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School-based eye health interventions for improving eye care and spectacles compliance in children in low- and middle-income countries: A scoping review

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ABSTRACT

Background: School vision screening is a cost-effective approach to identifying eye conditions like uncorrected refractive errors among children in low- and middle-income countries (LMICs), but challenges with spectacle compliance, procurement, and follow-up persist. This review examines school-based eye health interventions in LMICs to assess their impact on spectacle compliance, knowledge, attitudes, practices, and referral adherence, highlighting limitations and gaps in current literature.

Methods: A literature search was performed in three databases, focusing on studies published from 1999 onward. Following the PRISMA-ScR guidelines, the review included studies involving school children in LMICs that assessed school-based interventions aimed at improving spectacle compliance, knowledge, attitudes, practices and referral adherence. Studies conducted in universities or studies that did not perform primary data collection were excluded. Titles, abstract, full-text screening and data extraction was performed independently by two researchers.

Results: Of the 108 articles identified, seven studies from five countries met inclusion criteria. Study designs included four randomised controlled trials, one cross-sectional study, one quasi-experimental study, and one qualitative prospective study. Interventions varied: five studies (71 %) included eye health education, three (43 %) focused on promotional activities, two (29 %) provided free spectacles, and one (14 %) used media campaigns and incentives. Eye health education and free spectacles were most effective in increasing spectacle compliance, while education and promotional interventions improved knowledge, attitudes, and practices. Only one study measured referral adherence.

Conclusion: Eye health education, promotion, media reminders, and free spectacles improves spectacle compliance, knowledge, attitudes, practices, and referral adherence. Further research should investigate the cost-effectiveness of these interventions in LMICs.

1. Introduction

Uncorrected refractive errors and other vision impairments are prevalent among school-aged children in low- and middle-income countries (LMICs), where limited eye care resources and infrastructure exacerbate the impact of these conditions on children's development and well-being.[1] Vision impairment not only restricts children's ability to learn and engage academically but can also hinder their social development and quality of life, reinforcing cycles of poverty and inequity in education and health.[2] School-based eye health interventions have gained recognition as a practical, cost-effective solution to reach large numbers of children and improve access to eye care in resource-constrained settings.[2-5]

Despite the potential of these programmes, uncertainty remains regarding their most effective design and implementation. While some studies report improved spectacle-wearing compliance and increased

Abbreviations: LMICs, Low- and middle-income countries; PRISMA-ScR, Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews; PCC, Population-Concept-Context.

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referral adherence, others highlight barriers such as social stigma, misconceptions about spectacle use, and inconsistent follow-through on referrals.[1,5–11] Additionally, the literature points to diverse approaches in terms of personnel, methods, and educational components, leading to variable outcomes. These discrepancies underscore a gap in the evidence with regard to best practice for enhancing compliance, referral adherence, and eye health knowledge among school-aged children in LMICs.

Existing studies have explored specific aspects of school-based interventions but have not fully addressed key questions regarding how to optimise these programmes for maximum impact in diverse LMIC settings.[4,12–14] For example, some initiatives have demonstrated increased screening rates and early detection,[5,8] however, gaps remain in understanding how to foster sustained spectacle use and overcome social and cultural barriers among children and their families. Moreover, limited research has explored how school-based programmes can be adapted to overcome resource constraints, such as training teachers and community health workers to support eye health initiatives in schools. These limitations highlight a need for comprehensive analysis to guide future programme development and policy recommendations.

This scoping review aims to map and synthesise the evidence on school-based eye health interventions in LMICs, focusing on programmes designed to improve spectacle-wearing compliance, referral adherence, knowledge, attitudes, and practices toward eye health among school children. As such, this review will address the following questions: i) what are the primary school-based eye health interventions currently implemented in LMICs? ii) how do these interventions affect spectacle-wearing compliance, knowledge, attitudes, practices and referral adherence? and iii) what are the major limitations and gaps in the literature regarding these outcomes?

2. Methods

The review methodology was based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Extension for Scoping Reviews (PRISMA-ScR).[15] The main concepts relating to this scoping review were identified using the Population-Concept-Context (PCC) framework.[16] Our Population of interest was school-going children aged 6 to 17 years. The concepts related to interventions designed to improve knowledge, attitudes, practice, voluntary post-referral examination uptake, spectacle procurement, and spectacle-wearing compliance. The context was LMICs.

Studies were included if they investigated eye health education programmes that were implemented in schools and targeted children attending schools. Studies were also included that focussed on outcomes such as: (i) evaluation of school-based eye health screening programmes; (ii) increase in referral uptakes, spectacle procurement and wearing compliance; iii) change in knowledge, attitudes, and practice towards eye health in school children; and (iv) studies performed with proxies such as parents or guardians on behalf of school children to evaluate spectacle use compliance. Randomised controlled trials, qualitative studies, cross-sectional epidemiological surveys, and prospective observational studies were included.

Studies were excluded if: (i) the intervention did not include school children or a proxy for a school child; (ii) they were not conducted in a country that was classified as low- or middle-income according to World Bank classifications[17]; (iii) they did not report outcomes such as spectacle usage compliance, change in knowledge, attitudes, and practice, behavioural changes, or referral adherence. Conference papers, editorial discussions and commentaries, meeting abstracts, book chapters, theses, and studies that did perform primary data collection were also excluded (Table 1).

To identify peer-reviewed primary studies, three bibliographic databases (Medline, Embase and Web of Science) were searched in June 2024 using multiple combinations of the search terms ‘eye health’, ‘screening’, ‘child’, ‘spectacle’, ‘low- and middle-income countries’ and other associated terms (2). This was done in consultation with the information specialist librarian at Queen’s University Belfast. The search was broad due to the inter-connectedness of the terms ‘eye health interventions’ and ‘spectacle compliance’ in the literature and its similarity to concepts such as vision health and behavioural interventions. Additionally, searches were conducted using relevant online repositories including WHO Global Eye Reports, Lancet Global Health and the Institutional Repository for grey literature. The search was limited to include studies published in English from 1999 to 2024. This was because the International Agency for the Prevention of Blindness launched its “Vision 2020″ campaign in 1999. Reference management software Endnote was used to store studies retrieved during the literature search and to remove duplicate records.

Table 1
Inclusion and exclusion criteria.

Inclusion	Exclusion
English language written peer reviewed articles from 1999 – 2024.	Studies in higher learning institutions like universities.
Peer reviewed articles, grey literature, and conference papers.	Studies that focused on cosmetic benefits of spectacles.
Studies done in schools that utilized educational and health promotional strategies to improve knowledge, attitude, and practice.	Letters, commentaries, editorials, dissertations/theses, conference abstracts, and case studies.
Studies that used proxies like parent or guardians on behalf of school children to assess spectacle compliance in school children.	Studies without primary data collection.

Title and abstract screening were performed by one researcher (GOA) to identify papers that met the criteria for inclusion. Two researchers (GOA and MA) performed independent full-text screening for papers considered eligible during title and abstract screening. In the event of a disagreement between the researchers, a third researcher (VFC) was consulted to resolve the disagreement. Data extracted from each paper included: author(s); year of publication; study design; outcome measured; country income level[17,18]; intervention type; outcome; and main findings.

3. Results

The initial search retrieved $n = 108$ studies (Fig. 1). After title and abstract screening, $n = 23$ were selected for a full-text review, with an additional $n = 6$ studies identified by screening reference lists. In total, $n = 29$ full texts were assessed, of which $n = 7$ met the inclusion criteria. A summary of the search strategies is presented in Table 2.

3.1. Study characteristics

Nearly half of the included studies ($n = 3$, 43 %) were conducted in China. Additionally, three studies (43 %) were from other upper-middle-income countries, and three studies (43 %) were from lower-middle-income countries. Some studies fell into multiple classifications, which is why these percentages do not sum to 100 %. Most were randomised controlled trials ($n = 4$, 57 %), while others were cross-sectional ($n = 1$, 14 %), quasi-experimental ($n = 1$, 14 %), or qualitative prospective ($n = 1$, 14 %). All studies were published between 2010 and 2020 (Table 3). The most common reasons for exclusion were: (i) studies that did not implement interventions to improve spectacle-wearing compliance, knowledge, attitudes, and practice, or referral adherence; (ii) studies that only assessed prevalence or barriers without evaluating an intervention; and (iii) studies that lacked primary data collection or did not provide sufficient outcome measures related to intervention effectiveness.

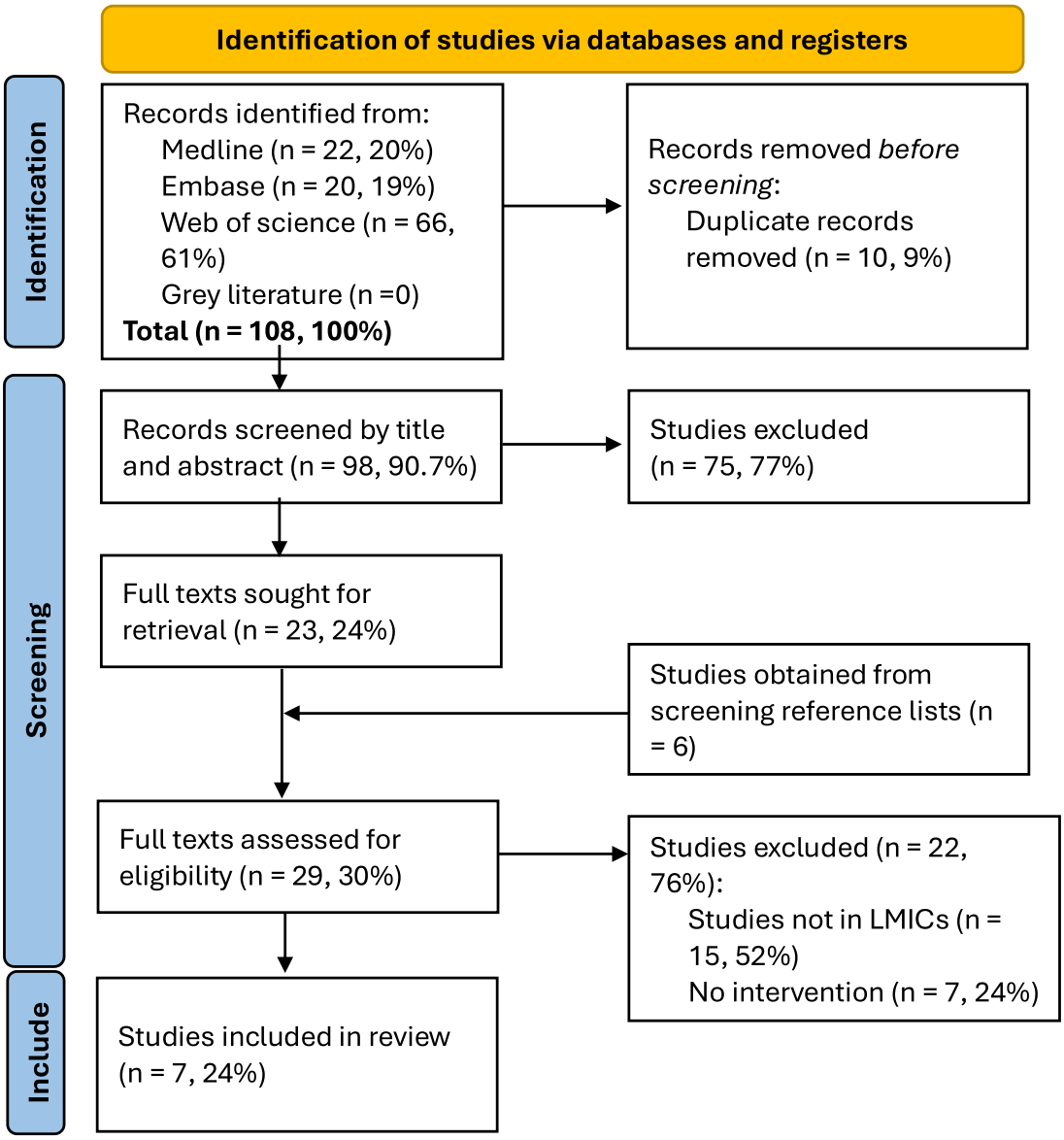


Fig. 1. PRISMA flow diagram.

Table 2
Example search strategy.

Keyword	Search terms
Eye	"Ocular" OR "sight" OR "visual acuity" OR "vision" OR "blindness" OR "eye disease" OR "blurred vision"
School	"School child" OR "child health" OR "preschool child" OR "child health care" OR "children" OR "adolescent"
Eye health intervention	"Intervention study" OR "early intervention" OR "health promotion" OR "promotion" OR "health promotion model" OR "behavioural change"
Spectacles	"Glasses" OR "eyeglasses" OR "eye lens"
Low- and middle-income country	"Developing countries" OR "low income" OR "lowest income" OR "middle income" OR "low and middle income" OR "low or middle income"
Screening	"Assessment" OR "test" OR "evaluation" OR "mass screening"

3.2. School-based eye health interventions implemented in low- and middle-income countries and their outcome measures

Most studies involved eye health education (n = 5, 71 %), with additional interventions including free spectacles (n = 2, 29 %), health promotion (n = 3, 43 %), media campaigns/reminders (n = 1, 14 %) and incentives (n = 1, 14 %). Targeted outcomes included spectacle-wearing compliance (n = 5, 71 %), changes in knowledge, attitudes, and practices (n = 4, 57 %) and referral adherence (n = 1, 14 %). A summary of the study characteristics in presented in Table 4.

3.3. Interventions and their effectiveness

3.3.1. Eye health education and free spectacle provision

Zhang et al[19] and Congdon et al[20] used multi-component interventions to improve spectacle-wearing compliance and change in knowledge, attitudes, and practices in randomised trials in China. Zhang et al[19] used group education which consisted of a 10-minute popular science video and designed a cartoon manual about the popularisation of vision knowledge and a class discussion. Teachers and parents also watched videos about the safety and benefits of eyeglasses at school and obtained a science manual on visual knowledge. Posters with the same content were displayed in classrooms. In one of the arms, free eyeglasses were provided. It was observed that the education group and the education plus free eyeglasses achieved better vision knowledge (from 37.3

Table 3
Study characteristics.

		n	%
Country	China	3	43
	Turkey	1	14
	Vietnam	1	14
	India	1	14
	Tanzania	1	14
Country income level[#]	Upper-middle	4	57
	Lower-middle	3	43
Year	2011	1	14
	2012	2	29
	2014	1	14
	2015	1	14
	2017	1	14
	2020	1	14
Design	Randomised controlled trial	4	57
	Cross-sectional study	1	14
	Quasi experimental study	1	14
	Qualitative prospective study	1	14
Sample size	>10,000	1	14
	1000 – 5000	3	43
	500 – 1000	1	14
	<500	2	29
Intervention type[*]	Eye health education	5	71
	Eye health promotion	3	43
	Free spectacles	2	29
	Media campaign	1	14
	Incentives	1	14
Outcome[*]	Spectacle wearing compliance	6	86
	Change in knowledge, attitudes, and practice	4	57
	Post-referral uptake	1	14

[*] Some studies combined more than one intervention and others assessed more than one outcome.

[#] According to World Bank country classifications by income level for 2024–2025 (available at https://blogs.worldbank.org/en/opendata/world-bank-country-classifications-by-income-level-for-2024–2025).

% to 48.8 %) and spectacle usage (from 26.3 % to 44.0 %) at the evaluation stage compared to the control group (from 25 % to 34 %). Congdon et al[20] used a 10-minute cartoon video, an ophthalmologist-led interactive lecture, and a study personnel-led interactive classroom-based demonstration to promote spectacle purchase or wearing. The educational intervention promoting spectacle purchase was delivered directly to children aged 12–17 years in years 1 and 2 of junior and senior high schools and teachers in rural China, with a sample size of 639 children in the intervention group and 609 children in the control group. However, purchase rate and spectacle-wearing did not differ between the control and intervention schools. In the intervention schools, 417 (25.7 %) children reported buying glasses while 537 (34.0 %) children from the control schools did ($p = 0.45$). A summary of the intervention significance is presented in Table 5.

3.3.2. Eye health education

In Tanzania, Chan et al[21] utilised Vision Champions in conducting screenings after providing eye health education to their peers and families. Spectacle provision was not part of the program, individuals who required glasses could obtain them at the local vision centre. Referrals were made for blurred distance and near vision, as well as for noticeable eye conditions such as squints, “white eye” (which could indicate cataracts or corneal conditions), and “red eyes.” (which could indicate conjunctivitis, scleritis or keratitis). It was observed that there was significant improvements in eye health knowledge and practices among children and adults after using comic booklets and peer-led education, though only 19 % of referrals were followed, which increased to 28 % with reminders. Additionally, vision centre visits rose from 120 to 600 per month post-intervention. Before the implementation of the Vision Champion program, screenings were conducted annually in schools but referral adherence remained low. Hence, it is likely that the eye health education component played a key role in improving adherence. However, the manuscript does not clarify whether the increased referral adherence was due to the screening process or the education on vision, as the Vision Champion program was evaluated as a whole rather than its individual components being analysed separately. Kirag and Temel[22] conducted a quasi-experimental study in Turkey (upper-middle income) to assess spectacle-wearing compliance and changes in knowledge, attitudes, and practices among primary school children ($n = 191$) over six months. The intervention group received a health promotion education campaign, including an information booklet, visual support via compact disk, and an information booklet for parents, while the control group received only health promotional campaigns using information booklets. Following the intervention, spectacle usage in the intervention group increased from 9 to 19 children (a 111 % increase), whereas the control group saw a decrease from 10 to 8 children. Additionally, the intervention group expressed more positive opinions regarding spectacle use compared to the control group, suggesting that multi-modal educational strategies can be effective in improving both compliance and attitudes toward spectacle use among schoolchildren.

3.3.3. Teacher incentives

Yi et al[23] conducted a cluster randomized controlled trial in China to assess spectacle-wearing compliance among schoolchildren ($n = 1248$). The intervention group ($n = 639$) received free spectacles, health education videos, classroom presentations, and a teacher incentive (a tablet computer if >80 % of students wore their spectacles at two unannounced visits). The control group ($n = 609$) received only a prescription and a letter to parents. At six months post-intervention, 68.3 % of children in the intervention group were wearing their spectacles compared to 23.9 % in the control group. Additionally, 40.4 % of intervention schools had a compliance rate >80 %, while no control schools achieved this threshold. The findings suggest that a multi-component approach, including free spectacles, education, and teacher incentives, significantly improves spectacle-wearing compliance among schoolchildren.

3.3.4. Media-based reminders

Morjaria et al[24] conducted a randomised controlled trial in India to assess spectacle-wearing compliance among schoolchildren aged 11–15 years ($n = 701$). The intervention group ($n = 376$) received health education, media-based reminders (visual aids using Peek images and voice messages), and free spectacles, while the control group ($n = 325$) underwent standard screening with an ETDRS chart and received free spectacles. At 3–4 months follow-up, 77.7 % (control) and 82.7 % (intervention) of children were accounted for, while spectacle usage at school was 52.9 % in the control group and 53.6 % in the intervention group. Although Peek images and voice reminders improved compliance, the overall difference between the groups was minimal, suggesting that additional strategies may be needed to enhance sustained spectacle use among schoolchildren.

3.3.5. Eye health promotion

Paudel et al[25] conducted a cross-sectional study in Vietnam to assess changes in knowledge, attitudes, and practices related to eye health among schoolchildren ($n = 300$) following a health promotion intervention. The intervention involved posters displayed at school premises, leaflets, and stickers communicating eye health messages. At 3 months follow-up, knowledge of poor eye health symptoms improved significantly, increasing from 42 %−84 % to 75–95 %. However, the intervention did not successfully change some beliefs around spectacle use, indicating that additional strategies may be necessary to address misconceptions and improve attitudes toward vision correction.

3.4. Limitations of included studies

One of the most common limitations among the included studies was

Table 4
Summary of study designs and findings.

Author/s and year	Country (income-level)	Participants and sample size	Study design	Outcome(s) assessed	Intervention type	Results
Yi et al.,[23] 2015	China (upper-middle income)	School children Intervention: $n = 639$ Control: $n = 609$ children	Cluster randomized controlled trial with a follow-up at 6 weeks and 6 months.	Spectacle wearing compliance.	*Intervention group*: Free spectacles, health education videos, and classroom presentations. Teacher incentive of a tablet computer if >80 % of children given free spectacles were wearing them at 2 unannounced visits. *Control group*: Prescription and letter to parent.	68.3 % of the intervention group were recorded as wearing their spectacles at 6-months post-intervention, compared to 23.9 % in the control group. 40.4 % of intervention group schools had spectacle wearing compliance rate of >80 % at follow-up. No control school achieved this.
Kirag and Temel,[22] 2014	Turkey (upper-middle income)	Primary school children $n = 191$	Quasi experimental study with a follow-up at 6 months.	Spectacle wearing compliance. Change in knowledge, attitudes, and practice.	Intervention group: Health promotional campaign using an information booklet. Health education using compact disk as visual support, and information booklet for parents. Control group: Health promotional campaigns using information booklets only.	The intervention increased spectacle usage of 9 children pre-intervention to 19 post-intervention (an increase of 111 %). A decrease from 10 to 8 in spectacle usage was observed in the control group. The intervention group also expressed more positive opinions regarding spectacle usage compared to control group.
Paudel et al.,[25] 2012	Vietnam (lower-middle income)	School children $n = 300$	Cross-sectional study with a follow-up at 3 months.	Change in knowledge, attitudes, and practice.	Health promotion using posters displayed at school premises, leaflets and stickers communicating eye health messages.	Knowledge of poor eye health symptoms increased from 42 %–84 % to 75–95 % post-intervention. However, the health promotion measures employed failed to change some beliefs around spectacle use.
Morjaria et al.,[24] 2020	India (lower-middle income)	School children 11–15 years Intervention: $n = 376$ Control: $n = 325$	Randomised controlled trial with a follow-up at 3–4 months.	Spectacle wearing compliance	*Intervention group*: Health education, Media-based reminders, including visual aids using peek images and voice message reminders and free spectacles *Control group*: Standard ETDRS chart for screening and free spectacles	Peek images and voice reminders did demonstrably improve spectacle wearing compliance. At follow-up, 77.7 % and 82.7 % in control and intervention group were accounted for respectively. 52.9 % in the control group and 53.6 % in the intervention group actively used their spectacles or had them at school.
Congdon et al.,[20] 2011	China (upper-middle income)	School children Intervention: $n = 2236$ Control: $n = 2212$	Randomised controlled trail with follow-up at 6 months.	Spectacle wearing compliance	*Intervention group*: Educational spectacle promotion using: 1. 10-minute video explaining refractive error and its correction. 2. lecture explaining the importance of spectacles in correcting refractive errors; and 3. demonstration of how spectacles correct refractive errors. *Control group*: Recommendation to purchase spectacles	Spectacle promotion did not improve spectacle compliance in this population. 25.7 % of the intervention group and 34.0 % of the control group reported buying glasses.
Chan et al.,[21] 2017	Tanzania (lower-middle income)	School children and community members. $n = 6311$ people received eye health messages. $n = 7575$ people were screened $n = 2433$ were referred. $n = 5746$ of those screened were children (76.4 %) and the rest were members of the community (23.6 %).	Quantitative prospective study with follow-up at 3 months	Change in knowledge, attitudes, and practice Post-referral uptake	Eye health education and promotion with pamphlets about good eye health practices.	An increase in rates of post-referral uptake and a positive change in knowledge, attitudes, and practices towards eye health care among school children were reported. 19 % and 28 % attended voluntary follow-up and after a reminder, respectively. 50 % received spectacles. Vision centre visits after intervention increased from 120 people per month to 600 people per month
Zhang et al.,[19] 2012	China (upper-middle income)	School children Education group: $n =$ 526 Free eyeglasses group= 527 Education + free	Randomised controlled trial with follow up at 7-months	Spectacle wearing compliance Change in knowledge,	*Intervention groups*: 1. Education group watched 10-minute popular science video. A cartoon handbook regarding the popularization of vision knowledge and materials were provided to	Education only increases students' knowledge about vision but does not increase spectacle usage. Similar free spectacle increased students' usages of spectacles but did not increase

(*continued on next page*)

Table 4 (*continued*)

Author/s and year	Country (income-level)	Participants and sample size	Study design	Outcome(s) assessed	Intervention type	Results
		eyeglasses: $n = 626$ Control group: $n = 510$		attitudes, and practice	students, teachers and parents that carried a message about the importance of spectacle use. 2. Free eyeglasses group; and 3. Free eyeglasses and health education. *Control group*: Received prescriptions	their knowledge about vision significantly. Education + free spectacle significantly increased knowledge and compliance to spectacle usage. Increase in knowledge from 30.1 % at baseline to 58.5 % after following up. Additionally, there was an increase in spectacle from 15 % at baseline for those who needed spectacles but were not wearing them to 48.1 % after follow-up in the education and education+ free spectacle groups respectively

Table 5
Intervention comparison.

INTERVENTION	Study (Author, year)	Significant results (Yes/No)	Key outcome
Free spectacles	Yi et al.,[23] 2015	Yes	68.3 % of the intervention group were wearing their spectacle at follow-up, compared to 23.9 % in the control group
	Zhang et al.,[19] 2012	Yes	Increase in spectacle wearing from 15 % to 43 % at follow-up
Eye health education	Zhang et al[19] 2012	Yes	Increase in knowledge from 30.1 % at baseline to 58.5 % after following up.
	Yi et al[23] 2015	Yes	Increase knowledge about positive eye health seeking behaviours
	Chan et al[21] 2017	Yes	A positive change in knowledge, attitudes, and practices towards eye health care among school
	Congdon et al[20] 2011	No	No difference in knowledge between intervention and control group
	Kirag and Temel[22] 2014	Yes	Positive opinion is spectacle use in intervention group compared to control group
	Morjaria et al[24] 2020	No	Increased spectacle wearing compliance in the intervention group compared to the control
Eye health promotion	Kirag and Temel[22] 2014	Yes	Improved general awareness about eye health
	Paudel et al[25] 2012	Yes	Increased in eye health knowledge, however some beliefs in spectacle use did not change
Media based reminders	Morjaria et al[24] 2020	No	Reinforcing eye health messages increases adherence to spectacle wear
Teacher incentives	Yi et al[23] 2015	Yes	Motivated teachers encouraged school children to wear their spectacles

insufficient follow-up time (three – seven months) to evaluate long-term improvements in knowledge, attitudes, and practices.[20,22,25] Financial constraints and limited generalisability to other settings were additional limitations noted in Congdon et al.[20] Many studies also relied on self-reported referral adherence,[20,25] introducing potential participation and reporting biases, and did not assess referral accuracy.[20] Notably, Zhang et al[19] reported no study limitations. A major limitation across the studies was the absence of a standardised tool to measure changes in knowledge, as each study used its own metrics to gauge intervention outcomes. This lack of standardisation poses challenges for applying results in other settings and reproducibility.

4. Discussion

The present review found that school-based eye health interventions, particularly those involving health education and promotion, can significantly improve knowledge, attitudes and practices related to eye health among children in LMICs. Interventions providing free spectacles and incorporating teacher incentives were particularly effective in increasing spectacle-wearing compliance.[19,21,25] Additionally, education-based initiatives[19,22] improved referral adherence and contributed to a general increase in eye health awareness among students. These findings support the potential for structured, accessible school-based programmes to fill critical gaps in spectacle use and early detection of vision problems in settings with limited resources in which free spectacles has proven to be pivotal in improving spectacle-wearing compliance.

The review's findings are broadly consistent with existing literature supporting the role of school-based programmes in enhancing compliance with spectacle use and advancing eye health knowledge.[6,26–28] However, variability in programme design, intervention components and outcome measures across studies highlights the lack of standardised approaches, complicating efforts to compare results directly across settings. This review aligns with previous studies showing that health education can drive behaviour change, particularly when culturally appropriate and engaging methods are used.[29-33] On the other hand, results diverged in the effectiveness of digital reminders, as the reviewed studies found limited success with these interventions in LMIC contexts, likely due to inefficiencies in implementation and local relevance.[34] Future research should ensure robust delivery mechanisms, explore alternative digital formats, and assess parental preferences to maximize engagement with such interventions. Furthermore, this highlights a key lesson: interventions need to be co-created with target communities to ensure they are contextually relevant and effectively received. A more participatory approach involving children, parents, and teachers in the design of educational messages may have improved engagement and reinforced spectacle compliance[35]

Differences in intervention outcomes could stem from varying degrees of community involvement, cultural adaptation and understanding of local needs. Studies that engaged both parents and teachers, along with providing teacher incentives, tended to report better compliance and engagement, suggesting that stakeholder buy-in can enhance intervention impact.[22] The limited success of digital interventions could

reflect technological or communication barriers, as well as parents' lack of familiarity with digital reminders. Behavioural change, particularly in spectacle use, often requires direct engagement and reinforcement, which automated reminders alone may not provide. In resource-limited settings, face-to-face interactions or community-based outreach may be necessary to ensure sustained behaviour change.

This review underscores the need for context-sensitive, multi-component school interventions to tackle eye health issues among children in LMICs. Findings suggest that free spectacles, teacher incentives, and ongoing health education in schools can enhance spectacle use and improve knowledge retention. Key questions remain about replicating, scaling and adapting these interventions in new settings. For instance, the Vision Champion programme implemented in Tanzania,[21] which utilised health education and promotional strategies using school children to deliver these interventions to improve positive eye health behaviour among their peers was successfully replicated in Uganda and Kenya and adapted into arts-based initiatives like Zanzibar Arts for Children's Eyesight.[35] Future studies should explore cost-effective ways to sustain these programmes within local health and education systems and whether governments could consider integrating eye health education into standard curricula to promote long-term awareness and adherence.

Additionally, none of the included studies performed longitudinal process or mechanistic evaluations to understand why interventions succeeded or failed. This may be due to resource constraints, as these types of evaluation require time and funding. Positive results should prompt an examination of factors such as content, delivery and cultural fit, while lack of improvement should lead to questions about possible barriers such as low engagement or cultural mismatches. Moving beyond binary classifications of success or failure (i.e., "it worked" or "it did not work") will help refine health education approaches, making them more relevant and effective for diverse communities and public health needs.

The present review identified several research gaps. For instance, current studies often lack long-term follow-up, limiting understanding of sustained impacts on spectacle-wearing compliance, knowledge, attitudes and practices. The absence of standardised tools such as the Health Belief Model to measure knowledge and attitudes hinders comparability and generalizability, while the limited focus on outcomes like referral adherence highlights the need to improve follow-up compliance for students referred for additional eye care. Cultural beliefs and misconceptions around spectacle use, particularly in rural areas, are also underexplored, which may reduce intervention effectiveness. Promising strategies, such as incentives and media-based reminders, require further investigation to understand their impact across diverse settings. Future research should address these gaps by using validated tools for consistent measurement, implementing long-term follow-ups, and developing culturally sensitive, multicomponent interventions involving teachers, parents, and community leaders. Studies should also explore digital tools to enhance parental engagement and examine cost-effective delivery models to support scalability, including integrating eye health education into school curricula.

Furthermore, from a programmatic perspective, key elements of an effective school vision screening program, Chan et al.,[36,37] Yong et al[38] and Srinivasan et al.'s[39] work on integrated school eye health program indicates that education, free spectacle provision, and engagement with teachers and parents are fundamental for improving spectacle adherence and knowledge retention. While interventions such as promotional activities, media-based reminders, and incentives can enhance outcomes, they should be seen as complementary rather than essential. To strengthen school vision screening programs, future studies should focus on integrated models that go beyond screening to include structured follow-up mechanisms, education, and accessibility of spectacles, ensuring that children not only get screened but also receive and use the necessary corrective measures.

Despite our scoping review being valuable for identifying research gaps, our review has its limitations. Title and abstract screening were performed by one reviewer which could have led to missing some resourceful paper for inclusion. We only mapped broad areas of our topic of interest but did not assess the quality of included studies, limiting our ability to evaluate the effectiveness of interventions. The broad, heterogeneous data we included made it challenging to provide conclusive recommendations and our reliance on broad eligibility criteria could have introduced bias.

5. Conclusions

The present review reinforces the importance of school-based vision screening and tailored interventions, such as health education, free spectacle provision and media-based reminders, for improving eye health outcomes among school children in LMICs. These findings demonstrate that accessible, multi-component interventions can increase spectacle-wearing compliance and foster better eye health awareness. However, challenges remain regarding the sustainability and scalability of these programmes, as most interventions are not integrated into the broader health and educational systems. Moving forward, multi-component strategies that involve teachers, parents, ministries of health, ministries of education and culturally relevant methods are recommended to achieve long-term, meaningful improvements in child eye health in low-resource settings such as LMICs.

Ethics approval and consent to participate

This is scoping review which does not require an ethics approval.

Consent for publication

Not applicable.

Clinical trial number

Not applicable.

Data availability statement

All data relevant to the study has been included in the manuscript and supplemental materials.

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Author contributions

VFC: Conceptualisation, funding acquisition, investigation, methodology, project administration, supervision, validation and writing – review and editing; GOA, CSP, ACY, MA: Data curation, formal analysis, visualisation, writing - original draft preparation and writing – review and editing; CT, RG: Writing - original draft preparation and writing – review and editing; VFC is guarantor of the study. All authors read and approved the final manuscript.

Declaration of competing interests

The authors declare that they have no competing interests.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ajoint.2025.100126.

References

1. Burnett AM, Yashadhana A, Lee L, Serova N, Brain D, Naidoo K. Interventions to improve school-based eye-care services in low- and middle-income countries: a systematic review. *Bull World Health Organ*. 2018;96(10):682–694d.
2. International Agency for the Prevention of Blindness, standard school eye health guidelines for low and middle-income countries [https://www.iapb.org/wp-content/uploads/Guidelines-School-Eye-Health-Programmes-English-Final.pdf] 2018 (accessed 20th July 2024).
3. Dhirar N, Dudeja S, Duggal M, Gupta PC, Jaiswal N, Singh M, Ram J. Compliance to spectacle use in children with refractive errors- a systematic review and meta-analysis. *BMC Ophthalmol*. 2020;20(1):71.
4. The international agency for the prevention of blindness, global action for eye health [https://www.iapb.org] 2024 (accessed 29th July 2024).
5. Organization WH: making every school a health-promoting school. 2021.
6. Morjaria P, McCormick I, Gilbert C. Compliance and predictors of spectacle wear in schoolchildren and reasons for non-wear: a review of the literature. *Ophthalmic Epidemiol*. 2019;26(6):367–377.
7. Naidoo K, Kempen JH, Gichuhi S, Braithwaite T, Casson RJ, Cicinelli MV, Das A, Flaxman SR, Jonas JB, Keeffe JE, et al. Prevalence and causes of vision loss in sub-Saharan Africa in 2015: magnitude, temporal trends and projections. *Br J Ophthalmol*. 2020;104(12):1658–1668.
8. Odedra N, Wedner SH, Shigongo ZS, Nyalali K, Gilbert C. Barriers to spectacle use in Tanzanian secondary school students. *Ophthalmic Epidemiol*. 2008;15(6):410–417.
9. Panda L, Nayak S, Das T. Tribal Odisha Eye Disease Study Report # 6. Opportunistic screening of vitamin A deficiency through School Sight Program in tribal Odisha (India). *Indian J Ophthalmol*. 2020;68(2):351–355.
10. The lancet global health commission on global eye health [https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30488-5/fulltext#seccestitle20] 2021 (accessed 20th June 2024).
11. World health organization. World report on vision [214-6]. https://www.who.int/publications/i/item/world-report-on-vision 2019 (accessed 17th August 2024).
12. Glanz KE, Lewis FME. *Rimer BK: Health Behavior and Health Education: Theory, Research, and Practice*. Jossey-Bass/Wiley; 1990.
13. Kyu HH, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, Abbastabar H, Abd-Allah F, Abdela J, Abdelalim A. Global, regional, and national disability-adjusted life-years (DALYs) for 359 diseases and injuries and healthy life expectancy (HALE) for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2018;392(10159):1859–1922.
14. Wedner S, Masanja H, Bowman R, Todd J, Gilbert C. Two strategies for correcting refractive errors in school students in Tanzania: randomised comparison, with implications for screening programmes. *Br J Ophthalmol*. 2008;92(1):19–24.
15. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MDJ, Horsley T, Weeks L, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169(7):467–473.
16. The Joanna Briggs Institute Reviewers' Manual 2015 methodology for JBI scoping reviews [https://repositorio.usp.br/directbitstream/5e8cac53-d709-4797-971f-263153570eb5/SOARES%2C+C+B+doc+150.pdf] 2015 (accessed 10th July 2024).
17. How does the World Bank classify countries [https://datahelpdesk.worldbank.org/knowledgebase/articles/378834-how-does-the-world-bank-classify-countries] 2024 (accessed 20th July 2024).
18. The World Bank, World Bank Country and lending Groups [https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups] 2014 (accessed 14th July 2024).
19. Zhang Y, Guan H, Du K, Zhao J, Shi Y, Wang H, Wang D. Effects of vision health education and free eyeglasses on knowledge of vision and usage of spectacles among primary school students: evidence from Gansu and Shaanxi provinces in China. *Risk Manag Healthc Policy*. 2021:1449–1464.
20. Congdon N, Li L, Zhang M, Yang A, Gao Y, Griffiths S, Wu J, Sharma A, Lam DS. Randomized, controlled trial of an educational intervention to promote spectacle use in rural China: the see well to learn well study. *Ophthalmology*. 2011;118(12):2343–2350.
21. Chan VF, Minto H, Mashayo E, Naidoo KS. Improving eye health using a child-to-child approach in Bariadi, Tanzania. *African Vision and Eye Health*. 2017;76(1):1–6.
22. Kirag N, Temel AB. The effect of an eye health promotion program on the health protective behaviors of primary school students. *J Educ Health Promot*. 2018;7(1):37.
23. Yi H, Zhang H, Ma X, Zhang L, Wang X, Jin L, Naidoo K, Minto H, Zou H, Lu L. Impact of free glasses and a teacher incentive on children's use of eyeglasses: a cluster-randomized controlled trial. *Am J Ophthalmol*. 2015;160(5):889–896. e881.
24. Morjaria P, Bastawrous A, Murthy GVS, Evans J, Sagar MJ, Pallepogula DR, Viswanath K, Gilbert C. Effectiveness of a novel mobile health (Peek) and education intervention on spectacle wear amongst children in India: results from a randomized superiority trial in India. *EClinicalMedicine*. 2020:28.
25. Paudel P, Yen PT, Kovai V, Naduvilath T, Ho SM, Giap NV, Holden BA. Effect of school eye health promotion on children's eye health literacy in Vietnam. *Health Promot Int*. 2019;34(1):113–122.
26. Holguin AMC, Congdon N, Patel N, Ratcliffe A, Esteso P, Flores ST, Gilbert D, Rito MAP, Munoz B. Factors associated with spectacle-wear compliance in school-aged Mexican children. *Invest Ophthalmol Vis Sci*. 2006;47(3):925–928.
27. Govender E. *Communication for social and behavioral change: a review of HIV prevention communication in South Africa. The Palgrave Handbook of Global Social Change*. 2024:1–23.
28. Green LW. National policy in the promotion of health. *Int J Health Educ*. 1979;22(3):161–168.
29. Hemptinne C, La Grange N, Yüksel D. Vision screening in Belgian children: too much or not enough? *Ophthalmic Epidemiol*. 2020;27(5):364–375.
30. Lim HC, Quah B, Balakrishnan V, Lim H, Tay V, Emmanuel S. Vision screening of 4-year-old children in Singapore. *Singapore Med J*. 2000;41(6):271–278.
31. Marmamula S, Yelagondula VK, Varada R, Khanna RC. Improving access to eye care in low and middle-income countries – challenges, opportunities, and the way forward. *Expert Rev Ophthalmol*. 2023;18(6):365–377.
32. Michie S, Atkins L, West R. The behaviour change wheel. *A guide to designing interventions*. 2014;1:1003–1010.
33. *Organization WH: Report of the 2030 Targets on Effective Coverage of Eye Care*. World Health Organization; 2022.
34. Cecilio-Fernandes D, Parisi MCR, Santos TM, Sandars J. The COVID-19 pandemic and the challenge of using technology for medical education in low and middle income countries. *MedEdPublish*. 2020;9.
35. Chan VF, Belluigi D, Yong AC, Mulewa D, Poonsamy-Govender P, Graham C, Mashayo E, Graham R, Price-Sanchez C, Omar F. Co-creating an arts-based eye health education strategy in Zanzibar: process, outcomes and lessons learnt. *BMJ Global Health*. 2022;7(9), e009317.
36. Chan VF, Yard E, Mashayo E, Mulewa D, Drake L, Omar F. Contextual factors affecting integration of eye health into school health programme in Zanzibar: a qualitative health system research. *BMC Health Serv Res*. 2023;23(1):1414.
37. Chan VF, Yard E, Mashayo E, Mulewa D, Drake L, Price-Sanchez C, Omar F. Does an integrated school eye health delivery model perform better than a vertical model in a real-world setting? A non-randomised interventional comparative implementation study in Zanzibar. *British Journal of Ophthalmology*. 2024;108(1):152–158.
38. Yong AC, Buglass A, Mwelwa G, Abdallah I, Chan VF. Can we scale up a comprehensive school-based eye health programme in Zambia? *BMC Health Serv Res*. 2022;22(1):945.
39. Srinivasan SP, Udat A, Ngaanuma E, Graham R, Faal H, Chan VF. Reach, effectiveness, adoption, implementation and maintenance of a school eye health program in Petauke district, Zambia. *AJO International*. 2025;2(1), 100106.