The Role of Artificial Intelligence in Optometry: Awareness and Perspectives Among Scandinavian Optometrists

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Abstract

The awareness and perspectives of Scandinavian optometrists regarding artificial intelligence (AI) in eye care was evaluated through a web-based questionnaire. Responses from 421 practising optometrists were analysed for familiarity, perceived benefits, concerns, and willingness to engage with AI technologies. Most participants expressed familiarity with AI and support for its inclusion in optometry education and practice, although concerns regarding diagnostic accuracy and the potential impact on the patient-optometrist relationship were noted. These findings may help inform educational strategies and knowledge-sharing initiatives to reduce uncertainty and support the effective use of AI in eye care.

Keywords: artificial intelligence, optometric practice

Introduction

Artificial intelligence (AI) is revolutionising many fields, especially healthcare. With the ability to process vast amounts of data, identify patterns, and make informed decisions with greater accuracy and efficiency, AI's influence on healthcare is expected to increase further. Several barriers to implementing AI in healthcare have been identified including ethical, technological, liability and regulatory, workforce, patient safety, and social barriers (Ahmed et al., 2023). It is essential to identify and address these barriers in order to establish an effective framework for the implementation of AI within healthcare systems.

AI shows great potential in the field of eye care, where diagnosis and treatment-monitoring of eye diseases depend largely on image recognition (Hogarty et al., 2019; Li et al., 2013; Oshika, 2025). As AI solutions become increasingly commonplace in clinical settings, it is crucial to assess the perspectives of practitioners on AI in healthcare to ensure successful integration into everyday practice. A survey conducted among members of the American Academy of Optometry indicated that most optometrists responded that AI could enhance optometry practice and be included in optometry curricula (Scanzera et al., 2022). An interview study of Scottish optometrists also found positive expectations for AI assistance (Constantin et al., 2023). Optometrists in Scandinavia practise at the World Council of Optometry's Competency Level 3, providing thorough evaluations of ocular health and implementing appropriate clinical interventions. Given the considerable clinical responsibility and autonomy entrusted to optometrists in Scandinavia, evaluating their awareness of AI technologies is essential.

The aim of this study was to evaluate the awareness and perspectives of optometrists practising across Scandinavia on the role of AI in eye care. The results are presented for the whole group as well as by country, educational level, and experience of the optometrist. This evaluation could reveal potential gaps that might affect the effective adoption of AI in optometric practice. This understanding is important for developing focused training and support initiatives that will facilitate engagement with emerging technologies.

Methods

A web-based questionnaire was distributed to practising optometrists in Sweden, Norway, and Denmark, mainly through their respective national optometry associations. Responses were collected anonymously. Data on the participants' gender, educational qualifications, and workplace were collected. The questionnaire contained nine simple statements regarding familiarity, potential, concerns, benefits, and willingness to learn about AI in eye care (Figures 1A and 2A). Response options for each statement were presented on a 5-point Likert scale, ranging from "fully agree" to "fully disagree". In addition, opinions on the potential role of AI in eye care were investigated by asking participants to select all relevant options: "screening", "diagnosis", "follow-up", "triage", and "others" (a free text field). Questionnaires were administered in the local language of each country (Swedish, Norwegian, or Danish) and authors from each country verified (with the help of colleagues) the cross-cultural adaptation of the questionnaire.

Questionnaires were distributed using Microsoft Forms (in Sweden and Denmark) and the web-based survey tool Nettskjema (in Norway) to all registered members of the respective national optometry associations. The study protocol conformed to the tenets of the Declaration of Helsinki. Participants gave their consent digitally and no personal information other than gender, educational qualifications, and type of workplace was collected. The questionnaires were open for responses for a period of 2 weeks, at different time points in each country, between late 2024 and early 2025.

Questionnaire responses were summarised for the overall sample. In addition, Chi-square analysis was performed to test for equal distribution of proportions for categorical variables among the different subgroups stratified by country, educational qualifications, and number of years since attainment of highest educational qualification. However, analysis of responses based on gender or workplace was not performed because the majority of respondents were female and worked in retail chains (see Table 1).

Table 1: *Participant demographics.*

	Sweden *n* = 207	Norway *n* = 136	Denmark *n* = 78
Gender			
Female	157 (76%)	92 (68%)	58 (75%)
Male	50 (24%)	44 (32%)	20 (25%)
Highest educational level attained			
Bachelor's degree	122 (59%)	82 (60%)	63 (81%)
Higher degree	45 (41%)	54 (40%)	15 (19%)
Years since attainment of highest educational qualification			
≤ 10 years	110 (53%)	63 (46%)	25 (32%)
> 10 years	97 (47%)	73 (54%)	53 (68%)
Workplace			
Retail chains	112 (54%)	93 (68%)	21 (27%)
Private stores or own practice	58 (28%)	22 (16%)	37 (48%)
Hospitals or clinics	27 (13%)	5 (4%)	10 (13%)
Consultant	10 (5%)	0 (0%)	5 (6%)
Others	0 (0%)	16 (12%)	5 (6%)

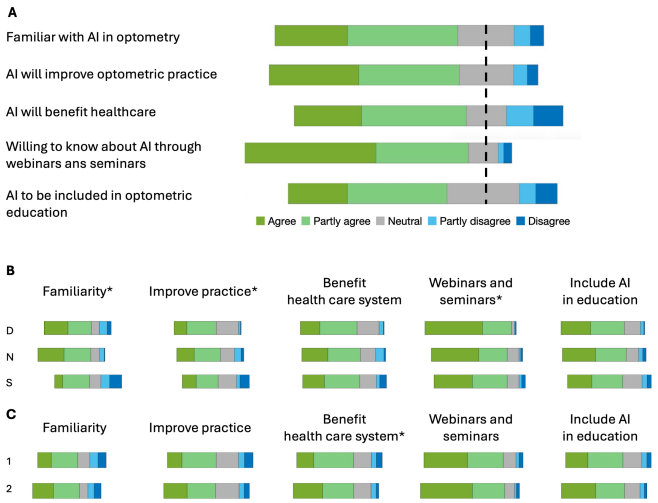

Figure 1: *Distribution of responses regarding familiarity and potential of AI in eye care. A: Summary of responses from Scandinavia. The bars are aligned with respect to the neutral response, centred on the dashed line. B: Responses from each country (D: Denmark, N: Norway, S: Sweden), C: Responses grouped by years since attainment of highest educational qualification (1: ≤ 10 years, 2: > 10 years). Statistically significant differences in the distribution of responses are indicated.* $p < 0.05$ *(*).*

Results

In total there were 421 respondents (207 in Sweden, 136 in Norway, and 78 in Denmark). Based on the total number of registered members of each national optometry association, the response rate for Sweden, Norway and Denmark, respectively, was approximately 12.5%, 10.5%, and 20.9%. Participant demographics are presented in Table 1.

Figure 1 summarises questionnaire responses regarding familiarity with, and potential of, AI in eye care. The majority of the participants (dark and light green segments in Figure 1) in Scandinavia agreed that they were familiar with AI in eye care, believed that AI will improve optometric practice and benefit the healthcare system, were willing to learn more about AI in eye care through continuous education (webinars and seminars), and supported AI being included in optometric education (Figure 1A). Distribution of responses varied significantly between the countries regarding three aspects (Figure 1B): familiarity ($p < 0.001$), potential of AI to improve optometric practice ($p < 0.001$) and willingness to learn about AI through continuous education ($p = 0.046$). Although the response distribution varied significantly, the majority of responses from each country tended towards agreement regarding familiarity and continuous education. In terms of the potential for AI to improve optometric practice, responses from Sweden were mixed, whereas in Norway and Denmark very few optometrists disagreed with the statement that AI will improve optometric practice. Figure 1C shows the distribution of responses by length of time since attainment of highest educational qualification (1: ≤ 10 years, 2: > 10 years). Only the distribution of responses regarding the benefits of AI to the healthcare system varied between these 2 groups ($p = 0.011$); however, both groups generally agreed that AI in eye care will benefit healthcare systems. The distribution of responses for other statements did not vary significantly by length of time since attainment of highest educational qualification.

Responses regarding concerns and worries about AI in eye care were mixed (Figure 2A). When analysed by country (Figure 2B), concerns about diagnostic accuracy varied significantly ($p < 0.001$), with Sweden and Denmark having more diverse responses, suggesting less consensus. The distribution for Norway showed moderate concerns or neutral views regarding diagnostic accuracy. Optometrists who attained their highest educational qualification in the last ten years reported relatively more concern over diagnostic accuracy ($p = 0.02$), damage to the patient-optometrist relationship ($p = 0.002$), and developments ($p = 0.009$) than those who attained their highest educational qualification more than 10 years ago.

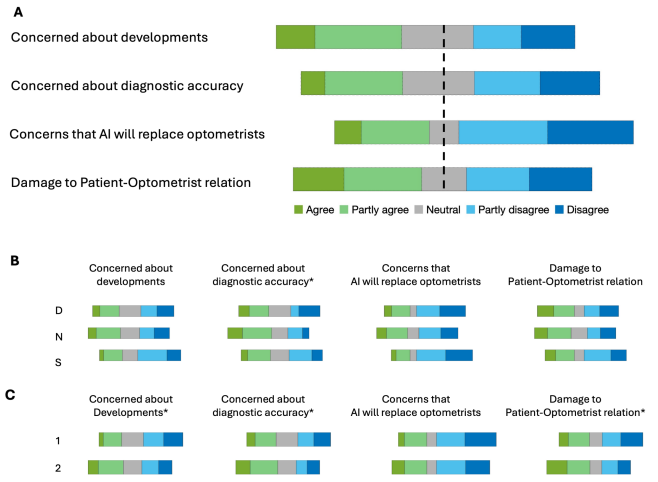

Figure 2: *Distribution of responses regarding concerns and worries about AI in eye care. A: Summary of responses from Scandinavia. The bars are aligned with respect to the neutral response, centred on the dashed line. B: Responses from each country (D: Denmark, N: Norway, S: Sweden), C: Responses grouped by years since attainment of highest educational qualification (1: ≤ 10 years, 2: > 10 years). Statistically significant differences in the distribution of responses are indicated.* $p < 0.05$ *(*).*

Grouping participants based on whether they had bachelor's-

level education alone or bachelor's-level plus higher-level education showed no significant differences in response distribution for any of the nine aspects evaluated ($p > 0.05$). Responses from both groups were similar and suggested agreement regarding familiarity, including AI in optometry education, continuous education, and benefits of AI in both optometric practice and healthcare. Both groups showed mixed responses regarding concerns about AI.

Figure 3 presents the frequency of responses regarding the use of AI across the four stages of the clinical workflow: triage, screening, diagnosis, and follow-up. Regarding the potential application of AI in eye care, responses were most positive for screening, followed by follow-up of eye diseases (Figure 3A). Regarding the potential application of AI in diagnosis, the majority of responses from Sweden and Norway were negative, whereas they were more equally distributed for Danish participants (Figure 3B). Regarding triage, the majority of responses from Danish participants were negative but among Swedish and Norwegian participants responses were distributed more equally. The free text responses indicated other potential applications for AI within optometry practice, encompassing areas such as history-taking, referral processes, and (notably) refraction, which emerged as the most frequently suggested application. These findings suggest that optometrists perceive AI to have a broad role in eye care.

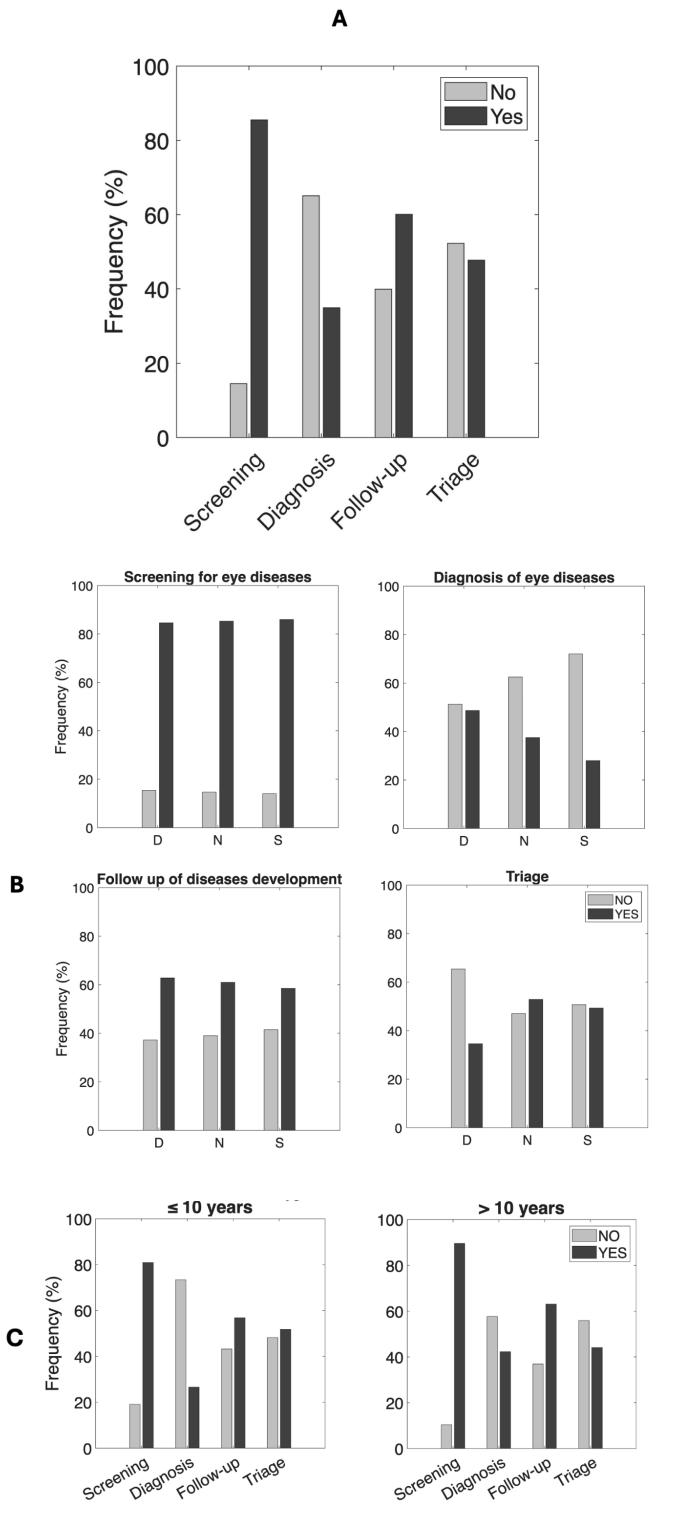

Figure 3: *Frequency of responses regarding the use of AI across the clinical workflow. A: Summary of responses from Scandinavia. B: Responses from each country (D: Denmark, N: Norway, S: Sweden), C: Responses grouped by years since attainment of highest educational qualification (1: ≤ 10 years, 2: > 10 years).*

Discussion

This report presents a brief overview of awareness and perspectives among Scandinavian optometrists regarding the role of AI in eye care. The current study's findings are consistent with previous reports involving American and Scottish optometrists (Constantin et al., 2023; Scanzera et al., 2022). The small variation in response distribution observed between different countries and based on the number of years since attainment of highest educational qualification suggests that local factors and educational experiences may influence attitudes towards AI in eye care. As this exploratory pilot study aimed to identify potential group differences, no adjustment for multiple comparisons was applied. The relatively low response rates, and reliance on self-reported data may limit the generalisability of the findings.

In summary, most respondents reported familiarity with AI in eye care and supported its inclusion in education and continued professional development, with some variation by country and years since attainment of highest educational qualification. Concerns about AI, in particular regarding diagnostic accuracy, were more pronounced among those who had qualified in the last decade. These findings are important for planning educational strategies and cross-country knowledge exchange to address uncertainties and maximise the benefits of AI technologies in eye care. As awareness of AI increases and related technologies continue to evolve, perspectives on AI in eye care are also likely to change, and this type of investigation should be repeated over time, preferably with a larger sample size.

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Conflicts of interest

The authors declare no conflicts of interest.

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Skandinaviske optometristers kjennskap til og synspunkter om kunstig intelligens sin rolle i optometrien

Sammendrag

Skandinaviske optometristers kjennskap til og synspunkter om kunstig intelligens (KI) i øyehelsetjenesten ble undersøkt gjennom et nettbasert spørreskjema. Svar fra 421 yrkesaktive optometrister ble analysert med hensyn til kjennskap til KI, opplevde fordeler, bekymringer og villighet til å ta i bruk KI-teknologi. De fleste deltakerne oppga at de kjente til KI, og støttet at teknologien brukes i optometriutdanningen og i klinisk praksis. Samtidig ble det uttrykt bekymring for diagnostisk nøyaktighet og for den mulige innvirkningen på forholdet mellom pasient og optometrist. Funnene kan bidra til å utforme undervisningstiltak og initiativer for kunnskapsdeling som reduserer usikkerhet og støtter effektiv bruk av KI i øyehelsetjenesten.

Nøkkelord: kunstig intelligens, optometrisk praksis

Il Ruolo dell'Intelligenza Artificiale in Optometria: Consapevolezza e Prospettive tra gli Optometristi Scandinavi

Riassunto

Tramite un questionario online sono state valutate la consapevolezza e le opinioni degli optometristi scandinavi riguardo l'intelligenza artificiale (IA) nella cura degli occhi.

Sono state analizzate le risposte fornite da 421 optometristi in attività per valutare il loro grado di familiarità con l'IA, i benefici percepiti, le preoccupazioni e la disponibilità a utilizzare le tecnologie basate sull'IA. La maggior parte dei partecipanti ha dichiarato di avere familiarità con l'IA e di essere favorevole alla sua integrazione nella formazione e nella pratica optometrica, sebbene siano state segnalate preoccupazioni relative all'accuratezza diagnostica e al potenziale impatto sul rapporto tra paziente e optometrista. Questi risultati possono contribuire a definire strategie formative e iniziative di condivisione delle conoscenze volte a ridurre l'incertezza e a favorire un uso efficace dell'IA nella cura degli occhi.

Parole chiave: intelligenza artificiale, pratica optometrica