

**Prevalence, Pattern, and Spectacle Utilization of Refractive Errors among School-Going Children in Mathura: A Cross-Sectional Study**Ravi Soni<sup>1</sup>, Paridhi Gupta<sup>2</sup>, Nidhi Jain<sup>3</sup>, Meemansha Maheshwari<sup>4</sup><sup>1,2</sup>Postgraduate Resident, Department of Ophthalmology, Krishna Mohan Medical College and Hospital, Mathura, Uttar Pradesh, India<sup>3</sup>Associate Professor, Department of Ophthalmology, Krishna Mohan Medical College and Hospital, Mathura, Uttar Pradesh, India<sup>4</sup>Assistant Professor, Department of Ophthalmology, Krishna Mohan Medical College and Hospital, Mathura, Uttar Pradesh, India

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Conflict of interest: Nil

**Abstract****Background:** Refractive errors are a common and potentially correctable cause of visual impairment in school-aged children. Early detection is important because uncorrected errors can affect visual function and school performance.**Methods:** This cross-sectional study included 129 school-going children aged 6-14 years from selected rural schools in Mathura. Visual acuity screening was performed using Snellen charts. Children with suspected visual impairment underwent autorefraction, retinoscopy, and cycloplegic refraction. Demographic data and information on prior diagnosis, spectacle ownership, spectacle use, and barriers to spectacle use were collected using a structured questionnaire. Data were analyzed using descriptive statistics, chi-square testing, and logistic regression. A p value of less than 0.05 was considered statistically significant.**Results:** Of 129 children, 67 (51.9%) were male and 62 (48.1%) were female. The overall prevalence of refractive errors was 19.4% (25/129). Myopia was the most common refractive error, affecting 16 children (64.0%), followed by astigmatism in 12 (48.0%) and hyperopia in 4 (16.0%). Prevalence increased significantly with age, from 7.3% in children aged 6-8 years to 32.6% in those aged 12-14 years (p=0.018). The difference by sex was not statistically significant (p=0.291). The mean spherical equivalent among affected children was -1.12 ± 1.65 D. Eighteen affected children (72.0%) were newly diagnosed during screening. Only 6 of 25 affected children (24.0%) owned spectacles, and regular use was reported by 2 of 6 children (33.3%) who owned them.**Conclusion:** Refractive errors were present in nearly one-fifth of school-going children in rural Mathura, with myopia as the predominant type. Older age was significantly associated with refractive errors. Underdiagnosis, low spectacle ownership, and poor regular spectacle use indicate an important unmet need for school-based vision screening and access to corrective services.**Keywords:** Refractive errors; Myopia; Schoolchildren; Rural population; Spectacle use; Visual impairment.**DOI:** 10.25258/ijcpr.18.4.70

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**Introduction**

Uncorrected refractive errors are among the leading causes of visual impairment in children and can adversely affect educational performance, daily functioning, and quality of life. [1-3]

School-based screening studies have shown substantial variation in prevalence across populations, with myopia emerging as the dominant pattern in many settings. [2,4] Evidence also suggests that sustained near work and reduced outdoor activity may contribute to the development and progression of myopia in children. [5,6]

Indian school-based studies continue to demonstrate a substantial burden of refractive errors, including a large proportion of undetected and uncorrected cases. [7-12]

This study aimed to determine the prevalence and pattern of refractive errors among school-going children in rural Mathura, examine their association with age and sex, and assess spectacle ownership and utilization among affected children.

**Materials and Methods**

**Study Design and Setting:** This cross-sectional epidemiological study was conducted among school-going children in selected primary and secondary schools in rural Mathura.

**Study Duration:** The study was conducted over a period of fourteen months, from July 2024 to September 2025.

**Participants:** Children aged 6-14 years enrolled in the selected rural schools were screened after parental or guardian consent.

**Inclusion Criteria:** Children aged 6-14 years, enrolled in the selected rural schools, and with consent from a parent or guardian were eligible for inclusion.

**Exclusion Criteria:** Children with known eye disease other than refractive errors, those receiving

ongoing ophthalmic treatment at the time of assessment, and those unable to cooperate adequately with vision screening were excluded.

**Sample Size:** A total of 129 children were included in the study.

**Sampling Method:** Stratified random sampling was used to ensure representation across age groups and sexes.

**Data collection and variables:** Visual acuity screening was performed using Snellen charts. Children with suspected visual impairment underwent autorefraction, followed by retinoscopy and cycloplegic refraction for confirmation. A structured questionnaire was used to record age, sex, prior diagnosis of refractive error, spectacle ownership, spectacle-use pattern, and reported barriers to spectacle use.



Figure 1: Clinical assessment of refractive error using trial frame and trial lenses.

**Outcome Measures:** The primary outcome was the prevalence of refractive errors. Secondary outcomes included the distribution of refractive error types, association with age and sex, mean spherical equivalent, severity of myopia, prior diagnosis status, spectacle ownership, spectacle utilization, and presenting visual acuity among children without corrective spectacles.

**Statistical Analysis:** Data were analyzed using SPSS version 20.0. Descriptive statistics were used to summarize the data. Associations between categorical variables were assessed using the chi-square test. Logistic regression analysis was used to

evaluate predictors of refractive errors. A p value of less than 0.05 was considered statistically significant.

**Ethical Considerations:** Written informed consent was obtained from parents or guardians before examination.

## Results

**Baseline demographic characteristics:** A total of 129 children were included; 67 (51.9%) were male and 62 (48.1%) were female. The age groups 6-8, 9-11, and 12-14 years comprised 41 (31.8%), 45 (34.9%), and 43 (33.3%) participants, respectively.

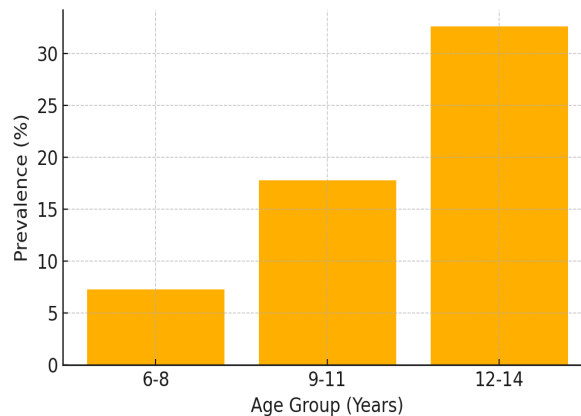
**Table 1: Baseline demographic characteristics of the study participants**

Variable	Category	n (%)
Total participants		129
Sex	Male	67 (51.9)
	Female	62 (48.1)
Age group (years)	6–8	41 (31.8)
	9–11	45 (34.9)
	12–14	43 (33.3)

**Overall prevalence of refractive errors:** Overall, 25 of 129 children (19.4%) had refractive errors, while 104 (80.6%) were emmetropic.

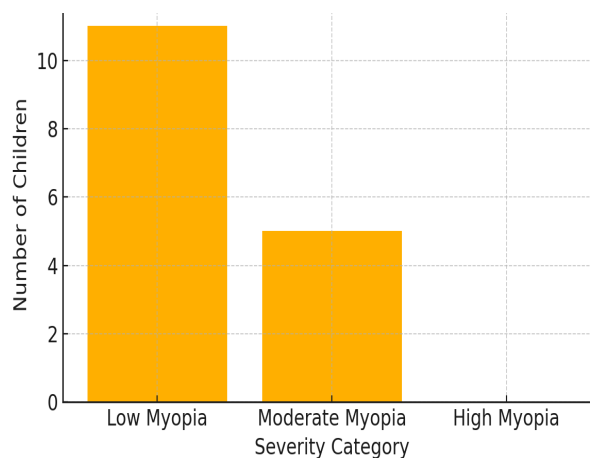
**Table 2. Prevalence of refractive errors by age group and sex**

Variable	Total (N)	With refractive error, n	Prevalence (%)	p value
Overall	129	25	19.4	—
Sex				0.291
Male	67	11	16.4	
Female	62	14	22.6	
Age group (years)				0.018
6–8	41	3	7.3	
9–11	45	8	17.8	
12–14	43	14	32.6	



**Figure 2: Prevalence of Refractive Errors by Age Group**

**Distribution of refractive error types:** Among the 25 affected children, myopia was present in 16 (64.0%), astigmatism in 12 (48.0%), and hyperopia in 4 (16.0%). More than one refractive error could be present in the same child.



**Figure 3: Severity of Myopia among Affected Children (n=16)**

**Association with sex and age:** Prevalence was 16.4% (11/67) in males and 22.6% (14/62) in females; the difference was not statistically significant ( $p=0.291$ ). By age group, prevalence increased from 7.3% (3/41) in children aged 6-8 years to 17.8% (8/45) in those aged 9-11 years and 32.6% (14/43) in those aged 12-14 years ( $p=0.018$ ).

**Age-wise distribution of refractive error types:** Myopia was most frequent in the 12-14-year group (10 cases), followed by the 9-11-year group (5

cases) and the 6-8-year group (1 case). Astigmatism was also most frequent in the 12-14-year group (7 cases), followed by the 9-11-year group (4 cases) and the 6-8-year group (1 case).

Hyperopia was relatively more common in the 6-8-year group (2 cases) than in the older age groups (1 case each in 9-11 and 12-14 years).

The association between age group and refractive error type was statistically significant ( $p=0.045$ ).

**Table 3: Distribution and pattern of refractive errors among affected children**

Refractive error type	n	%
Myopia	16	64.0
Astigmatism	12	48.0
Hyperopia	4	16.0

Multiple refractive errors could be present in the same child.

**Spherical equivalent and myopia severity:** The overall mean spherical equivalent among affected children was  $-1.12 \pm 1.65$  D. Mean spherical equivalent was  $-1.87 \pm 0.92$  D in myopia and  $+1.45 \pm 0.53$  D in hyperopia; the difference by refractive error type was statistically significant ( $p<0.001$ ). Among the 16 myopic children, 11 (68.8%) had low myopia and 5 (31.2%) had moderate myopia. No child had high myopia.

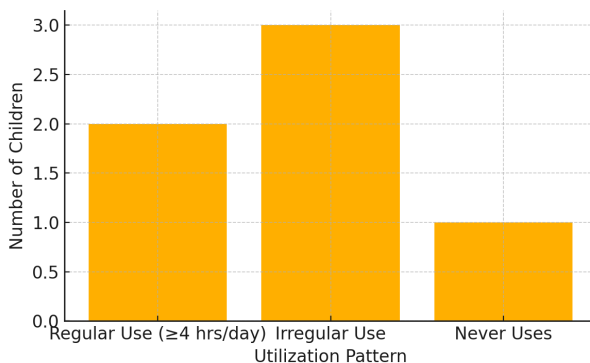
**Prior diagnosis and spectacle ownership:** Only 7 of 25 affected children (28.0%) had been diagnosed previously, whereas 18 (72.0%) were identified for the first time during screening. Spectacles were owned by 6 of 25 children (24.0%). Ownership increased from 0.0% in children aged 6-8 years to 12.5% in those aged 9-11 years and 35.7% in those aged 12-14 years, but this association was not statistically significant ( $p=0.184$ ).

**Table 4: Detection and spectacle correction status among children with refractive errors**

Variable	Category	n (%)
Prior diagnosis status	Previously diagnosed	7 (28.0)
	Newly diagnosed	18 (72.0)
Spectacle ownership	Owens spectacles	6 (24.0)
	Does not own spectacles	19 (76.0)
Spectacle utilization among owners (n=6)	Regular use	2 (33.3)
	Irregular use	3 (50.0)
	Never uses	1 (16.7)

**Spectacle utilization and barriers:** Among the six children who owned spectacles, 2 (33.3%) reported regular use, 3 (50.0%) irregular use, and 1 (16.7%) no use. Among the 19 children without functional spectacle correction, the reported barriers were lack

of felt need in 8 (42.1%), financial constraints in 7 (36.8%), parental disapproval or fear of teasing in 5 (26.3%), and broken or lost spectacles in 4 (21.1%). Multiple reasons could be reported.



**Figure 4: Spectacle Utilization among Children Who Own Them (n=6)**

**Visual acuity in uncorrected refractive error:**

Among the 19 children with uncorrected refractive error, 5 (26.3%) had normal or mild visual impairment (VA  $\geq 6/12$ ), 11 (57.9%) had moderate visual impairment (VA  $< 6/12$  to  $\geq 6/60$ ), and 3 (15.8%) had severe visual impairment (VA  $< 6/60$  to  $\geq 3/60$ ). No case of blindness was recorded.

**Discussion**

**Principal findings:** Refractive errors were identified in 19.4% of school-going children in rural Mathura. Myopia was the predominant refractive error, prevalence increased significantly with age, and most affected children had not been diagnosed previously. Spectacle ownership was low, and regular spectacle use among owners was limited.

**Comparison with previous studies:** The prevalence observed in this series was higher than that reported in Bangalore (7.03%), rural Andhra Pradesh (6.49%), Haryana (7.0%), and rural Bengaluru (10.5%), but lower than the 24.6% reported in Mathura city and similar to the 19.2% reported in Nepal. [7–11,14] Differences across studies may reflect variation in age distribution, screening methodology, case definitions, and local visual demands.

The predominance of myopia is consistent with multiple school-based studies from India and elsewhere, in which myopia was the commonest refractive error among affected children. [7,8,10,12,15,16] The significant age gradient observed in the present series also parallels previous reports showing higher prevalence in older children. [7,8,12–16] This pattern may reflect cumulative visual demands and age-related refractive shift during school years.

The high proportion of newly detected cases and the low rate of spectacle ownership also align with prior studies describing underdetection and undercorrection of refractive errors among schoolchildren. [11,13,14] The barriers reported here, including lack of felt need, financial constraints, and fear of teasing, are similar to those reported in other school-based studies of spectacle non-compliance. [11]

**Clinical interpretation:** The combination of a substantial proportion of newly detected cases, low spectacle ownership, poor regular spectacle use, and moderate-to-severe visual impairment in uncorrected children indicates an important service gap in school eye care. Although near work, screen exposure, and outdoor activity were not directly assessed in this cohort, the findings may be interpreted alongside broader evidence linking myopia risk to visual behaviour and reduced outdoor exposure. [5,6,13,17] The results support the need for school-based screening linked to

timely refraction, affordable spectacle provision, and follow-up to improve adherence.

**Strengths and Limitations:** Strengths of the study include school-based screening across multiple age groups and confirmatory assessment of suspected cases using autorefraction, retinoscopy, and cycloplegic refraction. Limitations include the cross-sectional design, relatively small sample size, restriction to rural schools in a single district, possible selection bias due to absenteeism and exclusion of out-of-school children, self-reported spectacle use, and incomplete assessment of socioeconomic, environmental, and family-history variables. Cycloplegic refraction was performed in suspected cases rather than universally, which may have led to underdetection of milder errors.

**Conclusion**

Refractive errors affected nearly one in five school-going children in rural Mathura. Myopia was the predominant type, and prevalence increased significantly with age. Most affected children were previously undiagnosed, while spectacle ownership and regular spectacle use were low. These findings support strengthening school-based vision screening and improving access to corrective services in rural settings.

**Declarations**

**Ethics approval:** The study was approved by the Institutional Ethics Committee.

**Consent for publication:** Written informed consent was obtained from parents or guardians. No identifying personal information has been included in this manuscript.

**Availability of data and materials:** The data supporting the findings of this study are available from the corresponding author on reasonable request.

**Author Contributions**

- Dr Ravi Soni contributed to study conception and design, data collection, clinical assessment, data interpretation, and manuscript drafting.
- Dr Paridhi Gupta contributed to study design, data interpretation, manuscript preparation, and critical revision of the manuscript.
- Dr Nidhi Jain contributed to study supervision, data interpretation, manuscript revision, and final approval of the manuscript.

Dr Meemansha Maheshwari contributed to data review, manuscript editing, critical revision, and final approval of the manuscript.

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