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Patient perspectives and utilization of telemedicine for chronic conditions in Pakistan barriers and facilitators towards its access

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Abstract

Background Telemedicine, utilizing technology for remote healthcare, offers promise for chronic disease management. It enables virtual consultations, addressing geographical barriers and mobility limitations. This study explores patient perspectives on using telemedicine, particularly via smartphones, to improve access, continuity of care, and ultimately reduce chronic disease burden.

Methods A cross-sectional study was carried out from February 1, 2024, to April 1, 2024, to examine telemedicine consultations. The investigation was conducted at the Sehat Kahani head office, where 460 persons with chronic diseases were recruited. These participants were initially identified by Electronic Health Records (EHR) of Sehat Kahani and subsequently registered following randomization through systematic random sampling.

Results This study investigated telemedicine perceptions among 450 chronic disease patients (74.2% female, avg. age 40.6). Over 85.5% agreed on the necessity of telemedicine for chronic care. Notably, higher education, income ≥ 25,000 PKR, and health insurance significantly correlated with telemedicine use. And a larger portion of participants expressed positive perceptions of TM services in terms of faster medical care delivery (n = 369, 82%). These findings underscore telemedicine's potential to revolutionize chronic disease management.

Conclusion The study found that chronic disease patients in Pakistan have a positive opinion of telemedicine. Variables such as educational attainment, financial resources, and access to insurance exerted a substantial impact on the utilization of telemedicine. This implies that efforts should be made to mitigate inequalities in order to promote broader acceptance and implementation of telemedicine. Telemedicine shows potential for enhancing the management of chronic diseases in Pakistan.

Keywords Chronic disease · Healthcare delivery · LMIC's · MHealth · Telemedicine

1 Introduction

The population of Pakistan is currently grappling with the dual challenge of managing both Communicable and Non-communicable Diseases. As a low- and middle-income country (LMIC) with a constrained healthcare infrastructure, relying solely on a single in-person consultation approach for healthcare provision presents a challenge.

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Over time, the population of Pakistan has experienced a steady increase with each passing day. The prevalence of Non-Communicable Diseases (NCD) and Disability-Adjusted Life Years (DALYs) has witnessed a significant increase in Pakistan, a country with a median age below 40. Specifically, the proportion of NCDs and DALYs rose from 25.3% of the total DALYs in 1990 to 43.7% in 2019 [1]. The situation becomes more complex as existing literature adds that individuals diagnosed with chronic illnesses are more vulnerable to mortality and morbidity. Consequently, this significantly deteriorates their overall quality of life compared to the general population [2].

There is a need to develop a sustainable solution that can effectively address the requirements of all individuals contributing to the burden of Non-communicable diseases. Smartphones and other technical equipment have become increasingly accessible to individuals across many socioeconomic levels. Mobile health (mHealth) treatments have the potential to serve as a cost-effective and feasible healthcare strategy in economically developing nations, particularly in the context of aiding medical professionals in chronic illness management and patient behaviour modification [3].

Telemedicine benefits patients with chronic illnesses who are housebound or unable to access conventional medical care. Remote medical consultations are especially helpful for patients who need medical attention but cannot physically visit a clinic or hospital, alongside individuals with chronic conditions who require regular check-ins with a specialist. Telemedicine has made it easier for people to get the care they need without compromising their security. More importantly, there is always the chance of catching an illness from close quarters with other patients at a hospital. Individuals with preexisting illnesses or weakened immune systems are primarily at danger in these settings [4].

2 Telemedicine transforming management of chronic health issues

According to existing literature, telemedicine has been identified as a viable approach for managing chronic illnesses. In Spain, around 10% of individuals with Type 2 Diabetes Mellitus have used telemedicine for healthcare delivery. This approach, particularly when utilizing glucometers, has been widely embraced by patients. The utilization of telemedicine has been observed to provide a multitude of advantages in the management of Type 2 Diabetes Mellitus [5]. Another study highlighting the importance of chronic disease remote monitoring describes how the participants expressed a strong appreciation for the contextual factors involved in a study on remote patient monitoring, noting its practicality. Initial findings indicate that this approach may positively impact some aspects of health literacy and the self-management of chronic diseases [6].

3 Remote patient monitoring a telehealth intervention

Remote Patient Monitoring (RPM) presents a viable approach to enhance the patient-physician relationship and mitigate the current lack of healthcare professionals. Research investigations pertaining to the effectiveness of RPM have encompassed several domains, such as postoperative rehospitalization, treatment of chronic diseases, adherence to medication, and enhancement of quality of life; these studies have yielded promising results [7–10]. Additionally, telemedicine can improve health literacy, which has shown remarkable potential as an effective strategy for achieving various health outcomes for chronic conditions [11].

4 The challenge of healthcare access in rural Pakistan

An analysis of healthcare service use models reveals the extent to which healthcare resources are available and accessible in a particular region [12, 13]. These models establish crucial variables, examine their interrelationships, and evaluate the efficacy of healthcare interventions. In Pakistan, a country with a high illiteracy rate and a majority of the population living in rural areas, the lack of education and low socioeconomic status are significant factors that contribute to a reduced ability and willingness to utilize information technologies [14].

Pakistan faces a significant difficulty in healthcare when it comes to chronic non-communicable diseases. Incorporating telemedicine services into a routine follow-up approach has the potential to alleviate the burden of chronic diseases by improving patient management, expanding access to care, and fostering continuity. This study addresses critical gaps in Pakistan's healthcare system by evaluating patient perspectives, willingness, and use of telemedicine, particularly through smartphones. By exploring the impact of clinical factors, patient characteristics, and healthcare settings on telehealth utilization for chronic disease management, this research will provide comprehensive insights to improve healthcare delivery models and patient outcomes in Pakistan.

5 Materials and methods

The study employed a cross-sectional design and a systematic random sampling technique to select participants. The monthly patient count for the Sehat Kahani application is reported to be 17,350 through EHR. Among these patients, 15% have chronic ailments and meet the inclusion criteria, which requires them to access the app on a monthly basis, bi-monthly basis or quarterly. Sehat Kahani is an e-health platform that has been actively promoting SDG-3 since its establishment in 2017 through its telemedicine application and 63 e-health facilities, making health care more accessible to individuals. For this study, we chose the single mean population proportion calculation with a 95% confidence level ($Z = 1.96$), a 50% outcome proportion (i.e., perceptions toward, acceptance of, and use of TM), a 50% power ($P = 0.5$), and a 5% relative precision ($D = 0.05$) to determine suitable sample size [15]. The initial sample size was determined to be 384, and an additional 20 percent rejection rate resulted in a final sample size of 460.

Accordingly, 2602 users were recorded within a month, considering the data collection spanned two months, so 5204 participants will visit in 2 months. Consequently, the sample fraction, known as the k-interval, was calculated as 5204 divided by 460, resulting in an approximate value of 11. The data was collected from 1st February 2024 to 1st April 2024. Consequently, the initial participants of the study was selected by a random process, while each successive participant would be chosen at regular intervals of eleventh individuals.

After the telemedicine consultation, the healthcare provider reassured the patient that participating in the study was entirely voluntary, would not affect their services, and would guarantee the protection of their anonymity at all costs. The study adhered to rigorous methodology to explain and demonstrate the consent procedure. To ensure participant understanding and accurate responses, healthcare providers were available to assist with any questions or concerns. As most of our users are based in rural areas, it was important to consider their varying levels of education. While participants demonstrated a decent level of literacy, healthcare providers were online to assist with any difficulties or questions. Inclusion criteria for the study stipulated that participants be adults aged 18 or older and diagnosed with at least one chronic disease. To ensure informed consent and reliable responses, individuals with severe illness who might struggle to participate were excluded. This included those with significant neurological or psychological impairments, as well as hearing difficulties.

5.1 Data collection tool

This study collected data using an online structured questionnaire. With permission from the author, this questionnaire was adapted from a validated instrument used in a comparable study situation. Perceived willingness to adopt telemedicine was categorized as high or low based on responses to a series of questions adapted from the same questionnaire [15]. To guarantee easy access and effective data collection, the survey was conducted using Google Forms. The healthcare professionals sent the questionnaire to participants after their telemedicine consultations by providing them with a link to facilitate its completion and support if the respondents were unable to understand any questions. Participants who did not complete the questionnaire were sent a reminder email after 3 days and our telehealth helpline number was provided in the questionnaire link to facilitate the participants. The study had 2.1% non-responsive rate as nearly 450 participant's respondent out of 460 participants.

5.2 Statistical analysis

The Statistical Package for the Social Sciences (SPSS) version 22 was utilized for statistical analysis. Frequencies and percentages were calculated to create descriptive statistics for demographic factors. The perception of telemedicine was evaluated by determining the average scores of the pertinent items in the questionnaire. The chi-square test and multivariate logistic regression model were used to identify factors independently associated with perceived willingness to adopt telemedicine.

6 Results

In this study, a total of 460 patients were recruited to investigate the perceptions of telemedicine (TM) services. However, ten participants were excluded due to incomplete data, resulting in a final analysis of data from 450 participants. The remaining sample, had an average age of 40.6 years with a standard deviation of 13.2. The bulk of participants (n = 334, 74.2%) were females. The majority of patients were married (n = 381, 84.7%), educated (n = 191, 42.4%). The largest occupational category consisted of housewives (n = 292, 64.9%), with the majority falling into the low-income band (n = 315, 70%). The most prevalent chronic health issues reported were reproductive diseases (n = 136, 30.7%) and endocrine disorders (n = 111, 24.7%). The average duration of the illness was shorter than 5 years in the majority of cases (n = 358, 79.6%). The anticipated cost per visit for a physical examination varied from 500 to 1000 Pakistani Rupees (PKR) (n = 290, 64.4%). The predominant waiting time for in-person checkups was 1–2 h, as reported by 264 individuals, accounting for 58.7% of the total.

The predominant approach for funding healthcare visits was out-of-pocket expenditure, with 348 patients (77.3%). Regarding technology access, 40% of the participants (n = 180) indicated competence in utilizing mobile phones and the internet. Notably, (n = 208, 46.2%) of these people had previous exposure to telemedicine services. When asked about their familiarity with certain telemedicine technologies, the majority (n = 319, 70.9%) recognized the Sehat Kahani e-health mobile application Table 1.

Respondents' overall perception of telemedicine (TM) services was positive, with a mean score of 4.06 (± 0.08) SD. The majority of participants (n = 385, 85.5%) agreed on the necessity of TM services for chronic patient care. Similarly, a large portion of participants expressed positive perceptions of TM services in terms of faster medical care delivery (n = 369, 82%), reduced effort (n = 333, 74%) and cost (n = 333, 74%), reduced transportation costs (n = 330, 73.3%), reduced wait times at medical facilities (n = 335, 74.5%). The positive perceptions suggest telemedicine interventions hold promise for improving chronic disease management and patient care Table 2.

Type of chronic disease diagnosed, education, occupation, social income group, health cost coverage, expected distance, expected amount utilised, use of mobile phone, knowledge of telemedicine tools, admission history to hospital in 6 months and no of follow-ups done for chronic condition had a statistically significant association with telemedicine practice Table 3.

Results from the multivariate logistic regression study showed that a number of variables increase the probability that people with chronic diseases may use telemedicine. Telemedicine utilization was 2.301 times higher among individuals with a primary education or above (95% CI [1.380, 3.837], p = 0.001) than among those with a lesser level of education. Furthermore, telemedicine utilization was nearly twice as common among participants with an annual income of 25,000 or more (OR = 1.928, 95% CI [1.007, 3.690], p = 0.047). Also showing a strong correlation with telemedicine use was health insurance status; those who had it were 2.3 times more likely to use it than those without (95% CI [1.200, 4.467], p = 0.012). Participants living within a 6–10 km radius of a healthcare center (OR = 0.535, 95% CI [0.302, 0.950], p = 0.033) and people who had follow-up appointments every six months for their chronic diseases (OR = 0.338, 95% CI [0.151, 0.756], p = 0.008) were less likely to use telemedicine. Finally, participants with prior experience using telemedicine services (either online or at e-health centers) were nearly twice as likely to choose telemedicine for future needs (OR = 1.879, 95% CI [1.075, 3.287], p = 0.027) Table 4.

Table 1 Socio-demographics of chronic disease patients

Variable	Category	Frequency n	Percent %
Type of chronic disease diagnosed	Cardiovascular Disease	80	17.8
	Endocrine Disease	111	24.7
	Respiratory Disease	87	19.3
	Mental Health Disease	34	7.6
	Reproductive Disease	138	30.7
Age categories of the patients	18–28 Age Group	72	16
	29–39 Age Group	156	34.7
	40–50 Age Group	144	32
	51–60 Age Group	42	9.3
	61–70 Age Group	27	6
	70 + Age Group	9	2
Residence of patient	Urban	150	33.3
	Rural	300	66.7
Gender of patient	Female	334	74.2
	Male	116	25.8
Marital status of patient	Single	39	8.7
	Married	381	84.7
	Divorced	11	2.4
	Widowed	19	4.2
Education of patient	No Formal Education	191	42.4
	Primary Education Class (1–5)	132	29.3
	Secondary Education Class (7–12)	112	24.9
	Tertiary Education (Bachelors, Masters, PhD)	15	3.3
Religion of the patient	Islam	415	92.2
	Hinduism	8	1.8
	Chirstianity	5	1.1
	Not willing to tell	22	4.9
Language spoken by the patient	Urdu	149	33.1
	English	3	0.7
	Sindhi	47	10.4
	Punjabi	23	5.1
	Balochi	10	2.2
	Pashto	173	38.4
	Hindko	29	6.4
	Other languages	16	3.6

Table 1 (continued)

Variable	Category	Frequency n	Percent %
Occupation of the patient	Government employee	33	7.3
	Business/self employee	38	8.4
	Freelancing	17	3.8
	Unemployed	70	15.6
	Housewife	292	64.9
Social income group	Low Income Group (1000–25000 Rs)	315	70
	Middle Income Group (26000–75000 Rs)	131	29.1
	High Income (more than 75000 Rs)	4	0.9
Current living situation of patient	Living alone	61	13.6
	Living with family	389	86.4
Health cost coverage of patient	Out of Pocket Spending OPPS	348	77.3
	Health Insurance	16	3.6
	NGO Non-Governmental Organisation	86	19.1
Expected distance from healthcare facility to home	1–5 km	239	53.1
	6–10 km	144	32
	10–15 km	50	11.1
	More than 15 km	17	3.8
What method patient use when traveling to healthcare facility	Walking to the clinic	181	40.2
	Driving personal vehicle (Bike/Car)	55	12.2
	Public transport (Rickshaw/Taxi/Bus)	214	47.6
Expected amount that is utilize per visit for physical check-up at healthcare facility	500–1000 Rs	290	64.4
	1000–2000 Rs	130	28.9
	2000–3000 Rs	24	5.3
	More than 3000 Rs	6	1.3
Duration of disease	< 5 years (Less than 5 years)	358	79.6
	≥ 5 years (More than 5 years)	92	20.4
How many follow-ups are done for the chronic condition	Monthly	89	19.8
	Once every 2 months	111	24.7
	Once every 3 months (Quarterly)	111	24.7
	Semi-annually/once in 6 months	89	19.8
	Annually/once in 12 months	50	11.1
What is the duration of the patient's waiting time to receive a physical checkup at the hospital	1–2 h	264	58.7
	2–4 h	153	34
	More than 4 h	33	7.3

Table 1 (continued)

Variable	Category	Frequency n	Percent %
Admission history to the hospital within 6 months	No	302	67.1
	Yes	148	32.9
Dose the patient know, how to use mobile phone and internet	No	270	60
	Yes	180	40
Previously if patient have use any telemedicine services online or visited any E-health centers	No	242	53.8
	Yes	208	46.2
Knowledge of telemedicine tools, how it works	Mobile Apps	60	13.3
	Video & Audio calls	46	10.2
	E-health application of Sehat Kahani	319	70.9
	Don't know	25	5.6

Table 2 Perception towards telemedicine in patients with chronic disease

Perception statements	Level of response, n (%)					
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Mean (SD)
Tele medical services should be made part of chronic patient care	195 (43.3)	190 (42.2)	60 (13.3)	3 (0.7)	2 (0.4)	4.27 (0.74)
Providing a telemedicine service helps faster medical care	189 (42)	180 (40)	64 (14.2)	15 (3.3)	2 (0.4)	4.20 (0.83)
Providing telemedicine is important for medical care to remote and underserved areas of healthcare	167 (37.1)	192 (42.7)	79 (17.6)	11 (2.4)	1 (0.2)	4.14 (0.80)
Providing a telemedicine service saves effort	146 (32.4)	187 (41.6)	99 (22)	15 (3.3)	3 (0.7)	4.02 (0.86)
Providing a telemedicine service saves money	132 (29.3)	201 (44.7)	105 (23.3)	9 (2)	3 (0.7)	4 (0.81)
Providing a telemedicine service saves transportation cost	137 (30.4)	193 (42.9)	94 (20.9)	25 (5.6)	1 (0.2)	3.98 (0.87)
Providing a telemedicine service reduces waiting lists in medical centers	139 (30.9)	196 (43.6)	96 (21.3)	17 (3.8)	2 (0.4)	4.01 (0.84)
Providing a telemedicine service can improve communication between patients and their doctor or nurse	131 (29.1)	206 (45.8)	93 (20.7)	17 (3.8)	3 (0.7)	3.99 (0.84)
Providing a telemedicine, service can help in providing appropriate instructions in emergencies	138 (30.7)	212 (47.1)	86 (19.1)	11 (2.4)	3 (0.7)	4.05 (0.80)
Using Sehat Kahani solution to access health services offers greater security	143 (31.8)	237 (52.7)	65 (14.4)	5 (1.1)	0	4.15 (0.69)
Easy to provide medical information on Sehat Kahani healthcare solution	125 (27.8)	233 (51.8)	78 (17.3)	11 (2.4)	3 (0.7)	4.04 (0.78)
Using Sehat Kahani healthcare solution to access healthcare is convenient	115 (25.6)	218 (48.4)	101 (22.4)	10 (2.2)	6 (1.3)	3.95 (0.82)
Is utilizing the Sehat Kahani healthcare solution is suitable for consulting physicians and specialists	123 (27.3)	238 (52.9)	76 (16.9)	12 (2.7)	1 (0.2)	4.04 (0.75)
Sehat Kahani healthcare solution makes appointments much easier to see physicians directly through telemedicine app/ e-health centers	130 (28.9)	238 (52.9)	69 (15.3)	11 (2.4)	2 (0.4)	4.07 (0.75)
The Sehat Kahani app and nurse-assisted clinics are making reliable medical care readily accessible to a wider audience	120 (26.7)	227 (50.4)	92 (20.4)	10 (2.2)	1 (0.2)	4.01 (0.76)
Overall mean (± SD) of the respondents						4.06 (0.08)

Table 3 Comparison of patient's demographic characteristics with telemedicine practice

Characteristics	Category	Perceived willingness		P value
		Low (n = 149)	High (n = 301)	
Type of chronic disease diagnosed	Cardiovascular Disease	22 (14.8)	58 (19.3)	0.001*
	Endocrine Disease	26 (17.4)	85 (28.2)	
	Respiratory Disease	23 (15.4)	64 (21.3)	
	Mental Health Disease	13 (8.7)	21 (7)	
	Reproductive Disease	65 (43.6)	73 (24.3)	
Gender of patient	Female	118 (79.2)	216 (71.8)	0.09
	Male	31 (20.8)	85 (28.2)	
Age categories of the patients	18–28 age group	26 (17.4)	46 (15.3)	0.273
	29–39 age group	57 (38.3)	99 (32.9)	
	40–50 age group	49 (32.9)	95 (31.6)	
	51–60 age group	9 (6)	33 (11)	
	61–70 age group	7 (4.7)	20 (6.6)	
	70 + age group	1 (0.7)	8 (2.7)	
Residence of patient	Urban	54 (36.2)	96 (31.9)	0.357
	Rural	95 (63.8)	205 (68.1)	
Marital status of patient	Single	13 (8.7)	26 (8.6)	0.659
	Married	129 (86.6)	252 (83.7)	
	Divorced	2 (1.3)	9 (3)	
	Widowed	5 (3.4)	14 (4.7)	
Education of patient	No Formal Education	94 (63.1)	97 (32.2)	0.001*
	Primary Education Class (1–5)	30 (20.1)	102 (33.9)	
	Secondary Education Class (7–12)	21 (14.1)	91 (30.2)	
	Tertiary Education (Bachelors, Masters, PhD)	4 (2.7)	11 (3.7)	
Language spoken by the patient	Urdu	49 (32.9)	100 (33.2)	0.08
	English	1 (0.7)	2 (0.7)	
	Sindhi	19 (12.8)	28 (9.3)	
	Punjabi	5 (3.4)	18 (6)	
	Balochi	0 (0)	10 (3.3)	
	Pashto	65 (43.6)	108 (35.9)	
	Hindko	8 (5.4)	21 (7)	
	Other languages	2 (1.3)	14 (4.7)	

Table 3 (continued)

Characteristics	Category	Perceived willingness		P value
		Low (n = 149)	High (n = 301)	
Occupation of the patient	Government employee	8 (5.4)	25 (8.3)	0.01*
	Business/self employee	7 (4.7)	31 (10.3)	
	Freelancing	4 (2.7)	13 (4.3)	
	Unemployed	17 (11.4)	53 (17.6)	
	Housewife	113 (75.8)	179 (59.5)	
Social Income Group	Low Income Group (1000–25000 Rs)	127 (85.2)	188 (62.5)	0.001*
	Middle Income Group (26000–75000 Rs)	21 (14.1)	110 (36.5)	
	High Income (more than 75000 Rs)	1 (0.7)	3 (1)	
Health cost coverage of patient	Out of Pocket Spending OPPS	130 (87.2)	218 (72.4)	0.001*
	Health Insurance	5 (3.4)	11 (3.7)	
	NGO Non-Governmental Organisation	14 (9.4)	72 (23.9)	
Current living situation of patient	Living alone	19 (12.8)	42 (14)	0.726
	Living with family	130 (87.2)	259 (86)	
What method patient use when traveling to healthcare facility	Walking to the clinic	61 (40.9)	120 (39.9)	0.429
	Driving personal vehicle (Bike/Car)	14 (9.4)	41 (13.6)	
	Public transport (Rickshaw/Taxi/Bus)	74 (49.7)	140 (46.5)	
Expected distance from healthcare facility to home	1–5 km	86 (57.7)	153 (50.8)	0.008*
	6–10 km	53 (35.6)	91 (30.2)	
	10–15 km	7 (4.7)	43 (14.3)	
	More than 15 km	3 (2)	14 (4.7)	
Expected amount that is utilize per visit for physical check-up at healthcare facility	500–1000 Rs	111 (74.5)	179 (59.5)	0.009*
	1000–2000 Rs	33 (22.1)	97 (32.2)	
	2000–3000 Rs	3 (2)	21 (7)	
	More than 3000 Rs	2 (1.3)	4 (1.3)	
Dose the patient know, how to use mobile phone and internet	No	116 (77.9)	154 (51.2)	0.001*
	Yes	33 (22.1)	147 (48.8)	
Previously if patient have use any telemedicine services online or visited any E-health centers	No	109 (73.2)	133 (44.2)	0.001*
	Yes	40 (26.8)	168 (55.8)	
Knowledge of telemedicine tools, how it works	Mobile Apps	19 (12.8)	41 (13.6)	0.001*
	Video & audio calls	10 (6.7)	36 (12)	
	E-health Nurse assisted centers	101 (67.8)	218 (72.4)	
	Don't know	19 (12.8)	6 (2)	
Duration of disease	< 5 years (less than 5 years)	121 (81.2)	237 (78.7)	0.541
	≥ 5 years (more than 5 years)	28 (18.8)	64 (21.3)	

Table 3 (continued)

Characteristics	Category	Perceived willingness		P value
		Low (n = 149)	High (n = 301)	
Admission history to the hospital within 6 months	No	113 (75.8)	189 (62.8)	0.006*
	Yes	36 (24.2)	112 (37.2)	
What is the duration of the patient's waiting time to receive a physical checkup at the hospital	1–2 h	94 (63.1)	170 (56.5)	0.315
	2–4 h	47 (31.5)	106 (35.2)	
	More than 4 h	8 (5.4)	25 (8.3)	
How many follow-ups are done for the chronic condition	Monthly	18 (12.1)	71 (23.6)	0.001*
	Once every 2 months	25 (16.8)	86 (28.6)	
	Once every 3 months (Quarterly)	38 (25.5)	73 (24.3)	
	Semi-annually/once in 6 months	42 (28.2)	47 (15.6)	
	Annually/once in 12 months	26 (17.4)	24 (8)	

*In this table, the p-value is drawn using the Chi-square test

Table 4 Multivariate logistic regression analysis of Telemedicine practice with important risk factors

Variables	Perceived willingness	
	Multivariate	
	AOR [95%CI]	P value
Duration of disease		
< 5 years (Less than 5 years)	Ref	
≥ 5 years (More than 5 years)	1.118 [0.593, 2.107]	0.731
Socio-demographics		
Age of the patient		
18–39 years	Ref	
40–64 years	1.236 [0.746, 2.047]	0.410
≥ 65 years	1.666 [0.557, 4.983]	0.361
Gender of the patient		
Female	Ref	
Male	0.849 [0.462, 1.560]	0.597
Education Status of the patient		
No Formal Education	Ref	
Primary and Above	2.301 [1.380, 3.837]	0.001*
Social Income Group		
< 25 k	Ref	
≥ 25 k	1.928 [1.007, 3.690]	0.047*
Health cost coverage of patient		
Out of Pocket Spending	Ref	
Health Insurance and Others	2.315 [1.200, 4.467]	0.012*
Expected distance from healthcare facility to home		
1–5 km	Ref	
6–10 km	0.535 [0.302, 0.950]	0.033*
10–15 km	2.338 [0.892, 6.129]	0.084
More than 15 km	4.802 [0.949, 24.290]	0.058
How many follow-ups are done for the chronic condition		
Monthly	Ref	
Once every 2 months	1.175 [0.535, 2.584]	0.688
Once every 3 months (quarterly)	0.564 [0.261, 1.219]	0.145
Semi-annually/once in 6 months	0.338 [0.151, 0.756]	0.008*
Annually/once in 12 months	0.953[0.347, 2.619]	0.926
Expected amount that is utilize per visit for physical check-up at healthcare facility		
500–1000 Rs	Ref	
1000–2000 Rs	1.317 [0.729,2.379]	0.362
2000–3000 Rs	1.643 [0.397, 6.805]	0.493
More than 3000 Rs	0.551 [0.055, 5.486]	0.611
Knowledge of Telemedicine		
Dose the patient know, how to use mobile phone and internet		
No	Ref	
Yes	1.77[0.941, 3.329]]	0.077
Previously if patient have use any telemedicine services online or visited any E-health centers		
No	Ref	
Yes	1.879 [1.075, 3.287]	0.027*
Knowledge of telemedicine tools, how it works		
Mobile Apps	Ref	
Video and Audio calls	1.740 [0.643, 4.709]	0.276
E-health Nurse assisted centers	1.959 [0.920, 4.170]	0.081
Don't know	0.467 [0.117, 1.863]	0.28

*In this table, the p-value is drawn using the Multivariate logistic regression

7 Discussion

This study investigated the perception, willingness, and utilization of telemedicine services among chronic illness patients in Pakistan. The findings revealed a generally favorable impression of telemedicine and a strong willingness to use these services. The study participants exhibited a distinct demographic profile. The majority of participants (74.2%) were female, with a high proportion being married (84.7%) and falling between the age range of 29–50 (66.7%). A significant proportion of the participant population, specifically 66.7%, lived in rural areas further analysis shows socioeconomic characteristics demonstrated a distinct pattern, as 70% of the participants were classed as low-income, and only 24.9% had achieved secondary education. Notably, a significant focus on family life was seen, with 86.4% of participants indicating that they are living in joint family environments. These findings show similarities with a study carried out in Bangladesh, where the majority of participants were also female (53%), married (87.2%), and lived in rural regions (46.2%). Nevertheless, the population of the study conducted in Bangladesh exhibited a greater degree of educational achievement (with at least ten years of schooling for 53% of participants) and a somewhat lower occurrence of residing in family environments (35.4%) [16].

The overall perception of telemedicine in the current study is a mean score ± (SD) 4.06 ± (0.08) which is higher than the study done in Ethiopia's mean score ± (SD) 3.92 ± (1.06) [15]. A significant portion of participants expressed positive views towards telemedicine, exceeding the results of a similar study conducted in Ethiopia [15]. The results also align with studies conducted in Saudi Arabia [17] and Bangladesh [16], which also reported positive patient attitudes towards telemedicine. In the present study, most of the participants (301, 66.8%) expressed their readiness to engage in telemedicine practices. Similarly, a study done in Ethiopia reported that a majority of participants (242, 63.3%) indicated a willingness to participate in telemedicine practices [15].

The study found substantial associations between the use of telemedicine and several characteristics, a study conducted in Bangladesh [16] found a notable association with years of education ($p = 0.047$), our analysis revealed a more robust association ($p = 0.001$). In the same way, a study conducted in Ethiopia [15] found significant associations between the usage of telemedicine and owning a smartphone ($p = 0.001$), having health coverage ($p = 0.007$), and the frequency of follow-up appointments ($p < 0.001$). Notably, our study found even stronger significant associations for all these factors ($p = 0.001$). The results indicate a stronger impact of these characteristics on the use of telemedicine among the participants in our study.

Through multivariate logistic regression analysis, several demographic and health-related characteristics were identified as significant predictors of telemedicine utilization, in comparison to a study conducted in Saudi Arabia [18], the analysis revealed that individuals with higher education levels (OR = 5.87, 95% CI = 2.761–8.235), ($p = < 0.0001$) were more likely to accept telemedicine. A study conducted in Hong Kong [19] also found that private medical insurance coverage (OR = 2.284 CI = 0.784–6.652) ($p = 0.130$) influenced telemedicine acceptance after the coronavirus disease 2019. Similarly, a study conducted in Bangladesh [16] indicated that individuals with a monthly income > USD 116.58 (OR = 0.51, CI = 0.33–0.78) ($p = 0.002$) were less likely to use telemedicine. These findings align with the results of the current study, which found that primary and above education (OR = 2.301, CI = 1.380–3.837), ($p = 0.001$), social income group of ≥ 25 k (OR = 1.928, CI = 1.007–3.690, ($p = 0.047$), and health cost coverage through health insurance and others (OR = 2.315, CI = 1.200–4.467, ($p = 0.012$) were strongly correlated with telemedicine use.

The positive perception and willingness to use telemedicine, particularly among rural populations, underscore its potential to bridge geographic gaps in healthcare access. Future research should explore the long-term impact of telemedicine on patient outcomes, cost-effectiveness, and quality of care. By addressing these implications, we can harness the power of telemedicine to improve healthcare delivery and patient satisfaction in Pakistan.

8 Conclusion

This study investigated the patient's perspectives, readiness, and usage of telemedicine services for chronic diseases in Pakistan. The findings indicated a predominantly positive perception of telemedicine and a significant desire to utilize these services. A substantial number of participants shown a distinct willingness to participate in telemedicine, surpassing comparable research conducted in other locations. The study also discovered many parameters

that regularly appeared as robust markers of telemedicine utilization among this specific group of patients. These factors, including education level, socioeconomic status, health insurance coverage, and frequency of follow-up appointments, appeared to have an even more stronger impact on telemedicine adoption compared to findings from previous research. The findings indicate that telemedicine has the capacity to greatly enhance the treatment of chronic diseases and the delivery of patient care in Pakistan.

9 Limitations

- The study specifically examined individuals' opinions of a single telemedicine platform, Sehat Kahani. This restricts the potential to apply the findings to other telemedicine systems that may possess distinct functionalities or user interfaces. Subsequent studies should investigate the perspectives and experiences related to a broader spectrum of telemedicine platforms utilized in Pakistan.
- The study sample had a markedly greater proportion of females than males. The disparity in gender representation could potentially reduce the generalizability of the general perception of patients and their inclination to utilize telemedicine for chronic conditions.

10 Recommendations

- The study emphasizes the favorable perceptions and readiness to employ telemedicine services among chronic disease patients in Pakistan. Policymakers and healthcare practitioners should take these findings into account when creating and executing telemedicine programs to enhance healthcare accessibility, especially in remote regions.
- Telemedicine use was significantly predicted by socioeconomic criteria such as education level, social income category, and health insurance coverage. To provide equal access to telemedicine for all patients, it may be required to implement measures such as providing digital literacy training and offering subsidized health insurance coverage to address these gaps.

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Author contribution IA developed the study's framework and methodology. Data was gathered and organized by MM, HGH, YY and MK. SH and MM did the analysis and interpretation. The manuscript was initially drafted by IA, MK and finished by MM. The manuscript was edited for clarity and accuracy by SSK. All authors have critically reviewed and approved the final draft.

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Data availability No the data that support the findings of this study, is not available as restrictions apply to the availability of this data, for the current study and so is not publicly available. The data is, however, available from the authors upon reasonable request and with the permission of Sehat Kahani C/O Community Innovation Hub.

Declarations

Ethics approval and consent to participate The protocol was approved by "Sehat Kahani C/O Community Innovation Hub" in accordance with the Deceleration of Helsinki with the approval number IRB-0022/CIH/2024.

Consent for publication Patients who use the Sehat Kahani E-health platform provide informed consent, which explicitly acknowledges the potential use of anonymized data for commercial purposes and publications that promote the telemedicine approach to healthcare access. This transparent method safeguards patient privacy while allowing the study to contribute to the improvement of telemedicine in health care delivery.

Competing interests The authors declare no competing interests.

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