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Research Article

# Assessing knowledge, perceptions, and readiness of telemedicine recipients: A cross-sectional study

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## Abstract

**Objectives:** The current study aimed to assess the knowledge and perceptions of telemedicine recipients. Secondly, to evaluate their readiness towards adopting telemedicine in clinical settings.

**Methods:** A cross-sectional survey study was conducted in Jordan and designed to show the demographics of participants. The questionnaire was piloted for validity and reliability to achieve the aim of the study, and a collective of 420 participants were recruited.

**Findings:** Multiple regression analysis conducted showed that telemedicine services were significant at a level of $\alpha \leq 0.05$. Whereas the Pearson's correlation of the dependent and independent variables was also significant at a level of $\alpha \leq 0.05$ as a function of age, working status, and income.

**Conclusions:** Regardless of the fact that participants showed a limited knowledge of telemedicine services, most of the participants expressed positive perceptions towards telemedicine services and its adoption in the clinical settings.

## Keywords

Telemedicine, Telemedicine recipients, Knowledge, Perceptions, Readiness

## Introduction

Although the healthcare system has undergone a remarkable change in recent years, still, some areas need reform (Campion et al. 2016; Barbosa et al. 2021). A major dilemma confronting healthcare systems nowadays is to sustain capacity and improve access (Barbosa et al. 2021; Burau et al. 2022; Chauhan et al. 2024) to provide medical services to patients without compromising the safety of the healthcare providers as well as patients, especially in circumstances where so-called social distancing in a clinical setting is pressing (Bashshur et al. 2020; Ftouni et al. 2022; Wilhite et al. 2022). Telemedicine is an emerging tool that has the potential to provide more effective, organized, and accessible healthcare services at the convenience of both patients and healthcare providers. (Bashshur et al. 2020; Haleem et al. 2021; Bell-Aldeghi et al. 2023). It concerns with providing medical information, teleconsultation, and telediagnosis remotely (Clark et al. 2010; Witkowski et al. 2016; Hassan et al. 2019; Cui et al. 2020; Peltan et al. 2020; Ando et al. 2022). Teleconsultation is notably of paramount importance in the prevention of diseases that hold unnoticeable symptoms to patients (Carrillo de Albornoz et al. 2022; Furlepa et al. 2022). Telemedicine is

the merging between advanced technology, network and medical services (Lucas 2008; Haleem et al. 2021; Alenoghena et al. 2023) that has a great potential with the most significant effect on patients in remote areas (Freiburger et al. 2007; Lopez et al. 2021), and communities suffering from shortage or absence of healthcare services (Su et al. 2022). Telemedicine has proven to be reliable and cost-effective (Fong et al. 2011) as costs are comparable to that of face-to-face traditional visits (Nittari et al. 2020). Nevertheless, telemedicine confronts many challenges to its adoption which would vary depending on the country (Ammenwerth et al. 2003; Barlow et al. 2007; Cresswell and Sheikh 2013; Alaboudi et al. 2016; Albarrak et al. 2021). Telemedicine implementation would be hampered by various issues such as the lack of knowledge and incorrect perception by the public (Demartines et al. 2000; Ammenwerth et al. 2003; Meher et al. 2009; Cresswell and Sheikh 2013; Alaboudi et al. 2016). Therefore, it is essential to make the public comprehend the new idea of telemedicine and assess their willingness and readiness to adopt telemedicine services. The present study aims to evaluate the knowledge of telemedicine recipients about telemedicine and its applications. Furthermore, to assess their willingness and readiness towards adopting telemedicine.

# Materials and methods

## Study design

A cross-sectional study was carried out in Jordan between August, 2023 and January, 2024. The Survey method employed consisted of mixed mood questions type i.e. closed ended and scoring questions (Suppl. material 1, Sec 1), and designed to show the demographics of participants. The questionnaire was piloted for validity and reliability to achieve the aim of the study (Suppl. material 1, Sec 2). Reliability testing for stability and internal consistency were met and confirmed by Cronbach's alpha (0.877) and Pearson's correlation analysis. A voluntary simple random sampling strategy was adopted to collect the data. To estimate the expected response numbers, the sample size of participants was calculated using Eq.1, and a collective of 420 participants were recruited.

$$s = X^2NP(1 - P) \div d^2 (N - 1) + X^2P(1 - P) \quad \text{Eq. 1}$$

Where; $s$ = required sample size, $X^2$ = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841), $N$ = the population size, $P$ = the population proportion, and $d$ = the degree of accuracy expressed as a proportion (0.05). The inclusion criteria were individuals aged 20 years old or above, willing to take part in the study. Participants were briefed on the study and invited to complete the online survey sent through social media. Before commencing the questionnaire, participants were informed that the completion of the questionnaire is voluntary and all the information obtained will be treated confidentially.

## Study model

The study model was structured based on observations from literature (Bashshur et al. 2011; Cui et al. 2020; Nguyen et al. 2020; Nittari et al. 2020; Albarrak et al. 2021; Hajesmaeel-Gohari and Bahaadinbeigy 2021; Haleem et al. 2021; Furlepa et al. 2022), and interviewing professionals who have experience and expertise in this field. This study model consisted of four dimensions which are; A) telemedicine services, B) knowledge, C) perceptions, and D) readiness. The study hypothesis was developed as follows; ($H_{01}$): recipients' knowledge does not impact telemedicine services, at $\alpha \leq 0.05$, ($H_{02}$): recipients' perceptions do not relate to telemedicine services, at $\alpha \leq 0.05$, ($H_{03}$): recipients' readiness does not attribute to telemedicine services, at $\alpha \leq 0.05$. The questions rating was measured by five likert type scale; strongly disagree, disagree, neutral, agree, strongly agree.

## Ethical approval

Ethical approval for the present study was granted by the Research Ethics Committee/Middle East University, Amman, Jordan; Reference number PD/E/2429.

## Statistical analysis

Descriptive statistics (means, standard deviations, frequencies, and percentages) were generated using IBM SPSS (Statistical Package for Social Science) version 27. Where appropriate, different statistical analysis were performed to compare results such as; two sample (*t-test*), Pearson's correlation test, one-way analysis of variant (ANOVA), multiple comparison (LSD) test, and Phi correlation test. The significance level was set at $P < 0.05$.

# Results

## Demographics

A total of 420 participants took part in this current study and were all from Jordan. About (47%) of the participants had health insurance, where (16%) suffered from chronic disease, and (7.4%) stated they have experienced telemedicine previously. The participants' gender, age distribution, qualification, working status, and income are presented in Table 1.

Mean values, standard deviations, and one-way analysis of variant (ANOVA) test were calculated for the responses to the study dimensions as a function of age, qualifications, working status, and income. The resulting data showed that there were statistically significant differences ($\alpha < 0.05$) in all dimensions as a function of age, which means that age, qualifications, working status, and income had an impact on the dependent and the independent variables of the study. Means and standard deviations were calculated for the study dimensions as show in Table 2. It was noted that the knowledge of telemedicine recipients is low and limited with a mean value of 2.1 ±

**Table 1.** Demographic distribution of the study sample.

| Type | Frequency (N) | Percent (%) |
|---|---|---|
| **Gender** | | |
| Male | 169 | 40.2 |
| Female | 251 | 59.8 |
| **Age** | | |
| 20–30 | 164 | 39.0 |
| 31–40 | 128 | 30.5 |
| 41–50 | 113 | 26.9 |
| > 50 | 15 | 3.6 |
| **Qualifications** | | |
| High school | 30 | 7.1 |
| Diploma | 56 | 13.3 |
| Bachelors | 280 | 66.7 |
| Higher educational degrees | 54 | 12.9 |
| **Working status** | | |
| Employed/ self employed | 306 | 72.9 |
| Unemployed | 106 | 25.2 |
| Retired | 8 | 1.9 |
| **Average income/ month** | | |
| <500 $ | 110 | 26.2 |
| 500–1000 $ | 143 | 34.0 |
| 1001–1500 $ | 61 | 14.5 |
| >1500$ | 14 | 3.3 |
| **Health insurance** | | |
| Yes | 197 | 46.9 |
| **Chronic diseases** | | |
| Yes | 67 | 16 |
| **Experienced telemedicine previously** | | |
| Yes | 31 | 7.4 |

0.87. By contrast, perceptions and readiness of telemedicine recipients were positive and had a high score of mean values 4.1 ± 0.82, 4.0 ± 0.78, respectively.

**Table 2.** Means and standard deviations of the four study dimensions.

| Dimensions | N | Mean | Std. Deviation | Assessment |
|---|---|---|---|---|
| **Telemedicine services** | 420 | 4.1 | 0.76 | High |
| **Knowledge** | 420 | 2.1 | 0.87 | Low |
| **Perceptions** | 420 | 4.1 | 0.82 | High |
| **Readiness** | 420 | 4.0 | 0.78 | High |
| **Total** | 420 | 3.6 | 0.79 | Medium |

Multiple regression analysis was conducted between the independent and dependent variables i.e. knowledge, willingness, readiness of telemedicine recipients and telemedicine services as presented in Table 3. The resulting data showed that the dependent variable i.e. telemedicine services was significant at a level of $\alpha \leq 0.05$. The calculated *F*-value was (108.65) at a level of $\alpha \leq 0.05$, accordingly, the null hypothesis was rejected, and hence, there was a statically significant impact of knowledge, willingness, and readiness of telemedicine recipients on telemedicine services. The relationship between the dependent and independent variables was strong and positive with *R* value of 0.663. The higher significance was assigned to the willingness of recipients for telemedicine services with a *t* value of 9.9.

Data presented in Table 4 showed that knowledge, willingness, and readiness of telemedicine recipients had a significant linear correlation with telemedicine services at a level of $\alpha \leq 0.05$. These correlations were also significant at a level of $\alpha \leq 0.05$ as a function of age, working status, and income. The Pearson's correlation was strong with values of 0.64 and 0.52 assigned for willingness and readiness of telemedicine recipients towards

**Table 3.** Multiple regressions conducted for the study hypothesis.

| Dependent variable | R | R2 | F | Sig. | Independent variable | Beta | t | Sig. |
|---|---|---|---|---|---|---|---|---|
| Telemedicine services | 0.663 | 0.439 | 108.649 | 0.000*** | Knowledge | 0.114 | 3.463 | <0.001*** |
| | | | | | Willingness | 0.476 | 9.886 | <0.001*** |
| | | | | | Readiness | 0.173 | 3.395 | <0.001*** |

*R* = correlation coefficient; *R2* = coefficient of determination; *F* = F-statistic; Sig. = significance probability (*p*-value ≤ 0.05: statistically significant; *p*-value > 0.05 = not statistically significant); Beta = unstandardized coefficients; and *t* = test statistic for t-test.

**Table 4.** Pearson's correlation between independent and dependent variables.

| | Knowledge | Willingness | Readiness for Telemedicine | |
|---|---|---|---|---|
| **Overall correlation with the telemedicine technology** | | | | |
| | 0.135 | 0.643 | 0.515 | |
| **Impact of age on the telemedicine technology** | | | | Sig. |
| 20–30 years | 0.227 | 0.153 | 0.023 | <0.001*** |
| 31–40 years | 0.142 | 0.101 | 0.049 | |
| 41–50 years | 0.094 | 0.049 | 0.013 | |
| > 50 years | 0.020 | 0.035 | 0.028 | |
| **Impact of working status on the telemedicine technology** | | | | Sig. |
| Employed | 0.212 | 0.145 | 0.116 | <0.001*** |
| Retired | 0.070 | 0.076 | 0.052 | |
| Unemployed | 0.239 | 0.173 | 0.135 | |
| **Impact of income on the telemedicine technology** | | | | Sig. |
| <500 $ | 0.008 | 0.159 | 0.112 | <0.001*** |
| 500–1000 $ | 0.168 | 0.184 | 0.113 | |
| 1001–1500 $ | 0.034 | 0.072 | 0.065 | |
| > 1500 $ | 0.088 | 0.050 | 0.080 | |
| No income | 0.192 | 0.126 | 0.101 | |

telemedicine services, respectively. The latter illustrated that the demographics of participants had an impact on telemedicine services.

## Discussion

This study explored the knowledge, perceptions, and readiness of patients towards the application of telemedicine services in Jordan. A total of 420 participants took part in the survey, and their demographics were captured (Table 1). There is scarcity in the existing literature in the region regarding telemedicine technology and services from recipients' perspectives (AlBar and Hoque 2019; Baradwan and Al-Hanawi 2023), and hence, this was considered a focal point behind conducting this research so as to fill in the gaps in literature and generate a valuable database that holds a great value to stakeholders. Additionally, there is an urgent need to have deeper insights into the factors that hinder the advancement of telemedicine technology in Jordan, which once they are defined, would maximize the utility of healthcare services.

The current study showed the impact of sociodemographic factors on overall knowledge, perceptions and readiness of telemedicine recipients towards telemedicine services, except for gender and education variables (Table 4). The knowledge of telemedicine recipients towards telemedicine services was limited in Jordan (Table 2), and there is a need to specially target older adults and people who are retired, supported by their very low values of Pearson's correlation coefficient; 0.02 and 0.07, respectively (Table 4). Some of these outcomes were in agreement with other studies conducted in Saudi Arabia and Indonesia for the same examined sociodemographic factors (Tjiptoatmadja and Alfian 2022; Baradwan and Al-Hanawi 2023), which may be attributed to cultural and regional differences. Our study illustrated that there was an association between age, working status, income and knowledge and perceptions towards telemedicine services ($p < 0.001$). Tjiptoatmadja and Alfian (2022), demonstrated that an association was observed between all demographics and knowledge of telemedicine except for gender. While there were no association between gender, age, education and perceptions towards telemedicine services (Tjiptoatmadja and Alfian 2022).

The surveyed participants' knowledge of telemedicine services showed a low mean score 2.1 ± 0.87 (Table 2), however, was statistically significant ($p < 0.001$) (Table 3). One study demonstrated that around three-quarters of the participants had never heard about telemedicine (Baradwan and Al-Hanawi 2023), while another study showed that about half of the participants had heard about telemedicine services (Tjiptoatmadja and Alfian 2022). Despite the limited knowledge and the limited number of individuals who had actually used telemedicine services before, participants had positive perceptions and a readiness towards telemedicine services supported by the mean scores of 4.1 ± 0.82 and 4.0 ± 0.78, respectively, (Table 2). Both perceptions and readiness of participants were statistically significant towards telemedicine services at a level of $\alpha \leq 0.05$ (Table 3). Participants agreed to consult doctors while at home due to crowding in hospitals or when social distancing is recommended as in pandemics. In addition, participants would like to pay for the online-based healthcare services and to get training on how to use telemedicine technology (Suppl. material 1, Sec 1). Participants stated that they own technology devices such as; smartphones, tablets, or computers and internet connection at home. They expressed that they feel confident to download a telemedicine application and were ready to benefit from the services that telemedicine offers (Suppl. material 1, Sec 1). These findings were supported by a previous study in which participants showed a positive perception towards telemedicine services (Tjiptoatmadja and Alfian 2022; Baradwan and Al-Hanawi 2023). Participants had agreed that they would benefit from telemedicine services in terms of saving time, cost effectiveness, and comfort (Tjiptoatmadja and Alfian 2022; Baradwan and Al-Hanawi 2023). Another study reported that patients who received telemedicine healthcare services had acknowledged this experience (Holtz 2021). However, there were individuals who reported their concerns regarding the information privacy and unclear legal aspects of telemedicine practice (Baradwan and Al-Hanawi 2023). Telemedicine can provide distant, off-site, and interactive real-time consultations for patients (Zheng et al. 2018; Sharifi Kia et al. 2023), when an in-person visit is unnecessary. Virtual healthcare through telemedicine services may be considered as equally effective alternative to face-to-face visits. This may remove the necessity for work absences and so reduce the spread of infections among patients, which is especially risky for people suffering from chronic diseases or who are immunodeficient (Sarhan 2009; Bashshur et al. 2011; Funderskov et al. 2019; Rockwell and Gilroy 2020; Haleem et al. 2021). This technology permits patients to take repeat medications and be recalled for appointments (Lokkerbol et al. 2014). Numerous studies have investigated the usefulness of telemedicine in the treatment of various ailments such as diabetes and burns and many others (Zhai et al. 2014; Wang et al. 2017; Cheng et al. 2019).

## Conclusions

Regardless of the fact that participants showed a limited knowledge of telemedicine services, most of the participants expressed positive perceptions towards telemedicine services and its adoption in clinical settings. Telemedicine can provide distant, off-site, and interactive real-time consultations for patients when an in-person visit is unnecessary. Virtual healthcare through telemedicine services may be considered as an equally effective alternative to face-to-face visits. Poor knowledge by end users, particularly patients, imposes an urgent need

to increase awareness of telemedicine services in the healthcare domain to facilitate its adoption in Jordan. Interventions to increase knowledge of telemedicine in Jordan need to specially target older adults and people who are retired.

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## Supplementary material 1

### Questionnaire and validation

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