

## Satisfaction on Telemedicine during the COVID-19 among diabetes type 2 what can Saudi Arabia in Makkah Al-Mukarramah do in 2022

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### Abstract:

### Background:

The importance of telemedicine in diabetes care became more evident during the coronavirus disease 2019 (COVID-19) pandemic as many people with diabetes, especially those in areas without well-established telemedicine, lost access to their health care providers (HCPs) during this pandemic. The importance of telemedicine in diabetes care became more evident during the coronavirus disease 2019 (COVID-19) pandemic as many people with diabetes, especially those in areas without well-established telemedicine, lost access to their health care providers (HCPs) during this pandemic. While telemedicine has several advantages, such as accessibility and cost-effectiveness, its diagnostic reliability should be further investigated. The Saudi Vision (2030) has

drawn up a roadmap to invest in digital healthcare during the coming decade; however, some barriers related to using telemedicine in Saudi healthcare settings, including cultural issues and technical difficulties, should be openly discussed. In addition, before putting telemedicine in practice on a wide scale in Saudi Arabia, more efforts should be carried out to issue updated legislation and regulations, discuss and respond to ethical concerns, and ensure data security.

**Aim of the study:** To assessment the Satisfaction on Telemedicine during the COVID-19 among diabetes Type 2 What Can Saudi Arabia in Makkah Do in 2022.

**Method:** cross sectional study conducted about Telemedicine during the of COVID-19 among diabetes Type 2, we searched PubMed for articles that discussed the potential uses of telemedicine during the COVID-19 pandemic among diabetes Type 2 using the search terms “Telemedicine” and “COVID-19”.Our total participants were (250) patients with Type 2 Diabetes attending a virtual integrated care clinic center

**Results:** distribution of the participant with satisfaction and heave a significant relation between the satisfaction and frequency while P-value<0.001 and  $X^2$ 89.192, participant toward Satisfaction study results show the majority of participant had AverageSatisfied were(48.4%) while high satisfied were(46.4.67

**Conclusion:** our Diabetes Telemedicine Clinic protocol and the high satisfaction reported by patients and HCPs make it a suitable model to be adopted by clinics, especially during pandemics or disasters in resource-limited settings.This clinic model can be quickly implemented and does not require technological tools other than those available.

**Keywords:**Telemedicine, Satisfaction, COVID-19,Type2 Diabetes, Saudi Arabia in MakkaAl-Mukarramah

## Introduction

Telemedicine is a rapidly evolving medical service nowadays. It is defined as the use of devices along with technological resources to gain access to a patient and their health information to assess, evaluate, and diagnose them, as well as to decide if a visit to a healthcare center is required [1]. Therefore, Telemedicine in Saudi Arabia it is considered a diagnostic method as well as a screening method. [2] Since then, Telemedicine, smartphone App and television, have aided in the transmission of information [3]. Today, the advancement of electronic and mobile technologies and the implementation of medical devices making telemedicine very accessible and helpful in many fields of medicine[4].

The percentage of patients receiving recommended annual screenings for early detection of

diabetes-related changes in the eyes, kidneys, and feet also remains suboptimal.[5] From the patient's perspective, T2D is a complex and demanding chronic illness. Patients must initiate or modify many daily lifestyle behaviors to benefit from the treatment plan, including physical activity, eating, medication taking, monitoring of BG and BP, problem solving (especially for BG for high and low levels and during sick days), reduce risks of diabetes complications, and develop coping skills. Diabetes self-management education, delivered in individual or group outpatient sessions, is the cornerstone of clinical support for behavior change.[6]

According to the World Health Organization (WHO), telemedicine uses information and communication technologies to promote health, provide medical care, exchange medical information and educate healthcare providers and patients over long distances.[7] Likewise, these technologies are used by healthcare professionals to diagnose, treat and prevent diseases where distance is a crucial factor.[8] Telemedicine systems use smartphones, computers, tablets, internet platforms, webcams, microphones, teleworking devices, video calls, video conference systems, video communication, e-mail and other digital and virtual connections that facilitate communication between patients and healthcare providers at long distances.[9]

Maintaining an uninterrupted access to health care providers(HCPs) is essential when managing people with diabetes and becomes more important during times of pandemics and disasters.[10] Being confined to home with limited physical activity and hindered access to HCPs and diabetes medications and supply are expected to result in unfavorable metabolic outcomes in people with diabetes.[11] In addition, several reports have linked diabetes to a higher risk of mortality from COVID-19, which added more psychological burden on people with diabetes who are left with no access to their HCPs during a time when this was needed the most.[12]. Due to the COVID-19 pandemic and mandatory social distancing to minimize exposure to and spread of the infection, telemedicine has been used in remote monitoring of COVID-19, diabetes, cardiovascular diseases, dermatology, urology, neurology, obstetric care, oncology and other illnesses in numerous countries around the world, including as the USA, China, Italy, Australia, Saudi Arabia and Japan.[13,14]

Complicating matters, the COVID-19 pandemic broke a few weeks prior to the month of Ramadan, when millions of Muslims, including those with diabetes, attempt to fast every year. Many diabetes clinics in Muslim-majority countries, including Saudi Arabia (SA), arrange a "Pre-Ramadan" clinic visit for their patients during this time to provide diabetes education and medication adjustments prior to fasting.[10,15]This could not have been done this year, which further complicated matters for both patients and HCPs. Though telemedicine 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 telemedicine does not exist.[16] As the COVID-19 outbreak

escalated rapidly, patients and HCPs in many countries were forced to navigate temporary tools to telecommunicate.[17] 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 telemedicine clinic that could serve the purpose during pandemics without adding a significant burden on patients and health systems. Here, we describe our protocol of Diabetes.[18]

## Literature Review

Nasser, et al.(2021) report that thanks to telemedicine, several patients with chronic diseases were able to avoid exposure to the COVID-19 infection in healthcare settings and receive their diagnosis, treatment, and monitoring at home. Although telemedicine can offer a wider coverage of healthcare, individuals who are not familiar with technologies, those who do not have broadband fast internet, illiterate people, older adults, and people with specific disabilities such as hearing loss and blindness may find difficulties in using telemedicine services [19,20]

The COVID-19 pandemic, two studies from Japan[13] and Saudi Arabia (14) reported similar positive clinical outcomes in terms of glycemic control. In addition, it has been shown that increasing patient contact through frequent Telemedicine calls improves patient therapy adherence, motivation, and metabolic control.[21] However, only limited literature is currently available on the cost-effectiveness of telemedicine for diabetes care.[22]

In Saudi Arabia, a study assessing the use of the Seha application that provides telemedicine 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 [23]

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.[24] Moreover, diabetes care is an area that is well suited to the use of telemedicine[25]

It should be noted that there were a few national studies that assessed knowledge and perceptions about telemedicine before the time of the COVID-19 pandemic, and those studies showed, compared with the post-COVID-19 studies, inadequate knowledge and negative attitudes towards telemedicine in Saudi Arabia [26,27]

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 [28]. 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 [30].

Rohilla, et al.(2021) findings that revealed that proper and more frequent telecommunication between patients and healthcare providers results in better adherence to medications and interventions and overall better diabetes care.[31]

However, only limited literature is currently available on the cost-effectiveness of smartphone App to deliver virtual follow-up care for children with Type 1 for diabetes care.[28]

However, there are several constraints in using virtual care in the context of developing countries [24]. The acceptance of virtual care advice may be low as patients are conventionally used to physical visits. Internet services and connectivity is poor in remote areas. Additionally, several individuals need help in operating telemedicine devices due to their low literacy [32].

In another study found that a comparable developing country set up are similar and further demonstrate the usefulness of the exclusive use of the telemedicine WhatsApp to deliver virtual follow-up care for children with T1D. A notable feature of our study was a high level of satisfaction with the use of WhatsApp for follow-up care expressed by almost two-thirds of families. This is consistent with the high satisfaction rates observed in previous similar studies concerning diabetes care during the COVID-19 pandemic [29].

The impact of telemedicine care on improving the outcomes of patients with DM is consistent with other studies reported in the literature.[30] The study participants in this project showed improvements in glycaemic control, blood pressure readings and cholesterol levels after following the participants for 1 year.[28]

### **Rationale:**

In several healthcare settings worldwide, telemedicine was used to efficiently provide medical services during the COVID-19 pandemic. For example, the University of California, San Diego Health, developed electronic health record-based tools to provide medicalcare. This electronic system included video meetings with patients, triage of patients via phone calls, giving home isolation instructions for COVID-19 patients, tracking COVID-19-related infections, screening and treating urgent cases, and providing decision support for patients and junior physicians, due to the

increased risk of serious disease with COVID-19 in people with children with Type 2 Diabetes during the COVID-19 Pandemic, it is important that patients are well informed on the importance of optimal metabolic and glycemic control. Fears relating to COVID-19 that may lead patients to avoid seeking medical advice should be proactively addressed, particularly, the researcher found that patients with Type 2 Diabetes During the COVID-19 Pandemic is not welcome to the approach telehealth .

### **Aim of the study:**

To assessment the Satisfaction on Telemedicine during the COVID-19 among diabetes Type 2 What Can Saudi Arabia in Makkah Al-Mukarramah Do in 2022.

### **Objectives:**

This study assessment the Satisfaction on Telemedicine during the COVID-19 among diabetes Type 2 What Can Saudi Arabia in Makkah Al-Mukarramah Do in 2022.

### **Methodology:**

#### **Study design:**

This study is a cross sectional study

### **Study Area**

Patients aged 35 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 35 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 July and September 2022

### **Selection criteria:**

#### **Inclusion criteria**

- In this study, the inclusion criteria included the following: patients aged 35 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 100 patients who met the criteria. Socio economic and clinical characteristics, such as age, sex, and comorbidities, were included in the Telemedicine. Hence, to include the children managed through Telemedicine. ( 250 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 (250). 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; (250)

### **Data collection tool**

- Children with Type 2 Diabetes during the COVID-19 Pandemic who were managed using Telemedicine to Deliver Virtual Follow-up Care. Patients were followed for at least 4 month to assess the telemedicine 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 Telemedicine. 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 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 collected through the May and October 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  $\leq 0.05$  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 Socio-demographic characteristics of the participants in telemedicine during the of COVID-19 among diabetes Type 2.(n-250)**

|                    | N   | %    |
|--------------------|-----|------|
| <b>Age (year)</b>  |     |      |
| 35-44              | 75  | 30   |
| 45-54              | 55  | 22   |
| 55-64              | 88  | 35.2 |
| >65                | 32  | 12.8 |
| <b>Gender</b>      |     |      |
| Male               | 70  | 28   |
| Female             | 180 | 72   |
| <b>Nationality</b> |     |      |
| Saudi              | 213 | 85.2 |
| Non-Saudi          | 37  | 14.8 |



| <b>Educational level</b> |    |      |
|--------------------------|----|------|
| Primary school/below     | 80 | 32   |
| Intermediate school      | 38 | 15.2 |
| High school              | 27 | 10.8 |
| University               | 95 | 38   |
| Postgraduate             | 10 | 4    |
| <b>Job</b>               |    |      |
| Governmental employee    | 38 | 15.2 |
| Private sector employee  | 80 | 32   |
| Professional worker      | 27 | 10.8 |
| House wife               | 25 | 10   |
| Not working              | 80 | 32   |

Table 1 shows that most of the participants (35.2%) were in the age group 55-64 years follow by the (30.0%) were the age group 35-44 years, the majority of them were female (72.0%) while male(28.0%), also regarding Nationality the majority of participant are Saudi were(85.2%) while Non- Saudi were(14.8%). regarding Educational levelthe majority of participant are University were(38.0%) while Primary school/below were(32.0%). Regarding the Job the majority of participant Private sector employee were (32.0%) while Not working were(32.0%) .

**Table 2 Health Care Providers' Satisfaction with the Diabetes Telemedicine Clinicduring the of COVID-19**

| Questions about Health Providers' Satisfaction  | Care | Satisfaction   |       |         |          |                   | % Of agreement | Chi-square     |         |
|---|------|----------------|-------|---------|----------|-------------------|----------------|----------------|---------|
|   |      | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |                | X <sup>2</sup> | P-value |
| It was easy to run and work in the Diabetes Telemedicine Clinic during the of COVID-19. | N    | 108            | 55    | 38      | 25       | 24                | 75.84          | 96.680         | <0.001* |
|   | %    | 43.2           | 22    | 15.2    | 10       | 9.6               |                |                |         |
| I was confident   | N    | 138            | 30    | 55      | 20       | 7                 | 81.76          | 218.360        | <0.001* |

|  |   |      |      |      |     |     |       |         |         |
|--|---|------|------|------|-----|-----|-------|---------|---------|
| and felt at ease when I worked in the Diabetes Telemedicine Clinic during the of COVID-19  | % | 55.2 | 12   | 22   | 8   | 2.8 |       |         |         |
| The images and audios during the Telemedicine encounter were clear.  | N | 155  | 33   | 47   | 10  | 5   | 85.84 | 298.960 | <0.001* |
|  | % | 62   | 13.2 | 18.8 | 4   | 2   |       |         |         |
| I believe the Diabetes Telemedicine Clinic was essential in maintaining a good glucose control for our patients during the COVID-19 pandemic                                 | N | 165  | 30   | 25   | 18  | 12  | 85.44 | 334.360 | <0.001* |
|  | % | 66   | 12   | 10   | 7.2 | 4.8 |       |         |         |
| In the Diabetes Telemedicine Clinic, the number of patients that I can see virtually in one clinic is more than the number that I can see in the standard “in-person” clinic | N | 175  | 30   | 28   | 15  | 2   | 88.88 | 400.760 | <0.001* |
|  | % | 70   | 12   | 11.2 | 6   | 0.8 |       |         |         |

|  |          |      |    |      |   |    |       |         |         |
|--|----------|------|----|------|---|----|-------|---------|---------|
| <b>In the Diabetes Telemedicine Clinic, there is less No-Shows rates Some of our patients will still benefit from offering the Diabetes Telemedicine Clinic after the COVID-19 pandemic is over.</b> | <b>N</b> | 153  | 50 | 32   | 5 | 10 |       |         |         |
|  | <b>%</b> | 61.2 | 20 | 12.8 | 2 | 4  | 86.48 | 291.160 | <0.001* |

Table (2) shows the satisfaction level it was easy to run and work in the Diabetes Telemedicine Clinic during the COVID-19. Our study the majority of our participant Strongly agree were (43.2%) while Strongly disagree were(9.6%) while % Of agreement(75.84%) were significantly associated were  $P < 0.001$  and  $X^2$  (96.680). Regarding the I was confident and felt at ease when I worked in the Diabetes Telemedicine Clinic during the of COVID-19 majority of our participant Strongly agree were (55.2%) while Strongly disagree were(2.8%)were a significantly associated were  $P < 0.001$  and  $X^2$  (218.360), while % of satisfaction were(81.76%), regarding The images and audios during the Telemedicine encounter were clear majority of our participant Strongly agree were (62.0%) while Strongly disagree were(2.0%)were a significantly associated were  $P < 0.001$  and  $X^2$  (298.960), while % of satisfaction were(85.84%) . Regarding the I believe the Diabetes Telemedicine Clinic was essential in maintaining a good glucose control for our patients during the COVID-19 pandemic majority of our participant Strongly agree were (66.0%) while Strongly disagree were(4.8%)were a significantly associated were  $P < 0.001$  and  $X^2$  (334.360), while % of satisfaction were(85.44%). Regarding the In the Diabetes Telemedicine Clinic, the number of patients that I can see virtually in one clinic is more than the number that I can see in the standard “in-person” clinic majority of our participant Strongly agree were (70.0%) while Strongly disagree were(0.8%)were a significantly associated were  $P < 0.001$  and  $X^2$  (400.760), while % of satisfaction were(88.88%), regarding In the Diabetes Telemedicine Clinic, there is less No-Shows rates Some of our patients will still benefit from offering the Diabetes Telemedicine Clinic after the COVID-19

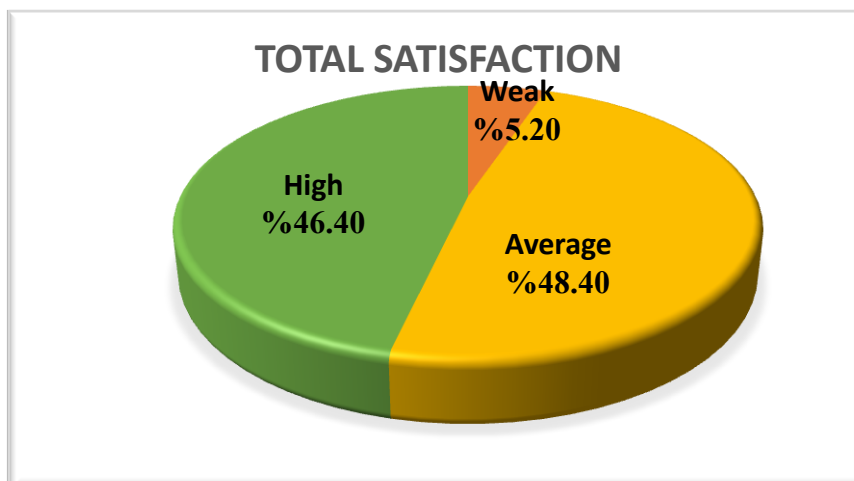
pandemic is over majority of our participant Strongly agree were (61.2%) while Strongly disagree were(4.0%)were a significantly associated were  $P < 0.001$  and  $X^2$  (291.160), while % of satisfaction were(86.48%) .

**Table 3 Distribution of the Frequency of the participants in telemedicine during the COVID-19 among diabetes Type 2 about Satisfaction .**

| Total satisfaction |         |              | Chi-square |        |         |
|--------------------|---------|--------------|------------|--------|---------|
|                    |         | F            | N          | $X^2$  | P-value |
| Data               | Weak    | 13           | 5.2        | 89.192 | <0.001* |
|                    | Average | 121          | 48.4       |        |         |
|                    | High    | 116          | 46.4       |        |         |
| Score              | Range   | 9-30.        |            |        |         |
|                    | Mean±SD | 21.872±4.213 |            |        |         |

Table 3 Regarding distribution of the participant with satisfaction and have a significant relation between the satisfaction and frequency while  $P\text{-value} < 0.001$  and  $X^2 89.192$ , participant toward Satisfaction study results show the majority of participant had AverageSatisfied were(48.4%) while high satisfied were(46.4.67%) but weak were (5.0%), while Range were(9-30) while Mean + SD(21.872±4.213)

**Figure 1 Distribution of the Frequency of the participants in telemedicine during the COVID-19 among diabetes Type 2 about Satisfaction**



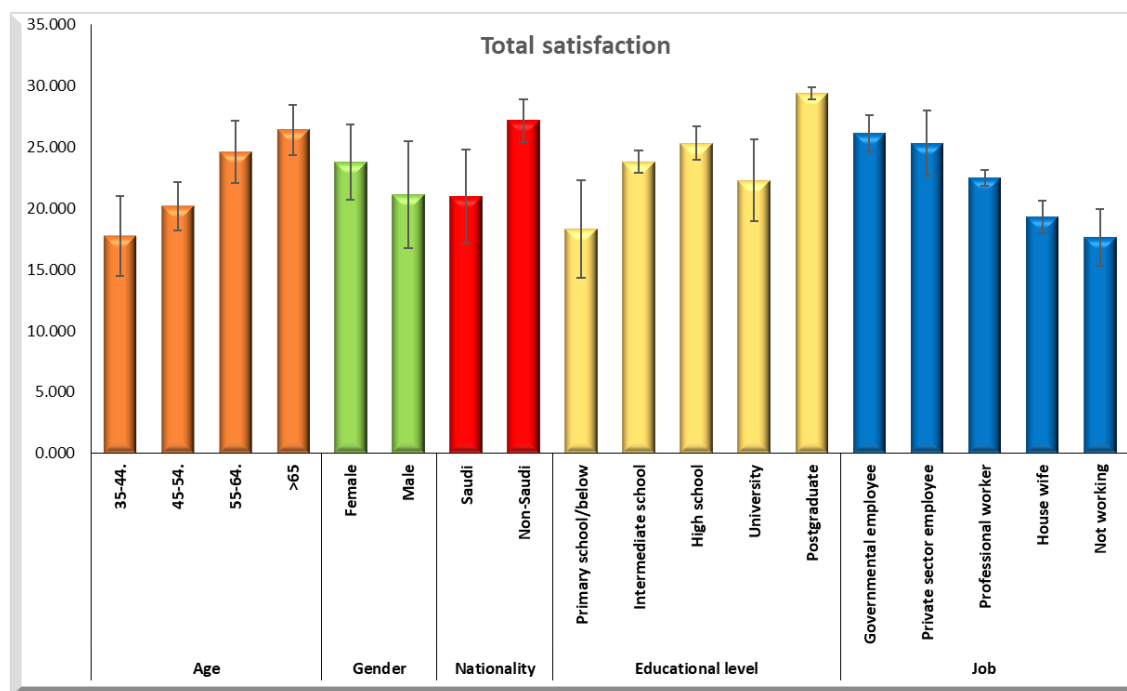
**Table 4 Distribution of the relationship of the total Satisfaction level the participants in telemedicine during the of COVID-19 among diabetes Type 2 and Socio-demographic characteristics**

|                   |                         | N   | satisfaction |         | F or T | ANOVA or T-test |         |
|-------------------|-------------------------|-----|--------------|---------|--------|-----------------|---------|
|                   |                         |     | Mean         | ± SD    |        | Test value      | P-value |
| Age               | 35-44.                  | 75  | 17.767       | ± 3.268 | F      | 132.390         | <0.001* |
|                   | 45-54.                  | 55  | 20.182       | ± 2.010 |        |                 |         |
|                   | 55-64.                  | 88  | 24.591       | ± 2.549 |        |                 |         |
|                   | >65                     | 32  | 26.382       | ± 2.045 |        |                 |         |
| Gender            | Female                  | 70  | 23.786       | ± 3.064 | T      | 4.661           | <0.001* |
|                   | Male                    | 180 | 21.128       | ± 4.369 |        |                 |         |
| Nationality       | Saudi                   | 213 | 21.005       | ± 3.843 | T      | -9.368          | <0.001* |
|                   | Non-Saudi               | 37  | 27.200       | ± 1.746 |        |                 |         |
| Educational level | Primary school/below    | 80  | 18.338       | ± 3.984 | F      | 52.990          | <0.001* |
|                   | Intermediate school     | 38  | 23.816       | ± 0.896 |        |                 |         |
|                   | High school             | 27  | 25.333       | ± 1.359 |        |                 |         |
|                   | University              | 95  | 22.295       | ± 3.319 |        |                 |         |
|                   | Postgraduate            | 10  | 29.400       | ± 0.516 |        |                 |         |
| Job               | Governmental employee   | 38  | 26.158       | ± 1.462 | F      | 184.970         | <0.001* |
|                   | Private sector employee | 80  | 25.342       | ± 2.636 |        |                 |         |
|                   | Professional worker     | 27  | 22.519       | ± 0.643 |        |                 |         |
|                   | House wife              | 25  | 19.280       | ± 1.339 |        |                 |         |
|                   | Not working             | 80  | 17.632       | ± 2.328 |        |                 |         |

Table (4) show that is a significant relation between satisfaction and demographic data regarding age increase in >60 years were (Mean± SD 26.382 ±2.045), follow by55-64 age in satisfaction were (Mean± SD, 24.591 ± 2.549) P-value=0.001, F= 132.390. Regarding the gender is a significant relation between satisfaction and gender increase in Female were (Mean± SD

23.786±3.064), follow male were (Mean± SD, 21.128±4.369) also P-value=0.001, T= 4.661. Regarding the nationality is a significant relation between satisfaction and Nationality increase in Non-Saudi were (Mean± SD 27.200±1.746), follow Saudi were (Mean± SD, 21.005±3.843) also P-value=0.001, T= -9.368. Regarding the Educational level a significant relation between satisfaction and Educational level increase in Postgraduate were (Mean± SD 29.400±0.516), follow by high school were (Mean± SD, 25.333 ± 1.359) also P-value=0.001, F= 52.990 . Regarding the Job is a significant relation between satisfaction and Job status increase in Private sector employee were (Mean± SD 25.342 ±2.636), follow Professional worker were (Mean± SD, 22.519±0.643) also P-value=0.001, F= 9184.970.727.

**Figure 2 Distribution of the relationship of the total Satisfaction level the participants in telemedicine during the of COVID-19 among diabetes Type 2 and Socio-demographic characteristics**



## Discussion

Saudi Arabia was not far from putting telemedicine in practice during the COVID-19 pandemic. The Ministry of Health in Saudi Arabia and the private sector had developed several telemedicine services before and during the COVID-19 pandemic as a part of the Saudi Vision (2030) that managed to invest in digital health and provide innovative digital solutions for the increasing need for healthcare [33] We undertook the current study to assessment the Satisfaction on Telemedicine during the COVID-19 among diabetes Type 2 What Can Saudi Arabia in Do in 2022 . shows there

were 250 participants, most of the participants (35.2%) were in the age group 55-64 years follow by the (30.0%) were the age group 35-44 years, the majority of them were female (72.0%) while male(28.0%), also regarding Nationality the majority of participant are Saudi were(85.2%) while Non- Saudi were(14.8%). regarding Educational level the majority of participant are University were(38.0%) while Primary school/below were(32.0%). Regarding the Job the majority of participant Private sector employee were (32.0%) while Not working were(32.0%). (See Table 1) In China, a study conducted on 161 tertiary hospitals representing 29 provinces showed that 93.8% of tertiary hospitals provided synchronous and asynchronous telemedicine services during the COVID-19 pandemic and 75.8% of hospitals had assigned telemedicine staff [34]. Another study conducted on 48 public dental hospitals in China during the COVID-19 pandemic showed that 90% of hospitals changed their face-to-face consultations to web based and mobile-based consultations, and telemedicine triage to detect the cases that needed urgent intervention was carried out in 69% of the included hospitals [21].

Our current study results in a Health Care Providers' Satisfaction with the Diabetes Telemedicine Clinic during the of COVID-19 are similar and further demonstrate the usefulness of the exclusive use of the Telemedicine to deliver follow-up care for participant with T2D. distribution of the participant with satisfaction and have a significant relation between the satisfaction and frequency while P-value  $<0.001$  and  $X^2$  89.192, participant toward Satisfaction study results show the majority of participant had Average Satisfied were(48.4%) while high satisfied were(46.4.67%) but weak were (5.0%), while Range were(9-30) while Mean + SD(21.872±4.213)(See Table 2,3) In addition to exploring the readiness of healthcare workers in Saudi Arabia to provide telemedicine services, it was also important to consider the opinions of health care worker about these new forms of health care services. One study used an online survey to assess the satisfaction of 425 health care worker treatment by telemedicine in Saudi Arabia during the early months of the COVID-19 pandemic [19]. Of the participants, 83.8% were satisfied with the ease of registration and scheduling, 80.3% with the ability to understand recommendations, also diabetic patients 80.2% with the ability to talk freely, 74.8% with the quality of healthcare provided, 78.1% with the quality of visual image, and 78.1% with the quality of audio sound. Overall, 77.9% were satisfied with the telemedicine experience [30]. Despite 84.9% of participants reported that telemedicine made access to healthcare easier, 51.1% said that they would prefer face-to-face over telemedicine consultation and 59.8% said that they were not willing to take part in a telemedicine consultation again. The main concern of most participants (80.2%) was that the presence of a camera and other telemedicine equipment made them uncomfortable [19].

Our current study results regarding the relationship of the total Satisfaction level the participants in

telemedicine during the of COVID-19 among diabetes Type 2 and Socio-demographic characteristics found over all item a significant relation between satisfaction and over all item were  $P$ -value=0.001. (See table 4). Similar the reported effectiveness of virtual diabetes care in high-income countries is due to better internet services and connectivity, the use of technologically advanced telemedicine, and the parents' ability to communicate, which largely depends on their high literacy levels [9, 10]. However, there are several constraints in using virtual care in the context of developing countries [24].

## Conclusions

Smartphone App can offer a convenient way of expanding access to healthcare in Saudi Arabia accurately and cost-effectively while minimizing the risk of COVID-19 transmission. More efforts should be exerted to provide healthcare settings with technical equipment and training needed for smartphone App in the telemedicine. Regulations to implement telemedicine on a large scale in Saudi Arabia while protecting data privacy are also needed, as a result of adopting to the deliver Virtual Follow-up Care for Children with Type 1 Diabetes During the COVID-19 Pandemic.

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