

## Original Research Article

# Visual acuity profile of school-going children: a descriptive cross-sectional study

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## ABSTRACT

**Background:** Visual acuity is a critical component of a child's visual function and is essential for learning and overall development. Unrecognized reduction in visual acuity during school years can adversely affect academic performance and quality of life. School-based vision screening offers an effective opportunity for early identification of reduced visual acuity, particularly in urban settings where visual demands are high. In this context, the present study aimed to assess the visual acuity status of school-going children aged 6-16 years and to document the eye-wise distribution of visual acuity categories in urban schools of Mysuru.

**Methods:** A cross-sectional study was conducted over one month among 422 children aged 6-16 years selected using probability proportionate to size sampling. Visual acuity was assessed using a standardized Snellen chart. Sociodemographic details and family history of spectacle use were recorded. Data were analyzed using descriptive statistics.

**Results:** Normal visual acuity (6/6) was observed in 81.5% of right eyes and 82.7% of left eyes. Reduced visual acuity of 6/12 or worse was observed in a smaller proportion, with higher frequencies noted among older age groups. Visual acuity of 6/18 or worse was more common in children aged 11-16 years. Gender-wise distributions of visual acuity were comparable between boys and girls.

**Conclusions:** A substantial proportion of school-going children exhibited reduced visual acuity detectable through routine screening. The findings highlight the importance of regular school-based visual acuity assessment to facilitate early identification and timely intervention for visual impairment.

**Keywords:** Refractive errors, Vision screening, Visual acuity

## INTRODUCTION

Visual acuity is a fundamental measure of visual function and plays a crucial role in a child's learning, development, and overall well-being. During school years, children rely heavily on vision for academic activities such as reading, writing, and viewing the blackboard. Any reduction in visual acuity during this critical period, if unrecognized, may negatively influence educational performance and daily functioning.<sup>1,2</sup>

Globally, it is estimated that nearly 1.4 billion people live with some form of vision impairment, of whom a significant proportion are children.<sup>3</sup> The World Health Organization reports that approximately 90% of visual impairment occurs in low- and middle-income countries, where access to early eye care services remains limited.<sup>4</sup> Among children, uncorrected refractive errors constitute the leading cause of visual impairment, accounting for nearly 40% of avoidable childhood vision loss worldwide.<sup>5</sup>

In India, childhood visual impairment continues to be a public health priority. Studies have reported that the prevalence of refractive errors among school-going children ranges from 5% to 15%, with higher detection rates observed in urban settings.<sup>6,7</sup> School eye screening programs have demonstrated that a substantial proportion of children with reduced visual acuity remain previously undiagnosed, underscoring the importance of routine vision assessment during school years.<sup>8</sup>

School-based vision screening is recognized as an effective, feasible, and cost-efficient strategy for early identification of reduced visual acuity among children aged 6 to 16 years, a period characterized by increasing visual demands.<sup>5</sup> Large-scale school screening initiatives in India have shown that systematic visual acuity assessment can identify visual impairment in 6-10% of school children, many of whom benefit from simple interventions such as spectacle correction.<sup>8,9</sup> Beyond early detection, such screening activities generate valuable descriptive data that help in understanding the visual acuity profile of school-going children and support planning of school eye health services.

The National Programme for Control of Blindness and Visual Impairment in India emphasizes early detection of visual problems among school children as a key strategy to reduce the burden of avoidable visual impairment.<sup>10</sup> Urban field practice areas, such as schools in Mysuru city, provide an important setting for school-based screening, where lifestyle factors including increased near-work and screen exposure highlight the need for regular assessment of visual acuity.

Despite ongoing school eye health initiatives, systematically documented descriptive data on the visual acuity profile of school-going children aged 6-16 years in urban field practice areas remain limited. Presenting eye-wise distributions of visual acuity categories can provide baseline information on the magnitude of reduced vision identified through routine screening and inform future school eye health planning.

In this context, the present descriptive cross-sectional study was conducted among school-going children aged 6 to 16 years in urban schools of Mysuru, the field practice area, to assess the visual acuity status and to document the distribution of visual acuity categories in the right and left eyes.

## **METHODS**

### ***Study design and setting***

A school-based cross-sectional study was conducted for a period of one month, from 1<sup>st</sup> June to 30<sup>th</sup> June, across educational institutions located in the Mysuru urban field practice area. The study setting included schools representing primary, upper primary, and secondary education levels.

### ***Study population and eligibility criteria***

The target population comprised school-going children aged 6 to 16 years. All students within this age range who were enrolled in the selected institutions during the study period constituted the accessible population. Children were included if they met the age criteria and were regularly attending school at the time of data collection. Children with physical or cognitive disabilities that could hinder accurate visual acuity testing were excluded. Students who did not provide written assent, or for whom parental or guardian consent was unavailable, were also excluded to preserve the reliability of the assessment process.

### ***Sample size estimation***

The sample size was calculated using the single-proportion formula, assuming an expected refractive error prevalence of approximately 10%, based on prior epidemiological studies conducted in similar populations (A 95% confidence interval and acceptable precision level were applied).<sup>11</sup> Adjustments were made for design effect and anticipated non-response, resulting in a final sample size of 422 children.

### ***Sampling technique***

The probability proportionate to size (PPS) sampling technique was used to allocate the required number of participants from each school according to its total enrolment of students aged 6-16 years. Within each school, the list of eligible students served as the sampling frame. The required number of participants was then selected using the lottery method of simple random sampling, thereby ensuring equitable selection and minimizing sampling bias.

### ***Data collection procedure***

Data collection was carried out using a structured proforma, organized into two sections. Section one captured key sociodemographic variables, including the child's age, gender, and family history of refractive error, such as the use of spectacles. Section two was dedicated to documenting the visual acuity assessment findings, which were obtained using a standardized Snellen chart protocol. All visual acuity evaluations were conducted meticulously under the direct supervision of the principal investigator to ensure procedural accuracy, consistency, and adherence to recommended clinical guidelines.

### ***Statistical analysis***

The collected data were first entered into Microsoft Excel for data cleaning and coding and subsequently transferred to IBM SPSS (version 30 licensed to JSSAHER) Statistics for comprehensive analysis. Descriptive statistics, including frequencies, proportions, and distributions, were used to summarize participant

characteristics and to assess the visual acuity status of the children. The distribution of visual acuity categories in the right and left eyes was documented in accordance with the study objectives.

**RESULTS**

Among the 422 school-going children included in the study, 39.8% were aged 11-13 years, followed by 32.9% aged 14-16 years and 27.3% aged 6-10 years. Females constituted 55.7% of the study population, while males accounted for 44.3%. Most children were studying in upper primary education (40.0%), followed by secondary (32.9%) and primary education (27.0%). Regarding parental education, the highest proportion of fathers (34.6%) and mothers (64.7%) had primary or secondary education. A family history of spectacle use was reported by 32.9% of children. Among those reporting spectacle use in the family, grandparents (12.3%) and mothers (9.7%) were the most commonly reported users, while 67.5% reported no family member using spectacles (Table 1).

**Table 1: Socio-demographic characteristics and family history of spectacle use among school-going children (n=422).**

Variables	Category	Frequency (%)
<b>Age of child in years</b>	6-10	115 (27.3)
	11-13	168 (39.8)
	14-16	139 (32.9)
<b>Gender</b>	Male	187 (44.3)
	Female	235 (55.7)
<b>Class studying</b>	Primary education	114 (27.0)
	Upper primary education	169 (40.0)
	Secondary education	139 (32.9)
<b>Father's occupation</b>	Primary education	127 (30.1)
	Secondary education	146 (34.6)
	Higher secondary education	123 (29.1)
	Higher education	26 (6.2)
<b>Mother's occupation</b>	Primary education	273 (64.7)
	Secondary education	111 (26.3)
	Higher secondary education	20 (4.7)
	Higher education	18 (4.3)
<b>Family history of spectacle use</b>	Yes	139 (32.9)
	No	283 (67.1)
<b>Family member using spectacles</b>	Father	30 (7.1)
	Mother	41 (9.7)
	Siblings	14 (3.3)
	Grandparents	52 (12.3)
	None	285 (67.5)

Visual acuity assessment revealed that the majority of children had normal visual acuity (6/6) in both the right

eye (81.5%) and the left eye (82.7%). Reduced visual acuity of 6/12 or worse was observed in a smaller proportion of children. Visual acuity of 6/18 was noted in 6.6% of right eyes and 3.3% of left eyes, while severe reduction (6/36) was observed in 1.4% of right eyes and 0.5% of left eyes (Table 2).

**Table 2: Distribution of visual acuity categories in the right and left eyes among school-going children (n=422).**

Visual acuity category	Right eye- N (%)	Left eye- N (%)
<b>6/6</b>	344 (81.5)	349 (82.7)
<b>6/9</b>	15 (3.6)	17 (4.0)
<b>6/12</b>	22 (5.2)	38 (9.0)
<b>6/18</b>	28 (6.6)	14 (3.3)
<b>6/24</b>	7 (1.7)	2 (0.5)
<b>6/36</b>	6 (1.4)	2 (0.5)
<b>Total</b>	422 (100.0)	422 (100.0)

**Table 3: Age-wise distribution of visual acuity categories in the right and left eyes among school-going children (n=422).**

Age group	Visual acuity	Right eye N (%)	Left eye N (%)
<b>6 to 9 years (n=115)</b>	6	105 (91.3)	107 (93.0)
	9	–	1 (0.9)
	12	4 (3.5)	5 (4.3)
	18	4 (3.5)	2 (1.7)
	24	2 (1.7)	–
<b>11 to 13 years (n=168)</b>	6	132 (78.6)	132 (78.6)
	9	9 (5.4)	10 (6.0)
	12	8 (4.8)	16 (9.5)
	18	14 (8.3)	7 (4.2)
	24	3 (1.8)	2 (1.2)
<b>14 to 16 years (n=139)</b>	36	2 (1.2)	1 (0.6)
	6	107 (77.0)	110 (79.1)
	9	6 (4.3)	6 (4.3)
	12	10 (7.2)	17 (12.2)
	18	10 (7.2)	5 (3.6)
	24	2 (1.4)	–
	36	4 (2.9)	1 (0.7)

In the 6-9 years age group, the majority of children had normal visual acuity, with 91.3% of right eyes and 93.0% of left eyes showing 6/6 vision. In the 11-13 years age group, 78.6% of both right and left eyes had visual acuity of 6/6. Among children aged 14-16 years, 77.0% of right eyes and 79.1% of left eyes demonstrated normal visual acuity. Reduced visual acuity categories were observed across all age groups, with higher frequencies noted in the older age groups (Table 3).

Among boys (n=187), normal visual acuity (6/6) was observed in 80.2% of right eyes and 81.3% of left eyes. Among girls (n=235), 82.6% of right eyes and 83.8% of

left eyes had visual acuity of 6/6. Reduced visual acuity categories were observed in both genders across right and left eyes, with similar distribution patterns. Visual acuity of 6/36 was observed in 0.5% of boys' right eyes and 2.1% of girls' right eyes, while left-eye involvement was less frequent (Table 4).

**Table 4: Gender-wise distribution of visual acuity categories in the right and left eyes among school-going children (n=422).**

Gender	Visual acuity	Right eye N (%)	Left eye N (%)
<b>Boy (n=187)</b>	6	150 (80.2)	152 (81.3)
	9	4 (2.1)	10 (5.3)
	12	13 (7.0)	19 (10.2)
	18	16 (8.6)	4 (2.1)
	24	3 (1.6)	2 (1.1)
	36	1 (0.5)	–
<b>Girl (n=235)</b>	6	194 (82.6)	197 (83.8)
	9	11 (4.7)	7 (3.0)
	12	9 (3.8)	19 (8.1)
	18	12 (5.1)	10 (4.3)
	24	4 (1.7)	–
	36	5 (2.1)	2 (0.9)

## DISCUSSION

Overall, the findings of the present school-based descriptive study are largely consistent with recent original research, while also demonstrating certain contrasts attributable to differences in study settings, age groups, and outcome definitions. In the current study, approximately 81-83% of eyes demonstrated normal visual acuity (6/6), with about 17-19% showing acuity worse than 6/6, a distribution that aligns closely with recent Indian school-based studies reporting refractive error or reduced visual acuity prevalence ranging from 15% to 22% in urban school populations.<sup>11,12</sup> Similar to the present findings, Srivastava et al reported an overall refractive error prevalence of 17.4% among school-going children, with higher detection rates in urban settings.<sup>12</sup> Comparable magnitudes have also been reported in other school-based surveys conducted in South Asia, reinforcing the observation that a substantial proportion of school children exhibit reduced vision detectable through routine screening.<sup>13</sup> In contrast, several studies have reported lower prevalence estimates, often in the range of 5-10%, particularly where stricter definitions such as visual acuity worse than 6/12 or cycloplegic refraction-confirmed refractive error were used.<sup>14,15</sup> Such methodological differences likely explain the lower estimates reported by Kawache et al and other district-level surveys, when compared with the broader categorization of visual acuity used in the present study.<sup>15,16</sup>

Age-related trends observed in this study, with a higher proportion of normal visual acuity among younger

children and increased reduced acuity in older age groups, are in agreement with multiple recent studies and systematic reviews documenting a rise in myopia and refractive errors with advancing age during school years.<sup>13,17,18</sup> Large surveillance studies from East and Southeast Asia have reported substantially higher prevalence of myopia, often exceeding 30-40% among older schoolchildren, which contrasts with the lower proportions observed in the present study but reflects known geographic and epidemiological differences.<sup>17,19</sup>

Gender-wise distributions in the current study were comparable between boys and girls, a finding consistent with several recent Indian and international studies reporting minimal or no gender differences in overall visual acuity status.<sup>15,20</sup> Variability across studies highlights the influence of urbanization, screening protocols, diagnostic thresholds, and regional lifestyle factors on reported visual acuity distributions. Taken together, the present findings fall within the spectrum of results reported in recent literature and underscore the continued relevance of school-based visual acuity screening as a practical approach for identifying children with reduced vision in urban settings.

The study was limited by its descriptive cross-sectional design, which precludes causal interpretation. Visual acuity was assessed using a Snellen chart without cycloplegic refraction, limiting diagnostic specificity. The urban school-based setting restricts generalizability to rural populations, and lifestyle factors influencing vision were not explored.

## CONCLUSION

The study demonstrates that most school-going children in urban Mysuru had normal visual acuity, and a notable proportion had reduced vision detectable through routine screening. Reduced visual acuity was more common among older children, reflecting increasing visual demands with age. Similar visual acuity patterns among boys and girls indicate no gender-based difference. These findings emphasize the need for regular school-based visual acuity screening as a simple and cost-effective approach for early detection. Integrating such screening into school health services can enable timely correction and reduce the educational impact of unrecognized visual impairment.

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