Disclaimer: This is not the final version of the article. Changes may occur when the manuscript is published in its final format.

From Communities to Classrooms: Integrating Community and School-Based Paediatric Eye Care

Ragni Kumari *
Department of Optometry, Uttar Pradesh University of Medical Sciences (UPUMS), Saifai, Etawah-206130, Uttar Pradesh, India
ORCID: 0000-0002-6238-6004
Email: ragnimishraa@gmail.com

Abstract

Background: Childhood visual impairment can affect learning, development, and participation, while access to assessment and treatment remains uneven. In this review, 'universal paediatric eye care' means an equitable, continuous pathway connecting age-appropriate identification with confirmatory assessment, treatment, referral, and follow-up.

Methods: This narrative review examines published research and public-health guidance on childhood visual impairment and paediatric eye-care delivery. Evidence was synthesised thematically across disease burden, screening, refractive services, referral, follow-up, and implementation barriers. The available documentation did not permit reliable reconstruction of database-specific search strategies, exact search dates, or a contemporaneous study-selection log. Accordingly, the review is presented as a narrative review rather than a systematic or scoping review, and no PRISMA study-selection counts are reported.

Results: The reviewed literature and guidance consistently indicate that screening is only one step in the care pathway. Programmes must connect screening to confirmatory examination, indicated treatment, referral completion, and follow-up. The evidence base is heterogeneous in population, screening method, outcome definition, and follow-up duration; this review does not calculate pooled or harmonised regional estimates.

Conclusion: The evidence supports linking community awareness and school-based screening with confirmatory examination, appropriate treatment, referral, and follow-up; screening alone does not ensure that children complete care. No single service model can be considered effective in every setting because programmes and reported outcomes are heterogeneous. The narrative design and incomplete search documentation limit comprehensiveness and reproducibility, and publication bias remains a possible, unassessed limitation. Future evaluations should report screening protocols, referral completion, spectacle receipt and use, and longer-term outcomes.

Keywords: paediatric eye care; childhood visual impairment; school eye health; vision screening; refractive error; integrated paediatric eye care.

1. Introduction

Vision contributes to children's learning, development, and social participation. Childhood visual impairment has multiple causes, including uncorrected refractive error and conditions requiring timely clinical assessment. Global burden estimates depend on the age range, definition of visual impairment, measurement method, and year of estimation; figures should therefore be reported only with a traceable source and a clearly specified outcome. The present review does not treat estimates drawn from non-comparable populations as directly interchangeable [1,2,3].

Uncorrected refractive error is an important treatable contributor to visual impairment among school-aged children [2]. Estimates from individual school-screening studies vary with age, sampling frame, visual-acuity threshold, and the definition of refractive error. A single range should not be interpreted as a universal prevalence estimate unless these features are comparable. Appropriate spectacles can correct the associated refractive visual impairment, but they do not remove the underlying refractive error [2,4].

Visual difficulties may affect reading and classroom participation, although the magnitude of educational effects varies by condition, setting, and study design. A cluster-randomised trial in China reported educational outcomes after free spectacles were provided to children with refractive error; this supports the potential value of access to correction but should not be generalised to every eye condition or service model [4].

Despite the availability of effective and affordable interventions, many children continue to remain undiagnosed or untreated because of barriers such as limited access to eye care services, inadequate screening programmes, shortages of trained eye care professionals, and poor awareness among parents, caregivers, and teachers, particularly in low- and middle-income countries.[3,5] School-based vision screening programmes integrated with spectacle provision and structured referral pathways have consistently demonstrated their effectiveness in correcting visual impairment associated with refractive errors and improving visual outcomes among schoolchildren.[6]

A comprehensive public health approach that links community-based eye health initiatives with school vision screening has considerable potential to improve the early detection, referral, treatment, and long-term management of childhood eye disorders. Such integrated service delivery models promote collaboration among healthcare providers, educators, families, and policymakers, thereby improving access to essential paediatric eye care services.

The aim of this narrative review is to describe how community outreach and school-based services can be connected to clinical assessment, treatment, referral, and follow-up. The guiding question is: what service components, implementation barriers, and monitoring indicators are described in the literature for improving equitable access to paediatric eye care?

For this review, universal paediatric eye care is an aspirational service framework, not a claim of universal current coverage. It refers to equitable access to a continuous pathway that includes age-appropriate identification, confirmatory assessment, indicated treatment, referral, and follow-up for children and adolescents, regardless of whether the first point of contact is the community, school, or health facility.

2. Methodology

This article is a narrative review of published evidence and public-health guidance on childhood visual impairment and paediatric eye-care delivery. The discussion is organised around: (1) burden and causes; (2) community outreach; (3) school-based vision screening; (4) refraction and spectacle provision; (5) referral and follow-up; and (6) implementation barriers and policy options. The purpose is descriptive and interpretive rather than to estimate a pooled effect or claim exhaustive coverage.

Relevant material concerned children and adolescents aged 0–18 years and addressed childhood visual impairment, screening, refractive correction, referral, follow-up, or service delivery. Primary studies, evidence reviews, and relevant guidance were considered when they informed one or more review themes. The documentation available for this revision did not permit reliable reconstruction of the database-specific search strings, exact search dates, or contemporaneous record-selection log. This reporting limitation is acknowledged; the article is therefore classified as a narrative review rather than a systematic or scoping review.

The evidence was organised thematically by population and setting, service-delivery approach, and outcomes reported for identification, referral, spectacle provision, use, or follow-up. Study findings were not pooled. Because study designs, age ranges, screening thresholds, outcome definitions, and follow-up periods differ, cross-study comparisons are descriptive and should be interpreted cautiously.

This review used previously published studies and publicly available reports and did not involve recruitment of human participants or collection of identifiable personal data; ethical approval was therefore not required. Limitations include the lack of a fully reproducible search log, possible omissions of relevant literature, heterogeneity in study designs and outcome definitions, and the inability to conduct a formal risk-of-bias assessment from the information available for this revision. Publication bias cannot be excluded.

This review is a narrative synthesis and did not use a protocol-driven systematic-review process. A PRISMA flow diagram and study-selection counts are not presented because a verifiable screening log was unavailable.

3. Burden and Causes of Childhood Visual Impairment

Childhood visual impairment has multiple causes and its reported burden depends on the population, age range, diagnostic definition, and assessment method used. Uncorrected refractive error is an important treatable contributor, while amblyopia, strabismus, congenital cataract, ocular trauma, infection, and inherited disorders may also require assessment or treatment [2,3,5]. These conditions should not be combined into a single prevalence estimate unless the source defines and measures them consistently.

Uncorrected refractive error is an important treatable cause of visual impairment among school-aged children. The relative frequency of myopia, hyperopia, and astigmatism varies by age, population, diagnostic thresholds, and whether refraction is performed with cycloplegia; a recent meta-analysis of Indian schoolchildren found myopia to be the most prevalent refractive error, followed by astigmatism and hyperopia [2,7]. Timely clinical assessment and appropriate spectacle correction can improve vision when refractive error is responsible for reduced visual acuity, although spectacles do not eliminate the underlying refractive error [2,4,7].

Other significant causes of childhood visual impairment include amblyopia, congenital cataract, strabismus, ocular infections, ocular trauma, and inherited eye disorders [3,5]. Delayed recognition or treatment of these conditions may result in permanent visual loss, highlighting the need for effective screening, referral, and comprehensive paediatric eye care services.

Visual difficulties can interfere with learning and everyday participation, but the strength of evidence differs by condition and intervention. Evidence from trials of spectacle provision is relevant to children with refractive error and should not be taken as direct evidence for the effects of screening or treatment for congenital cataract, amblyopia, inherited disorders, or other conditions [3,4].

4. Global Prevalence

Reported prevalence varies across settings, reflecting differences in population structure, age, case definitions, sampling, and access to services. The references used in this narrative review do not provide a sufficiently harmonised set of regional primary estimates to support a like-for-like country comparison.

Regional estimates should be compared only when the age range, outcome definition, sampling method, and assessment protocol are sufficiently similar. For that reason, this review does not reproduce unsupported regional percentages. Table 1 summarises key evidence themes and the limitations that should be considered when interpreting childhood eye-health data.

Table 1. Summary of evidence themes relevant to paediatric eye care

Evidence theme	Summary	Interpretive caution	Evidence base
Uncorrected refractive error	A major treatable contributor to childhood visual impairment; access to refraction and spectacles is central to service delivery.	Prevalence estimates vary by age, setting, visual-acuity threshold, and case definition; avoid cross-region comparisons without harmonised methods.	Holden et al.[1]; Fricke et al. [2]
Other childhood eye conditions	Amblyopia, strabismus, cataract, infection, trauma, and inherited disorders may require clinical assessment beyond a basic vision screen.	A screening result is not a diagnosis; referral should reflect the suspected condition and the child's age.	Mathers et al. [3]; WHO handbook.[5]
Service access and continuity	Community outreach and school platforms can help identify children who might otherwise not reach eye-care services.	Coverage and benefit depend on referral completion, trained personnel, available clinical services, and follow-up.	Little et al. [8]; Anokye et al.[9]

4. Effective Service Delivery Models

Integrated paediatric eye care links community outreach and school-based screening to confirmatory clinical assessment, indicated treatment, referral, and follow-up. The approach is intended to reduce gaps between identifying a possible problem and completing care; the strength and generalisability of evidence vary by programme and outcome, so effectiveness should not be assumed uniformly across settings [5,8,9].

4.1 Community-Based Eye Care

4.1.1 Outreach and Early Detection

Community-based programmes may include caregiver education, identification of children with possible visual difficulties, and support for referral to clinical services. Their specific screening methods and the training of personnel differ between programmes; claims about screening accuracy should be made only when supported by a study that directly evaluated the personnel and test used [5,8]. Outreach screening is not a substitute for diagnostic examination.

4.1.2 Raising Awareness

Community awareness programmes directed toward parents, caregivers, teachers, and local communities can substantially increase the uptake of eye care services and improve adherence to referral recommendations and spectacle use.[6,9] Educational campaigns that address misconceptions about childhood vision problems and spectacle wear have been shown to encourage participation in screening programmes and enhance follow-up compliance.

A summary of the major community- and school-based interventions, their target populations, and associated outcomes is presented in **Table 2**, highlighting the effectiveness of integrated service delivery models for improving the early detection and management of childhood visual impairment.

Table 2. Community- and school-based paediatric eye-care interventions and monitoring outcomes

Intervention	Target population	Core activities	Outcome measures to monitor	Evidence base
Community outreach	Children and caregivers in underserved communities	Awareness, age-appropriate screening, referral information	Screening coverage; proportion referred; referral completion	WHO handbook [5]; Little et al [8].

Intervention	Target population	Core activities	Outcome measures to monitor	Evidence base
School-based screening	School-aged children	Visual-acuity screening; caregiver communication; referral for assessment	Screen-positive rate; referral completion; time to assessment	Mathers et al. [3]; Little et al. [8]
Refraction and spectacle services	Children with suspected or confirmed refractive error	Clinical assessment, appropriate refraction, spectacle dispensing and fitting	Spectacle dispensing; correct fit; use at follow-up	Ma et al. [4]; Gogate et al. [6]
Referral and follow-up	Children needing further examination or treatment	Named referral destination, caregiver guidance, reminders or tracking	Referral attendance; treatment completion; loss to follow-up	WHO handbook [5]; Anokye et al. [9]

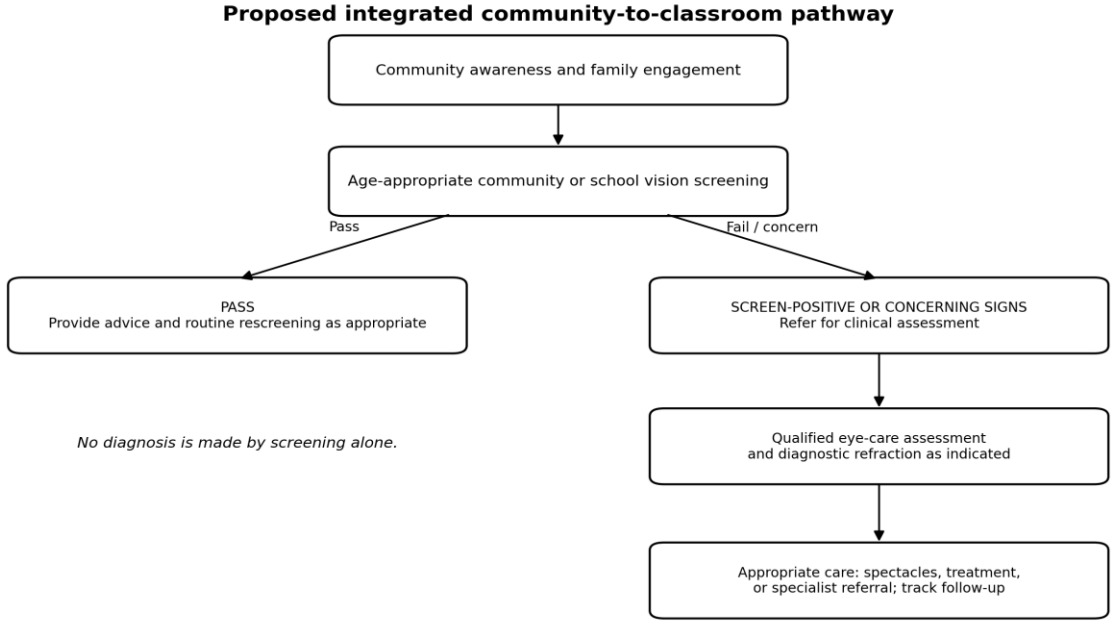


Figure 1. Proposed integrated community-to-classroom pathway for paediatric eye care.

Integrated paediatric eye care programmes require coordinated referral pathways that connect community awareness activities with school-based vision screening and specialised eye care services. The overall community-to-classroom referral pathway is illustrated in Figure 1, showing separate pathways for children who pass screening and those who need further clinical assessment.

4.2 School-Based Vision Screening

Schools provide a practical platform for reaching school-attending children, but screening methods vary by age, purpose, equipment, and local protocol. Chart-based screening commonly measures monocular distance visual acuity using age-appropriate optotypes. Instrument-based approaches, including photoscreening or autorefraction, may be useful for younger children or those unable to complete chart testing, depending on device validation and programme resources. Protocols should state the test, referral threshold, screener training, referral criteria, caregiver communication, and destination for assessment. A screening result is not a diagnosis; children with symptoms or concerning signs may require assessment even if they pass a basic screen [3,5,8].

4.3 Refraction and Spectacle Provision

Children who screen positive should receive an appropriate clinical examination and diagnostic refraction when indicated. Assessment may include ocular history, visual acuity, ocular alignment and motility, ocular health evaluation, and objective and subjective refraction. Cycloplegic refraction may

be clinically indicated in children when accurate measurement of refractive error requires it. Whether dilation is used and whether the examination is conducted by an optometrist, ophthalmologist, or another appropriately qualified professional depend on the clinical protocol and service setting. The source studies do not consistently report these details, so they should not be inferred when absent. Spectacle provision should include suitable frame selection, fitting, caregiver counselling, and instructions on wear and replacement. Spectacles correct refractive visual impairment but do not eliminate the underlying refractive error [2,4,6].

4.4 Referral Pathways and Follow-Up

Referral should be a defined service component rather than a note on a screening form. Families need clear information about why further examination is required, where and when to attend, and how to seek help if barriers arise. Programmes should document whether referred children attend, the type of examination completed, the professional providing it, whether dilation or cycloplegia was used when relevant, the diagnosis, and the care recommended. Because these details are not uniformly reported across the literature, their absence limits comparison of diagnostic yield and programme outcomes. The WHO implementation handbook supports mapping referral processes to existing health systems and reducing loss to follow-up [5]. Digital reminders or tracking may be useful where feasible, but their performance should be evaluated locally rather than assumed.

4.5 Integrated Community-to-Classroom Care

An integrated model coordinates community workers, teachers, caregivers, screeners, optometrists, ophthalmologists, and programme managers, with roles defined by local policy and professional scope. A functional pathway links awareness and screening with clinical assessment, refractive services, specialist referral when needed, and follow-up. Monitoring should distinguish activity from outcomes: numbers reached and screened, screen-positive proportion, referral completion, time to assessment, confirmed diagnosis, treatment uptake, spectacle receipt and use, and follow-up attendance. Recent reviews identify variation in programme models and continuing gaps in referral adherence, spectacle compliance, and evidence on sustainability [8,9].

5. Challenges and Opportunities

Despite the potential benefits of community- and school-based paediatric eye-care programmes, implementation, coverage, and long-term outcomes may be constrained by workforce, access, financial, and follow-up barriers.

5.1 Barriers

Poor follow-up and spectacle use are important implementation challenges. Children may stop wearing spectacles because of discomfort, breakage, loss, concerns about appearance, peer influence, or limited caregiver support [5,8]. Studies do not always use the same definition of compliance or the same follow-up interval. Some report observed wear, others caregiver or child report, and assessment may occur at different time points. These outcomes should therefore be described using each study's own definition and follow-up duration rather than treated as a single directly comparable measure.

Workforce shortages also remain a significant challenge, particularly in rural and underserved areas where the availability of ophthalmologists, optometrists, and trained vision technicians is limited.[5,8] Insufficient human resources restrict the implementation of regular vision screening programmes and delay referral for comprehensive eye care.

Socioeconomic and cultural factors further influence access to paediatric eye care services. Limited parental awareness, misconceptions regarding spectacle use, financial constraints, and

cultural beliefs may discourage families from seeking timely eye examinations or adhering to recommended treatment.[6,9]

5.2 Addressing Emerging Trends

Myopia is an increasing public-health concern in many school-age populations. A recent meta-analysis of Indian schoolchildren identified myopia as the most prevalent refractive error in the included studies [7]. Evidence from reviews and meta-analyses suggests that increasing outdoor time may reduce the risk of myopia onset in children who are not yet myopic, although effects on progression among children with established myopia are less certain [10]. Associations involving near work and digital-device use vary according to exposure measurement and study design. Vision screening can identify children who need further assessment, but screening itself does not prevent myopia.

A summary of the major barriers affecting childhood eye care programmes and the corresponding strategies to overcome these challenges is presented in **Table 3**.

Table 3. Barriers to paediatric eye-care delivery and potential responses

Barrier	Potential impact	Practical response	Suggested indicator
Poor follow-up	Children may not receive examination or treatment after screening	Provide clear referral details, caregiver communication, and follow-up tracking	Referral completion rate
Workforce constraints	Reduced screening capacity and delays in clinical assessment	Train screeners for defined tasks and link them to qualified eye-care professionals	Coverage and waiting time
Cost and access barriers	Families may not complete referrals or obtain spectacles	Use affordable service pathways and assess local barriers to access	Proportion completing care
Spectacle discomfort or stigma	Reduced spectacle use after dispensing	Ensure fitting, counselling, caregiver engagement, and access to replacement spectacles	Self-reported or observed spectacle use

5.3 Spectacle Compliance

Spectacle-use outcomes require careful interpretation. Studies may define compliance through observed wear, child or caregiver report, or other measures, and follow-up periods differ. This variability limits direct comparison and can affect reported adherence. Programmes should state the definition used, the time since prescription, the method of assessing use, and reasons for non-use. Counselling, fit assessment, caregiver engagement, and replacement arrangements are plausible service components, but their effects should be evaluated rather than presumed [6,9].

6. Best Practices: Program Design and Integration

6.1 Standardized Screening Protocols

Screening protocols should be age-appropriate and clearly distinguish screening from diagnostic examination. The World Health Organization's Vision and eye screening implementation handbook provides guidance relevant to screening and referral in community and primary-care settings [5]. A protocol should specify the target condition, test or tool, threshold for referral, staff training, documentation, and referral destination. Children who fail screening or have concerning symptoms or signs require clinical assessment; a basic acuity test alone does not exclude all ocular disease.

6.2 Cross-Sector Collaboration

Sustained paediatric eye-care delivery requires coordination among health services, schools, families, community organisations, and policymakers. Operational roles should be specified locally: schools and community teams may support awareness and screening; qualified eye-care professionals undertake clinical assessment and treatment within their scope; and programme managers monitor referral and service outcomes. Core indicators can include screening coverage, proportion referred, referral

completion, time to assessment, treatment uptake, spectacle receipt and use, and follow-up attendance. Evidence reviews emphasise the importance of linking screening to accessible interventions, while the magnitude and generalisability of programme effects remain uncertain [8,9].

7. Policy Recommendations

Based on the available evidence, several policy measures can strengthen paediatric eye care services and improve access to timely vision care for children:

1. Integrate comprehensive eye care services into national school health programmes to ensure routine vision screening at key developmental stages.
2. Strengthen training programmes for teachers, community health workers, and primary healthcare personnel to support the early identification and appropriate referral of childhood visual disorders.[5,8]
3. Expand community awareness initiatives to improve public understanding of childhood eye diseases, encourage timely care-seeking behaviour, and promote acceptance of spectacle use among children.[6,9]
4. Develop monitoring and tracking systems to improve referral completion, follow-up care, and long-term spectacle compliance among children diagnosed with refractive errors.[5,9]
5. Promote operational and implementation research to evaluate programme effectiveness, cost-effectiveness, and the long-term sustainability of integrated community- and school-based paediatric eye care services.

Conclusion

This review identifies a consistent service-planning priority: community outreach and school-based screening should be connected to confirmatory assessment, appropriate refractive correction or other indicated treatment, referral, and follow-up. Screening alone is insufficient if children cannot access or complete subsequent care. Programmes should monitor screening coverage, referral completion, treatment uptake, spectacle receipt and use, and follow-up attendance. The evidence remains heterogeneous, and current literature does not establish one service model as universally effective [5,8,9].

This narrative review has limitations. Search documentation was insufficient to reconstruct a fully reproducible search, and relevant studies may therefore have been missed. The included literature also varies in study design, outcome definitions, screening protocols, examiner qualifications, and follow-up procedures. Publication bias is a possible limitation but was not formally assessed. The findings should consequently be interpreted as service-planning implications rather than a formal rating of intervention effectiveness. Future evaluations should report age, screening method and threshold, examiner role, use of dilation or cycloplegia when relevant, referral completion, treatment uptake, spectacle-use definition, and follow-up duration.

List of Abbreviations

AI: artificial intelligence;

WHO: World Health Organization.

Author Contributions

Ragni Kumari: Conceptualization, Methodology, Writing – Original Draft, and Writing – Review & Editing, Visualization. The author has read and approved the final manuscript.

Funding

No external funding was received for this study.

Conflicts of Interest

The author declares no conflicts of interest related to this manuscript.

Acknowledgment

The author acknowledges the researchers and organisations whose published work contributed to this narrative review.

AI-disclosure

Artificial intelligence (AI) assistance was used only to improve the language, grammar, sentence structure, and overall readability of this manuscript during the writing process. OpenAI ChatGPT (GPT-5.5) was used exclusively for editorial support. The AI tool was not involved in formulating the research question, conducting the literature search, screening studies, extracting data, interpreting the evidence, or drawing scientific conclusions. All content generated with AI assistance was carefully reviewed, revised, and verified by the author, who accepts full responsibility for the accuracy, originality, and integrity of the manuscript.

References

1. Holden BA, Fricke TR, Wilson DA, Jong M, Naidoo KS, Sankaridurg P, et al. Global prevalence of myopia and high myopia and temporal trends from 2000 through 2050. Ophthalmology. 2016;123(5):1036–1042. doi:10.1016/j.ophtha.2016.01.006.

2. Fricke TR, Tahhan N, Resnikoff S, Papas E, Burnett A, Ho SM, et al. Global prevalence of visual impairment associated with refractive error. Ophthalmology. 2018;125(10):1492–1499. doi:10.1016/j.ophtha.2018.04.023.

3. Mathers M, Keyes M, Wright M. A review of the evidence on the effectiveness of children's vision screening. Child Care Health Dev. 2010;36(6):756–780. doi:10.1111/j.1365-2214.2010.01109.x.

4. Ma X, Zhou Z, Yi H, Pang X, Shi Y, Chen Q, et al. Effect of providing free glasses on children's educational outcomes in China: cluster randomised controlled trial. BMJ. 2014;349:g5740. doi:10.1136/bmj.g5740.

5. World Health Organization. Vision and eye screening implementation handbook. Geneva: World Health Organization; 2024. ISBN 978-92-4-008245-8. Available from: https://www.who.int/publications-detail-redirect/9789240082458

6. Gogate P, Mukhopadhyaya D, Mahadik A, Naduvilath TJ, Sane S, Shinde A, et al. Spectacle compliance amongst rural secondary school children in Pune district, India. Indian J Ophthalmol. 2013;61(1):8–12. doi:10.4103/0301-4738.99996.

7. Kumar V, Soni M, Rajagopal V, Behera A, Gandhi A, Shamim MA, et al. The prevalence of refractive errors in Indian school children: a systematic review and meta-analysis. Ophthalmic Epidemiol. 2026;33(2):162–171. doi:10.1080/09286586.2025.2450346.

8. Little JA, Chan VF, Saw SM, Tham YC, Chew L, Foo LL, et al. Current status of school vision screening—rationale, models, impact and challenges: a review. Br J Ophthalmol. 2025;109(11):1207–1214. doi:10.1136/bjo-2024-326726.

9. Anokye GO, et al. School-based eye health interventions for improving eye care and spectacles compliance in children in low- and middle-income countries: a scoping review. AJO Int. 2025;2(2):100126. doi:10.1016/j.ajoint.2025.100126.

10. Li D, Min S, Li X. Is spending more time outdoors able to prevent and control myopia in children and adolescents? A meta-analysis. Ophthalmic Res. 2024;67(1):393–404. doi:10.1159/000539229.