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RESEARCH ARTICLE

Awareness, Attitudes, and Willingness to Adopt Artificial Intelligence Among Indian Optometrists: A Cross-Sectional Questionnaire-Based Study

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ABSTRACT

Artificial intelligence (AI) is increasingly being integrated into healthcare and eye care, with potential applications in disease detection, diagnosis, screening, and clinical decision-making. However, successful implementation depends not only on technological capabilities but also on healthcare professionals' awareness, attitudes, confidence, and willingness to adopt these technologies. This study aimed to assess awareness, attitudes, perceptions, and willingness to adopt AI among optometrists practising in India. A descriptive cross-sectional questionnaire-based study was conducted among qualified optometrists in India. Participants were recruited through professional networks, social media platforms, and academic groups using non-probability convenience sampling. Data were collected using a structured, self-administered online questionnaire containing demographic questions and 5-point Likert-scale items assessing familiarity with AI, perceived benefits and challenges, willingness to adopt AI, and concerns regarding ethics and professional impact. A total of 213 optometrists participated, with a mean age of 29.1 ± 5.9 years and a nearly equal distribution of males (50.7%) and females (49.3%). Approximately 62% of participants reported familiarity with AI applications in eye care, while 73% expressed a positive attitude towards the potential of AI to improve optometric practice. However, only 52% indicated willingness to incorporate AI into their clinical workflow, whereas 60.7% expressed concerns regarding diagnostic accuracy, ethical considerations, and data privacy. More than 70% of participants did not believe that AI would replace optometrists. Hands-on experience with AI devices was significantly associated with a favourable attitude towards AI improving optometric practice ($p = 0.044$). Willingness to adopt AI was significantly associated with experience during the COVID-19 pandemic ($p < 0.0001$), while graduation era was significantly associated with perceptions regarding the inclusion of AI in the optometry curriculum ($p = 0.0004$). Overall, Indian optometrists demonstrated a positive but cautious attitude towards AI. Although the potential benefits of AI were recognised, concerns regarding accuracy, ethics, privacy, and clinical implementation may influence adoption. Structured AI education, practical exposure, and appropriate implementation frameworks may help improve confidence and support the responsible integration of AI into optometric practice.

Keywords: *Artificial Intelligence; Optometry; Eye Care; AI Adoption; AI Awareness.*

INTRODUCTION

Artificial intelligence (AI) has emerged as an important technological development in healthcare, with applications ranging from disease detection and screening to diagnosis, clinical decision-making, patient monitoring, and workflow optimisation. In eye care, the increasing

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availability of digital imaging and large clinical datasets has created opportunities for AI-based systems to support the detection and management of ocular diseases. AI applications have been investigated particularly extensively in retinal imaging, diabetic retinopathy, glaucoma, and other image-based areas of ophthalmic practice.

The successful integration of AI into clinical practice, however, depends not only on the technical performance of these systems but also on the attitudes, knowledge, confidence, and acceptance of healthcare professionals. Scheetz et al. reported that 71% of clinicians surveyed across ophthalmology, dermatology, radiology, and radiation oncology believed that AI would improve their field, while education was identified as an important priority for preparing clinicians for implementation. At the same time, concerns regarding medical liability and the increasing involvement of technology companies in healthcare were identified as important barriers.

Evidence from ophthalmology has similarly demonstrated generally favourable attitudes towards AI but also considerable caution regarding its clinical implementation. The multinational APPRAISE study by Gunasekeran et al. examined perceptions of AI among ophthalmologists internationally and highlighted the importance of clinician acceptance, regulation, implementation, and appropriate clinical translation. Alwadani et al. also reported generally favourable knowledge and perceptions of AI among ophthalmologists in Saudi Arabia and suggested that AI should be incorporated into ophthalmic education. Similarly, a survey examining clinicians' perceptions of AI-based diabetic retinopathy screening in Saudi Arabia demonstrated that although many clinicians reported reasonable knowledge of AI, misconceptions and differences in perceived knowledge remained.

Optometrists represent an important group in the implementation of AI in eye care because they are often involved in primary eye care, screening, imaging, referral, and longitudinal patient management. Research specifically involving optometrists has shown that practitioners recognise the potential benefits of AI while also identifying practical and ethical concerns. Constantin et al. explored optometrist's perspectives regarding AI decision-support systems and the use of retinal image repositories, highlighting the importance of data quality, implementation, usability, and professional involvement in the development of AI systems. Murphy et al. further emphasised that optometrists need sufficient understanding of AI systems to evaluate their validity, limitations, regulatory status, and suitability for clinical populations. They proposed that AI should be viewed primarily as an assistive tool rather than an alternative to comprehensive clinical examination.

The educational dimension of AI adoption is also becoming increasingly important. Recent research among optometry students and educators in the United Kingdom found substantial gaps in AI training and knowledge. Buckmaster et al. reported that 96% of students had received no formal AI training and 76% reported little or no knowledge of AI applications in optometry. Importantly, participants who had received AI training demonstrated more positive attitudes towards AI, while educators strongly supported the inclusion of AI within the optometry curriculum. A recent study of optometry students similarly found that students recognised the potential impact of AI on future optometric practice but remained cautious regarding its accuracy, usefulness, and implementation. Qualitative research has additionally identified barriers to incorporating AI into optometry education, including limited access to AI technologies, financial and time constraints, and the need for frequent curriculum updates as AI technology evolves.

More recent international evidence suggests that a gap may exist between recognising the potential of AI and actually using it in clinical practice. In a 2025 international survey of 622 ophthalmologists from 45 countries, 69.5% anticipated that AI could moderately to substantially improve clinical outcomes, but only 7.2% reported regular AI use. Lack of training, implementation cost, reliability concerns, algorithmic bias, and liability were among the major barriers identified. The majority of participants also expressed interest in structured AI education. These findings suggest that positive attitudes alone may not be sufficient to ensure clinical adoption.

Although AI is increasingly relevant to eye care, evidence specifically addressing the awareness, attitudes, concerns, and willingness to adopt AI among practising optometrists in India remains limited. Understanding these perceptions is important because the successful implementation of AI requires clinicians who are sufficiently informed about its capabilities and limitations and are confident in incorporating it into appropriate clinical workflows. Therefore, the present study aimed to assess awareness, attitudes, perceptions, and willingness to adopt AI among optometrists practising in India. The study also explored concerns regarding diagnostic accuracy, ethical and data-privacy issues, perceptions of professional replacement, and

factors associated with AI-related attitudes and willingness to adopt AI.

METHODOLOGY

Study Design

A descriptive cross-sectional questionnaire-based study was conducted among qualified optometrists practising in India.

Study Population

Qualified optometrists practicing in India were included in the study. Participants were recruited by professional network, social media and academic groups from 01/06/2025 to 01/04/2026.

Sample Size

During the study period, however, a total of 213 responses were obtained and analyzed.

Sampling Technique

Non-probability convenience sampling was used. The questionnaire was distributed through professional networks, social media platforms, and academic groups, and participation was voluntary

Data Collection Tool

A self-administered structured questionnaire was created on Google Forms to gather the data. There were two parts to the questionnaire:

Section 1: Demographic details (age, gender, year of graduation, and type of practice)

Section 2: Questions assessing awareness, attitudes, and perceptions of AI using a **5-point Likert scale** (ranging from strongly disagree to strongly agree)

The questionnaire included items related to:

- Familiarity with AI in eye care
- Perceived benefits and challenges
- Willingness to adopt AI
- Concerns regarding ethics and professional impact

DATA COLLECTION PROCEDURE

The link to the questionnaire was sent online using different professional platforms. The participation was voluntary and informed consent was taken at the start of the survey. Respondents were allowed to complete the questionnaire anonymously.

Data was collected in a period of 10 months from 01/06/2025 to 01/04/2026. Duplicate submission was prevented as with one email id only one form can be submitted. Email id of all participants was collected. Once respondent has filled the form and submitted response cannot be change or edited.

Inclusion Criteria

- Qualified optometrists practising in India
- Willing to participate in the study
- Able to understand and respond in English

Exclusion Criteria

- Incomplete or partially filled responses
- Students who had not yet completed their optometry degree

Data Analysis

Data were entered into Microsoft Excel and analysed using python software. Categorical variables were summarised using frequencies and percentages, while continuous variables were summarised using mean and standard deviation, where appropriate. Associations between categorical demographic variables and AI-related responses were assessed using the chi-square test. A p-value <0.05 was considered statistically significant.

Ethical Considerations

Ethical principles were upheld during the study. All participants gave informed consent prior to data collection. Responses were confidential and volunteers were not coerced. No personal information was kept or recorded, and information was only used for academic research.

RESULTS

A total of 213 optometrists participated in this study. The data were analysed using descriptive and inferential statistics to evaluate the level of awareness, attitudes and perceptions about Artificial Intelligence (AI) in Eye Care.

Demographic Characteristics

The mean age of participants was 29.1 ± 5.9 years. The sample had a near-equal distribution of males (50.7%) and females (49.3%). Most participants held a bachelor's degree (65.5%), while 30.6% held a master's degree and 3.8% held a PhD. Approximately 56% worked primarily in clinical settings.

The average age of the subjects was 29.1 ± 5.9 years, reflecting a young sample of practicing optometrists.

The sex ratio was nearly equal with males (50.7%) and females (49.3%) thus giving a good representation of males and females in the study population.

The study population was predominantly composed of young optometrists, with the largest proportion belonging to the 21–30-year age group. This indicates that the findings primarily reflect the perceptions and attitudes of early-career optometrists towards the use of AI in eye care.

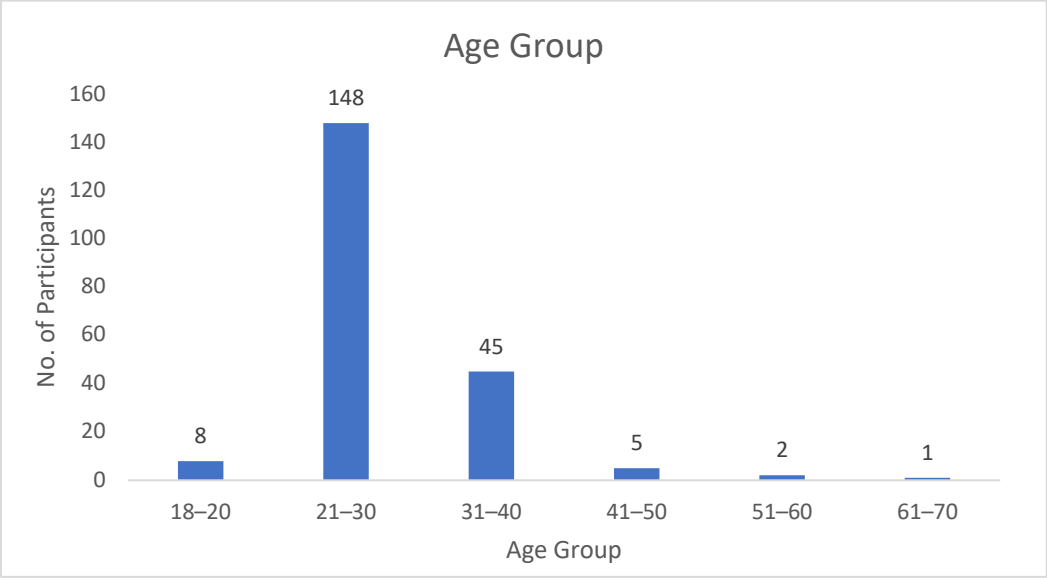


Figure 1. Demographic age of participants

The analysis of the educational qualification of the participants showed that 65.5% possessed Bachelor of Optometry, 30.6% had a master's degree in Optometry, and 3.8% held a PhD.

As far as practice setting was concerned, most of the participants were working in a clinical setting (~56%), whereas some were working in an optical setting, academics, corporate, or a mix of all these settings.

Most participants were working in clinical settings, while others were engaged in optical practice, academics, corporate settings, community health centres, or combinations of these settings. This distribution provides representation from different professional environments within optometry.

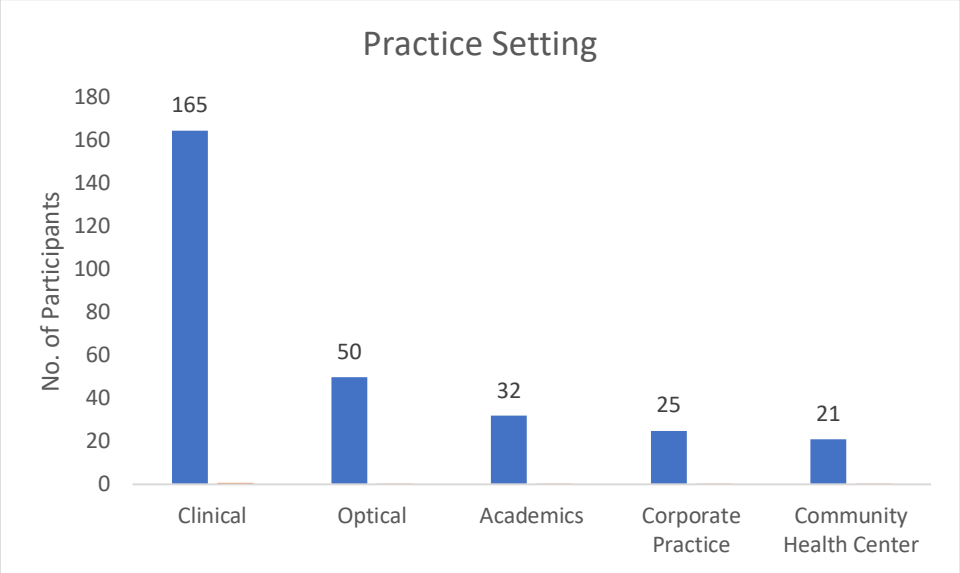


Figure 2 Distribution of practice setting

Awareness And Familiarity With Ai

AI's integration into eye care was found to have moderate awareness, as 62% of respondents were aware of its uses. The majority of answers were strongly positive, with a significant portion choosing "Somewhat Agree" (40.2%) and "Strongly Agree" (21.5%) indicating a positive attitude toward familiarity with AI.

The findings indicate a moderate level of familiarity with AI among the participating optometrists, with 62% reporting awareness of AI applications in eye care. This suggests that although AI is increasingly recognised within optometry, a substantial proportion of practitioners may still require greater exposure and education regarding its clinical applications.

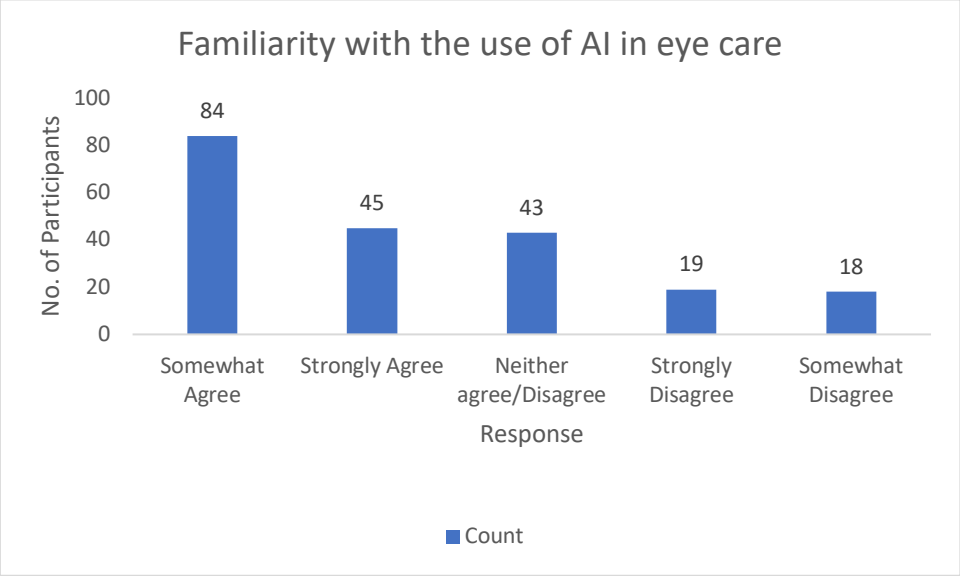


Figure 3 Familiarity with the use of AI in eye care

Attitude Toward AI Integration

Many participants (73%) felt positive about using AI in optometric practice. In particular, 38.8% somewhat agreed and 34% strongly agreed that AI would enhance the practice of optometry. The majority were accepting of AI as a helpful tool, with only a minority dissenting.

A favourable attitude towards AI integration was observed, with 73% of participants agreeing that AI could improve optometric practice. This suggests that most optometrists recognise AI as a potentially useful tool for supporting and enhancing clinical practice.

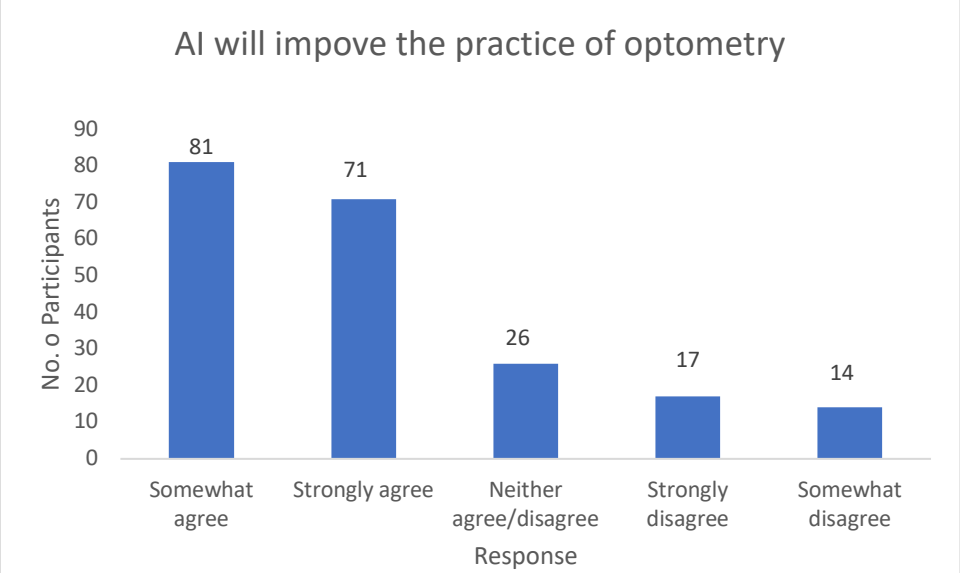


Figure 4 Attitude towards AI integration

Perceived Benefits And Challenge

While most participants recognized the positive aspects of AI, there were also some concerns. Around 60.7% of the participants were apprehensive about AI implementation, with concerns about diagnostic accuracy, ethical considerations, and data privacy.

Somewhat agreed (50.2%) was the largest percentage who felt worried about the accuracy of diagnosis provided by AI in eye care.

Despite the generally positive attitude towards AI, concerns regarding diagnostic accuracy were evident. Approximately half of the participants (50.2%) somewhat agreed that they were concerned about the accuracy of AI-based diagnosis, highlighting reliability as an important consideration for clinical adoption.

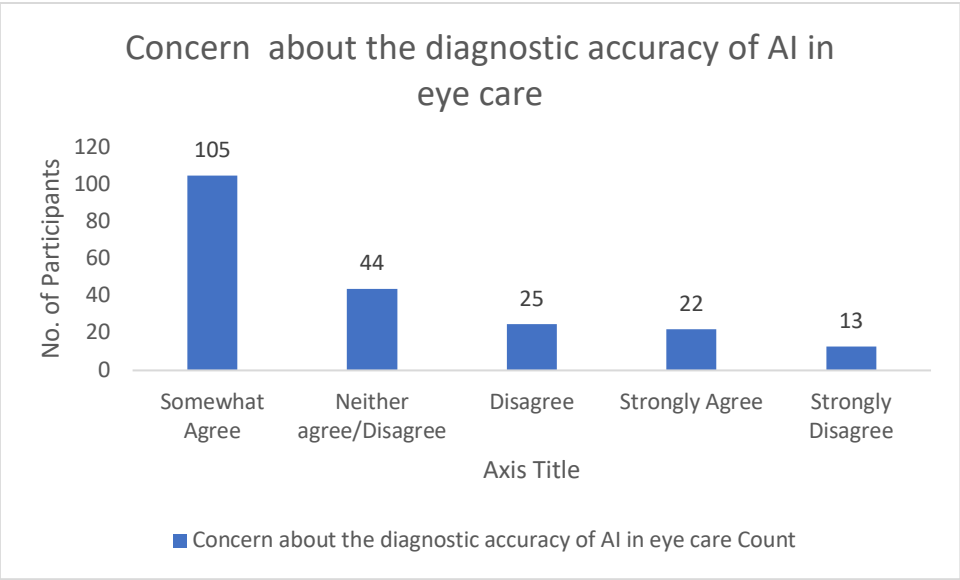


Figure 5 concern about the diagnostic accuracy of AI

Willingness to Adopt AI

The results indicated that 52% of the participants would be interested in using AI tools in their clinical workflow.

The majority of respondents (38.3%) agreed somewhat to adopt the program, with smaller percentages agreeing strongly and disagreeing strongly.

Although many participants viewed AI positively, only 52% expressed willingness to incorporate AI into their clinical workflow. This difference between positive perception and actual willingness to adopt AI suggests that additional factors, such as confidence, training, infrastructure, and concerns regarding impleentation, may influence clinical adoption.

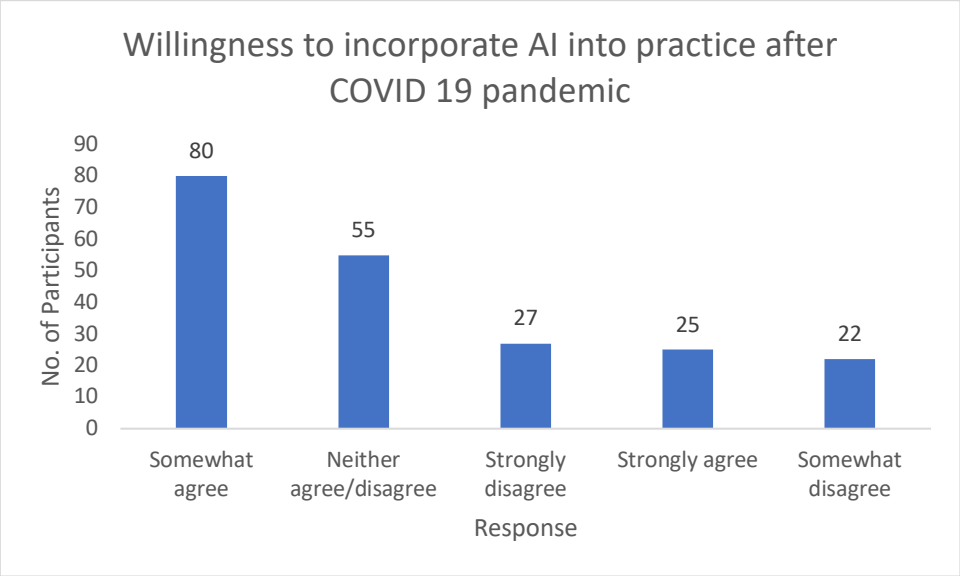


Figure 6 Willingness to incorporate AI

Perception Of AI Replacing Optometrists

Most of those who participated did not view AI as a replacement for optometrists. Over three-quarters (75.5%) of respondents disagreed with the statement that AI would replace optometrists, with 51.7% strongly disagreeing and 22.5% somewhat disagreeing. A somewhat lower percentage of participants, however, expressed uncertainty or concerns about the future implications of AI, reflecting mixed feelings.

This suggests that participants largely view AI as a supportive technology that can complement professional expertise rather than substitute the role of the optometrist.

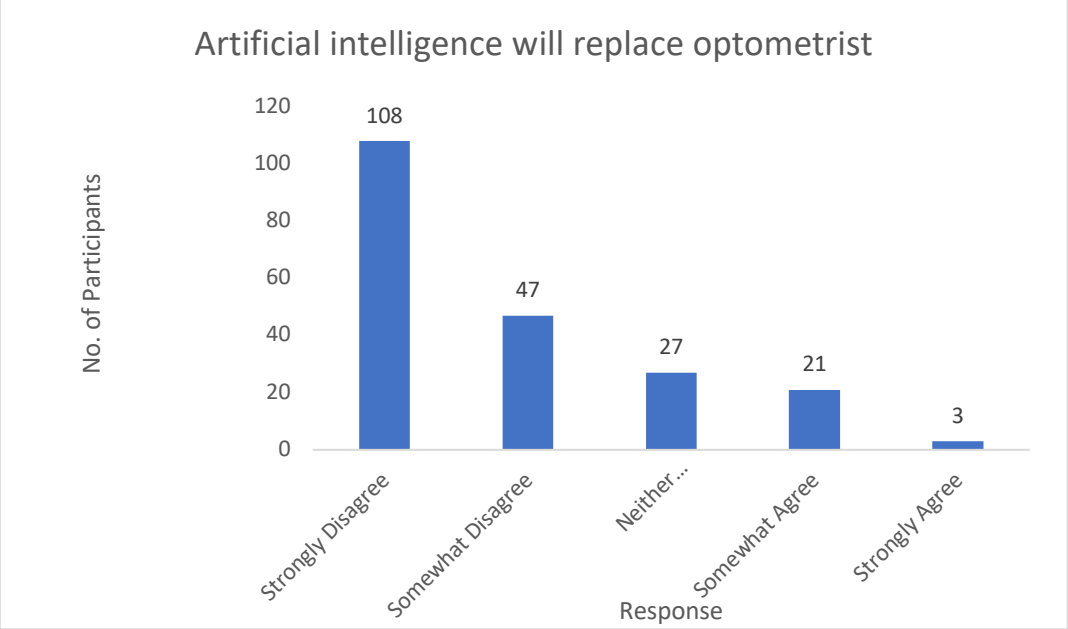


Figure 7 Perception that AI will replace optometrist

Inferential Statistics (Chi-Square Analysis)

To assess the relationship of demographic parameters with knowledge about AI, chi-square tests were done. The findings showed that there was no statistically significant correlation between familiarity with AI and the following variables:

- Qualification ($p = 0.084$)
- Age group ($p = 0.108$)
- Practice setting ($p = 0.149$)
- Gender ($p = 0.816$)

None of the p values were < 0.05, therefore the null hypothesis is not rejected. This implies that the knowledge of AI is not very different from group to group.

Additional Findings

The willingness to adopt AI ($p < 0.0001$) was also statistically significantly associated with the COVID-19 pandemic, suggesting that the pandemic was a catalyst for greater acceptance of AI technologies.

Further, use of hands-on experience with AI devices was highly correlated with favorable attitudes towards AI enhancing optometric practice ($p = 0.044$).

There was also a significant relationship between generational year and the perception of using AI in the curriculum ($p = 0.0004$), highlighting generational differences in attitudes towards using AI in education.

DISCUSSION

Principal Findings

The present study assessed awareness, attitudes, perceptions, and willingness to adopt artificial intelligence (AI) among Indian optometrists. Overall, the findings indicate a positive but cautious perception of AI. Approximately 62% of participants reported familiarity with AI applications in eye care, while 73% believed that AI could improve optometric practice. However, only 52% expressed willingness to incorporate AI into their clinical workflow. This difference suggests that recognition of the potential benefits of AI does not necessarily translate into immediate readiness for clinical adoption.

These findings are broadly consistent with previous research among eye-care professionals. Scheetz et al. reported that 71% of clinicians surveyed across several medical specialties believed AI would improve their field, although concerns regarding liability and the changing role of healthcare professionals remained. The multinational APPRAISE study also demonstrated substantial interest in AI among ophthalmologists while emphasising the importance of appropriate implementation, regulation, and clinical translation. Together with the present findings, these studies suggest that healthcare professionals generally recognise the potential value of AI while remaining cautious about its practical use.

Attitude–Adoption Gap

One of the most important findings of the present study is the approximately 21-percentage-point difference between positive attitudes towards AI and willingness to adopt it clinically. Although 73% of participants believed AI could improve optometric practice, only 52% were willing to incorporate it into their clinical workflow. This finding is consistent with more recent international evidence demonstrating that perceived potential does not necessarily correspond to actual use. In a 2025 survey of 622 ophthalmologists from 45 countries, 69.5% believed AI had moderate-to-high potential to improve clinical outcomes, but only 7.2% reported regular use. Lack of training, cost, and concerns regarding reliability were among the principal barriers.

The gap observed in the present study may therefore reflect factors beyond general awareness. Clinical adoption requires confidence in AI performance, adequate training, appropriate infrastructure, affordability, regulatory support, and evidence demonstrating clinical usefulness. Consequently, a positive attitude should not be interpreted as equivalent to readiness for implementation.

Concerns Regarding Accuracy, Ethics and Privacy

Despite the generally positive attitude towards AI, 60.7% of participants expressed concerns regarding its implementation, particularly in relation to diagnostic accuracy, ethical considerations, and data privacy. Half of the respondents somewhat agreed that they were concerned about the diagnostic accuracy of AI in eye care. These concerns are clinically important because inaccurate AI outputs could influence clinical decision-making and patient management.

Similar concerns have been reported internationally. Scheetz et al. identified medical liability among the major concerns regarding AI implementation, while the more recent global ophthalmology survey identified algorithmic bias, liability, and reduced physician–patient interaction as important ethical concerns. Murphy et al. have also highlighted the importance of understanding the limitations, regulatory status, clinical population, and explainability of AI systems before their use in optometric practice. These findings reinforce the need for AI literacy that goes beyond simply understanding what AI can do and includes critical appraisal of AI outputs.

AI as a Supportive Rather Than Replacement Technology

More than 70% of participants in the present study did not believe that AI would replace optometrists. This finding suggests that participants predominantly view AI as a complementary or decision-support technology rather than as a substitute for professional expertise. This interpretation is consistent with guidance for optometrists suggesting that AI should function as an assistive tool and should not replace comprehensive clinical examination or professional judgement.

The perception of AI as a supportive technology is also important from an implementation perspective. Rather than positioning AI as a replacement for clinicians, implementation strategies may be more acceptable when AI is presented as a tool that can assist with screening, image interpretation, risk stratification, documentation, and clinical decision support while retaining clinician oversight.

Importance of Practical Exposure and Education

The present study found a statistically significant association between hands-on experience with AI devices and a favourable perception of AI improving optometric practice ($p = 0.044$). This finding provides an important indication that practical exposure may influence confidence and acceptance.

Recent evidence from optometry education supports this interpretation. Buckmaster et al. found that AI training was associated with more positive attitudes among optometry students and educators, while 96% of students in their study had not received AI training. Educators strongly supported incorporating AI into optometry curricula. Similarly, recent work examining optometry students' perceptions found that students recognised the potential of AI but remained cautious regarding its accuracy and usefulness, particularly when they had limited experience with AI tools.

These findings support the inclusion of structured AI education in optometry programmes. Such education should include not only the technical principles of AI but also interpretation of AI outputs, diagnostic accuracy, bias, limitations, data privacy, ethics, regulatory considerations, and appropriate clinical decision-making.

Implications for Optometry Education

The significant association between graduation era and perceptions regarding the inclusion of AI in the optometry curriculum ($p = 0.0004$) further highlights the importance of educational exposure. AI is evolving rapidly, and optometry curricula may need to adapt accordingly.

Recent qualitative research involving optometry education stakeholders identified lack of access to AI devices, funding constraints, limited time, and the rapid pace of technological development as barriers to AI education. Therefore, curriculum development should focus on practical and clinically relevant AI literacy rather than purely technical programming skills.

Implications for Clinical Implementation

The findings suggest that AI should initially be implemented as a clinical decision-support tool rather than as an autonomous replacement for optometrists. Implementation should be accompanied by appropriate training, validation in relevant patient populations, clear institutional policies, data-protection measures, and defined professional responsibility.

The multinational literature further supports this approach. The APPRAISE study emphasised the importance of clinician acceptance, regulation, and implementation when translating AI technologies into eye-care practice. More recent international evidence similarly identified training, cost, reliability, and regulatory concerns as major barriers to adoption. Thus, successful implementation in India will require attention not only to technological availability but also to infrastructure, affordability, workforce preparation, and appropriate regulatory frameworks.

STRENGTHS AND FUTURE DIRECTIONS

The present study contributes to the growing literature by specifically examining practising optometrists in India, a population that remains relatively underrepresented in AI perception research. The findings provide evidence of a positive but cautious attitude and demonstrate that familiarity alone may not be sufficient for adoption.

Future research should include larger and more representative samples from different regions of India and should assess actual use of specific AI applications rather than AI as a broad concept. Longitudinal studies could also evaluate whether structured education and hands-on exposure lead to sustained changes in confidence and clinical adoption. Recent international research suggests that structured education is an important component of responsible AI implementation, making this an important direction for future optometric research.

Limitations

This study has several limitations. First, participants were recruited using non-probability convenience sampling through online professional and academic networks, which may have introduced selection and response bias and limits the generalisability of the findings to the wider population of Indian optometrists. Second, the cross-sectional design captures perceptions at a single point in time and does not allow causal relationships to be established. Third, the study relied on self-reported responses, which may be influenced by social desirability or recall bias. The questionnaire was administered in English, which may have limited participation among optometrists less comfortable with English. Finally, perceptions and willingness to adopt AI do not necessarily reflect actual clinical use of AI.

CONCLUSION

Indian optometrists demonstrated generally favourable attitudes towards the potential role of AI in eye care, although willingness to incorporate AI into clinical practice was comparatively lower. Concerns regarding diagnostic accuracy, ethical considerations, and data privacy remain important barriers to adoption. Structured education, practical exposure, and appropriate implementation frameworks may help improve confidence and support the responsible integration of AI into optometric practice. Further studies should evaluate actual AI use, training needs, and barriers to implementation among optometrists across different regions of India.

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Conflict of Interest: The authors declare that they have no conflict of interest related to this study.

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