Original Article

# Awareness and attitude of using telemedicine among diabetic; a cross-sectional survey in Asser region, Saudi Arabia

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## Abstract

**Context:** Telehealth has usually been observed to be the minor of the two compared to in-person health care. **Aims:** The aim of this study was to assess awareness and attitude toward using telemedicine among diabetic patients in the Aseer region. **Settings and Design:** A descriptive cross-sectional approach was used targeting all accessible diabetic patients in the Aseer region, southern Saudi Arabia. **Methods and Material:** Data were obtained from eligible patients using an electronic prestructured questionnaire. The researchers prepared the questionnaire with the support of field experts and after a comprehensive literature analysis. The questionnaire was published online utilizing social media platforms by the researchers and their friends throughout the period from August to September 2023. All accessible and eligible patients in the study environment were invited to fill in the accompanying tool. **Results:** A total of 786 diabetic patients were enrolled. Patients' age ranged from 18 to more than 60 years with a mean age of 40.6 ± 13.9 years old. Exactly 151 (19.2%) people used telemedicine for medical consultation, whereas 635 (80.8%) never used it. Regarding patient readiness and perception, a total of 67 (44.4%) patients had good telemonitoring readiness regarding the use of TM in their diabetic control. **Conclusions:** The current study showed that only one-fifth of diabetic patients used telemedicine for medical purposes. On the other hand, diabetic patients showed an average level of readiness and perception toward the use of telemedicine for medical consultations.

**Keywords:** Attitude, diabetes, Saudi Arabia, telehealth, telemedicine, utilization

## Introduction

Telemedicine (TM) is the application of telemetry in medical care.[1] There are many definitions for telemedicine including a simple one involving the providing of medical information and services using telecommunication and information technology, and a more complete definition as the usage of exchanged

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medical information through electronic networks to improve a patient's awareness, healthcare provider's education, and patient care.[2] Telemedicine is not recently used and it is possible to enhance the accessibility of health care with reduced costs that pushed it into the current healthcare restructuring debate.[3,4]

In the IDF Middle East North Africa (MENA) region, around 73 million people currently live with diabetes.[5] By 2030, nearly 336 million people will be affected by diabetes mellites globally.[6] In 2021, diabetes affected 17.7% of the adult population in Saudi Arabia, equating to approximately 4,274,100 cases. A comprehensive epidemiological study in Saudi Arabia, focusing on adults aged 30 to 70 years, surveyed 16,917 participants and found that 4,004 were diagnosed with diabetes, representing about 23.7% of the population.[7] However, other studies have reported even higher prevalence rates among Saudis, ranging from 26.0 to 61.8%.[8-10] The American Diabetes Association indorses improving healthcare systems, submission of self-management care, and applying shared decision making in the management of diabetic patients.[11] In a recent study, self-efficacy was reported to be crucial for diabetes management and overall well-being among diabetic patients in Saudi Arabia.[12]

Telemedicine supports these recommendations by making patient access to care easier through reduced travel needs and improving outcomes through video visits and virtual nurse check-ins between physician visits, resulting in better diabetic glycemic control.[13] A meta-analysis of 39 studies found high acceptability rates of 71.0% for beneficiaries and 66.0% for providers, with usability at 66.0%.[14] During 2010, in Saudi Arabia, the Ministry of Health (MOH) conducted a study for the acceptance of telemedicine, revealing that telemedicine potential can ease many challenges of the Kingdom of Saudi Arabia healthcare system.

In 2011, the MOH launched the first national project for telemedicine, referred to as the Saudi Telemedicine Network (STN), at all Healthcare Facilities. The MOH collaborated with Canada Health Info Way and Ontario Telemedicine Network to offer guidance in developing a telemedicine roadmap for KSA, the STN roadmap, which was issued in 2013.[15] For primary care providers and family physicians, telemedicine offers a practical solution to enhance patient care, particularly in managing chronic conditions like diabetes. It enables continuous monitoring, timely interventions, and a collaborative approach to patient management, thereby improving patient outcomes and satisfaction. Telemedicine's role in primary care is pivotal in addressing the rising prevalence of chronic diseases and optimizing healthcare delivery. The current study aimed to assess awareness and attitude of using telemedicine among diabetic patients in the Aseer region.

## Methodology

A descriptive cross-sectional approach was used targeting all accessible diabetic patients in the Aseer region, southern Saudi Arabia. All those with ages of 18 years or more living in the Aseer region with any type of DM were encouraged to fill out the study questionnaire. A total of 890 individuals received the study survey. Exactly 786 respondents completed the study questionnaire with response rate of 88.3%. After obtaining permission from the Institutional Ethics Committee, data collection started. Data were collected from eligible patients using an electronic prestructured questionnaire. The researchers developed the questionnaire by the help of field experts and after an intensive literature review. The tool was reviewed using a panel of three experts for validation and applicability. Tool reliability was assessed using the pilot study of 25 participants with a reliability coefficient (α-Cronbach's) of 0.74 for the awareness section. The questionnaire included the following data: patients' sociodemographic data like age, gender, work, and education, and comorbidities. The second section covered diabetes-related data and diabetes monitoring among study patients. The frequency of using telemedicine for medical consultation was also assessed. The last section covered diabetic patients' attitude and perception regarding telemedicine for medical consultation. The questionnaire was uploaded online using social media platforms by the researchers and their friends during the period from August to September 2023. All accessible and eligible patients in the study setting were invited to fill the attached tool.

### Data analysis

After data were extracted, it was revised, coded, and fed to statistical software IBM SPSS version 22 (SPSS, Inc. Chicago, IL). All statistical analysis was done using two-tailed tests. *P* value less than 0.05 was statistically significant. As for telemonitoring readiness level, patients who had an overall composite mean score after adding all discreet items grades of 1–3 points out of 5 were considered at poor readiness level, while others with an overall composite mean score of 3.1–5 were considered at high readiness level. Descriptive analysis based on frequency and percent distribution was done for all variables including patient's biodemographic data, diabetes data, medical history and complications, and their attitude toward TM readiness. Patients' use of TM and their overall readiness were graphed. Cross-tabulation for relations was used for all these relations using Persons' Chi-square test and exact probability test for small frequency distributions.

## Results

A total of 786 diabetic patients were included. Patients' age ranged from 18 to more than 60 years with mean age of 40.6 ± 13.9 years old. Exactly 508 (64.6%) patients were females and 487 (62%) were married. As for education, 471 (59.9%) graduated from university graduated while 17.8% had below the secondary level of education. Considering occupation, 191 (24.3%) worked in the governmental sector, 9.9% in the private sector, 25.2% were not working, and 18.6% were students. A monthly income of 10000–20000 SR was reported among 307 (39.1%) patients and 28.1% had a monthly income of 5000–9000 SR. As for other comorbidities, 57.5% had four diseases and 23.3% had one disease [Table 1].

**Table 1: Personal data of diabetic patients in Aseer region, southern Saudi Arabia**

| Personal data | No | % |
|---|---|---|
| Age in years | | |
| <20 | 86 | 10.9% |
| 21–39 | 245 | 31.2% |
| 40–59 | 329 | 41.9% |
| 60+ | 126 | 16.0% |
| Gender | | |
| Male | 278 | 35.4% |
| Female | 508 | 64.6% |
| Marital status | | |
| Single | 232 | 29.5% |
| Married | 487 | 62.0% |
| Divorced/Widow | 67 | 8.5% |
| Education | | |
| Below secondary | 140 | 17.8% |
| Secondary education | 175 | 22.3% |
| University and above | 471 | 59.9% |
| Occupation | | |
| Unemployed | 198 | 25.2% |
| Retired | 147 | 18.7% |
| Student | 146 | 18.6% |
| Self-employed | 26 | 3.3% |
| Working in governmental sector | 191 | 24.3% |
| Working in Private sector | 78 | 9.9% |
| Family income | | |
| <5000 SR | 148 | 18.8% |
| 5000–9000 SR | 221 | 28.1% |
| 10000–20000 SR | 307 | 39.1% |
| >20000 SR | 110 | 14.0% |
| Other comorbidities | | |
| 1 | 183 | 23.3% |
| 2 | 87 | 11.1% |
| 3 | 57 | 7.3% |
| 4 | 452 | 57.5% |
| 5 | 81 | 10.3% |

**Table 2: Diabetes-related data and diabetes monitoring among study patients, Aseer region, Saudi Arabia**

| Diabetes clinical data | No | % |
|---|---|---|
| Type of diabetes | | |
| Type 1 DM | 424 | 53.9% |
| Type 2 DM | 307 | 39.1% |
| Secondary diabetes | 41 | 5.2% |
| LADA | 14 | 1.8% |
| When did you diagnose with diabetes? | | |
| Months ago | 243 | 30.9% |
| Years ago | 543 | 69.1% |
| Regular follow-up of diabetes with your physician | | |
| Yes | 578 | 73.5% |
| No | 208 | 26.5% |
| Generally, control your diabetes | | |
| Yes | 577 | 73.4% |
| No | 209 | 26.6% |
| Home-monitoring of blood glucose levels | | |
| Most of times | 367 | 46.7% |
| Sometimes | 361 | 45.9% |
| Never | 58 | 7.4% |
| Do you suffer from persistent hyperglycemia? (blood glucose greater than 250 mg/dL (13.9 mmol/L) | | |
| Yes | 303 | 38.5% |
| No | 483 | 61.5% |
| If yes, state the frequency of hyperglycemia: | | |
| >5 high (rates) readers/week | 73 | 24.1% |
| 3 to 5 high (rates) readers/week | 151 | 49.8% |
| 1 or 2 high (average) readers/week | 66 | 21.8% |
| From time to time | 13 | 4.3% |
| Have you experienced hypoglycemia (blood glucose less than 70 mg/dL) in the last six months? | | |
| Yes | 241 | 30.7% |
| No | 545 | 69.3% |
| If yes, how many times in the last six months have you experienced hypoglycemia that you needed help from another person? | | |
| 1–2 times | 148 | 61.4% |
| 3–4 times | 93 | 38.6% |
| Did you buy your glucometer by yourself? | | |
| Yes | 324 | 41.2% |
| No, it was provided by governmental supplies | 301 | 38.3% |
| No, it was covered by medical insurance | 77 | 9.8% |
| I don't have one | 84 | 10.7% |

Table 2. Diabetes-related data and diabetes monitoring among study patients, Aseer region, Saudi Arabia. A total of 424 (53.9%) had type 1 DM, 307 (39.1%) had type 2 DM, and 55 (7%) had other types. Exactly 69.1% had diabetes for years and 578 (73.5%) had regular follow-up of diabetes with a physician. Diabetes control was reported among 73.4% of patients, 46.7% monitoring of blood glucose levels most times. Exactly 38.5% complained of persistent hyperglycemia which was more than 5 high (rates) readers/week among 24.1% and 3 to 5 high (rates) readers/week among 49.8%. Considering hypoglycemia, 30.7% experienced hypoglycemia which was 1–2 times during the last 6 months among 61.4% of the patients. A total of 41.2% bought glucometer by themselves.

Figure 1: The frequency of using telemedicine for medical consultation among diabetic patients, Aseer region, Saudi Arabia. Exactly 151 (19.2%) patients used telemedicine for medical consultation, while 635 (80.8%) never used it.

Table 3. Diabetic patients' attitude and perception regarding telemedicine for medical consultation use among diabetic patients, Aseer region, Saudi Arabia. Exactly 88.7% recommend using telehealth to other diabetic patients, 88.1% felt comfortable with using telemedicine in monitoring their diabetes, 32.5% were comfortable that telehealth services are an adjunct to usual care, rather than a replacement, 26.5% felt that using telehealth helped me to manage my diabetes, 26.5% felt they knew more about my diabetes while using the telehealth than I had in clinic, and 20.5% believe that concerns specific to privacy/confidentiality/security have been addressed when using telemedicine.

Table 4. Factors associated with diabetic patient's use of telemedicine for medical consultation. Exactly 24.4% of young, aged patients used TM for consultation versus 15.1%

**Table 3: Diabetic patients' attitude and perception regarding telemedicine for medical consultation use among diabetic patients, Aseer region, Saudi Arabia**

| Attitude items | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | No | % | No | % |
| I feel comfortable with using telemedicine in monitoring my diabetes | 3 | 2.0% | 15 | 9.9% | 0 | 0.0% | 96 | 63.6% | 37 | 24.5% |
| I would recommend using telehealth to other diabetic patients | 6 | 4.0% | 11 | 7.3% | 0 | 0.0% | 90 | 59.6% | 44 | 29.1% |
| I feel that using the telehealth helped me to manage my diabetes | 4 | 2.6% | 8 | 5.3% | 99 | 65.6% | 40 | 26.5% | 0 | 0.0% |
| Overall, I felt I knew more about my diabetes while using the telehealth than I had in clinic | 6 | 4.0% | 12 | 7.9% | 93 | 61.6% | 40 | 26.5% | 0 | 0.0% |
| I believe that concerns specific to privacy/confidentiality/security have been addressed when using telemedicine | 7 | 4.6% | 14 | 9.3% | 99 | 65.6% | 31 | 20.5% | 0 | 0.0% |
| I am comfortable that telehealth services is an adjunct to usual care, rather than a replacement | 4 | 2.6% | 8 | 5.3% | 90 | 59.6% | 49 | 32.5% | 0 | 0.0% |
| I feel sense of difficult of access to healthcare when using telehealth: | 16 | 10.6% | 72 | 47.7% | 48 | 31.8% | 15 | 9.9% | 0 | 0.0% |
| I identify with a sense of dissatisfaction with the current state of telehealth: | 28 | 18.5% | 68 | 45.0% | 42 | 27.8% | 13 | 8.6% | 0 | 0.0% |
| I feel dissatisfied with doctor-patient interaction using telehealth: | 28 | 18.5% | 83 | 55.0% | 28 | 18.5% | 12 | 7.9% | 0 | 0.0% |
| I think that telehealth unmet diabetic patient's needs | 28 | 18.5% | 81 | 53.6% | 34 | 22.5% | 8 | 5.3% | 0 | 0.0% |

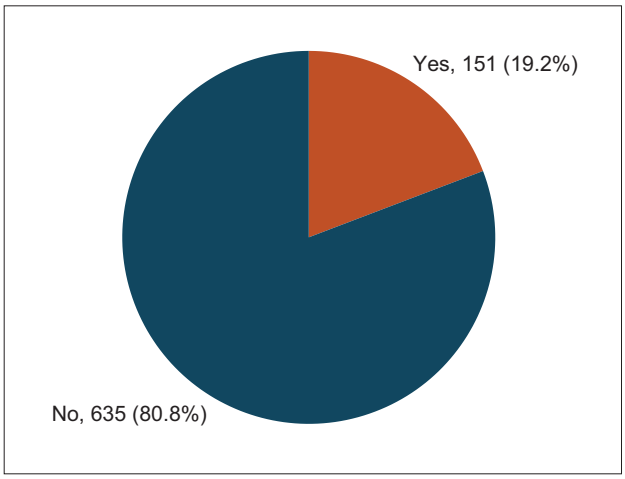


**Figure 1:** Frequency of using telemedicine for medical consultation among diabetic patients, Aseer region, Saudi Arabia

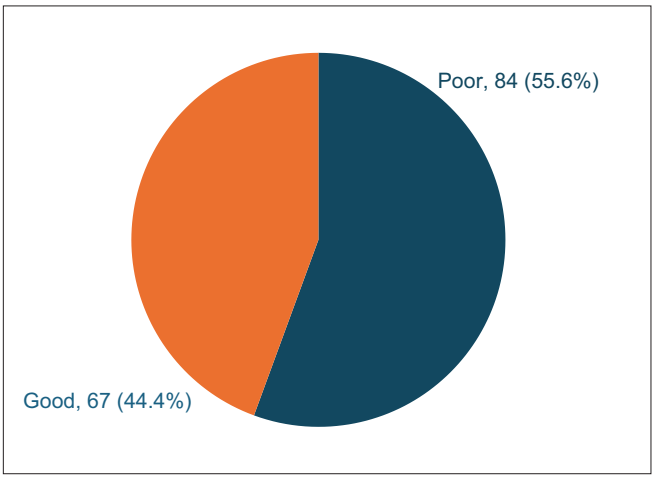


**Figure 2:** Telemonitoring readiness among diabetic patients, Aseer region, Saudi Arabia

of others aged 60 years or more with recorded statistical significance ($P$ = .017). Also, 21.8% of patients with regular follow-up of diabetes with your physician use TM for consultation compared to 12% of others who did not ($P$ = .002). TM was used by 21.7% of patients with controlled DM in comparison with 12.4% of others with poor control ($P$ = .004).

Figure 2: Telemonitoring readiness among diabetic patients, Aseer region, Saudi Arabia. Exactly 67 (44.4%) patients had good telemonitoring readiness regarding using TM in their diabetic control.

Table 5. Factors associated with telemonitoring readiness among diabetic patients in the Aseer region. Exactly 53.6% of female patients had good readiness toward TM use for their diabetic monitoring versus 27.8% of males ($P$ = .002). All other factors showed an insignificant relation with their readiness level.

## Discussion

Telemedicine is based on the use of electronic exchange of health data to enhance a patient's health.[16] TM is categorized into three categories. Synchronous telemedicine includes virtual care that is achieved in real time. Asynchronous telemedicine encompasses obtaining medical data that are transmitted for later assessment. Remote monitoring is any health data continuously collected from the patient.[17,18] When telemedicine is applied, it has a beneficial effect not only on patients but also a time and economic benefit to all patients mainly those with chronic diseases.[19,20]

The current study aimed to assess awareness and attitude of using telemedicine among diabetic patients in the Aseer region. The study included different types of diabetic patients, mainly type 1 and type 2 diabetics where two-thirds were diagnosed for years. About three-fourths of the patients reported regular follow-up of diabetes with their physician and good diabetic control.

Considering telemedicine use, nearly one out of each five patients reported using telemedicine for medical consultation. Higher use was reported among young, aged patients who mostly more educated and more familiar with technology, helping them to easily understand and apply this technique. Also, patients

**Table 4: Factors associated with diabetic patients use of telemedicine for medical consultation**

| Factors | Did you ever use telemedicine for medical consultation? | | | | *P* |
|---|---|---|---|---|---|
| | Yes | | No | | |
| | No | % | No | % | |
| Age in years | | | | | 0.017* |
| <20 | 21 | 24.4% | 65 | 75.6% | |
| 21–39 | 60 | 24.5% | 185 | 75.5% | |
| 40–59 | 51 | 15.5% | 278 | 84.5% | |
| 60+ | 19 | 15.1% | 107 | 84.9% | |
| Gender | | | | | 0.911 |
| Male | 54 | 19.4% | 224 | 80.6% | |
| Female | 97 | 19.1% | 411 | 80.9% | |
| Marital status | | | | | 0.243 |
| Single | 49 | 21.1% | 183 | 78.9% | |
| Married | 94 | 19.3% | 393 | 80.7% | |
| Divorced/Widow | 8 | 11.9% | 59 | 88.1% | |
| Education | | | | | 0.625 |
| Below secondary | 23 | 16.4% | 117 | 83.6% | |
| Secondary education | 36 | 20.6% | 139 | 79.4% | |
| University and above | 92 | 19.5% | 379 | 80.5% | |
| Occupation | | | | | 0.868 |
| Unemployed | 37 | 18.7% | 161 | 81.3% | |
| Retired | 24 | 16.3% | 123 | 83.7% | |
| Student | 32 | 21.9% | 114 | 78.1% | |
| Self-employed | 5 | 19.2% | 21 | 80.8% | |
| Working in governmental sector | 36 | 18.8% | 155 | 81.2% | |
| Working in Private sector | 17 | 21.8% | 61 | 78.2% | |
| Family income | | | | | 0.747 |
| <5000 SR | 29 | 19.6% | 119 | 80.4% | |
| 5000–9000 SR | 45 | 20.4% | 176 | 79.6% | |
| 10000–20000 SR | 60 | 19.5% | 247 | 80.5% | |
| >20000 SR | 17 | 15.5% | 93 | 84.5% | |
| DM | | | | | 0.189$ |
| Type 1 DM | 93 | 21.9% | 331 | 78.1% | |
| Type 2 DM | 48 | 15.6% | 259 | 84.4% | |
| Secondary diabetes | 8 | 19.5% | 33 | 80.5% | |
| LADA | 2 | 14.3% | 12 | 85.7% | |
| Regular follow-up of diabetes with your physician | | | | | 0.002* |
| Yes | 126 | 21.8% | 452 | 78.2% | |
| No | 25 | 12.0% | 183 | 88.0% | |
| Generally, control your diabetes | | | | | 0.004* |
| Yes | 125 | 21.7% | 452 | 78.3% | |
| No | 26 | 12.4% | 183 | 87.6% | |
| Home-monitoring of blood glucose levels | | | | | 0.097 |
| Most of times | 82 | 22.3% | 285 | 77.7% | |
| Sometimes | 61 | 16.9% | 300 | 83.1% | |
| Never | 8 | 13.8% | 50 | 86.2% | |
| When did you diagnose with diabetes? | | | | | 0.103 |
| Months ago | 55 | 22.6% | 188 | 77.4% | |
| Years ago | 96 | 17.7% | 447 | 82.3% | |

*P*=Pearson $X^2$ test; $ = Exact probability test;**P*<0.05 (significant)

with regular follow-up and controlled diabetes were more users of telemedicine which explains being adherent for their management schedule, making physicians usually updated on their condition. A lower utilization rate in Colombia was detected as a total of 45,233,602 Medicaid enrollees from the 22 states with telemedicine reimbursement policies were included in the study. Only 0.1% were telemedicine users.[21] Also, about 0.7% of rural beneficiaries in Boston received a telemedicine visit in 2013 with a mean number of visits of 2.6.[22] A higher utilization rate among patients (not only diabetic) was reported by O'Gorman *et al*.[23] where 61.8% used Telemedicine Network (OTN) to facilitate access to medical care. In Saudi Arabia during the COVID-19 pandemic, a study was conducted including consultants, specialists, and residents, revealing that more than

**Table 5: Factors associated with telemonitoring readiness among diabetic patients in the Aseer region**

| Factors | Telemonitoring readiness | | | | *P* |
|---|---|---|---|---|---|
| | Poor | | Good | | |
| | No | % | No | % | |
| Age in years | | | | | 0.250 |
| <20 | 11 | 52.4% | 10 | 47.6% | |
| 21–39 | 29 | 48.3% | 31 | 51.7% | |
| 40–59 | 30 | 58.8% | 21 | 41.2% | |
| 60+ | 14 | 73.7% | 5 | 26.3% | |
| Gender | | | | | 0.002* |
| Male | 39 | 72.2% | 15 | 27.8% | |
| Female | 45 | 46.4% | 52 | 53.6% | |
| Marital status | | | | | 0.858$ |
| Single | 26 | 53.1% | 23 | 46.9% | |
| Married | 53 | 56.4% | 41 | 43.6% | |
| Divorced/Widow | 5 | 62.5% | 3 | 37.5% | |
| Education | | | | | 0.630 |
| Below secondary | 12 | 52.2% | 11 | 47.8% | |
| Secondary education | 18 | 50.0% | 18 | 50.0% | |
| University and above | 54 | 58.7% | 38 | 41.3% | |
| Occupation | | | | | 0.452 |
| Unemployed | 15 | 40.5% | 22 | 59.5% | |
| Retired | 14 | 58.3% | 10 | 41.7% | |
| Student | 19 | 59.4% | 13 | 40.6% | |
| Self-employed | 3 | 60.0% | 2 | 40.0% | |
| Working in governmental sector | 22 | 61.1% | 14 | 38.9% | |
| Working in Private sector | 11 | 64.7% | 6 | 35.3% | |
| Family income | | | | | 0.424 |
| <5000 SR | 17 | 58.6% | 12 | 41.4% | |
| 5000–9000 SR | 29 | 64.4% | 16 | 35.6% | |
| 10000–20000 SR | 30 | 50.0% | 30 | 50.0% | |
| >20000 SR | 8 | 47.1% | 9 | 52.9% | |
| DM | | | | | 0.761$ |
| Type 1 DM | 53 | 57.0% | 40 | 43.0% | |
| Type 2 DM | 27 | 56.3% | 21 | 43.8% | |
| Secondary diabetes | 3 | 37.5% | 5 | 62.5% | |
| LADA | 1 | 50.0% | 1 | 50.0% | |
| Regular follow-up of diabetes with your physician | | | | | 0.630 |
| Yes | 69 | 54.8% | 57 | 45.2% | |
| No | 15 | 60.0% | 10 | 40.0% | |
| Generally, control your diabetes | | | | | 0.505 |
| Yes | 68 | 54.4% | 57 | 45.6% | |
| No | 16 | 61.5% | 10 | 38.5% | |
| Home-monitoring of blood glucose levels | | | | | 0.181$ |
| Most of the times | 42 | 51.2% | 40 | 48.8% | |
| Sometimes | 39 | 63.9% | 22 | 36.1% | |
| Never | 3 | 37.5% | 5 | 62.5% | |
| When did you diagnose with diabetes? | | | | | 0.891 |
| Months ago | 31 | 56.4% | 24 | 43.6% | |
| Years ago | 53 | 55.2% | 43 | 44.8% | |

*P*=Pearson $X^2$ test; $ = Exact probability test;**P*<0.05 (significant)

half of them used telemedicine through WhatsApp (53.8%), Zoom (33.4%), emails (21.4%), Seha application (16.5%), and Microsoft Teams (6.2%).[24] The reported low utilization rates may be explained by other study conducted in Saudi Arabia[25] to assess barriers to using telemedicine and found that the availability of adequate sustainable funding/financial support, conformity of telemedicine with the core mission, vision, and needs of the healthcare facility and its constraints, reimbursement for telemedicine services, information quality, availability of required ICT infrastructure, culture and society constraints, system quality, and presence of approved strategy and plans. Other studies concluded that telemedicine programs should focus on individuals who have limited access to care.[26,27] Telemedicine can help primary care professionals and family

physicians manage patients better, especially for chronic conditions like diabetes. Telemedicine enables regular patient follow-up and remote monitoring, which is critical for early intervention and continuous management. The study's findings imply that incorporating telemedicine into normal diabetic care can enhance patient adherence to treatment plans and offer physicians timely updates on their patients' status. Furthermore, tackling financing, infrastructure, and cultural hurdles can help to increase telemedicine adoption, resulting in better patient outcomes and more efficient healthcare delivery.[28,29]

Regarding patients' readiness and attitude toward telemedicine in diabetes care and consultation, the study showed that less than half of the patients showed good readiness level especially young aged female diabetic patients. Valikodath *et al*.[30] estimated patients' attitudes toward participating in telemedicine for diabetic retinopathy. Authors found that patients had a decreased likelihood of readiness if they appreciated the patient–physician relationship or had a longer duration of diabetes. Patients had increased odds of willingness if they perceived increased opportuneness or had other comorbidities. Opinc *et al*.[31] assessed Polish patients during COVID-19 pandemic and found that 82% of the respondents selected telephone consultations as the most convenient form of receiving rheumatology advice. The patients reported for the absence of physical examination and additional tests as the issues depressing them from teleconsultations. In Saudi Arabia, Nasser *et al*.[32] found that the vast majority of the study patients supposed that telemedicine made health care easier during the COVID-19 pandemic. Nearly half of the patients showed high satisfaction with the ease of registration, while 43.4% of respondents stated that they had the ability to talk freely over telemedicine. During COVID-19 pandemic, one platform in Saudi Arabia was Seha, a Ministry of Health smartphone application that provides information, self-evaluation, and teleconsultations. A study conducted by Omari *et al*.[33] reported for high satisfaction rate among Saudi participants for that application.

## Strengths and limitations

The study employed a descriptive cross-sectional approach to investigate the utilization of telemedicine among diabetic patients in the Aseer region of Saudi Arabia. The questionnaire used in the study was rigorously developed with expert validation, ensuring data quality. It encompassed various aspects, including sociodemographic information, diabetes-related data, monitoring practices, and patients' attitudes toward telemedicine. However, the study has limitations, including potential self-reporting bias, its cross-sectional nature, sampling bias due to its focus on accessible patients, an online survey distribution method that might exclude certain individuals, a relatively small pilot sample, and potential selection bias introduced by the recruitment process. These limitations should be considered when interpreting the study's findings.

# Conclusions

In conclusion, the current study showed that only one-fifth of the diabetic patients used telemedicine for medical consultation mainly young aged, female patients with regular follow-up who showed higher diabetic control measures. On the other hand, diabetic patients showed an average level of readiness and perception toward the use of telemedicine for medical consultations. More effort should be paid to improve patients' and healthcare staffs' awareness regarding the benefits of applying telemedicine including financial, time-related, and easiness benefits. Also, larger-scale studies should be conducted to assess the most significant barriers to eliminate and make telemedicine facilities more available and accessible.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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