Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol.14 , Issue 8s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Pattern and Distribution of Refractive Error Types in North Indian Children: A Clinical Cross-Sectional Study.

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Cite this paper as: Ambrish Kumar Pandey, Himanshu Tripathi, Dilip Singh, Rajesh Kumar (2025) Pattern and Distribution of Refractive Error Types in North Indian Children: A Clinical Cross-Sectional Study.. Journal of Neonatal Surgery, 14, (8s) 1122-1125

ABSTRACT

Background: To assess the pattern and distribution of refractive error types among North Indian children attending a tertiary eye care center.

Methods: A clinical cross-sectional investigation, 183 children, ranging in age from 6 to 15, who had thorough eye exams were included. Using streak retinoscopy and an autorefractometer, we measured visual acuity and performed objective refraction. Refractive errors were categorized by severity: myopia, hypermetropia, hyperopic astigmatism, and mixed astigmatism. Using descriptive statistics, we looked at how refractive errors were distributed by gender and age.

Results: Myopia was the predominant refractive error, impacting 87 children (47.54%), followed by myopic astigmatism in 70 children (38.25%). Hypermetropia and hyperopic astigmatism were few, representing 7.10% and 6.01% of instances, respectively, but mixed astigmatism occurred in 1.09% of children. The majority of participants were aged 11 to 14 years, with the highest prevalence observed in the 13 to 14-year age group. The gender distribution was almost balanced, with 90 boys (49.18%) and 93 girls (50.82%).

Conclusion: The research reveals a prevalence of myopia and myopic astigmatism in North Indian children, signifying an increasing tendency of myopia in this demographic. Prompt refractive assessment and quick optical intervention are crucial to mitigate the incidence of preventable visual impairment in children...

Keywords: *Refractive errors; Myopia; Astigmatism; Children; Hypermetropia; North India.*

INTRODUCTION

Refractive errors are among the most prevalent causes of vision problems among kids worldwide and represent a significant public health problem, especially in developing nations. Uncorrected refractive defects constitute a significant percentage of preventable visual impairment and blindness worldwide, impacting scholastic achievement, psychosocial development, and overall quality of life in children. (1, 2, 3) Early detection and timely correction are therefore essential to prevent long-term visual morbidity, including amblyopia and binocular vision anomalies.

Myopia, hypermetropia, and astigmatism are the most common refractive defects in children. They can happen on their own or in groups. These refractive conditions are more common in some groups than others, and the prevalence of them changes with age, race, where people live, and other factors. In the last few decades, there has been a noticeable rise in the number of children with myopia around the world, especially in Asian populations. (4, 5) Increased near-work activities, decreasing outside exposure, and urbanization-related lifestyle changes are behind this trend. (6)Childhood refractive errors are a

prominent source of avoidable vision impairment in school-aged children in India. Refractive errors are the most common ocular condition among children in rural and urban India, according to population-based studies. (7, 8) Despite national vision screening programs, many impaired children, especially in impoverished regions, go untreated or poorly corrected. (9)

North India is demographically varied, with socioeconomic, educational, and environmental factors that may affect children's refractive development. Data on region-specific refractive error patterns and distributions are limited. Targeted screening, resource allocation, and community prevention require knowledge of local refractive characteristics.

Thus, this clinical cross-sectional investigation examined refractive error types in North Indian children aged 6–15. This study analyzes refractive errors by age and gender to add to epidemiological evidence and underline the necessity of early refractive assessment and optical treatment to prevent childhood visual impairment. (10, 11, 12)

Method

This clinical cross-sectional study was conducted at a tertiary eye care facility in North India to evaluate the pattern and distribution of refractive errors among children undergoing routine ocular assessment. A total of 183 children aged 6 to 15 years were consecutively enrolled during the research period. Children diagnosed with amblyopia, strabismus, ocular disease, previous ocular surgery, or disorders that hinder accurate refraction were excluded.

All subjects underwent a thorough ophthalmic evaluation, including measurement of distant and near visual acuity, ocular alignment, and objective and subjective refraction. Objective refraction was conducted with streak retinoscopy and autorefraction, with measurements acquired separately by various examiners, where possible, to reduce bias. Refractive errors were categorized according to spherical equivalent and cylindrical components utilizing established clinical criteria. To prevent inter-eye association, data from a single eye per participant were used for statistical analysis. Data were analyzed using descriptive statistics to determine the prevalence and distribution of refractive error categories by age and gender. This methodological approach provided a consistent and reliable assessment of refractive error patterns among pediatric patients visiting a tertiary eye care facility.

Bottom of Form

Results

Myopic refractive errors predominated in this clinical cross-sectional examination of 183 North Indian youngsters. Myopia was the most common ailment, affecting 87 children (47.54%). This shows that over half of the study population had a myopic shift, indicating a significant prevalence of myopic refractive error.

Seventy individuals (38.25%) had myopic astigmatism, the second most common refractive group. Myopia and myopic astigmatism account for 85.79 percent of refractive defects in children, indicating a substantial trend toward myopia. Hyperopic astigmatism affected 11 children (6.01%) while hypermetropia alone affected 13 (7.10%). These data suggest the study sample had less hyperopic refractive states. (Table 1)

Table 1: Frequency distribution of refractive error of patients

Refractive Error	n = 183	In %
Myopia	87	47.54%
Myopic Astigmatism	70	38.25%
Hypermetropic. Astigmatism	11	6.01%
Mixed Astigmatism	2	1.09%
Hypermetropia	13	7.10%

Mixed astigmatism was found in 2 children (1.09%), the smallest category.

Myopia and myopic astigmatism dominate the refractive error profile, with hyperopic and mixed errors contributing little. This pattern matches global patterns of rising childhood myopia prevalence and underscores the need for early refractive screening and optical correction.

A total of 183 youngsters aged 6–15 were studied. The largest age group was 13–14, with 47 children (25.68%). Following closely was the 11–12-year interval, with 43 individuals (23.50%). The 9–10-year-old group had 35 cases (19.13%), while the 14–15-year group had 34 (18.58%). It was the smallest cohort, with 24 children aged 6–8 (13.11%). In general, representation increases from younger to early-teen age groups, peaking at 13–14 years. (Table 2)

Table 2: Frequency distribution of the age of patients

Age Interval (In Yrs.)	n = 183	In %
6 – 8	24	13.11%
9 - 10	35	19.13%
11 - 12	43	23.50%
13 - 14	47	25.68%
14 - 15	34	18.58%

Of the 183 youngsters studied, 90 were boys (49.18%) and 93 were girls (50.82%). The sample was virtually equally gendered, with a small female predominance. Balanced representation reduces gender-related sampling bias in the assessment of refractive error patterns. (Table 3)

Table 3: Frequency distribution of the gender of patients

Gender	n = 183	In %
Boy	90	49.18%
Girl	93	50.82%

DISCUSSION

This clinical cross-sectional study examined the pattern and distribution of refractive defects in North Indian children aged 6 to 15 years. The findings indicate a significant prevalence of myopia and myopic astigmatism, collectively representing over 85% of all diagnosed refractive abnormalities. These results show that this group of children is highly likely to be nearsighted, consistent with studies of rising nearsightedness among children in Asian countries. (4, 5)

The most prevalent refractive error was myopia (47.54%), followed by myopic astigmatism (38.25%). Similar trends have been observed in prior Indian investigations, which identified myopia as the predominant refractive error among school-aged children. 8, 2 The growing number of people with myopia is thought to be caused by more time spent working up close, less time spent outside, and more pressure to do well in school, all of which are becoming more common in cities and suburbs. (11)

Hypermetropia and hyperopic astigmatism were relatively few, constituting 7.10% and 6.01% of patients, respectively. This reduced prevalence may indicate emmetropization and a first transition towards myopia throughout the school years, as documented in longitudinal pediatric refractive studies. (13,14) Mixed astigmatism was the least prevalent refractive error (1.09%), consistent with previous studies showing that it is uncommon in youngsters. (15)

An age-wise examination showed that most of the kids were between 11 and 14, with the highest number of cases among those aged 13 to 14. This period is considered a key time for the onset and progression of myopia due to the increased demands of schoolwork and close-up tasks. (6, 10) These results underscore the significance of focused refractive screening in early adolescence.

The gender distribution in this study was nearly equal, with no significant difference in refractive error prevalence between boys and girls. This finding aligns with several Indian and worldwide studies indicating no gender-related differences in childhood refractive errors. (16, 17)

The significant prevalence of myopia and myopic astigmatism identified in this study highlights the necessity for early detection, prompt optical correction, and consistent follow-up to avert visual impairment, amblyopia, and negative impacts on academic performance. School-based vision screening programs have been successful in the early detection of refractive problems and should be enhanced in resource-constrained environments. (18)

The limitations of this study include its clinic-based methodology, which may hinder generalizability, and the absence of cycloplegic refraction, which may lead to an underestimation of hyperopia. Nonetheless, clinic-based studies offer significant insights into current refractive trends and help pinpoint high-risk age groups that require targeted care. (9)

CONCLUSION

This study shows a strong preponderance of myopia and myopic astigmatism in North Indian children, indicating an early shift toward myopia. The high prevalence of these refractive defects during critical visual and academic development underscores the need for early detection, monitoring, and optical correction. The findings highlight the need to improve school-based vision screening programs, raise awareness among parents and educators, and promote myopia prevention techniques. Early intervention can improve visual outcomes, education, and ocular health. This study adds regional data to the literature and emphasizes the need to address childhood refractive defects in India as a public health issue..

REFERENCES

1. Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP. Global magnitude of visual impairment caused by uncorrCorrected refractive errors in 2004. Bull World Health Organ. 2008;86(1):63–70.
2. Dandona R, Dandona L. Refractive error blindness. Bull World Health Organ. 2001;79(3):237–243.
3. World Health Organization. Elimination of Avoidable Visual Disability Due to Refractive Errors. WHO, 2000.
4. Morgan IG, Ohno-Matsui K, Saw SM. Myopia. Lancet. 2012;379(9827):1739–1748.
5. Holden BA, Fricke TR, Wilson DA, et al. Global prevalence of myopia and high myopia and temporal trends from 2000 through 2050. Ophthalmology. 2016;123(5):1036–1042.
6. Saw SM, Gazzard G, Shih-Yen EC, Chua WH. Myopia and associated pathological complications. Ophthalmic Physiol Opt. 2005;25(5):381–391.
7. Dandona R, Dandona L, Srinivas M, et al. Refractive error in children in a rural population in India. Invest Ophthalmol Vis Sci. 2002;43(3):615–622.
8. Murthy GV, Gupta SK, Ellwein LB, et al. Refractive error in children in an urban population in New Delhi. Invest Ophthalmol Vis Sci. 2002;43(3):623–631.
9. Sheeladevi S, Seelam B, Nukella PB, Modi A, Ali R, Keay L. Prevalence of refractive errors in children in India: a systematic review. Clin Exp Optom. 2018;101(4):495–503.
10. Pan CW, Dirani M, Cheng CY, Wong TY, Saw SM. The age-specific prevalence of myopia in Asia: a meta-analysis. Optom Vis Sci. 2015;92(3):258–266.
11. Flitcroft DI. The complex interactions of retinal, optical, and environmental factors in myopia aetiology. Prog Retin Eye Res. 2012;31(6):622–660.
12. WHO–UNICEF Joint Statement. Vision Screening in School Children. World Health Organization; 2018.
13. Mutti DO, Mitchell GL, Jones LA, et al. Axial growth and changes in lenticular and corneal power during emmetropization in infants. Invest Ophthalmol Vis Sci. 2005;46(9):3074–3080.
14. Hashemi H, Khabazkhoob M, Asharlous A, et al. Overestimation of hyperopia with autorefraction compared with retinoscopy under cycloplegia in school-age children. Br J Ophthalmol. 2018;102(12):1717–1722.
15. Katz J, Tielsch JM, Sommer A. Prevalence and risk factors for refractive errors in an adult inner city population. Invest Ophthalmol Vis Sci. 1997;38(2):334–340.
16. Zadnik K, Jones LA, Irvin BC, et al. Myopia progression as a function of sex, age, and ethnicity. Invest Ophthalmol Vis Sci. 2003;44(4):1557–1563.
17. Czepita D, Mojsa A, Zejmo M. Prevalence of myopia and hyperopia among urban and rural schoolchildren in Poland. Ann Acad Med Stetin. 2008;54(1):17–21.
18. Wedner SH, Ross DA, Todd J, Anemona A, Balira R. Myopia in secondary school students in Mwanza City, Tanzania: the need for a national screening programme. Br J Ophthalmol. 2002;86(11):1200–1206..