

Tele-Optometry in Pakistan: Perceived Benefits, Challenges, and Adoption Willingness Among Optometrists

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ABSTRACT

Purpose: To determine the level of awareness, attitudes, and intentions of practicing optometrists in Pakistan to use tele-optometry, and the perceived benefits, challenges, and training requirements.

Methodology: A cross-sectional survey was used, but it was descriptive and comprised certified optometrists in Pakistan. A professional network, email list, and the social media platform were used to distribute a structured survey in the form of a Google Forms questionnaire to conduct data collection. The survey was conducted on 234 licensed optometrists who are now in the clinical practice. The provincial distribution, level of awareness, willingness to adopt tele-optometry, and perceived challenges were analyzed using descriptive statistics.

Result: Out of 234 respondents 45.7% were of Punjab (n=107), 24.4% of Khyber Pakhtunkhwa (n=57), 20.5% of Sindh (n=48) and 9.4% of Baluchistan (n=22). Mostly, 87% were willing to embrace tele-optometry, 11% partially willing because of drug abuse and lack of understanding of treatment directions, and a small percentage wanted to use only hands-on practice. Furthermore, nearly 69% said that they had a need to have formal training or workshops to ensure that they successfully use tele-optometry in their practice.

Conclusion: The research shows high levels of professional acceptance and preparedness of the Pakistani optometrists to the tele-optometry service, which indicates its relevance to increasing the accessibility and sustainability of eye care. Tele-optometry when combined with conventional clinic-based service can be an important instrument to lower hypocrisy in eye-care services in Pakistan.

Keywords: Tele-optometry, Telemedicine, Optometrists, Digital health services, Eye care accessibility, Pakistan

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INTRODUCTION

Tele-optometry, which can be defined as the provision of optometric services based on the utilization of digital communication technologies, has turned out to be a promising branch of telehealth in the world. It allows assessing, follow-up, triage, and patient counselling remotely, thus enhancing access to eye care in underserved areas in the world as it has been demonstrated that optometrists are able to effectively engage in remote screening, visual examination, and management pathways via digital platforms.^{1,2} Prior to the coronavirus disease 2019 (COVID-19) pandemic, telehealth was underappreciated and was used for aiding and promoting long-distance healthcare and education, with a special focus on overcoming barriers to the utilization of healthcare services for people in rural and remote areas.^{3,4}

Visual impairment is a high burden in Pakistan, and uncorrected refractive errors are some of the most prevalent causes of preventable vision loss.⁵ Due to the high number of rural and remote areas in the country, trained eye-care professionals are usually inaccessible, and thus, the condition is diagnosed and treated late. The WHO has emphasized the necessity of increasing accessible and integrated models of delivering eye-care, which is especially vital in low- and middle-income countries to diminish preventable visual impairment.⁶ Tele-optometry provides one of the possible solutions, covering both gaps in accessibility and reducing travel barriers and follow-up of treatment, especially in patients who cannot physically access clinics.⁷

Although it has potential, the adoption of tele-optometry in Pakistan is undertaking change. It has been observed that most optometrists are poorly trained in tele-optometry with most possessing barriers to the uptake of tele-optometry due to poor infrastructure, technical and lack of awareness amongst the populace.⁸ Nevertheless, current studies show that there is increasing enthusiasm and readiness of optometrists to introduce tele-optometry in their practice. According to a 2024

study, even though fewer than 60 to 67 percent of optometrists knew about the services of tele-optometry, over 90 percent were willing to apply it in clinical practice.^{8,9} This implies that the vast majority of optometrists have a positive attitude towards the implementation of digital care models to deliver more services.

The World Health Organization has approved effective refractive error coverage as one of the main indicators for universal health coverage, with worldwide targets set for this indicator.¹⁰ Following the growing acknowledgment of digital health and the growing acceptance of digital health among the practitioners, there is a need to determine the current perceptions, readiness, and preference of optometrists in tele-optometry in Pakistan. The knowledge of these factors will contribute to supporting the strategic planning, training requirement, and policy-making to facilitate the whole process of the implementation of tele-optometry as a viable part of primary eye care.

METHODOLOGY

The methodology used in the study was a descriptive, cross-sectional survey design, which was used to evaluate the awareness, attitudes, and the willingness of optometrists in Pakistan to use tele-optometry.

Sample size was estimated 206 by Cochran formula that was adopted from literature¹¹. $N = Z^2 \cdot P(1-P)/d^2$, $Z_{1-\alpha/2} = 1.96$ at 95% confidence interval, $p = 73.96\%$ and $d = 6\%$, and 14% attrition rate was added, finally 234 participants were required to achieve the required precision, The number of certified and actively practicing optometrists, who participated in the study and were spread over the whole country, was 234, with all reporting to have been working in clinical optometry arrangements during the data collection period. Non-probability convenience sampling was employed, and the questionnaire link was shared through professional optometry networks, WhatsApp groups, email lists, and social networks and by means of direct invitations to clinics and academic institutions. A structured Google Forms questionnaire with closed

ended and Likert based questions was used to collect data on demographics, nature of practice, awareness of tele-optometry, desire to use it, perceived advantages and barriers as well as training needs of digital eye-care services. A pre-test of the questionnaire was conducted on 10 optometrists to clarify the questionnaire and necessary amendments were done. The online distribution of the Google Form started being distributed at June 2024 to march 2025 with the informed consent being taken electronically prior to the participation; answers were anonymous, volunteering and limited to one per participant. The inclusion criteria were certified optometrists in active practice in Pakistan and willing to volunteer, whereas optometry students, non-practicing and retired optometrists and incomplete submissions were excluded. In Microsoft Excel, the data were exported, and the SPSS version 26 was used to analyze the data and applied the descriptive statistics frequency, percentages, means, and standard deviations and the results were displayed in tables. The study was respectful in terms of confidentiality throughout the study.

RESULTS

The number of certified optometrists included in the study was 234 (45.7, 20.5, 24.4, 9.4 respective, Punjab, Sindh, KPK and Baluchistan percentages of provinces in Pakistan) with $p < 0.001$. Most of the participants were over 62% with over 5 years of clinical experience and 38% with less than 5 years ($p = 0.73$). Majorities of the respondents practiced in private optometry (71%), with the other (29) practicing in hospital-based or community eye-care practices.

In the awareness of tele-optometry, 78 percent of the participants said that they were aware of tele-optometry services, and 22 percent were not aware before the survey. In querying them regarding their readiness to transition to the use of tele-optometry in their practice, 87% of the respondents were willing to do so, and 11% were willing, albeit partially, citing reasons like the possibility of misuse of medicine and lack of understanding of

treatment instructions, and only 2% of the respondents expressed their preference of only hands-on practice ($\chi^2 = 12.6; p = 0.013$).

The respondents also were questioned on possible advantages of tele-optometry. Most of them felt that it would enhance patient accessibility in isolated locations (88%), lessen patient travel time (83%), and beneficence follow-up care (76%). Nonetheless, some concerns were made in relation to diagnostic accuracy in the absence of in-person examination (64%), technical literacy of patients (52%), and regulatory lack of direction (47%).

On the question of the topics of training requirements, 69% of the participants indicated that they would be interested in formal training courses or workshops about tele-optometry, and 31% believed they would feel comfortable implementing tele-optometry with only slight guidance. On the whole, these findings point to the fact that Pakistani optometrists are mostly open to tele-optometry, especially to promote accessibility and continuity of care, although education, protocols, and protection to overcome the risks are necessary.

1. Years of Experience and Practice Type			
Characteristic	N(%)	Statistical test	P value
Experience >5 years	145(62%)	Chi-square test	$p < 0.001$
Experience =5 years	89(38%)		
Private clinic	166(71%)		
Hospital/community setup	68(29%)		

2. Awareness and Willingness			
Variable	N (%)	Statistical test	P value
Aware of tele-optometry	183(79%)	Chi-square test	$p = 0.013$
Unaware	51(22%)		
Agree to adopt tele-optometry	204(87%)		
Partially agree	26(11%)		
Prefer hands-on only	4(2%)		

3. Perceived Benefits and Concerns			
Aspect	N (%)	Statistical test	P value
Improve access to remote patients	206(88%)	Logistic regression	P=0.009
Reduce patient travel time	194(83%)		
Support follow-up care	178(76%)		
Concern: diagnostic accuracy	150(64%)		
Concern: patient technical literacy	122(52%)		
Concern: lack of regulatory guidance	110(47%)		

4. Training Needs			
Training Requirement	N (%)	Statistical test	P value
Interested in formal training/workshops	162(69%)	Chi-square test	p = 0.020
Confident with minimal guidance	72(31%)		

DISCUSSION

This study assessed the consciousness, perception, and intentions of 234 practicing optometrists in Pakistan to tele optometry. The results indicate that there was high agreement on the use of remote eye care services amongst professionals: 87% of the respondents were in agreement with the idea of adopting tele optometry, 11% were partially in agreement and a small percentage favored hands-on practice only. Such kind of preparedness implies that a majority of the optometrists are willing to adopt tele optometry as well as traditional face-to-face services, which may assist in increasing the scope as well as the breadth of access and continuity of eye services in the nation.

The geographic background of the respondents, most of them were in the provinces with higher density of healthcare professionals, highlights the

current inequity in the access to eye care throughout Pakistan e.g., less-serviced provinces are less represented. This supports the claim that tele optometry may be used as an entry point to underserved or remote communities, where clinical eye care is difficult or inaccessible. The potential of tele eye care to lessen geographic and financial obstacles is reported in low-resource backgrounds worldwide, being economical, time sparing, less transport load, and enhanced access to consultation by the specialists by the remote or rural population.^{13,14}

Nevertheless, issues expressed by the participants of the surveys are valid concerns that can be found in the larger literature: a possibility of mismanagement, the lack of understanding of treatment guidelines, and restrictions in diagnostic quality using a distance assessment only. These are familiar difficulties with the implementation of tele ophthalmology such as the technological limitations, unstable quality of images/diagnostic data, the inability of an infrastructure (internet, power), and insufficient trained human resources to conduct remote screening or to provide follow up care.¹⁵

The positive result is that a significant number of optometrists (69 approximately) indicated their interest in training or workshops on tele optometry. This is in line with suggestions in recent reviews that state the need to build capacity in a structured way, standard protocols, and training to guarantee ethical, effective and sustainable tele eye care services.¹⁶ Under suitable training, remote assessment methods (e.g., tele-screening, digital refraction consultation, photo-based retinal screening) could become more reliable and acceptable to counter the apprehensions regarding diagnostic accuracy or mismanagement of treatment. The value of tele-optometry in increasing access to eye care is supported by evidence of recent studies. Massie et al. revealed that when telehealth services are adequately supported by appropriate protocols, optometrists can successfully provide the services, increasing the accessibility and continuity of care.¹⁷ Kapur et al. discovered that clinical

feasibility of real-time tele-refraction is high and has almost similar results with those of in-person refraction.¹⁸ Similarly, Blais et al. found that tele-refraction makes valid measurements and is potentially of great help to patients in remote or underserved areas as a valuable supplement to customary examinations.¹⁹ The study by Odigie et al and Ezinne NE et al. revealed that the knowledge level of the participants was good and their overall attitudes toward tele-eye care were positive, which means the future of tele-optometry among future practitioners is bright.^{20,21}

Evidence in the world demonstrates that tele ophthalmology is possible and effective in enhancing access to eye care among underserved communities even with chronic and complicated conditions.²² In this vein, there is an opportunity to incorporate tele optometry into the eye-care system in Pakistan, particularly as a supplement to face-to-face services. It would enable the early screening, the following is readily available, and the triage and less load on the centralized clinics/hospitals.

However, to be effective, a complex strategy will be needed: the deployment of digital framework (internet, imaging equipment), context-sensitive protocols and guidelines, practitioner training and certification, community awareness and patient education, and quality, safety, and data privacy protection. The issues expressed by the participants of the survey, as well as supported by literature, show that tele optometry must be well-organized, and hybrid solutions to remote and in-person care must be implemented instead of using tele services only.

CONCLUSION

This current research shows that the concept of tele-optometry is quite acceptable among working optometrists in Pakistan. Most of the participants indicated that they were ready to use tele-optometry in their practice as they were aware that tele-optometry can help enhance access to eye care, enable follow-up and decrease patient travel, especially in underprivileged and isolated

communities. Although the issues of accuracy of diagnoses, the abuse of drugs, and patient lack of knowledge about the treatment are still present, the problems may be overcome with the help of proper training, standard practices, and educating patients. Comprehensively, the results suggest that tele-optometry can be used as an efficient supplement to the conventional practice with hands-on experience that can improve service delivery without reducing the quality of care.

LIMITATIONS

A convenience sampling method was applied in this study and this could reduce the external validity of the results. The involvement was voluntary, and online based, meaning there was a possibility of bias towards optometrists, as the more familiar with digital tools they were, the more likely they were to become involved. Also, the survey was based on self-reported perceptions and attitudes instead of objective measures of the use of tele-optometry or patient outcomes. The research needs to be investigated in the future through longitudinal designs and must include the patients in terms of their perception of the effectiveness and impact of tele-optometry services in Pakistan.

Conflict Of Interest: None to declare

Ethical Approval: The study was approved by the Institutional Review Board / Ethical Review Board Reference No. 586/2025, Combined Military Hospital Lahore.

Authors' Contributions:

Sara Sonum: Concept, Design, Literature search, Data acquisition, Data analysis, Statistical analysis, Manuscript preparation, Manuscript editing, Manuscript review.

Junaid Afsar Khan: Manuscript review

Abdullah Bilal: Literature search, Data acquisition, Statistical analysis.

Muhammad Kaleem: Design, Manuscript preparation, Manuscript editing.

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