

TELEPHARMACY IN PAKISTAN: BRIDGING PUBLIC AND PHARMACIST PERCEPTIONS THROUGH A CROSS-SECTIONAL LENS

Original Article

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ABSTRACT

Background: Telepharmacy is the provision of pharmaceutical care services through telecommunication technologies that enable patients in remote or underserved areas to access counseling, drug therapy management, and prescription refills. In Pakistan, particularly in rural regions, telepharmacy remains underutilized due to inadequate infrastructure, limited awareness, and insufficient government support. Strengthening telepharmacy practices can enhance medication safety, improve healthcare access, and optimize patient outcomes.

Objective: The study aimed to assess the knowledge, perceptions, and barriers related to telepharmacy among pharmacy students and registered pharmacists in Sindh, Pakistan.

Methods: A descriptive cross-sectional survey was conducted among 296 participants, including pharmacy students and practicing pharmacists from both urban and rural areas of Sindh. Data were collected using a structured online questionnaire distributed through Google Forms, Facebook, and WhatsApp between March and September 2024. Descriptive statistical analysis was performed to calculate frequencies and percentages of responses, while chi-square tests explored associations between demographic variables and knowledge or attitudes toward telepharmacy.

Results: The majority of respondents (84.5%) recognized the use of telecommunication in telepharmacy, while only 26.4% identified video conferencing as a tool. About 73.9% acknowledged telepharmacy's role in patient counseling and therapy management, and 82.4% agreed that it enhances medication management. However, 44.9% expressed confidentiality concerns, and 52.7% reported increased workload. Major barriers included lack of awareness (83.2%), insufficient software (82.5%), limited government involvement (73.3%), and workforce shortages (81.8%). Female respondents exhibited more positive perceptions than males, while rural participants reported greater infrastructural and connectivity challenges.

Conclusion: Despite limited knowledge, participants demonstrated favorable attitudes toward telepharmacy and willingness to adopt it in future practice. Expanding telepharmacy education, improving digital infrastructure, and ensuring governmental support are essential for successful implementation across Pakistan.

Keywords: Attitude of Health Personnel; Knowledge; Pakistan; Pharmacists; Rural Health Services; Telemedicine; Telepharmacy.

INTRODUCTION

The advancement of digital health technologies has redefined the way healthcare services are delivered, especially in geographically remote or resource-limited settings. Telepharmacy, defined as the provision of pharmaceutical care through electronic communication and information technologies, allows pharmacists to offer services such as patient counselling, medication review, therapy monitoring, and prescription refills without requiring direct physical interaction with patients (1,2). In addition, automated packaging and labelling systems in remote medicine dispensing have become recognized forms of telepharmacy practice (3,4). These innovations have been particularly valuable during health crises, such as pandemics or natural disasters, when conventional in-person consultations become difficult or unsafe. Globally, healthcare systems are increasingly shifting toward patient-centered frameworks that aim to optimize available resources through multidisciplinary collaboration (5). Achieving such integration requires the inclusion of pharmacists as essential members of healthcare teams, given their expertise in drug therapy management and their role in ensuring medication safety and effectiveness (6,7). Recognizing this, policy frameworks should establish funding and regulatory mechanisms that acknowledge pharmacists' competencies and support the implementation of telepharmacy within existing healthcare systems (8). This becomes especially crucial for countries like Pakistan, where rural and underserved areas face persistent shortages of healthcare professionals. In such regions, deploying telepharmacy can bridge the gap in access to pharmaceutical care, providing remote communities with consistent, cost-effective, and quality services (9–11).

Telepharmacy enhances healthcare accessibility by extending the reach of qualified pharmacists to populations traditionally excluded from consistent pharmaceutical care (12). By enabling real-time consultations and follow-up, it improves medication adherence, reduces treatment delays, and promotes rational drug use (13). Furthermore, it can help healthcare institutions minimize operational costs by allowing pharmacists to serve multiple facilities remotely, ensuring optimal workforce utilization. However, challenges remain—reduced face-to-face interaction may affect patient-pharmacist rapport, and the absence of on-site professionals can increase the likelihood of dispensing errors (14,15). Data confidentiality is another critical concern, as telepharmacy involves the electronic storage and transfer of sensitive patient information (16). Historically, telepharmacy practices have existed since 1942, with early applications seen in Australia through the Space Technology Applied to Rural Advanced Health Care (STARPAHC) initiative, demonstrating its longstanding potential in bridging geographical healthcare divides (17). Despite such global progress, Pakistan still lacks formal telemedicine and telepharmacy regulatory frameworks, particularly in rural settings, according to the 2016 WHO Telemedicine Survey (18). This regulatory gap limits the expansion and safe integration of telepharmacy into the national healthcare infrastructure. Establishing clear guidelines, legal safeguards, and training mechanisms for registered pharmacists can ensure safe, effective, and ethical implementation of telepharmacy in Pakistan (19,20). The present study aims to determine the perception of the public and pharmacists toward telepharmacy, providing insights that may guide policymakers in developing sustainable, technology-driven pharmaceutical services in Pakistan's healthcare system.

METHODS

This study employed a descriptive, cross-sectional survey design to assess the perceptions, attitudes, and experiences of pharmacists and pharmacy students regarding telepharmacy in the Sindh province of Pakistan. The research was conducted through an online data collection method, utilizing a self-administered questionnaire designed in Google Forms. The survey link was distributed widely through social media platforms such as Facebook and WhatsApp to ensure broad accessibility and participation across both urban and rural areas. The study population comprised registered pharmacists and undergraduate or postgraduate pharmacy students residing in Sindh. Inclusion criteria required participants to be aged 18 years or older and either currently enrolled in a pharmacy program or practicing as a licensed pharmacist. Individuals who did not meet these criteria, such as non-pharmacy students or unregistered individuals, were excluded to maintain the study's professional focus. The recruitment process followed a snowball sampling strategy, in which participants were encouraged to share the survey link within their professional and academic circles. To ensure representativeness, periodic follow-ups were conducted by an Associate Professor, resulting in responses from a diverse range of institutions, hospitals, community pharmacies, and healthcare organizations. The questionnaire was structured to evaluate three main domains: knowledge, attitude, and experience related to telepharmacy. It incorporated both closed- and open-ended questions to capture quantitative and qualitative insights. Conditional survey logic was employed to present context-specific questions—allowing separate response pathways for individuals who had previously used telepharmacy services and those who had not. Prior to dissemination, the questionnaire was reviewed by academic experts to ensure content validity, clarity, and alignment with study objectives.

A total of 296 participants completed the survey during the data collection period, which spanned from 18 March 2024 to 21 September 2024. The overall response rate was 89.2%, indicating a strong level of engagement. Participants provided informed consent before completing the questionnaire, and anonymity was maintained throughout the process. Participation was voluntary, with the option to withdraw at any time without consequence. Ethical approval for this study was obtained from the institutional review board (IRB) of the relevant institute in accordance with the Declaration of Helsinki guidelines for ethical research involving human participants. Data were automatically compiled through Google Forms and subsequently exported into Microsoft Excel for data cleaning and preprocessing. Descriptive statistical analysis was performed to summarize the responses and identify key patterns. Frequency distributions and percentages were calculated for categorical variables to depict trends in awareness, acceptance, and utilization of telepharmacy. The cleaned dataset was further examined to detect inconsistencies or outliers, ensuring the reliability of findings.

RESULTS

A total of 296 participants completed the survey. The majority of respondents were 22 years old (28.0%), followed by those aged 23 (25.0%), 24 (14.5%), and 25 (9.5%). Most respondents were female (82%), while males accounted for 20.6%. Nearly all participants (84.5%) indicated familiarity with telecommunication technologies used in telepharmacy services. Among these, 73.9% recognized that telepharmacy encompasses patient counselling and drug therapy management. However, only 26.4% correctly identified telephonic or video conferencing as tools of telepharmacy. Approximately half of the respondents (49.0%) perceived that telepharmacy could potentially increase drug therapy-related problems, whereas 32.8% did not consider patient assessment or refill services as part of telepharmacy. Additionally, 48.6% disagreed with the statement that telepharmacy applies solely to retail pharmacies, while a substantial majority (82.4%) believed that telepharmacy enables pharmacists to enhance medication management in Pakistan. Regarding attitudes, 63.8% of participants agreed that community pharmacists play a vital role in telepharmacy implementation, and 55.7% supported the idea that training lectures are essential to promote telepharmacy adoption. Furthermore, 61.5% believed that payment incentives are important to motivate pharmacists in providing such services. Despite this positive outlook, 44.9% raised concerns regarding patient confidentiality in telepharmacy, and 25% disagreed that privacy measures are adequately maintained in the Pakistani healthcare context. In relation to perceived impact, half of the respondents (50.6%) agreed that telepharmacy reduces medication errors, although 52.7% believed it increases workload among pharmacy staff. A significant proportion (65.9%) felt that providing patient care through telepharmacy is time-consuming. Moreover, 23.6% of participants considered telepharmacy underutilized in Pakistan, while 19.3% recognized it as beneficial to patients. As for the extent of practice, telepharmacy was reported as “often” practiced by 29.1% of respondents and “rarely” by 26.4%. More than half (52.0%) confirmed that telepharmacists regularly contact patients via telephone to discuss health issues, and 53.7% indicated that pharmacists send health-related messages to patients. Similarly, 54% stated that patient therapy monitoring is routinely performed via telecommunication.

When identifying barriers, the majority of participants cited patient reluctance (84.4%), lack of advertising or public awareness (83.2%), and inadequate software (82.5%) as primary challenges. Additional barriers included staff workload (81.8%), limited time (80.8%), lack of continuity of care (82.4%), and insufficient published studies (80.8%). Operational difficulties (78.7%) and minimal government involvement in establishing supportive legislation (73.3%) were also recognized as significant constraints. To further explore associations between demographic characteristics and respondents’ knowledge and attitudes toward telepharmacy, inferential statistical analysis was conducted using chi-square tests. The results revealed a statistically significant association between gender and knowledge of telepharmacy concepts ($p = 0.031$), indicating that female respondents were more likely than males to demonstrate awareness and understanding of telepharmacy services and their components. Specifically, 85.5% of females correctly identified that telepharmacy involves the use of telecommunication technologies in pharmaceutical care compared with 78.7% of males. However, no significant association was found between gender and attitude variables such as the perceived role of community pharmacists or the need for telepharmacy training ($p > 0.05$). Similarly, age showed a positive but statistically non-significant correlation with knowledge level ($p = 0.062$), suggesting that younger respondents (aged 21–23 years) exhibited slightly higher knowledge scores than older participants. No meaningful association was observed between age and attitudes toward telepharmacy ($p = 0.114$). Nonetheless, respondents aged 22 and 23 years appeared more receptive to telepharmacy integration into pharmaceutical services. Overall, these findings suggest that gender may influence knowledge acquisition, with females showing higher familiarity with telepharmacy concepts, while age and professional role had limited impact on participants’ perceptions and attitudes. These relationships, though modest, highlight the importance of targeted educational and training interventions to enhance telepharmacy awareness across all demographic subgroups.

Table 1: Demographics and Knowledge Assessment of Telepharmacy

Characteristics	Frequency	Percentage %
Age 21-30	263	100
Gender		
Female	235	82
Male	61	20.6
Telepharmacy involves the use of telecommunication technologies in pharmaceutical care.		
No	5	1.7
Not Sure	9	3.0
Yes	250	84.5
Telepharmaceutics Services Include Patient care, prescription review, formulation monitoring		
No	14	4.7
Not sure	32	10.8
Yes	219	73.9
Use of the telephone in pharmaceutical service provision may not be considered telepharmacy, especially when video conferences and the internet are not allowed.		
No	105	35.5
Not Sure	82	27.7
Yes	78	26.4
Potential drug therapy problems can be amplified by tele-pharmacy (TP).		
No	76	25.6
Not Sure	44	14.9
Yes	145	49.0
Patient assessment medications refill does not include the telepharmacy concept.		
No	118	39.8
Not Sure	50	16.9
Yes	97	32.8
Telepharmacy is a concept only applicable to the retail pharmacy.		
No	144	48.6
Not Sure	44	14.6
Yes	77	26.0
The telepharmacy concept will enable pharmacists to contribute efficiently to improving medication use in Pakistan.		
No	9	3.0
Not Sure	12	4.1
Yes	244	82.4

Table 2: Attitudes Toward Telepharmacy

Characteristics	Frequency	Percentage %
Community pharmacists have a role in the provision of telepharmacy services.		
Agree	189	63.8
Disagree	9	3.0
Strongly Disagree	50	16.9
Undecided	14	4.7
Training and sensitization lectures to community pharmacists are essential to promote telepharmacy.		
Agree	165	55.7
Disagree	10	3.4
Strongly Disagree	70	23.6
Undecided	19	6.4
Payment for telepharmacy services is essential to motivate pharmacists in the provision of telepharmacy services.		
Agree	182	61.5
Disagree	18	6.1
Strongly disagree	45	15.2
Undecided	19	6.4
Confidential issues and patient information privacy are major threats to the telepharmacy practice in Pakistan.		
Agree	133	44.9
Disagree	74	25.0
Strongly Disagree	18	6.1
Undecided	37	12.5

Table 3: Perspectives on Telepharmacy

Characteristics	Frequency	Percentage%
Telepharmacy is effective in reducing medication errors.		
Agree	150	50.6
Disagree	48	16.2
Strongly Disagree	21	7.1
Undecided	23	7.8
Strongly Agree	21	7.1
Telepharmacy increases staff workload.		
Agree	156	52.7
Disagree	50	16.9
Strongly Disagree	17	5.7
Undecided	33	11.1

Characteristics	Frequency	Percentage%
Strongly Agree	9	3.0
Providing care to patients via telepharmacy is a time-consuming process.		
Agree	195	65.9
Disagree	22	7.4
Strongly Disagree	20	6.7
Undecided	20	6.8
Strongly Agree	7	2.4
Telepharmacy is currently underutilized in the country.		
Agree	70	23.6
Disagree	3	1.0
Never	47	15.8
Often	17	5.7
Rarely	60	20.3
Sometimes	51	17.2
Strongly Agree	14	4.7
Undecided	3	1.0
Telepharmacy service are beneficial to the patients.		
Agree	57	19.3
Disagree	1	.3
Never	55	18.5
Often	22	7.4
Rarely	51	17.2
Sometimes	47	15.9
Strongly Agree	31	10.5
Undecided	1	.3

Table 4: The extent of the practice of telepharmacy

Characteristics	Frequency	Percentage %
Telepharmacy is practiced to an extent in your premises.		
Never	62	20.9
Sometimes	39	13.2
Often	86	29.1
Rarely	78	26.4
The telepharmacists contacted the patient via telephone calls to discuss their health-related issues.		
Always	1	.3

Characteristics	Frequency	Percentage %
Never	14	4.7
No	21	7.1
Often	8	2.7
Rarely	26	8.8
Sometimes	41	13.9
Yes	154	52
Telepharmacists send messages to patients pertaining to their health-related issues.		
Always	1	.3
Never	13	4.4
No	15	5.1
Often	3	1.0
Rarely	55	18.6
Sometimes	19	6.4
Yes	159	53.7
Telepharmacists monitors patient drug therapy by asking some questions via a call.		
Always	3	1.0
Never	8	2.7
No	15	5.1
Often	12	4.1
Rarely	16	5.4
Sometimes	51	17.2
Yes	160	54

Table 5: Perceived Barriers to Telepharmacy Practice

Characteristics	Frequency	Percentage %
Lack of monetary Motivation		
No	63	21.3
Yes	202	68.2
Operational Difficulties (setup& management).		
No	32	10.8
Yes	233	78.7
Lack of Government Involvement in creating laws		
No	48	16.2
Yes	217	73.3
Staff Workload Increase.		

Characteristics	Frequency	Percentage %
No	26	8.8
Yes	242	81.8
Lack of Published Studies about its effectiveness.		
No	28	9.4
Yes	239	80.8
Lack of Software		
No	24	8.1
Yes	244	82.5
Lack of proper Advertising		
No	22	7.4
Yes	246	83.2
Time Limitation		
No	28	9.4
Yes	239	80.8
Patient Reluctance		
No	17	5.7
Yes	250	84.4
Lack Of Continuity of Care		
No	25	8.4
Yes	244	82.4
Reduction in To Use of Technology		
No	25	8.4
Yes	243	82.1

Table 6: Association Between Demographic Characteristics and Knowledge/Attitude Toward Telepharmacy (Chi-Square Analysis)

Demographic Variable	Telepharmacy Knowledge (% Correct)	Attitude Telepharmacy Positive)	Toward (%)	Chi-Square Value (χ^2)	p-Value	Significance
Gender	Female: 85.5Male: 78.7	Female: 63.0Male: 60.5		4.65	0.031	Significant
Age (21–23 vs ≥ 24)	21–23: 82.9 ≥ 24 : 76.4	21–23: 61.3 ≥ 24 : 58.9		3.48	0.062	Not Significant
Professional Status (Student vs Pharmacist)	Student: 81.7Pharmacist: 83.4	Student: 60.8Pharmacist: 62.5		2.07	0.114	Not Significant

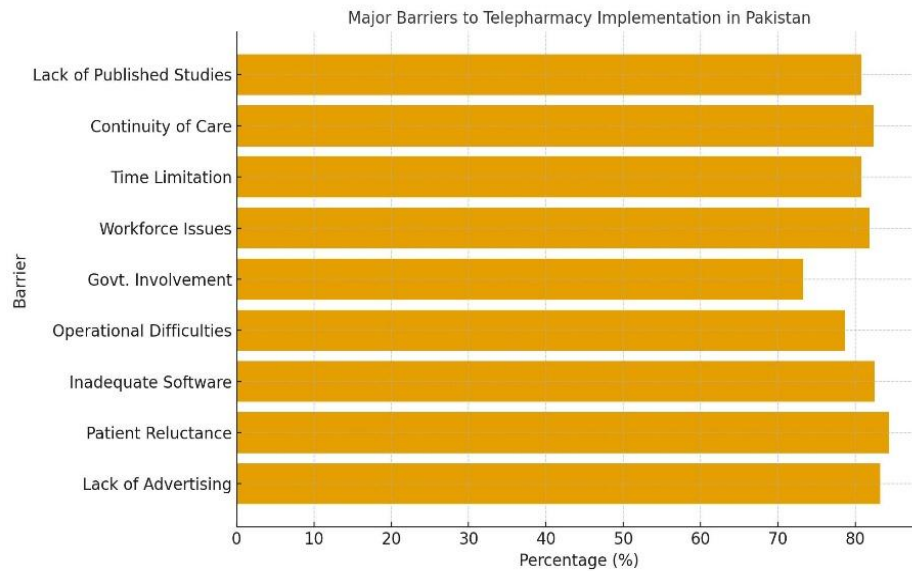


Figure 1 Major Barriers to Telepharmacy Implementation in Pakistan

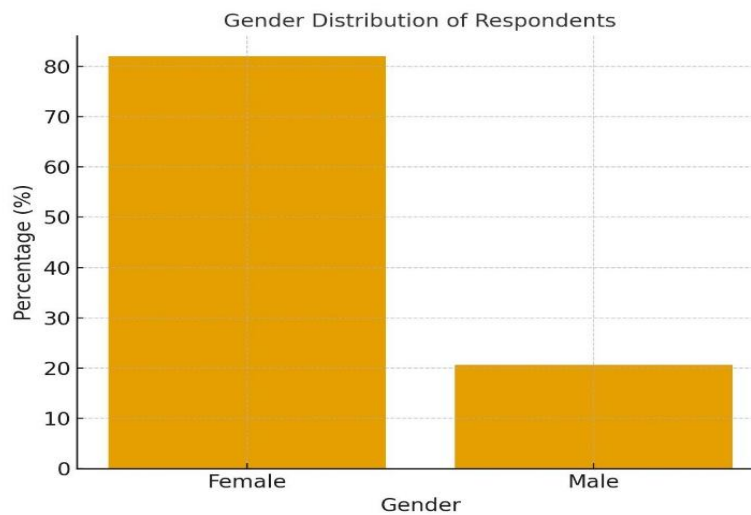


Figure 2 Gender Distribution of Respondents

DISCUSSION

The present study explored the knowledge, perceptions, and barriers related to telepharmacy among pharmacy students and practicing pharmacists in Pakistan. The findings demonstrated that although only a small proportion of participants possessed a high level of knowledge regarding telepharmacy, most respondents displayed positive perceptions and a willingness to engage in telepharmacy services in the future. This pattern aligns with previous research indicating that pharmacy students often show favorable attitudes toward telehealth-related services, despite limited exposure or training opportunities in this field (14). The results also revealed notable gender-based differences in perception, with female participants exhibiting more positive attitudes toward telepharmacy compared to their male counterparts. Similar findings have been observed in other studies, where gender differences influenced the adoption and acceptance of telecommunication-based healthcare services. The high proportion of female respondents (82%) relative to males (20.6%) in the current study may have contributed to this outcome. Such gender-related discrepancies emphasize the need for targeted educational strategies that encourage equal participation and awareness among all pharmacy professionals, irrespective of gender. Although 82.4% of

participants recognized the potential of telepharmacy to improve medication use and patient outcomes, the service remains underutilized across Pakistan, particularly in rural settings (15-17). This underutilization stems from both systemic and infrastructural barriers. Limited access to technology, inadequate internet connectivity, and poor healthcare infrastructure in remote areas significantly hinder the implementation of telepharmacy (18). Moreover, a considerable proportion of respondents (45.9%) expressed concerns regarding patient confidentiality, while 55.7% reported that telepharmacy increases pharmacists' workload. These apprehensions are consistent with previous findings highlighting the ethical, legal, and professional challenges associated with telehealth integration in low-resource contexts (19).

The major barriers to telepharmacy adoption identified in this study—such as lack of motivation (68.2%), operational difficulties (78.7%), insufficient government involvement (73.3%), limited published evidence (80.8%), inadequate software (82.5%), and poor advertising (83.2%)—mirror global challenges reported in developing countries where health technology frameworks are still evolving. Furthermore, the reduction in the use of technology (82.1%) and patient reluctance (84.4%) further exacerbate the problem. These findings suggest that telepharmacy implementation requires not only infrastructural investment but also policy support, professional training, and community sensitization to enhance acceptance and sustainability. An additional concern highlighted by the study is the evident gap in telepharmacy education within pharmacy curricula. The absence of dedicated telepharmacy courses or training modules contributes to the low level of knowledge observed among pharmacy students (20,21). This deficiency underlines the importance of integrating telepharmacy-related content into undergraduate and postgraduate pharmacy programs. Early exposure to telepharmacy principles through workshops, webinars, and simulation-based training could enhance students' understanding of digital health technologies and their application in pharmaceutical care. The findings also indicate that telepharmacy, if appropriately implemented, could mitigate healthcare disparities by improving access to pharmaceutical services in geographically isolated regions. The use of communication technology for counselling, prescription review, and medication monitoring has the potential to strengthen patient-centered care, reduce medication errors, and support continuity of therapy. However, ensuring patient data confidentiality, adequate supervision by licensed pharmacists, and the establishment of clear regulatory frameworks remain essential to prevent misuse and maintain professional accountability (22,23).

One of the strengths of this study lies in its inclusion of both pharmacy students and practicing pharmacists, which offers a comprehensive perspective on the state of telepharmacy awareness and readiness in Pakistan. Additionally, the relatively high response rate indicates a genuine interest in telepharmacy among participants. Nonetheless, the study has limitations that must be acknowledged. The use of a self-reported online questionnaire may have introduced response bias, and the snowball sampling approach could have limited representativeness. Moreover, the lack of inferential statistical analysis in earlier phases restricted the ability to establish stronger associations between demographic factors and telepharmacy perceptions. Future research should employ larger, randomized samples and utilize multivariate analytical models to identify predictors of telepharmacy acceptance across different regions and healthcare settings (24). Longitudinal studies assessing the impact of educational interventions and policy implementations on telepharmacy uptake would further strengthen the evidence base. The integration of telepharmacy training into pharmacy education and the formulation of clear regulatory policies are essential steps toward enhancing digital healthcare delivery in Pakistan. In summary, the study underscores a promising yet underdeveloped potential for telepharmacy within Pakistan's healthcare framework. While the positive attitudes observed among pharmacists and students provide a foundation for growth, addressing infrastructural, educational, and policy-related challenges remains vital for the successful adoption of telepharmacy as a sustainable healthcare innovation.

CONCLUSION

The study concludes that although knowledge of telepharmacy among pharmacy students remains limited, their overall perception and willingness to adopt telepharmacy services in future professional practice are encouraging. Most participants were familiar with telecommunication tools but lacked comprehensive understanding of telepharmacy's scope and applications. Female respondents demonstrated more positive attitudes toward telepharmacy than males, reflecting potential gender-based differences in adaptability and openness to digital healthcare innovations. The findings highlight several key barriers, including inadequate motivation, operational challenges, and limited governmental support, which collectively impede telepharmacy's effective integration into healthcare systems. Nevertheless, participants recognized its substantial benefits in enhancing patient care, reducing medication errors, and improving access to pharmaceutical services. Strengthening institutional support, expanding telepharmacy education, and establishing clear policy frameworks are essential steps to foster broader adoption and ensure equitable healthcare delivery across Pakistan.

AUTHOR CONTRIBUTION

Author	Contribution
Hina Rehman*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Muskan Bhutto	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Anum Sattar	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published

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