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Exploring medical students' perceptions of telehealth in Pakistan: a cross-sectional study

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Abstract

Introduction This study aimed to investigate medical students' perceptions of telehealth in Pakistan and assess the relationship between students' proficiency in computers and technology, gender, and age.

Methods A cross-sectional study was conducted on 330 medical students from various universities in Karachi, Pakistan. Data on demographic characteristics, computer proficiency, and perceptions of telehealth were collected using a self-administered questionnaire. Descriptive statistics, chi-square tests, and Spearman's rank correlation coefficient were utilized for data analysis.

Results The study included 330 participants, predominantly from public universities (83.3%), with a mean age of 21.40 ± 4.24 years. Most participants were pursuing MBBS (67%). In terms of computer proficiency, 41.8% fell into the middle category. Gender correlated significantly with proficiency ($p < 0.05$), with females more often in the middle category and males in the not-that-amateur category. Age demonstrated a small positive correlation with proficiency ($p < 0.05$). A majority (77.6%) expressed a general interest in technology. Regarding healthcare apps, 51.8% had 1–3 apps, and 33.6% had none. Most participants believed telehealth would enhance healthcare (72.1%) and make it cheaper (63.3%). Additionally, 56.7% agreed that Pakistan should invest in telehealth, while only 2.7% disagreed.

Conclusion The study revealed that medical students in Pakistan exhibit an interest in technology and perceive telehealth as beneficial. These findings suggest that telehealth holds the potential to enhance healthcare opportunities in Pakistan. Therefore, investing in and expanding telehealth services may represent a viable solution for improving access to healthcare in the country.

Keywords Computer proficiency, Telehealth, Medical students

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Introduction

Advancements in Information Technology (IT) have led to significant progress in healthcare systems. These developments have the potential to revolutionize the field. However, the healthcare sector has not fully utilized the benefits of IT, lagging behind other industries in harnessing its potential [1, 2]. Telehealth refers to the use of telecommunications technologies and strategies to deliver healthcare services, health education, and health information remotely, emerging as a crucial component in healthcare delivery by leveraging smartphones, email, video conferencing, and more. These tools have proven particularly valuable in addressing healthcare challenges in rural areas providing healthcare from a distance [3, 4].

Telehealth emerged as a solution to various healthcare delivery challenges during the pandemic, ensuring continuous treatment while minimizing exposure to COVID-19 complications. It became an essential service for the general population and healthcare providers, particularly for quarantined individuals [5]. The demand for telemedicine experienced a substantial surge due to social distancing measures, lockdowns, increased healthcare workload, and shortages of healthcare professionals. A study in the United States reported a remarkable 683% increase in telemedicine cases, accompanied by a significant decrease in in-person visits during the same period [6].

According to the World Bank, approximately 63% of Pakistan's population resides in rural areas, with the remaining 37% located in urban areas [7]. The demographic distribution in Pakistan emphasizes the importance of healthcare initiatives, such as telehealth services, that address the unique needs and challenges of both rural and urban populations. The scarcity of medical professionals in peri-urban and rural regions of Pakistan is a consequence of the disproportion between healthcare service supply and demand, which is further aggravated by rapid population growth and an unorganized healthcare system. Telehealth has emerged as a viable solution to confront this issue by enabling individuals in rural areas to connect with general practitioners and specialists situated in urban areas, thereby eliminating the need for expensive and time-consuming travel [8]. The utilization of telehealth services in Pakistan has experienced notable growth in recent years. Digital health-based interventions, including mHealth, eHealth, telehealth, and telemedicine, are being gradually integrated into the country's existing healthcare infrastructure [9].

Telemedicine, although gaining global recognition, remains poorly understood in developing countries. However, by effectively integrating this technology into healthcare systems can help overcome challenges, and access to quality and affordable healthcare services can be enhanced [1]. The implementation of telehealth has the potential to improve patient-physician interaction, expand treatment accessibility, facilitate timely interventions for better health outcomes, and reduce costs when integrated with longitudinal care [10].

The healthcare sector in Pakistan faces numerous challenges when it comes to providing services to remote and rural areas. These challenges include an inadequate allocation of doctors and specialists, limited telecommunications infrastructure, and insufficient road and transportation systems. Furthermore, like any other developing country, Pakistan has limited awareness, internet connectivity, and technological proficiency, leading to restricted access to healthcare services. Moreover, the lack of knowledge and expertise among healthcare professionals acts as a barrier to the widespread adoption of telemedicine, particularly in remote and rural areas [11].

Telehealth is a vital aspect of modern healthcare and evaluating the perception of medical students toward it is essential in understanding how future healthcare professionals are embracing new technological advancements in the field [12].

This cross-sectional aim to assess the knowledge of telehealth among students of indifferent medical universities in Karachi and explore their perceptions of its benefits, drawbacks, applications, and barriers to adoption. They are also contributing to the existing literature on telehealth acceptance in Pakistan, considering the accelerated adoption of telehealth during the COVID-19 pandemic.

Methods

Study design

A descriptive cross-sectional study was conducted among medical students in Karachi from different medical universities to assess medical students' perceptions and knowledge of telehealth in Karachi, Pakistan. The study was conducted over a period of six months, from January to June 2023, providing a temporal context for the data collection. The study population consisted of medical students enrolled in medical universities in Karachi, while the study primarily targeted medical students, a small percentage of responses were from students in allied health fields, which were included to provide a broader perspective on telehealth perceptions. The study was conducted in Karachi due to its diverse population, having major hospitals of the country and being a major center for medical education in Pakistan. The city's unique healthcare landscape and the availability of a large number of medical students made it an ideal location for this study. A self-administered questionnaire was developed based on previous literature and was subjected to a reliability analysis using Cronbach's alpha, which yielded a value of 0.85, indicating good internal consistency [13].

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The survey was limited to medical students aged 18 to 30 years old as they are the future of the healthcare system, therefore, to assess and educate medical students regarding telehealth to form a future workforce well trained in using telehealth. The age range of 18–30 years was selected to encompass the typical age range of medical students in Pakistan. This range ensures that the participants are within the expected demographic of individuals currently enrolled in medical programs and likely to use telehealth services in their future careers.

Inclusion criteria were (1) being enrolled in a medical school in Karachi and (2) being aged between 18 and 30. Exclusion criteria were (1) non-medical students and (2) students under 18 or above 30.

Data collection

Data was collected using Google Forms, which were distributed via WhatsApp. The questionnaire was made by the authors with the help of different studies. A pilot study was conducted with 30 medical students to test the questionnaire's clarity and reliability. Feedback from the pilot study led to minor adjustments in wording and question format to enhance comprehension and response accuracy. The understanding of telehealth was asked both through open-ended and multiple-choice questions. The survey consisted of four sections with a total of 34 questions. The first section collected demographic information such as gender, age, university, year of study, and field of interest. The second section included questions related to internet and computer usage, interest in technology, and the use of technology for health purposes. The third section aimed to assess participants' awareness and knowledge of telehealth, while the fourth section focused on participants' perceptions of telehealth, including its usage in various fields, its advantages and disadvantages, and the acceptance of telehealth by individuals in Pakistan.

Statistical analysis

Descriptive statistics such as frequencies, percentages, means, and standard deviations were calculated for all variables. Inferential statistics, including Spearman's rank correlation and chi-square test, were used to determine the relationship between various demographic and health-related variables. Spearman's rank correlation was used to assess the relationship between continuous variables due to the non-parametric nature of the data, while chi-square tests were employed to examine associations between categorical variables. These statistical tests were chosen to align with the data structure and research objectives. All statistical analyses were performed using IBM SPSS version 24, and *P* values < 0.05 were considered statistically significant.

A statistician was consulted to verify the appropriateness of the statistical methods used. Advanced techniques were considered but determined unnecessary given the study design and data characteristics.

Ethical approval

The study was approved by the Ethical Review Committee of Ziauddin University with protocol reference # 0300124HFM4. For multi-center studies, we ensured that the ethical standards were uniform across all participating institutions, although formal IRB approvals from each center were not individually taken. Informed consent was obtained from all participants after they were provided with a detailed explanation of the study's purpose, their right to withdraw at any time, and assurances that their data would be kept confidential and used solely for research purposes.

Results

Demographic

A total of 348 individuals responded to the study, but only 330 responses were considered. Eighteen out of 348 participants did not fill the form completely and therefore were excluded from the study. The respondents were medical students from various universities in Karachi, with Dow University of Health Sciences having the largest representation (133, 40.3%). Among the respondents, the majority were female (246, 74.5%), and the most common age range was 20–23 years (21.40 ± 4.24). The highest number of respondents attended public universities (275, 83.3%) and were in their fifth year of medical school (80, 24.2%) studying MBBS 221(67%). Details can be found in Table 1. In terms of educational background, the majority of respondents attended public universities (83.3%) and pursued the MBBS program (221, 67%). The fifth year was the most common academic year (80, 24.2%), with the majority (151, 45.8%) having an annual professional exam score of < 60%. Moreover, the majority (323, 97.9%) had daily access to the Internet (Table 1).

Computer and technology proficiency

As far as proficiency in computers and technology, most participants (256, 77.6%) were interested in technology in general, and 219 (72.3%) reported having at least one healthcare-related app on their phones. The majority of respondents (223, 67.6%) in the study demonstrated middle to expert proficiency in computers and technology. Age was found to be positively correlated with proficiency in computers and technology (r(328) = 0.171, p = 0.002). However, there was no significant relationship between proficiency in computers and technology and attending a public or private university. Computer usage of the respondents was majorly for education (220. 66.7%), followed by entertainment (82, 24.8%) (Table 2).

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Table 1 Participants demographic data

Variable	Results
Age (Mean ± SD)	21.40+-4.24
Gender n (%)	
Female	246 (74.5)
Male	84 (25.5)
University n (%)	
Baqai Medical University	1 (0.3)
Dow University of Health Sciences	133 (40.3)
Fatima Jinnah Dental College	2 (0.6)
Hamdard University	39 (11.8)
Jinnah Sindh Medical University	132 (40.0)
Karachi University	10 (3.0)
Liaquat National Hospital and Medical College	1 (0.3)
National Institutes of Child Health	2 (0.6)
People University	1 (0.3)
Ziauddin University	6 (1.8)
Federal Urdu university	1 (0.3)
HITEC Institute of Medical Sciences	2 (0.6)
Is your university public or private? n (%)	
Private	55 (16.7)
Public	275 (83.3)
Program of Study n (%)	
MBBS	221 (67.0)
BDS	33 (10.0)
Other:	76 (23.0)
Academic Year n (%)	
First-year	77 (23.3)
Second-year	77 (23.3)
Third-year	50 (15.2)
Fourth-year	46 (13.9)
Fifth-year	80 (24.2)
What is your annual professional exam score? n(%)	
> 80%	98 (29.7)
< 60%	151 (45.8)
60–70%	73 (22.1)
70–80%	8 (2.4)

Table 2 Computer and technology proficiency data

Variable	Results
Do you have daily access to the internet?	
No	6 (1.8)
Yes	323 (97.9)
What is your use of a computer?	
No Computer	1 (.3)
Entertainment (games, music, ... etc.)	82 (24.8)
Educational (articles, videos, study groups, events ... etc.)	220 (66.7)
Software (graphic designing, coding, animation ... etc.)	6 (1.8)
All of them	4 (1.2)
Entertainment and Educational	17 (5.2)
What is your proficiency in computers and technology?	
Amateur	37 (11.2)
Not that Amateur	70 (21.2)
Middle	138 (41.8)
Not that Expert	67 (20.3)
Expert	18 (5.5)
Are you interested in technology in general?	
No	74 (22.4)
Yes	256 (77.6)
How many healthcare-related applications or "apps" do you have on your phone?	
0	111 (33.6)
1–3	171 (51.8)
3–5	36 (10.9)
more than 5	12 (9.6)

Perception of telehealth in Karachi

Perception of telehealth in Karachi is positive. The study showed that 150 (45.4%) respondents had good knowledge of telemedicine, and the majority (288, 87.3%) participants thought that patients in Pakistan would accept telehealth. Out of a total of 330 medical students, 238 (72.5%) think that telehealth will provide better healthcare opportunities, and 275 (83.3%) respondents agreed and strongly agreed Pakistan should invest and expand in telehealth. 238 (72.1%) and 209 (63.3%) of the respondents think that telehealth will provide better and cheaper healthcare opportunities, respectively. There is no significant relation between attitudes to telehealth and gender. ($p=0.694$). Regarding the association between telehealth and various demographic and academic variables, no statistically significant associations were found (Table 3).

Other findings

77.1% of participants preferred virtual over face-to-face communication with patients and fellow health workers. No significant associations were found between virtual communication and various demographic and academic variables.

Spearman's rank correlation showed a statistically significant, small positive correlation between age and access to healthcare information via smartphone or computer, $r(328)=0.105$, $p=0.055$. A moderate association was found between academic year and previous knowledge about telehealth, $x2(2)=27.4$, $p<0.001$, with a moderate effect size (Cramer's V=0.288). A moderate association was also found between public/private universities and awareness about telehealth organizations/companies in Pakistan, $x2(2)=6.77$, $p<0.03$, with a moderate effect size (Cramer's V=0.143), as well as between public/private university and awareness about telehealth organizations/companies teaching telehealth in Pakistan, $x2(2)=6.68$, $p<0.03$, with a moderate effect size (Cramer's V=0.142).

Discussion

In our study, we found 98% of medical students had access to the Internet, and the majority of them used it for education or entertainment (97%). Table 2 shows that access to the internet and the ability to use it provides a

Table 3 Perception of telehealth in Karachi data

Variable	Results
Do you think the patients in Pakistan will accept telehealth?	
No	19(5.8)
Yes	133 (40.3)
Somewhat	155 (47.0)
Do not know	22 (6.7)
Do you think that Pakistan should invest and expand in telehealth?	
Strongly Agree	88 (26.7)
Agree	187 (56.7)
Do not know	44 (13.3)
Disagree	9 (2.7)
Strongly Disagree	2 (0.6)
Do you think telehealth is beneficial?	
No	11 (3.3)
Yes	193 (58.5)
Somewhat	104 (31.5)
Do not know	22 (6.7)
Do you think telehealth will provide better healthcare opportunities?	
No	26 (7.9)
Yes	238 (72.1)
Don't know	64 (19.4)
Do you think telehealth will provide cheaper healthcare opportunities?	
No	42 (12.7)
Yes	209 (63.3)
Don't know	79 (23.9)

big future for telemedicine, and more opportunities will open up for these future doctors.

However, to make it more helpful, healthcare students should have a favorable attitude towards this technology and should be ready to be computer-friendly. Our study showed that medical students do have a positive view of the telemedicine concept. It showed that (45.4%) of respondents had good knowledge of telemedicine, and (72.3%) reported having at least one healthcare-related app on their phone. Our study showed since COVID-19; there has been an increase in knowledge regarding telehealth as a previous study conducted in 2020 in India showed that 18.9% of students were aware of telemedicine and 15.7% were aware of telemedicine-related applications; another study was done in India, among 120 professionals in a tertiary hospital has also shown the same results, where it was discovered that 59% had insufficient knowledge of telemedicine [14]. A study done in northern Iran among health professionals found that most of their study participants (96.1%) had inadequate knowledge about telemedicine [15]. This has changed as the COVID-19 pandemic situation in the country has shown the importance of telemedicine, which has led to more telemedicine adoptions, webinars, and online training being held and telemedicine guidelines being

issued. This is also reflected in our study result that more students (83.3%) perceived that telemedicine implementations need more expansion and investment in the country.

The majority of the students, 56%, agreed that Pakistan can use telemedicine solutions effectively. (63.3%) also believed that telemedicine can help healthcare providers save time and money by offering services. Other studies had similar positive perspectives, with Malhotra et al. having 80% of students and Dey et al. having 60% [16]. Other studies also had very similar thoughts on the cost-effectiveness of telemedicine [17]. Telemedicine can save patients time and money by reducing the need to go back to the hospital for follow-up visits, travel long distances to access healthcare services, or wait for doctors who are not available [18]. This may explain why students who are studying to become doctors and administrators have a positive attitude toward telemedicine. They may anticipate using it themselves or in their organizations and benefiting from it.

In our survey, 87.3% of candidates believe that Pakistan will somewhat or surely accept telemedicine in the future, and 90% share the same perspective regarding the future benefits of telemedicine. In another study, despite their lack of awareness about telemedicine, most of the participants (84.3%) were ready to use and pay for this service. This result agrees with a study of 150 postgraduate students from tertiary hospitals in Malhotra et al., who said that 76% of them would pay for telemedicine [16]. According to Albarrak et al., among 391 Saudi medical students, 95% of them wanted to adopt this technology and use it to consult with bigger institutions [2].

Our study revealed that a significant proportion of medical students (98%) have access to the Internet. The data also reveal that a majority of the medical students surveyed (97%) use the Internet for educational and entertainment purposes. This indicates that they are comfortable with technology and likely have the skills and familiarity needed to adapt to telemedicine practices. With such a high level of Internet usage for educational purposes, these students may already be exposed to online medical resources and platforms that can enhance their knowledge and understanding of telemedicine.

A study in Nigeria found that a considerable percentage of the surveyed students (54.2%) expressed support for using telemedicine for routine care. This indicates a positive attitude towards the integration of telemedicine into the healthcare system, potentially reflecting a recognition of its benefits, such as increased accessibility to healthcare services and improved healthcare delivery in remote areas. Moreover, most of the students (85%) believed that telemedicine could be integrated effectively into the existing healthcare system and used to provide services in remote areas [19]. This aligns with similar findings

from Pakistan, suggesting that medical students in both countries share a similar perspective on the potential of telemedicine. This consistency across different regions indicates a growing acceptance and understanding of telemedicine's potential to address healthcare challenges and improve healthcare delivery.

The knowledge of medical students regarding telemedicine in Pakistan has been corroborated by previous studies as well. The study by M Mujtaba et al., conducted during the time of COVID-19 at a prominent tertiary care facility in Karachi, demonstrated the extent of these challenges. Out of 403 participants, only a small percentage (11.2%) were familiar with telehealth technology, and 4.5% had previously used it, while 40.7% of patients lacked access to the internet, and 32.7% did not possess a smart device [20].

The study by Zahid et al. shows only 36% of physicians working in a tertiary hospital in Karachi had prior experience in the field of telemedicine. The study also found that 73% of participants had no knowledge of legal obligations when interacting with patients online, and only 46% were familiar with the technology used in telemedicine applications. Additionally, a mere 42% of the participants were acquainted with telemedicine tools such as virtual stethoscopes and pulse oximeters [21].

According to a survey conducted by S. Kazmi et al., it was found that most medical students from Pakistan (59%) had a reasonable understanding of the concept of telemedicine during the COVID-19 pandemic. However, a minority of participants (37.7%) accurately described the concept. The study revealed that first-year ($p < 0.001$) and second-year ($p = 0.011$) medical students had less awareness of telemedicine compared to other respondents. Furthermore, the scarcity of telehealth-related publications in Pakistan was highlighted, indicating the need for further research, especially among medical students. This could ensure a promising future for the telehealth industry [22].

The adoption of telehealth services has significantly increased due to the COVID-19 pandemic, and it's expected that the demand for these services will continue to rise in the future. This trend is driven by the need to optimize resource utilization, improve medical care effectiveness, encourage patient adherence, and provide patients with time and cost savings [23, 24]. It is crucial to highlight the significance of telemedicine in effectively managing infectious diseases, like coronavirus, during a pandemic while also adhering to social distancing measures [25]. Telemedicine enables the delivery of top-notch medical care while minimizing physical contact. However, setting up telemedicine in developing countries, especially during emergencies, is challenging and constraining [26].

Telemedicine training has been integrated into undergraduate and postgraduate medical education in some parts of the world, such as the USA and France [27–29]. However, most universities in Pakistan have not yet included it in their formal curricula. Although the government has declared telemedicine a core competency, they have not provided clear guidelines on how or when to teach it. Furthermore, telehealth training is often not included in postgraduate programs. This lack of specificity in telemedicine education has resulted in a low percentage of individuals demonstrating adequate knowledge in this area. Telemedicine training should be incorporated into undergraduate medical education as a standard part of the curriculum to address this gap. This training should ensure that almost all medical students possess a solid understanding of telemedicine's various aspects, including its socioeconomic, cultural, legal, and ethical dimensions [30]. Additionally, promoting and adopting telehealth requires a well-trained workforce capable of delivering high-quality care, as emphasized in the study by Thomas et al. [31]. Creating an optimal and integrated system that caters to patients' needs is also crucial, allowing patients to choose telehealth as their preferred option.

Limitations

The survey was conducted using a self-administered electronic questionnaire distributed to medical students in Pakistan via various online platforms. However, there are certain limitations to this approach. Firstly, the use of Google Forms and WhatsApp for survey distribution may introduce a bias towards students who are more technologically savvy. This potential bias is acknowledged, and efforts were made to reach a broad demographic by distributing the survey across various student groups and forums. Additionally, the potential for response bias is acknowledged, particularly due to the self-administered nature of the questionnaire. To mitigate this, anonymity was ensured, and participants were encouraged to provide honest responses by clarifying that there were no right or wrong answers. Secondly, the study sample was limited to medical students in Karachi, which may not be representative of all medical students in Pakistan. This limitation restricts the generalizability of the findings to other regions and medical institutions in the country.

It is essential to acknowledge that findings may vary across different population groups, such as general students versus medical students. Using the results of this survey for a larger population may not be appropriate. Additionally, since the study relied on personal perceptions rather than real-world experience, it may have overestimated positive attitudes towards telemedicine, particularly among participants in a virtual telemedicine course.

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Conclusion

The study highlights the positive perceptions of telehealth among medical students in Karachi, with a significant correlation between computer proficiency and perceived benefits of telehealth. These findings suggest that enhancing telehealth education and resources could facilitate telehealth adoption in Pakistan's future healthcare workforce. Further research involving a more diverse sample and additional regions is recommended to generalize these findings.

Data availability
The data supporting this article's findings are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
The study has been approved by the Ethical Review Committee of Ziauddin University with IRB approval No (0300124HFM4). Informed consent was obtained from all subjects.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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