients with Type 2 Diabetes During the COVID-19 Pandemic is not welcome to the approach telehealth. In accordance with the proposed model to

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

consider Diabetes Centre of Excellence, the programme has the infrastructure and competency of a multidisciplinary and comprehensive care model, which is feasible and virtual mode of the same displays good acceptance. The virtual (like telemedicine and virtual clinic) mode can be employed to improve outcomes, educate patients and prevent acute or chronic complications in patients with T2D. Fears relating to COVID-19 that may lead patients to avoid seeking medical advice should be proactively addressed, particularly.

Aim of the study:

To Assessment of the Satisfaction on Implementation of Diabetes Type 2 virtual clinic During the Coronavirus Disease Outbreak in Makkah Al-Mukarramah Saudi Arabia 2022.

Objectives:

This study Assessment of the Satisfaction on Implementation of a Diabetes Type 2 virtual clinic During the Coronavirus Disease Outbreak in Makkah Al-Mukarramah Saudi Arabia 2022**.**

Methodology:

Study design:

This study is a cross sectional study

Study Area

Patients aged <25 to >65 years and above with uncontrolled type 2 DM during the COVID-19 Pandemic attending in primary health care outpatient in the diabetes center, the patients were recruited from an integrated care clinic at the diabetes center and clinics of the Family and Community Medicine Department at Makkah Al-Mokarrama,Saudi Arabia at diabetes center and clinics of the Family and Community Medicine Department, high-risk patients with type 2 diabetes during the COVID-19 Pandemic are referred to this diabetes center and clinics of the Family and Community Medicine Department from, the patients receive comprehensive diabetes care during the COVID-19 Pandemic

Study Population

The study has been conducted among patients aged <25 to >65 years and above with type 2 DM during the COVID-19 Pandemic attending in primary health care outpatient in the Diabetic Center, family and Community Medicine Department in the Makkah, from June and August 2022

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

Selection criteria:

Inclusion criteria

- In this study, the inclusion criteria included the following: patients aged 25 to >65 years with Type 2 Diabetes during the COVID-19 Pandemic .

Exclusion criteria :

- All patients with Type 1 Diabetes during the COVID-19 Pandemic and after receiving telemedicine care or traditional care were excluded. Based on these inclusion and exclusion criteria, in the traditional care model, we included all the first 50 patients who met the criteria. Socio economic and clinical characteristics, such as age, sex, and comorbidities, were included in the virtual clinic. Hence, to include the children managed through virtual clinic. (200 patients).

Sample size

The sample size has been calculated by applying Raosoft sample size calculator based on (The margin of error: 5%, Confidence level: 95%, and the response distribution was considered to be 20%) accordingly the Sample size is 250 of diabetic patients attending and adding 10 more to decrease margin of error. After adding 5% oversampling, the minimum calculated sample has been (200). Computer generated simple random sampling technique was used to select the study participants.

Sampling technique :

Systematic random sampling technique is adopted. By using systematic sampling random as dividing the total population by the required sample size; (200)

Data collection tool

- Children with Type 2 Diabetes during the COVID-19 Pandemic who were managed using virtual clinic to deliver Virtual Follow-up Care. Patients were followed for at least 4 month to assess the virtual clinic. to deliver care for diabetic patients with Type 2 Diabetes .
- Diabetic patients' age, sex, disease duration, follow-up period, comorbidities, shipping, and the frequency of physical and virtual clinic. Visits were collected.
- Consequently, the costs, namely the costs of medications, laboratory tests, medical supplies, shipping, phone calls, and clinic visits (in-person and virtual visits), were collected. The

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

costs of visits to the clinic and laboratory tests were retrieved from the cost center of the Ministry of Health, Saudi Arabia.

Data collection technique :

Researcher has been visits the selected Diabetic Center after getting the approval from the ministry of health. She has been explained the purpose of the study to all participants attending the clinic. The data has been collect through the June and August 2022.

Data entry and analysis:

The Statistical Package for Social Sciences (SPSS) software version 24.0 has been used for data entry and analysis. Descriptive statistics (e.g., number, percentage) and analytic statistics using test for the association and the difference between two categorical variables were applied. A p-value ≤ 0.05 has been considered statistically significant.

Pilot study:

A pilot study has been conducted to test the methodology of the study, the questionnaire has been clear **.**

Ethical considerations:

- Permission has been obtained, and has been Verbal consents from all participants in the questionnaire were obtained.
- All information was kept confidential, and a result has been submitted to the department as feedback.

Budget:

Self-funded

Results

Table 1 Distribution of the Characteristics of Patients Who Visited of a Diabetes Type 2 virtual clinic During the Coronavirus Disease Outbreak (age, gender, Level of education, Nationality, Marital status, economic level) **in our study(n=200).**

	N	**%**
Age		
<25	26	13
25-35	46	23

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

35-45	44	22
45-55	24	12
>65	60	30
Gender		
Female	96	48
Male	104	52
Level of education		
Primary	32	16
Intermediate	44	22
Secondary	52	26
High education	72	36
Nationality		
Saudi	134	67
Non-Saudi	66	33
Marital status		
Single	38	19
Married	118	59
Divorced	24	12
Widow	20	10
BMI Categories		
Underweight	40	20
Normal weight	24	12
Overweight	60	30
Obese	76	38
Economic level		
Low	48	24
Average	66	33
High	86	43

Table 1 shows that most of the participants (30.0%) were in the age group >65 years follow by the (32.0%) were the age group 25-35 years, the majority of them were male (52.0%) while female(48.0%), regarding Educational level the majority of participant are High education were(36.0%) while Secondary were(26.0%) also regarding Nationality the majority of participant are Saudi were(67.0%) while Non- Saudi were(33.0%). Regarding the Marital status the majority of

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

participant Married were (59.0%) while Single were(19.0%). Regarding the BMI Categories the majority of participant Obese were (38.0%) while Overweight were(30.0%). Regarding the Economic level the majority of participant high were (43.0%) while Average were(33.0%) .

Table 2 . Distribution of Characteristics of patients Diabetes Type 2 virtual clinic During the Coronavirus Disease Outbreak

	N	**%**
Sources of information about telemedicine care		
Booklets and brochures	6	3
Mass media	38	19
Own personal experience	92	46
Educational films	10	5
Medical education in health centers and hospitals	66	33
The Comorbidities diabetes (%)		
Vitamin D deficiency	24	12
Obesity	42	21
Hypertension	32	16
Diabetes mellitus	48	24
Cardiovascular disease	42	21
Congestive heart failure	66	33
Chronic kidney disease	42	21
Stroke	30	15

Table (2) show the Sources of information about diabetes type 2 virtual clinic During the Coronavirus Disease Outbreak the majority of participant from Own personal experience were(46.0%), while Medical education in health centers and hospitals were (33.0%) ,regarding the The Comorbidities diabetes % the majority of participant Congestive heart failure were(33.0%), followed by Diabetes mellitus were (24.0%) while Obesity disease were (21.0%) followed by Cardiovascular disease and Chronic kidney disease were (21.0%).

Table 3 . Distribution the Satisfaction of patients with Diabetes type 2 virtual clinic During the Coronavirus Disease Outbreak .

Questions Diabetes type 2'	**Satisfaction**	**%**	**Chi-square**

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

patients about virtual clinic Satisfaction		Strongly agree	Agree	Neutral	Disagree	Strongly disagree		X^2	P-value
It was easy to run and work in Diabetes type 2 virtual clinic During the Coronavirus disease outbreaks.	**N**	106	50	16	16	12	82.2	159.800	<0.001*
	%	53	25	8	8	6			
I was confident and felt at ease when I visit in the Diabetes virtual clinic.	**N**	132	30	18	14	6	86.8	272.000	<0.001*
	%	66	15	9	7	3			
The images and audios during the virtual clinic encounter were clear.	**N**	64	64	24	24	24	72	48.000	<0.001*
	%	32	32	12	12	12			
I believe the Diabetes virtual clinic was essential in maintaining a good glucose control for our patients during the COVID-19 pandemic.	**N**	118	32	16	18	16	81.8	194.600	<0.001*
	%	59	16	8	9	8			
The time patients spent with in the Diabetes virtual clinic was sufficient.	**N**	112	36	18	16	18	80.8	168.600	<0.001*
	%	56	18	9	8	9			
The Diabetes virtual clinic protocol is simple enough that it does not require technical knowledge or skills, and patients do not need to attend a dedicated orientation session prior to working there.	**N**	136	24	20	8	12	86.4	292.000	<0.001*
	%	68	12	10	4	6			
I am satisfied with my experience with the	**N**	124	36	22	10	8	85.8	233.000	<0.001*
	%	62	18	11	5	4			

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

Diabetes virtual clinic									
The patients will still benefit from the Diabetes virtual clinic visit after the COVID-19 pandemic is over.	**N**	96	32	18	34	20	75	103.000	<0.001*
	%	48	16	9	17	10			
I will use the Diabetes virtual clinic visit in the future if this is made as an available option in our clinics	**N**	98	40	16	22	24	76.6	113.000	<0.001*
	%	49	20	8	11	12			
The virtual clinic decreases my risk of contracting COVID-19infection because it does not require my physical presence.	**N**	116	30	18	24	12	81.4	185.000	<0.001*
	%	58	15	9	12	6			
The virtual clinic improves my ability to routinely follow-up diabetes mellitus with the physician.	**N**	118	22	2	26	32	76.8	202.800	<0.001*
	%	59	11	1	13	16			
The virtual phone clinics improve my accessibility to health care.	**N**	114	38	16	24	8	82.6	183.400	<0.001*
	%	57	19	8	12	4			
The virtual clinic can help me save money.	**N**	140	26	18	12	4	88.6	319.000	<0.001*
	%	70	13	9	6	2			
The virtual clinic can decrease my nonattendance at work or household duties.	**N**	122	34	22	16	6	85	220.400	<0.001*
	%	61	17	11	8	3			
Compared to the traditional clinics, I feel as satisfied with the	**N**	116	40	26	16	2	85.2	199.800	<0.001*
	%	58	20	13	8	1			

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

health service, talking to the physician over the virtual clinic.									
The physician can get a good understanding of my medical problem over the virtual clinic.	**N**	116	18	30	18	18	79.6	183.200	<0.001*
	%	58	9	15	9	9			
The virtual clinic can improve my diabetes control.	**N**	130	24	16	18	12	84.2	255.000	<0.001*
	%	65	12	8	9	6			
Overall, I am satisfied with my experience with the virtual clinic clinics for the routine follow-up of diabetes mellitus	**N**	126	26	18	22	8	84	235.600	<0.001*
	%	63	13	9	11	4			
In the future, I would prefer to continue attending my routine diabetes follow-up appointments in the virtual clinic than in the traditional clinics	**N**	118	36	14	24	8	83.2	201.400	<0.001*
	%	59	18	7	12	4			

Table (3) shows the satisfaction level of patients with Diabetes type 2 virtual clinic During the Coronavirus Disease Outbreak Our study regarding the easy to run and work in Diabetes type 2 virtual clinic During the Coronavirus disease outbreaks the majority of our participant Strongly agree were (53.2%) while Strongly disagree were(6.0%) while % Of agreement(82.2%) were significantly associated were P< 0.001 and X^2 (159.800). Regarding the confident and felt at ease when I visit in the Diabetes virtual clinic the majority of our participant Strongly agree were (66.2%) while Strongly disagree were(3.0%) were a significantly associated were P< 0.001 and X^2 (272.000), while % of satisfaction were(86.8%), regarding The images and audios during the virtual clinic encounter were clear the majority of our participant Strongly agree were (32.0%) while Strongly disagree were(12.0%) were a significantly associated were P< 0.001 and X^2 (48.000), while % of satisfaction were(72.00%) . Regarding the I believe the Diabetes virtual clinic was

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

essential in maintaining a good glucose control for our patients during the COVID-19 pandemic majority of our participant Strongly agree were (59.0%) while Strongly disagree were(8.0%) were a significantly associated were P< 0.001 and X^2 (194.600), while % of satisfaction were(81.8%).
Regarding the time patients spent with in the Diabetes virtual clinic was sufficient majority of our participant Strongly agree were (56.0%) while Strongly disagree were(9.0%) were a significantly associated were P< 0.001 and X^2 (168.600), while % of satisfaction were(80.8%), regarding In the Diabetes virtual clinic protocol is simple enough that it does not require technical knowledge or skills, and patients do not need to attend a dedicated orientation session prior to working there majority of our participant Strongly agree were (68.0%) while Strongly disagree were(6.0%) were a significantly associated were P< 0.001 and X^2 (292.000), while % of satisfaction were(86.4%) . regarding I am satisfied with my experience with the Diabetes virtual clinic majority of our participant Strongly agree were (62.0%) while Strongly disagree were(4.0%) were a significantly associated were P< 0.001 and X^2 (233.000), while % of satisfaction were(85.8%) .

Regarding The patients will still benefit from the Diabetes virtual clinic visit after the COVID-19 pandemic is over majority of our participant Strongly agree were (48.0%) while Strongly disagree were(10.0%) while % Of agreement(56.0%) were significantly associated were P< 0.001 and $\mathbf{X^2}$ (103.000). Regarding the I will use the Diabetes virtual clinic visit in the future if this is made as an available option in our clinics majority of our participant Strongly agree were (49.0%) while Strongly disagree were(12.0%) were a significantly associated were P< 0.001 and X^2 (113.000), while % of satisfaction were(76.6%), regarding The virtual clinic decreases my risk of contracting COVID-19infection because it does not require my physical presence majority of our participant Strongly agree were (58.0%) while Strongly disagree were(6.0%) were a significantly associated were P< 0.001 and X^2 (185.000), while % of satisfaction were(81.0%) . Regarding the virtual clinic improves my ability to routinely follow-up diabetes mellitus with the physician majority of our participant Strongly agree were (59.0%) while Strongly disagree were(16.0%) were a significantly associated were P< 0.001 and X^2 (202.800), while % of satisfaction were(76.8.8%). Regarding The virtual phone clinics improve my accessibility to health care majority of our participant Strongly agree were (57.0%) while Strongly disagree were(4.0%) were a significantly associated were P< 0.001 and X^2 (183.400), while % of satisfaction were(82.6%), regarding The virtual clinic can help me save money. majority of our participant Strongly agree were (70.0%) while Strongly disagree were(2.0%) were a significantly associated were P< 0.001 and X^2 (319.000), while % of satisfaction were(88.6%) . regarding The virtual clinic can decrease my nonattendance at work or household duties. majority of our participant Strongly agree were (61.0%) while Strongly disagree were(3.0%)

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

were a significantly associated were P< 0.001 and X^2 (220.400), while % of satisfaction were(85.0%) .

regarding Compared to the traditional clinics, I feel as satisfied with the health service, talking to the physician over the virtual clinic. majority of our participant Strongly agree were (58.0%) while Strongly disagree were(1.0%) while % Of agreement(85.2%) were significantly associated were P< 0.001 and $\mathbf{X^2}$ (199.800). Regarding the physician can get a good understanding of my medical problem over the virtual clinic majority of our participant Strongly agree were (58.0%) while Strongly disagree were(9.0%) were a significantly associated were P< 0.001 and X^2 (183.200), while % of satisfaction were(79.6%), regarding the virtual clinic can improve my diabetes control majority of our participant Strongly agree were (65.0%) while Strongly disagree were(6.0%) were a significantly associated were P< 0.001 and X^2 (255.000), while % of satisfaction were(84.2%) . Regarding Overall, I am satisfied with my experience with the virtual clinic clinics for the routine follow-up of diabetes mellitus majority of our participant Strongly agree were (63.0%) while Strongly disagree were(4.0%) were a significantly associated were P< 0.001 and X^2 (235.600), while % of satisfaction were(84.0%). Regarding In the future, I would prefer to continue attending my routine diabetes follow-up appointments in the virtual clinic than in the traditional clinics majority of our participant Strongly agree were (59.0%) while Strongly disagree were(4.0%) were a significantly associated were P< 0.001 and X^2 (201.400), while % of satisfaction were(83.2%).

Table 4 . Distribution the frequency of Satisfaction patients with Diabetes type 2 virtual clinic During the Coronavirus Disease Outbreak

Satisfaction				**Score**	
		N	**%**	**Range**	**Mean±SD**
Weak		17	8.5	34-91.	73.01±11.754
Average		55	27.5		
High		128	64.0		
Total		200	100.0		
Chi-square	**X^2**	95.47			
	P-value	<0.001*			

Table 4 Regarding distribution of the participant with satisfaction and heave a significant relation between the satisfaction and frequency while P-value <0.001 and X^2 95.47, participant toward Satisfaction study results show the majority of participant had High Satisfied were(64.0%)

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

while average satisfied were(27.5%) but weak were (8.5%), while Range were(34-91) while Mean + SD(73.01±11.754)

Figure 1 Distribution the frequency of Satisfaction patients with Diabetes type 2 virtual clinic During the Coronavirus Disease Outbreak.

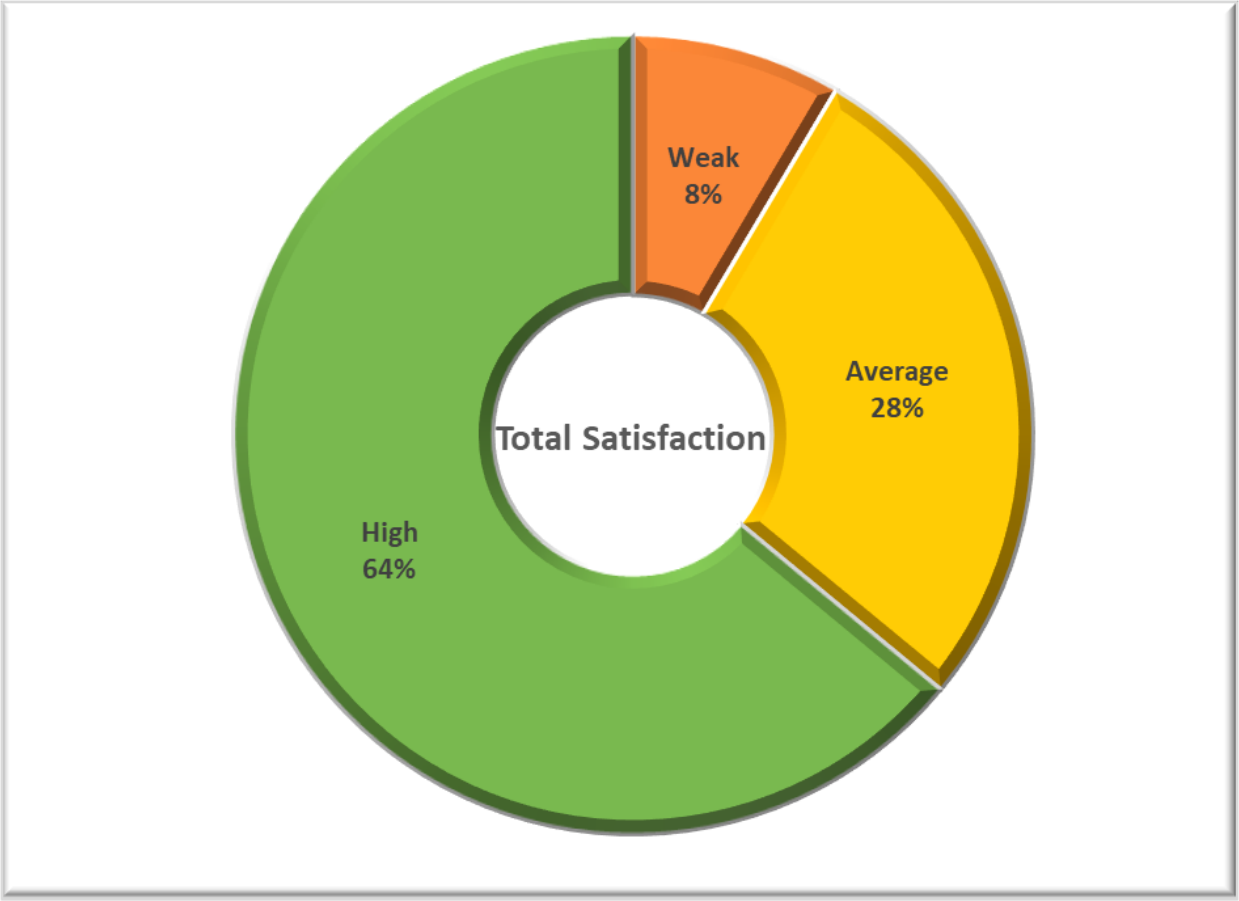


Table 5 Distribution of the relationship of the total Satisfaction level the participants with Diabetes type 2 virtual clinic During the Coronavirus Disease Outbreak and Socio-demographic characteristics

Demographic data		N	Satisfaction	F or T	ANOVA or T-test	
			Mean ± SD		Test value	P-value
Age	<25	26	68.615 ± 7.585	F	20.132	<0.001*
	25-35.	46	70.413 ± 7.259			
	35-45.	44	74.500 ± 6.399			
	45-55.	24	77.833 ± 8.292			
	>65	60	79.550 ± 4.545			
Gender	Female	96	79.104 ± 6.532	T	9.234	<0.001*
	Male	104	70.654 ± 6.393			

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

Level of education	**Primary**	32	65.625 ± 4.969	**F**	84.185	<0.001*
	Intermediate	44	68.773 ± 3.845			
	Secondary	52	78.827 ± 5.670			
	High education	72	79.403 ± 5.474			
Nationality	**Saudi**	134	71.530 ± 6.862	**T**	-11.592	<0.001*
	Non-Saudi	66	81.167 ± 4.735			
Marital status	**Single**	38	71.921 ± 10.643	**F**	26.728	<0.001*
	Married	118	77.881 ± 4.767			
	Divorced	24	66.167 ± 5.731			
	Widow	20	71.550 ± 6.444			
Economic level	**Low**	48	80.104 ± 5.714	**F**	64.410	<0.001*
	Average	66	77.939 ± 6.723			
	High	86	69.221 ± 5.614			

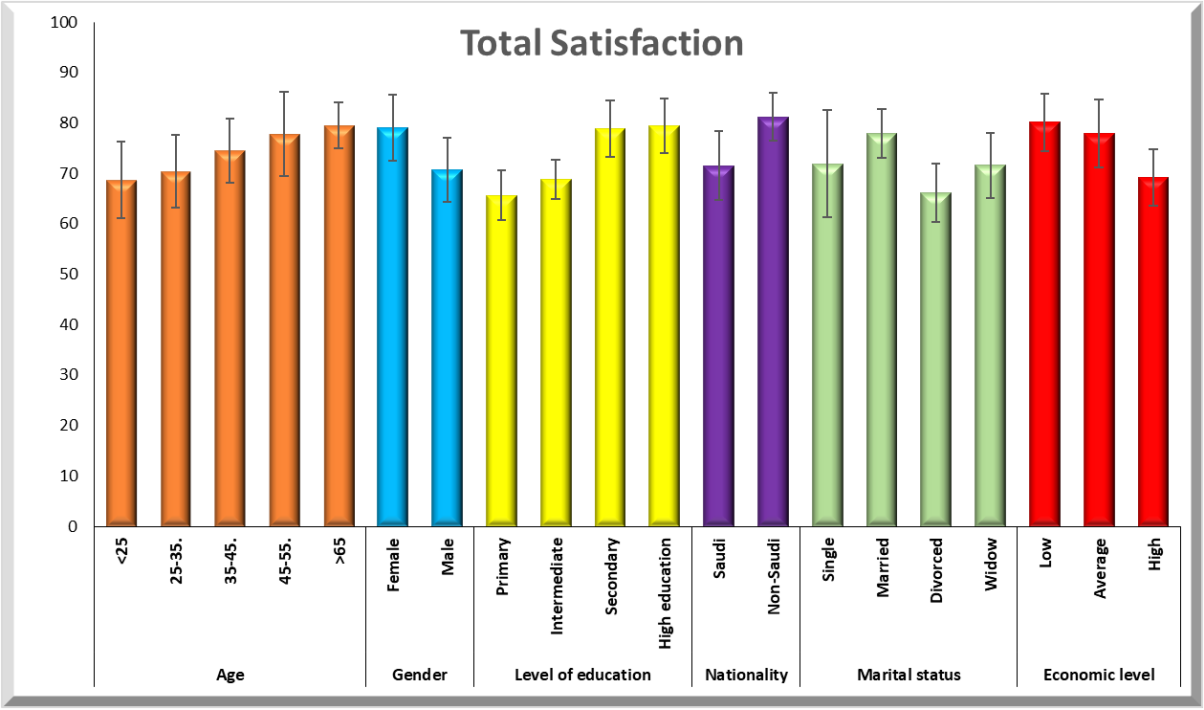
Table (5) show that is a significant relation between satisfaction and demographic data regarding age increase in >65 years were (Mean± SD 79.550 ±4.545), follow by45-55 age in satisfaction were (Mean± SD, 77.833 ± 8.292) P-value=0.001, F= 20.132. Regarding the gender is a significant relation between satisfaction and gender increase in Female were (Mean± SD 79.104 ± 6.532), follow male were (Mean± SD, 70.654±6.393) also P-value=0.001, T= 9.234.

Regarding the Educational level a significant relation between satisfaction and Educational level increase in High education were (Mean± SD 79.403 ±5.474), follow by Secondary were (Mean± SD, 78.827± 5.670) also P-value=0.001, F= 84.185 . Regarding the nationality is a significant relation between satisfaction and Nationality increase in Non-Saudi were (Mean± SD 81.167±4.735), follow Saudi were (Mean± SD, 71.530±6.862) also P-value=0.001, T= -11592.

Regarding the Marital status is a significant relation between satisfaction and Marital status increase in Married were (Mean± SD 77.881±4.767), follow Single were (Mean± SD, 71.921±10.643) also P-value=0.001, F=26.728. Regarding the Economic level is a significant relation between satisfaction and economic level increase in low were (Mean± SD 80.104±5.714), follow Single were (Mean± SD, 77.939±6.723) also P-value=0.001, F=64.410

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

Figure 2 Distribution of the relationship of the total Satisfaction level the participants with Diabetes type 2 virtual clinic During the Coronavirus Disease Outbreak and Socio-demographic characteristics



Discussion

Our clinic was one of many clinics around the world that had no telemedicine infrastructure or prior experience with this model of care and found themselves navigating the process of transitioning to become fully virtual as the COVID-19 situation evolved. Though most of our patients have not used virtual clinic prior to this time, the extremely high use of smart devices and wide availability of access to the internet, including in remote areas in Saudi Arabia , made our transition to telemedicine a relatively smooth one.[27] in our study shows that most of the participants (30.0%) were in the age group >65 years follow by the (32.0%) were the age group 25-35 years, the majority of them were male (52.0%) while female(48.0%), regarding Educational level the majority of participant are High education were(36.0%) while Secondary were(26.0%(also regarding Nationality the majority of participant are Saudi were(67.0%) while Non- Saudi were(33.0%(. Regarding the Marital status the majority of participant Married were (59.0%) while Single were(19.0%). Regarding the BMI Categories the majority of participant Obese were (38.0%) while Overweight were(30.0%). Regarding the Economic level the majority of participant high were (43.0%) while Average were(33.0%) .(See table 1,2)

Moreover, diabetes care is an area that is well suited to the use of virtual clinic[26] especially with the evolving advances in glucose monitoring devices and remote glucose data sharing features, they

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

can use Bluetooth glucose meters that allow for data upload to the cloud, or they can simply send photos of their daily glucose log to the HCPs via email or phone texts.

The high number of online "Patient Requests" submitted during the first month of the pandemic shows that people with diabetes are in fact ready to utilize virtual clinic when this is made available. Third of the requests were asking for an HCP to review their glucose readings and make treatment adjustments, which also shows that people with diabetes crave for an uninterrupted communication with their HCPs and highlights their interest in utilizing virtual clinic to improve their glucose control. Our current study results in Satisfaction with the diabetes virtual clinic during the of COVID-19 are similar and further demonstrate the usefulness of the exclusive use of the virtual clinic to deliver follow-up care for participant with T2D. Regarding distribution of the participant with satisfaction and heave a significant relation between the satisfaction and frequency while P-value <0.001 and X2 95.47, participant toward Satisfaction study results show the majority of participant had High Satisfied were(64.0%) while average satisfied were(27.5%) but weak were (8.5%), while Range were(34-91) while Mean + SD(73.01±11.754)(See Table 3,4)

Moreover, the remarkably high patients' attendance at the Diabetes virtual clinic and the virtual educational sessions along with the high satisfaction reported with the overall quality of the virtual visits and desire to continue this care model in the future highlight the efficiency of our virtual clinic despite its simplicity, in our study heave a significant relation between satisfaction and Diabetes type 2 virtual clinic During the Coronavirus Disease Outbreak and Socio-demographic characteristics also prior studies have shown similar high patients' satisfaction with virtual clinic [34] (See Figure 2)

Conclusions

Virtual consultations may become a necessity following this pandemic. The current system pressures due to COVID-19 have led to numerous challenges to the delivery of routine diabetes care. Despite the relative lack of data to support virtual care, in the face of adversity, these virtual measures have been imperative to maintain a line of communication with people with diabetes and to support self-management, technology is the key to evolution in diabetes care, and virtual consultations can be effectively embedded into routine diabetes care at the national level in the Saudi Arabia . At present, virtual clinics may be an ideal platform to reduce social isolation, encourage self-management remotely and in a less intrusive manner, and reduce burden of treatment. The COVID-19 outbreak has be shift the culture of health care across the world and the way we interact within clinical settings will gradually change to ensure that care can be delivered within social distancing rules

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

References:

1. Bostanciklioğlu, M. (2020). Severe acute respiratory syndrome coronavirus 2 is penetrating to dementia research. *Current neurovascular research*, *17*(4), 342-343.
2. Perkins, T. A., Cavany, S. M., Moore, S. M., Oidtman, R. J., Lerch, A., & Poterek, M. (2020). Estimating unobserved SARS-CoV-2 infections in the United States. *Proceedings of the National Academy of Sciences*, *117*(36), 22597-22602.
3. Ansori, A. N. M., Kharisma, V. D., Fadholly, A., Tacharina, M. R., Antonius, Y., & Parikesit, A. A. (2021). Severe acute respiratory syndrome coronavirus-2 emergence and its treatment with alternative medicines: A review. *Research Journal of Pharmacy and Technology*, *14*(10), 5551-5557.
4. Vitiello, A., Pelliccia, C., & Ferrara, F. (2021). Drugs acting on the renin–angiotensin system and SARS-CoV-2. *Drug Discovery Today*, *26*(4), 870-874.
5. Hashemi, S. A., Safamanesh, S., Ghasemzadeh-moghaddam, H., Ghafouri, M., & Azimian, A. (2021). High prevalence of SARS-CoV-2 and influenza A virus (H1N1) coinfection in dead patients in Northeastern Iran. *Journal of medical virology*, *93*(2), 1008-1012.
6. Outlaw, V. K., Bovier, F. T., Mears, M. C., Cajimat, M. N., Zhu, Y., Lin, M. J., ... & Porotto, M. (2020). Inhibition of coronavirus entry in vitro and ex vivo by a lipid-conjugated peptide derived from the SARS-CoV-2 spike glycoprotein HRC domain. *MBio*, *11*(5), e01935-20.
7. Katz, D., Bateman, B. T., Kjaer, K., Turner, D. P., Spence, N. Z., Habib, A. S., ... & Leffert, L. (2021). The society for obstetric anesthesia and perinatology coronavirus disease 2019 registry: an analysis of outcomes among pregnant women delivering during the initial severe acute respiratory syndrome coronavirus-2 outbreak in the United States. *Anesthesia & Analgesia*, *133*(2), 462-473.
8. Cui, P., Chen, Z., Wang, T., Dai, J., Zhang, J., Ding, T., ... & Wang, S. (2020). Severe acute respiratory syndrome coronavirus 2 detection in the female lower genital tract. *American Journal of Obstetrics & Gynecology*, *223*(1), 131-134.
9. Igbinosa, I., Miller, S., Bianco, K., Nelson, J., Kappagoda, S., Blackburn, B. G., ... & Aziz, N. (2020). Use of remdesivir for pregnant patients with severe novel coronavirus disease 2019. *American Journal of Obstetrics & Gynecology*, *223*(5), 768-770.
10. AlHabib, K. F., Elasfar, A. A., AlBackr, H., AlFaleh, H., Hersi, A., AlShaer, F., ... & Mimish, L. (2011). Design and preliminary results of the heart function assessment registry trial in Saudi Arabia (HEARTS) in patients with acute and chronic heart failure. *European journal of heart failure*, *13*(11), 1178-1184.

11. Jnr, B. A. (2020). Use of telemedicine and virtual care for remote treatment in response to COVID-19 pandemic. *Journal of medical systems*, *44*(7), 1-9.
12. Armstrong, C. M., Wilck, N. R., Murphy, J., Herout, J., Cone, W. J., Johnson, A. K., ... & Frizzell, N. (2022). Results and Lessons Learned when Implementing Virtual Health Resource Centers to Increase Virtual Care Adoption During the COVID-19 Pandemic. *Journal of Technology in Behavioral Science*, *7*(1), 81-99.
13. Magliah, S. F., Alsabban, A. S., Turkistani, H. A., Abulaban, B. A., Alsharif, A. H., Alsharif, S. S., & Zarif, H. A. (2021). Perception of virtual clinics among Saudi adults with type 1 diabetes during the COVID-19 pandemic. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *15*(4), 102175.
14. M Tourkmani, A., J ALHarbi, T., Rsheed, A. M. B., Alrasheedy, A. A., ALMadani, W., ALJuraisi, F., ... & Alshaikh, A. A. I. (2021). The impact of telemedicine on patients with uncontrolled type 2 diabetes mellitus during the COVID-19 pandemic in Saudi Arabia: findings and implications. *Journal of Telemedicine and Telecare*, 1357633X20985763.14]
15. Alharthi, S. K., Alyusuf, E. Y., Alguwaihes, A. M., Alfadda, A., & Al-Sofiani, M. E. (2021). The impact of a prolonged lockdown and use of telemedicine on glycemic control in people with type 1 diabetes during the COVID-19 outbreak in Saudi Arabia. *Diabetes Research and Clinical Practice*, *173*, 108682.
16. Faleh AlMutairi, M., Tourkmani, A. M., Alrasheedy, A. A., ALHarbi, T. J., Bin Rsheed, A. M., ALjehani, M., & AlRuthia, Y. (2021). Cost-effectiveness of telemedicine care for patients with uncontrolled type 2 diabetes mellitus during the COVID-19 pandemic in Saudi Arabia. *Therapeutic Advances in Chronic Disease*, *12*, 20406223211042542.
17. Nathan, D. M., Buse, J. B., Davidson, M. B., Heine, R. J., Holman, R. R., Sherwin, R., & Zinman, B. (2006). Management of hyperglycemia in type 2 diabetes: a consensus algorithm for the initiation and adjustment of therapy: a consensus statement from the American Diabetes Association and the European Association for the Study of Diabetes. *Diabetes care*, *29*(8), 1963-1972.
18. Tatovic, D., & Dayan, C. M. (2021). Replacing insulin with immunotherapy: Time for a paradigm change in Type 1 diabetes. *Diabetic Medicine*, *38*(12), e14696.
19. Scott, S. N., Fontana, F. Y., Helleputte, S., Pickles, J., Laimer, M., Zueger, T., & Stettler, C. (2022). Use and Perception of Telemedicine in People with Type 1 Diabetes During the COVID-19 Pandemic: A 1-Year Follow-Up. *Diabetes Technology & Therapeutics*, *24*(4), 276-280.

20. Alotaibi, A. S., & Boukelia, B. (2021). The effect of pre-quarantine physical activity on anxiety and depressive symptoms during the COVID-19 lockdown in the Kingdom of Saudi Arabia. *International journal of environmental research and public health*, *18*(15), 7771.
21. Yomoda, K., & Kurita, S. (2021). Influence of social distancing during the COVID-19 pandemic on physical activity in children: A scoping review of the literature. *Journal of Exercise Science & Fitness*, *19*(3), 195-203.
22. Aldarhami, A., Bazaid, A. S., Althomali, O. W., & Binsaleh, N. K. (2020). Public perceptions and commitment to social distancing "staying-at-home" during COVID-19 pandemic: a national survey in Saudi Arabia. *International Journal of General Medicine*, *13*, 677.
23. Al Argan, R., Alkhafaji, D., Al Elq, A., Albaker, W., Alqatari, S., Alzaki, A., ... & Alabdrabalnabi, F. I. (2021). The Impact of Diabetes Mellitus and Hyperglycemia on the Severity and Outcome of Patients with COVID-19 Disease: A Single-Center Experience. *International Journal of General Medicine*, *14*, 9445.
24. Hernández-Jiménez, S., García-Ulloa, A. C., Alcántara-Garcés, M. T., Urbina-Arronte, L. E., Lara-Sánchez, C., Velázquez-Jurado, H. R., & Group of Study CAIPaDi. (2021). Feasibility and acceptance of a virtual multidisciplinary care programme for patients with type 2 diabetes during the COVID-19 pandemic. *Therapeutic Advances in Endocrinology and Metabolism*, *12*, 20420188211059882.
25. Al-Sofiani, M. E., Alyusuf, E. Y., Alharthi, S., Alguwaihes, A. M., Al-Khalifah, R., & Alfadda, A. (2021). Rapid implementation of a diabetes telemedicine clinic during the coronavirus disease 2019 outbreak: our protocol, experience, and satisfaction reports in Saudi Arabia. *Journal of diabetes science and technology*, *15*(2), 329-338.
26. Sha, W., Wen, S., Chen, L., Xu, B., Lei, T., & Zhou, L. (2020). The role of SGLT2 inhibitor on the treatment of diabetic retinopathy. *Journal of Diabetes Research*, *2020*.
27. Polinski, J. M., Barker, T., Gagliano, N., Sussman, A., Brennan, T. A., & Shrank, W. H. (2016). Patients' satisfaction with and preference for telehealth visits. *Journal of general internal medicine*, *31*(3), 269-275.
28. Wardle, C., & Derakhshan, H. (2017). Information disorder: Toward an interdisciplinary framework for research and policymaking.
29. Lee, V. J., Chiew, C. J., & Khong, W. X. (2020). Interrupting transmission of COVID-19: lessons from containment efforts in Singapore. *Journal of travel medicine*, *27*(3), taaa039

Annals of R.S.C.B., ISSN:1583-6258, Vol. 26, Issue 1, 2022, Pages. 3337 - 3359
Received 08 November 2021; Accepted 15 December 2021.

30. Alharbi, A., Alzuwaed, J., & Qasem, H. (2021). Evaluation of e-health (Seha) application: a cross-sectional study in Saudi Arabia. *BMC medical informatics and decision making*, *21*(1), 1-9.
31. Hazenberg, C. E., aan de Stegge, W. B., Van Baal, S. G., Moll, F. L., & Bus, S. A. (2020). Telehealth and telemedicine applications for the diabetic foot: A systematic review. *Diabetes/metabolism research and reviews*, *36*(3), e3247.
32. Qureshi, A. Z., Ullah, S., Aldajani, A. A., Basson, P., AlHabter, A. M., Ali, T., ... & Al Jadid, M. S. (2021). Telerehabilitation guidelines in Saudi Arabia. *Telemedicine and e-Health*, *27*(10), 1087-1098.
33. Mubaraki, A. A., Alrabie, A. D., Sibyani, A. K., Aljuaid, R. S., Bajaber, A. S., & Mubaraki, M. A. (2021). Advantages and disadvantages of telemedicine during the COVID-19 pandemic era among physicians in Taif, Saudi Arabia. *Saudi medical journal*, *42*(1), 110.
34. Association, A. D. (2020). 1. Improving care and promoting health in populations: Standards of Medical Care in Diabetes—2020. *Diabetes care*, *43*(Supplement_1), S7-S13.