

VISUAL IMPAIRMENT IN SCHOOL-AGED CHILDREN

Ermira Tateshi

University of Tetovo, Faculty of Pedagogy, Institute for Special Education and Rehabilitation, Tetova,
North Macedonia, ermira.tateshi@unite.edu.mk

Makfirete Ameti

University of Tetovo, Faculty of Pedagogy, Institute for Special Education and Rehabilitation, Tetova,
North Macedonia, makfirete.ameti@unite.edu.mk

Aferdita Ilazi

University of Tetovo, Faculty of Pedagogy, Institute for Special Education and Rehabilitation, Tetova,
North Macedonia, aferdita.ilazi@unite.edu.mk

Daniela Dimitrova-Radojchikj

"St. Cyril and Methodius" University, Faculty of Philosophy, Institute for Special Education and
Rehabilitation, Skopje, North Macedonia, daniela@fzf.ukim.edu.mk

Bekim Tateshi

"Goce Delcev" University, Faculty of Medical Sciences, Stip, North Macedonia,
bekim.tatesi@ugd.edu.mk

Abstract: Purpose: Many eye disorders develop during childhood but are often not diagnosed early enough, which can negatively impact a child's academic performance and lead to serious vision problems later in life. This study aims to identify the primary causes of vision impairment in children and emphasize the importance of early intervention.

Methodology: The study is retrospective and includes an analysis of data on children up to 12 years old who were examined at the University Clinic of Ophthalmology in Skopje in 2023. A total of 15,039 children were diagnosed with some form of eye condition during this period.

Results: In 2023, strabismus was identified as the most common cause of vision impairment among the examined children, accounting for 56.9% of cases (8,555 children), followed by refractive errors, which affected 41.6% (6,258 cases). A smaller number of children were diagnosed with infantile and juvenile cataract, representing 0.7% of cases (111 children), and congenital malformations of the lens of the eye, found in 0.5% (69 cases).

Conclusion: The findings highlight the importance of targeted screening programs to detect vision impairments early in childhood, as conditions like strabismus and refractive errors account for most cases. Although less common, conditions such as amblyopia and congenital cataracts also require attention due to their potential long-term impact on visual development if left untreated. Implementing timely interventions and improving access to eye care services are essential steps toward enhancing visual health outcomes for children and supporting their academic and social development.

Keywords: children, eye diseases, strabismus, refractive errors

1. INTRODUCTION

Visual impairment presents a significant health challenge for children, particularly during their school years, when vision is crucial for both academic success and social-cognitive development. According to the American Optometric Association, around 80% of learning in the first 12 years of a child's life depends on vision, which involves activities such as reading, observing the blackboard, and interacting with various educational materials (Wodon et al., 2019). As a result, it can be concluded that vision impairment significantly limits a child's learning ability and motivation, often leading to lower academic performance (Zaba, 2001). In the United States, for instance, a large portion of students aged 8-18 who are academically or behaviorally at risk have undiagnosed or untreated vision issues (Zaba, Johnson, & Reynolds, 2003). These children face difficulties in school and may be mistakenly identified as having learning disabilities, which leads to their placement in special education programs. In China, the Smart Focus Program finds that students with visual impairments are often redirected to vocational tracks in Grade 7 with less rigorous academic requirements (Loh, Prem-Senthil, & Constable, 2024). While such redirection is common in countries that offer alternative educational pathways, children with visual impairments in countries without these options are more likely to drop out of school entirely.

Refractive errors are the most common visual impairments among children and can often be easily corrected with eyeglasses, but access to corrective measures remains limited in many low-resource areas. More complex conditions, such as amblyopia and strabismus, disrupt binocular vision, affecting depth perception and spatial

awareness, which are vital for daily activities and classroom participation. Additionally, serious conditions like congenital cataracts and retinopathy of prematurity, particularly in preterm infants, can lead to permanent vision loss if left untreated.

In our country, the lack of reliable data on the prevalence of vision impairment among school-aged children creates a substantial gap in understanding and addressing the needs of this population. Although vision plays a crucial role in a child's educational and developmental progress, information on how many children are affected by various visual impairments—particularly at key school ages—remains limited. This data gap impedes efforts to develop targeted interventions, allocate necessary resources, and implement effective preventive measures at the national level.

2. MATERIALS AND METHODS

This retrospective study assessed the number of children with vision impairment up to age 12 who were examined at the University Eye Clinic in Skopje in 2023 and analyzed their diagnoses. Clinical data from medical records, focusing on ocular conditions like refractive errors and strabismus, were reviewed. Sociodemographic factors were compared using the Chi-square test. Ethical guidelines were followed, ensuring data confidentiality, with approval from the relevant review board.

3. RESULTS

During this period, a total of 15,039 children were diagnosed with various ocular conditions. Table 1 categorized these children by gender, focusing specifically on those with vision impairment up to the age of 12.

Table 1. Gender of children with vision impairment

Gender	N	%
Female	7 737	51.4
Male	7 302	48.6
Total	15 039	100

Source: Electronic platform "My Appointment" at the University Eye Clinic in Skopje

The chi-square (χ^2) statistic was 25.05, with a p-value of 5.59e-07, well below the conventional threshold of 0.05. This result provided strong statistical evidence of a difference in diagnosis rates between genders.

Table 2. Causes of visual impairment

Causes	N	%
Strabismus	8 555	56.9
Disorders of refraction and accommodation	6 258	41.6
Visual disturbances	46	0.3
Congenital malformations of the lens of the eye	69	0.5
Infantile and juvenile cataract	111	0.7
Total	15 039	100

Source: Electronic platform "My Appointment" at the University Eye Clinic in Skopje

Table 2 provided a comprehensive summary of the causes of vision impairment among all children examined, categorizing each diagnosis to offer an in-depth understanding of the primary factors contributing to vision impairment within this population. Strabismus (56.9%) and refractive errors (41.6%) emerged as the leading causes, while other conditions such as visual disturbances, congenital malformations, and cataracts were much less common. A chi-square (χ^2) test, comparing the observed distribution to an equal distribution, yielded a value of 22,320.46 with a p-value of 0.0, indicating a statistically significant difference.

The specific types of impairments associated with these two leading causes were presented in the following two tables. Table 3, in particular, displayed the types of strabismus, with convergent strabismus being the most prevalent, comprising 73.7% of cases.

Table 3. Strabismus

Type	N	%
Convergent strabismus	6 305	73.7
Divergent strabismus	689	8.1
Vertical strabismus	27	0.3
Intermittent strabismus	185	2.2
Alternating strabismus	14	0.2
Residual strabismus	304	3.5
Mechanical strabismus	10	0.1
Other specified strabismus	453	5.3
Unspecified strabismus	568	6.6
Total	8 555	100

Source: Electronic platform "My Appointment" at the University Eye Clinic in Skopje

Table 4 presented the results of Disorders of Refraction and Accommodation. Among the conditions in this group, astigmatism and hypermetropia were the least commonly represented, showing lower prevalence compared to other refractive disorders.

Table 4. Disorders of refraction and accommodation

Type	N	%
Hypermetropia	1 393	22.3
Myopia	817	13.1
Astigmatism	3 181	50.3
Anisometropia	199	3.3
Other disorders of refraction	143	2.4
Disorders of accommodation	107	1.8
Unspecified disorder of refraction	418	6.8
Total	6 258	100

Source: Electronic platform "My Appointment" at the University Eye Clinic in Skopje

3. DISCUSSION

The data from this study revealed a notably higher prevalence of vision impairment in girls compared to boys, suggesting a potential gender-related trend. This disparity may warrant further exploration into the underlying causes or contributing factors. Consistent with these findings, other research has shown that vision impairment is more common among school-aged girls (Bountziouka et al., 2017; Da Silva et al., 2023).

The results also confirmed that the majority of cases were attributed to strabismus and refractive errors. A comparison with the study by Dimitrova-Radojichikj and Tasevska revealed a slightly higher refractive anomaly rate of 42.6%, compared to the 41.6% observed in this study. Additional research by Tateshi et al. (2024) indicated that the prevalence of refractive errors among school-aged children ranges from 12.0% to 47.8%. Refractive errors and/or refractive amblyopia were the most frequently diagnosed conditions in visually impaired children, which aligns with global trends reported by the WHO (1999).

In general, this study identified a high prevalence of strabismus, emphasizing the importance of effective treatment for this condition. Strabismus not only leads to vision impairment but also contributes to emotional challenges in affected children. Research by Chang et al. (2015) found that children with a history of strabismus are at increased risk of mental health issues, including social phobia and depression. The misalignment of the eyes can negatively impact self-image and emotional well-being. Furthermore, strabismus can affect social functioning, limiting career opportunities, academic performance, the ability to form positive relationships, and participation in sports. The authors also highlighted that strabismus is linked to a diminished quality of life.

Although myopia is the most common refractive error globally, affecting approximately 312 million children (Rudnicka et al., 2016), this study found that astigmatism was the most prevalent refractive error, accounting for 50.3% of cases. Similar findings were reported by Ali et al. (2022), who identified astigmatism as the most common refractive error among children (47.8%), with hypermetropia being the least common at 22.22%.

4. CONCLUSION

In summary, this study underscores the high prevalence of refractive anomalies and strabismus as leading causes of vision impairment in children. Many of these cases are treatable, making early detection and intervention essential to prevent the academic and social difficulties associated with uncorrected vision problems. Worldwide, millions experience vision impairment, yet most could benefit from basic corrective solutions like eyeglasses. In resource-limited settings, where education heavily depends on visual methods such as blackboard use, untreated vision issues can significantly hinder a child's learning and development. Implementing regular vision screenings, improving access to corrective eyewear, and advancing public health initiatives can greatly enhance children's academic success, social engagement, and overall quality of life.

REFERENCES

- Ali, J., Kumari, R., Dubey, G., Afroz, S., Gupta, S. K., Srivastava, N., et al. (2022). Prevalence of astigmatism in school-going children: A hospital-based study at Majeedia Hospital, New Delhi. *International Journal of Community Medicine and Public Health*, 9, 4114–4117.
- Bountziouka, V., Cumberland, P. M., & Rahi, J. S. (2017). Trends in visual health inequalities in childhood through associations of visual function with sex and social position across 3 UK birth cohorts. *JAMA Ophthalmology*, 135(9), 954–961. <https://doi.org/10.1001/jamaophthalmol.2017.2812>
- Chang, M. Y., et al. (2015). Quality of life in adults with strabismus. *American Journal of Ophthalmology*, 159(3), 539–544.e2. <https://doi.org/10.1016/j.ajo.2014.12.003>
- Da Silva, K., Dowell, M., Savatovsky, E. J., Grosvenor, D., Callender, D., Campbell, M. H., Hambleton, I., Dimitrova-Radojichikj, D., & Tasevska, D. (2020). Causes of visual impairment: A retrospective study in Macedonian children. *Journal of Ophthalmology (Ukraine)*, 3(494), 29–30.
- Loh, L., Prem-Senthil, M., & Constable, P. A. (2024). A systematic review of the impact of childhood vision impairment on reading and literacy in education. *Journal of Optometry*, 17(2), 100495. <https://doi.org/10.1016/j.optom.2023.100495>
- Looking ahead: Visual impairment and school eye health programs. *World Bank*. <https://pubdocs.worldbank.org/en/880171575325123775/WorldBank-InclusiveEducationVisualImpairment-v7-WebReady.pdf>
- Rudnicka, A. R., et al. (2016). Global variations and time trends in the prevalence of childhood myopia: A systematic review and quantitative meta-analysis—Implications for aetiology and early prevention. *British Journal of Ophthalmology*, 100, 882–890.
- Tateshi, E., Tateshi, B., & Dimitrova-Radojichikj, D. (2024). Refraktivni greski kaj decata od ucilsna vozrast: Pregled na literatura. *Medicus*, 29(1), 76–80.
- Vanner, E. A., Grajewski, A. L., & Chang, T. C. (2023). The burden of pediatric visual impairment and ocular diagnoses in Barbados. *International Journal of Environmental Research and Public Health*, 20(16), 6554. <https://doi.org/10.3390/ijerph20166554>
- Wodon, Q., Male, C., Nayihouba, A., & Smith, E. (2019). The price of exclusion: Disability and education. World Health Organization Blindness and Deafness Unit, & International Agency for the Prevention of Blindness. (1999). Preventing blindness in children: Report of a WHO/IAPB scientific meeting; Hyderabad, India, 13–17 April 1999. *World Health Organization*. <https://apps.who.int/iris/handle/10665/66663>
- Zaba, J. N., Johnson, R. A., & Reynolds, W. T. (2003). Vision examinations for all children entering public school: The new Kentucky law. *Optometry*, 74(3), 149–158.
- Zaba, J. (2001). Social, emotional, and educational consequences of undetected vision problems. *Journal of Behavioral Optometry*, 12, 66–70.