

Paradigm Shifts in Paediatric Myopia Management Standard Eyeglasses to Advanced Therapeutics

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ABSTRACT

Human eye works like a camera. The front of the eye bends light to form an image on the retina, the light-sensitive tissue in the back of the eye (like film in a camera). Myopia happens when the cornea, the lens, or the length of the eye makes the focus land in front of the retina. It is a common eye condition in humans where close objects look clear, but distant objects appear blurry. More screen time, less outdoor play and increased near work have made blurry distance vision extremely common among children. Childhood myopia is a growing concern for families worldwide. Myopia occurs when the eye grows too long or the front surface (cornea) becomes too curved. This causes light to focus in front of the retina instead of on it, making distant objects appear blurry. Myopia Prevalence in 2026 is roughly 30% to 33% of the global population, affecting over 2.6 billion people.

While, the Snellen chart remains a vital baseline tool for catching distance blur, recent breakthroughs focus on advanced biological metrics, smart screening technologies, and preventative tracking to halt myopia before it worsens. Standard Glasses help kids see clearly, but they don't stop myopia from getting worse. That's why modern treatments like Ortho-K lenses and atropine eye drops are used to slow its progression.

Materials and Methods: This article presents two cases one responding to standard eyeglasses and other resistant to standard glasses and responding to special eyeglasses in which the centre of the lens corrects distance vision, the rest of the lens intentionally blurs peripheral vision, acting as a signal to the eye to slow its growth.

Outcomes: One of the girls took almost 3 years to stabilize refractive errors, that to nearly 2 years after using special eyeglasses and the second girl within one year of normal eyeglasses.

Keywords: Myopia, The Snellen Chart, Visual Acuity, Axial length, Cycloplegic refraction, Corneal topography, functional validation, Longitudinal tracking & treatment adjustment

Introduction

Young children of 2-5 years squinting or sitting extremely close to the television or holding mobile phone, books very close to the face, is a common site in recent times, which is a warning sign. Dedicated Paediatric eye units in Ophthalmic hospitals are crowded these days with children or parents complaining of frequent headaches or tired, sore eyes or child struggling to see the blackboard clearly if they must sit beyond first few seats in classroom. This is due to Myopia, or Short-sightedness, a common eye condition in children where close objects look clear, but distant objects appear blurry [1]. Global Myopia Prevalence (2026) is roughly 30% to 33% of the global population, affecting over 2.6 billion people. East and Southeast Asia experience the

highest rates, with up to 80% to 90% prevalence among young adults in places like South Korea, Taiwan, and Singapore [2].

While, the Snellen chart remains a vital baseline tool for catching distance blur, recent breakthroughs focus on advanced biological metrics, smart screening technologies, and preventative tracking to halt myopia before it worsens [3].

Surveys by the All-India Institute of Medical Sciences (AIIMS) a decade ago indicated a 13% prevalence rate among school-aged children in urban areas which had doubled from 7% two decades ago [8]. Rural regions maintain a lower, though rising, prevalence of 6% to 8%. The worldwide spread of the coronavirus disease pandemic in 2020, followed by lockdowns, forced children to be in home confinement with increased screen time, leading to rapid progression of myopia and an increase in the prevalence of myopia. Myopia among children in urban

India has surged dramatically, from 4.44% in 1999 to 21.15% in 2019, almost 30% in 2026 with projections estimating it could affect nearly half of urban children by 2050 [2,5].

Ophthalmology research is the scientific study of eye diseases and vision care. It includes Research in

- Retinal Diseases, finding better therapies for age-related macular degeneration (ARMD) & diabetic retinopathy using anti-VEGF drugs.
- Testing laser treatments, new eye drops & surgical options to lower eye pressure of Glaucoma cases.
- Studying ways to slow down Myopia in children & young adults
- Exploring root causes & long-term relief for Dry Eye Disease
- Working on gene therapy & stem cells to repair damaged optic nerves & retina.

Optometry research is the scientific study of vision, eye health, & visual systems to improve how eye diseases & vision disorders are diagnosed, treated, & prevented. Vision Correction through testing new designs for contact lenses, spectacles, and refractive surgeries, finding early signs and treatments for conditions like glaucoma, myopia, and diabetic retinopathy condition that affect vision and studying how the brain and eyes work together and how to rehabilitate lost visual function. Research in these domains provide evidence-based data that shapes daily clinical practice, leading to safer vision correction technologies, better preventative eye care, and new ways to detect systemic health issues through the eye. High-resolution retinal imaging and artificial intelligence models for eye exams are becoming Validating advanced tools [18].

This article presents two cases one responding to standard eyeglasses and other resistant to standard glasses and responding to special eyeglasses in which the centre of the lens corrects distance vision, the rest of the lens intentionally blurs peripheral vision, acting as a signal to the eye to slow its growth.

Case Reports

Case 1:

Laxmi the mother of Anagha a 4-year-old girl observed that though the girl was taught how to read the time on a clock failed to do so from a distance and sought an ophthalmic care in May 2022. A detailed examination by a paediatric ophthalmologist in private dedicated eye care hospital in Bengaluru

MYOPIA Report 07-05-2022 12:11 PM Name: ANAGHA ALOK SHANBHOG

Date of birth, Age 07-06-2017, 4.9 Y. 1609582, Ethnicity Gender: Indian female

- ADVICE: minimum outdoor activity 2h
- do breaks and relax vision in far distance regularly when reading
- reduce time & increase distance when use proper illumination when reading
- using a smartphone reduce time & increase distance when
- using a tablet reduce time & increase distance when using a computer

Measurement Results

REFRACTION		AXIAL LENGTH		KERATOMETRY	
RE	LE	RE	LE	RE	LE
-5.00D	-4.12D	23.75 mm	23.15 mm	44.6 D	44.8D
Sphere	Sphere	Progressive Curve= 1700			
-3.75 D	-2.50 D				
Cylinder	Cylinder				
D	1300 D				
-2.50 D	-3.37 D				
Axis	Axis				
178°	176				



EYECARE OPTOMETRY- John D Optometrist

The Risk Assessment Values

- Risk evaluation of measurement- 4.9
- Number of myopic parents- 4.9
- Outdoor activity time-4.9
- Near-Work activity in addition to school / work- 4.9

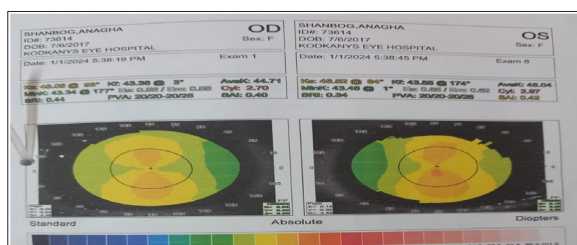
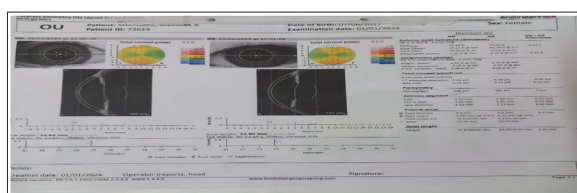
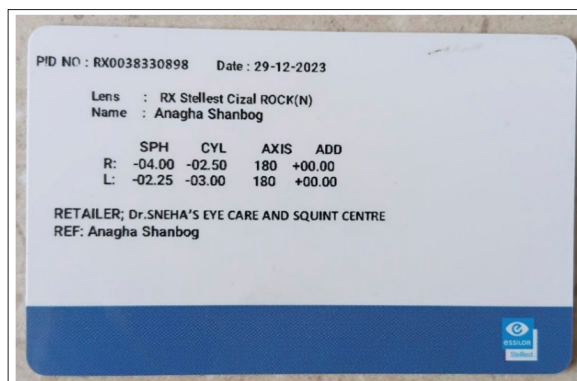
Follow-up 1

UK. KODKANY'S EYE CENTRE															
CTS 4824, Off Civil Hospital Road, Near Holy Cross, Fern, Ayodhya Nagar, Bengaluru - 560042															
Contact No. 0831-2422126, 0831-2422124															
Email: info@kodkanyseye.com Website: www.kodkanyseye.com															
Glasses Prescription															
Patient ID	73514	Visit Date	26/Nov/2022												
Patient Name	Miss. Anagha Alok Shanbhog	Age/Sex	4 Yrs / F												
Address	Anjanaya nagar bgn	Contact No.	9743555955												
Category	New	Old MFE No.	Indi												
Adv. Glasses															
		Right Eye						Left Eye							
Sph	-3.00	Cyl	-2.5	Axis	180	Prism	N/A	Sph	-1.5	Cyl	-3.00	Axis	180	Prism	N/A
Distance															
Add															
Prescribed By															
Ayodhya Nagar : CTS 4824, Off Civil Hospital Road, 88&88A, 900019															
Meruti Gull : 1575, Above Adhika Vastu Bhondar, Bengaluru - 560001															
Info@kodkanyseye.com															
0831 2422 126															
0831 2422 125															
www.kodkanyseye.com															

Follow-up 2

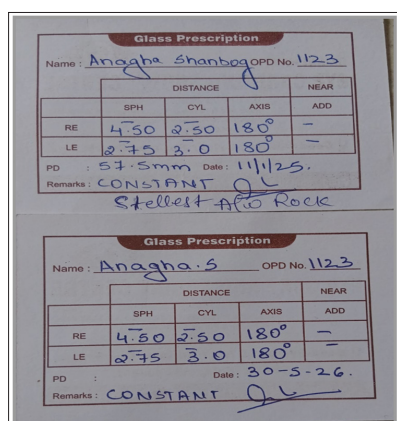
Glasses Prescription									
OPD NO: 1123									
Name: Anagha Shanbhog									
Age: 4 Y / F									
OD					OS				
SPH	CYL	AXIS	Prism	Vn	SPH	CYL	AXIS	Prism	Vn
Distance	-4.0	-2.50	180°		-4.12	-2.25	180°		-4.12
Near				N6					N6
PD : 54					Date : 10/10/2023				
Remarks : CONSTANT									

Follow-up 3: The vision glass power decreased between May 2022 and November 2023 and then increased again between November 2022 October and December 2023. Then she was prescribed Ortho-K lenses (Essilor Stellest Eyeglasses) to slow myopia progression. In such lenses while the centre of the lens corrects distance vision, the rest of the lens intentionally blurs peripheral vision, acting as a signal to the eye to slow its growth, because eyeball growth worsens myopia, in this way, the eyeglasses help slow it down. Other than visual side effects such as blur or halo, the glasses have not been shown to cause other adverse effects. For the best result, the glasses are worn full-time during waking hours. These may be a good option for children who are too young for contact lens treatments.



Follow-up 4

Parents were happy that in after the deterioration of vision in first 2years, vision remained stable since January 2025, thanks to the use of Essilor Stellest Eyeglasses, In May 2026 the vision has improved from 12/6 to 9/6 and with both eyes the girl can read 6/6 with lenses.



Case Report 2:

Aadya aged 5 years, in May 2023, Resident of Sydney Australia, then was on a visit to Mysuru and went through a routine eye check-up in same institution as case 1, in Bengaluru, going through similar tests and Optometry, showing similar results and prescribed eye-glasses with a request to monitor the changes over period.



Patient Name: Aadya Shrihari

Age / Gender: 5 / Female

Date of Exam: 10/May/2023

SPECTACLE PRESCRIPTION (Rx)

Eye	Sphere (SPH)	Cylinder (CYL)	Axis	Near Add (ADD)	Visual Acuity (VA)
Right Eye (OD / RE) 6/6	-3.50 DS	-1.50 DC	90°	—	6/6
Left Eye (OS / LE)	-2.00 DS	- 3.0 DC	—	—	6/6

Her RISK ASSESMENT values

1. Risk evaluation of measurement- 3.0
2. Number of myopic parents- 2.8
3. Outdoor activity time-2.9
4. Near-Work activity in addition to school / work- 2.9

Her parents were also advised to monitor:

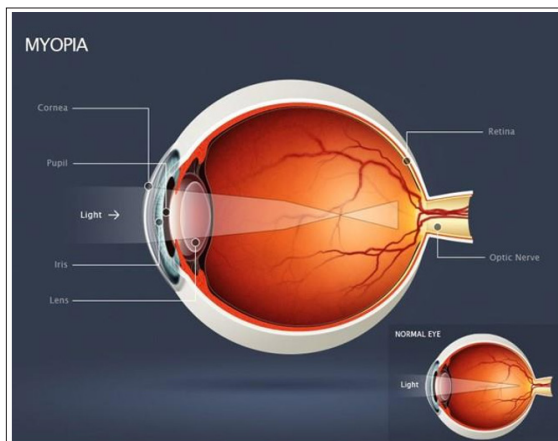
- minimum outdoor activity 2h
- do breaks and relax vision in far distance regularly when reading
- reduce time & increase distance when use proper illumination when reading
- using a smartphone reduce time & increase distance when
- using a tablet reduce time & increase distance when using a computer

A follow-up in 2024 revealed improvement in the vision and the girl is using the glasses now

Discussions:

Human eye works like a camera. The front of the eye bends light to form an image on the retina, the light-sensitive tissue in the back of the eye (like film in a camera). Myopia happens when the cornea (the clear front part), the lens, or the length of the eye makes the focus land in front of the retina [1].

Global Myopia Prevalence (2026) is roughly 30% to 33% of the global population, affecting over 2.6 billion people. East and Southeast Asia experience the highest rates, with up to 80% to 90% prevalence among young adults in places like South Korea, Taiwan, and Singapore [2]. Continued increases driven by near-work and reduced outdoor time mean rates are expected to approach 50% worldwide by 2050. Current estimates indicate that about 1 in every 5 to 6 children aged 5 to 15 in India already wears glasses or suffers from myopia. City children face a much higher risk (around 10% or higher in urban centres) compared to rural peers due to lifestyle differences [2,4].



Pathophysiology of Myopia

Myopia means that nearby objects can be seen clearly, but objects which are further away cannot. In eyes with normal vision, the cornea & the eye lens bundle the incoming light rays so that they meet precisely on the retina, creating a sharp image on the retina. Near-sighted eyes have a refractive power which is too high and/or the overall eye-length is too long. In both cases, the focus is in front of the retina, creating a blurred image.

Measuring the axial length of the eye is becoming important in the last decade. Normally, children are far-sighted after birth. In the first years of life, the eye grows until the focus is located on the retina resulting in normal vision. Once this condition has been reached, the eye should stop growing. If the eye continues to grow, however, near-sightedness develops. Children are still a little far-sighted or have normal vision when they start school or exposed to screens, they develop near-sightedness during the following years of their life. The most common form of near-sightedness used to develop when children start school, but since last few years even children of 2-5 years who are exposed to mobile phone or TV to calm from crying or feeding. To document the process, the length of the eye must be measured at regular intervals. Once near-sightedness reaches -6.00 dioptres or the eye length reaches or exceeds 26 mm, one is extremely near-sighted. Eyes must be checked regularly under these conditions, like our first case as there is a significant increase in the risk of eye diseases.

The Pandemic Impact

Covid 19 Pandemic in 2019-2022 and subsequent periodical Lockdowns and online schooling accelerated these numbers, with paediatric eye specialists noting a sharp spike in near-sightedness even in children under eight. A retrospective analysis points to the reasons as i) Excessive Screen Time: Long hours

spent staring at digital devices, phones, and computers strain the eye's focusing muscles and cause the eyeball to elongate ii) Lack of Outdoor Play: Spending less than 2 hours outdoors daily deprives eyes of natural sunlight, which helps trigger dopamine release to regulate healthy eye growth. iii) Children with one or both parents' wearing minus-power glasses face a significantly higher hereditary risk as per observation linking to genetical risk [10,11].

Diagnosis of Myopia

Modern myopia diagnosis has shifted from simply reacting to blurred letters on a Snellen chart to proactively predicting and tracking eye growth. While, the Snellen chart remains a vital baseline tool for catching distance blur, recent breakthroughs focus on advanced biological metrics, smart screening technologies, and preventative tracking to halt myopia before it worsens has Shifted from Visual Acuity to Ocular Biometry.

Historically, eye care professionals relied on the Snellen chart to diagnose myopia once vision dropped below 20/20. Today, the standard of care especially for paediatric patients—has evolved to focus on the structure of the eye itself [3]. Instead of tracking how many lines a patient can read, modern practitioners use optical biometers to measure the physical length of the eyeball from front to back. Because eye growth directly drives myopia, tracking axial elongation allows doctors to evaluate treatment efficacy more precisely than a standard visual acuity test [3]. Eye care strategies now emphasize detecting “pre-myopia” by assessing natural farsightedness in children who are born with hyperopic reserve. If a child's reserve drops below age-expected thresholds, treatments are initiated even if they still score perfectly on a Snellen chart [5,6,7]. In clinical management and trials, the LogMAR chart is preferred over Snellen, it utilizes uniform lettering, spacing, and geometric progression, ensuring that a change of one line represents a statistically reliable change in vision [8]. Smartphone & Hybrid Care Pathways: Tools like the WHO eyes App by the World Health Organization and remote paediatric self-assessments allow parents to screen visual acuity at home. These validated digital tools act as early warning systems, prompting a clinical visit if a child's distance vision begins to slip [9].



A direct Comparison- Snellen vs. Modern Diagnostics Feature
The Snellen Chart Modern Diagnostic Suite Primary Metric
Distance sharpness (Visual Acuity) Axial length, Cycloplegic

refraction, Corneal topography Role in Care Initial screening & functional validation Longitudinal tracking & treatment adjustment Capability Reacts after vision has already degraded Can predict myopia onset before symptoms start. Precision Variable influenced by chart memorization or lighting Micron-level structural accuracy.

Why the Shift Matters for Treatment

Detecting myopia progression early changes the entire treatment plan. Instead of just writing a prescription for stronger glasses, doctors use modern tracking to implement active myopia control therapies as was in our case of Anagha. 1. Optical Interventions include defocus-incorporated spectacles (like DOT lenses) and dual-focus daily contact lenses (like MiSight) that physically slow eye growth. 2. Pharmaceuticals interventions like Low-dose atropine eye drops to biochemically slow the elongation of the eye. 3. Clinically tracking outdoor time & near-work limits as therapeutic requirements [9,11].

Myopia Control for Kids

Childhood myopia, is a growing concern for families worldwide. It is a common condition usually diagnosed in young children. More screen time, less outdoor play and increased near work have made blurry distance vision extremely common among children. Myopia occurs when the eye grows too long or the front surface (cornea) becomes too curved. This causes light to focus in front of the retina instead of on it, making distant objects appear blurry. In children, myopia usually increases every year because the eyeball continues to grow. If myopia isn't managed early, it keeps getting worse, leading to frequent prescription changes and a higher risk of serious eye problems. Uncontrolled progression can lead to high myopia, which increases the lifetime risk of Retinal detachment, Glaucoma, Early cataracts, Myopic macular degeneration, managing myopia in children early helps protect their long-term eye health. Standard Glasses help kids see clearly, but they don't stop myopia from getting worse. That's why treatments like Ortho-K lenses and atropine eye drops for kids are used to slow its progression [12,13].

Myopia Control Options for Kids

Parents today have two scientifically proven treatments to slow myopia progression: 1) Orthokeratology (Ortho-K) lenses, 2) Low-dose atropine eye drops (0.01%–0.05%). Both options work, but in different ways. Understanding them helps you choose what fits your child's needs and lifestyle.

Ortho-K Lenses (Orthokeratology- OKL)

Ortho-K lenses are special rigid lenses worn only at night. While your child sleeps, the lenses gently reshape the cornea to reduce myopia, meaning your child wakes up with clear vision all day without wearing glasses. When used regularly, OKL slow myopia progression by nearly 50%, helping lower the risk of serious eye problems in the future. Its other benefits include i) No need for daytime glasses or lenses, ii) Excellent for active children, swimmers, athletes iii) Offers freedom from daytime eyewear iv) Strong myopia-control effect vi) Works especially well for children with fast progression

Low-Dose Atropine Eye Drops for Kids

Low-dose atropine (0.01–0.05%) is one of the world's most widely used treatments for childhood myopia control. These

drops relax certain focusing mechanisms and act on receptors in the sclera and retina, helping slow down the eye's axial growth. Benefits of Atropine Drops for Kids include i) Easy to use, 1 drop in each eye at bedtime, ii) Proven myopia control for children iii) Very low risk of side effects, iv) Works for children as young as 4-5 years v) Ideal for kids who cannot handle lenses

Both treatments are effective, but the best choice depends on factors like age, myopia level, progression speed, eye health and lifestyle. The effect is often strongest when Ortho-K and atropine are used together, especially in children with fast-progressing myopia.

Other Supportive Measures for Myopia Control in Children

Along with Ortho-K or atropine, lifestyle changes help reduce progression: i) 2 hours of outdoor play daily ii) Limit screen time, especially close viewing iii) Maintain proper reading distance iv) Ensure good lighting while reading v) Taking eye breaks every 20 minutes [12,13]

The prevalence of myopia among children in India increased significantly post-COVID-19, driven by extended home confinement and higher screen times. Prior to the pandemic, general refractive error rates among Indian children hovered around 10.8%, with urban centres showing a steady historical increase (prevalence in urban children aged 5–15 rising from 4.44% in 1999 to 21.15% in 2019 and almost 30% in 2026). Pre-pandemic prevalence was notably lower in rural areas where children had more outdoor exposure, though overall numbers were projected to rise gradually due to academic stress and near-work. Post-COVID-19 Trends and Studies show a sharp multi-fold Increase: An evaluation of public school-going children in South India reported a three- to six-fold rise in the incidence and progression of myopia following prolonged lockdowns and online e-learning [14].

Research post-lockdown highlighted that children engaging in less than 3 hours of outdoor activity per day and sleeping under 7 hours faced drastically higher risks (refractive error risks multiplied up to 7.4 times). Younger children (under 9 years old) showed higher susceptibility to environmental shifts and rapid dioptric changes during the sudden transition to digital home-schooling. Long-term models now estimate that without active lifestyle interventions and outdoor play, myopia could affect nearly 32% of Indian children by 2030 and up to 48% by 2050 [14].

Myopia was the most common refractive error, accounting for roughly 82.4% of cases diagnosed in regional studies such as in Chamarajanagar. Other refractive errors included Hypermetropia and astigmatism about 11.7% and 5.9% of cases respectively. Urban school children consistently showed a higher burden of refractive errors due to increased screen time and reduced outdoor activities, while rural parts of southern Karnataka reported lower baseline rates hovering around 8.2% to 12.7%, though uncorrected errors remain a challenge. Regular screen use, family history of glasses, and limited outdoor play are major factors linked to rising rates in both urban and rural children [15].

A school-based cross-sectional study from July to October 2025 among 1,070 students selected through cluster sampling using probability proportionate to size (PPS). Within each

school, participants were chosen by simple random sampling. Visual acuity was assessed using a standardized Snellen chart protocol. Data on sociodemographic, familial, clinical, and behavioural factors were collected using a structured proforma and Statistical analysis included descriptive measures and Chi-square tests to determine associations between RE and selected variables. The study pointed to the fact that the prevalence of RE was 8.2%. Age and educational grade showed significant associations ($p=0.005$), with older children presenting higher impairment. Significant determinants included history of eye infection ($p=0.027$), family history of glasses ($p=0.024$), and screen exposure ($p=0.014$), with RE rising from 6.2% in low screen-time groups to 16.7% in high-exposure groups. Gender, parental education, family type, and history of eye injury were not significantly associated [16].

A study aimed at determining if myopia progression seen in evidence-based practice resulted from the COVID-19 lockdown or delayed follow-ups of patients visiting the paediatric department of a tertiary care eye hospital in Mumbai, enrolled all children with myopia who had attended at least one follow-up visit before the COVID-19 lockdown and at least one follow-up visit post-lockdown. The spherical equivalent (SEQ) of refractive error values at baseline and pre- and post-COVID-19 lockdown follow-ups (hereinafter referred to as the “first” and “second” follow-ups, respectively) were recorded. Of the enrolled 112 eyes of 56 children, including 35 (62.5%) boys and 21 (37.5%) girls, with a mean (standard deviation [SD]) age of 9.54 (2.82) years. The mean (SD) SEQ values at baseline and first and second follow-ups were - 4.74 (3.83), - 5.46 (3.81), and - 6.42 (3.66) D, respectively. The mean change in SEQ, mean SEQ myopia progression, and rate of myopia progression per month differed significantly between the baseline and the first follow-up visit versus between the first and second follow-ups (all $P < 0.05$) [16].

Another study conducted as part of school eye screening between September and October 2021 among children between 14 and 17 years of age from public schools with a three-phased comprehensive eye examination. Children identified with refractive errors and an equal proportion of children without any refractive errors underwent a survey on outdoor activities. Prevalence estimates and 95% confidence interval were calculated. Chi-square tests and regression analysis were used to understand the association between refractive error and other variables. From the data of 3,850 children, the prevalence of vision impairment, refractive errors, and myopia in at least one eye was found to be 12.83% ($n = 494$), 21.51% ($n = 828$), and 19.53% ($n = 752$), respectively. The average myopic spherical equivalent error was found to be -2.17 ± 1.11 D (range: -0.50 D to -14.00 D). Almost 97% of girls had less than 3 h of outdoor activities. Refractive errors were 7.42 and 2.77 times more (95% CI: 3.51-15.70), $P < 0.001$ among children who had outdoor activities less than 3 h per day and sleep less than 7 h per day [17].

Conclusion

Myopia, an eye condition in children where close objects look clear, but distant objects appear blurry. More screen time, less outdoor play & increased near work have made blurry distance vision extremely common among children. Childhood myopia is a growing concern for families worldwide. Myopia occurs

when the eye grows too long or the cornea becomes too curved, causing light to focus in front of the retina instead of on it, making distant objects appear blurry.

Myopia Prevalence in 2026 is roughly 30% to 33% of the global population, affecting over 2.6 billion people. East and Southeast Asia experience the highest rates, in places like South Korea, Taiwan, and Singapore. The worldwide spread of the coronavirus disease pandemic in 2020, followed by lockdowns, forced children to be in home confinement with increased screen time, leading to rapid progression of myopia and an increase in the prevalence of myopia. Myopia among children in urban India has surged dramatically, from 4.44% in 1999 to 21.15% in 2019, 30% in 2026 with projections estimating it could affect nearly half of urban children by 2050. While, the Snellen chart remains a vital baseline tool for catching distance blur, recent breakthroughs focus on advanced biological metrics, smart screening technologies, and preventative tracking to halt myopia before it worsens. Standard Glasses help kids see clearly, but they don't stop myopia from getting worse. That's why treatments like Ortho-K lenses and atropine eye drops are used to slow its progression

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