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Original Research Article

Prevalence and Pattern of Refractive Error Among Government School Children in Angul, Odisha: A Retrospective Study

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Abstract:

Background: Refractive error is the most common and avoidable cause of visual impairment among school children. Early detection and correction are essential to prevent long-term visual disability.

Objective: To determine the prevalence and pattern of refractive error among government school children in Angul district, Odisha.

Methods: A retrospective study was conducted among 1,006 schoolchildren. Data were collected from the school-based vision screening program conducted from December 2025 to February 2026 in 44 schools in the rural and urban regions of Angul district of Odisha under the National Program for Control of blindness and Visual Impairment (NPCBVI).

Results: A total of 10,935 schoolchildren from 44 schools in the age group 6 -17 years were examined. Of these children, 1006 had refractive error. Average age was 12.7 +- 2.0 years (range 6-17 years). There were boys (36%) and girls (64%). The prevalence of refractive error was 9.2%. Myopia (6.6%) and astigmatism (2.5%) were more common than hypermetropia (0.07%). The prevalence of refractive error among boys was 9.2%, and among girls was 9.1%. 77 % children were from the general category, 13% from the scheduled caste, and 10% from the scheduled tribe.

Conclusion: A notable proportion of children with refractive error were either undiagnosed or not using corrective measures. Therefore, coordinated effort involving schools, parents and health care providers is essential to implement effective screening and awareness initiatives.

Keywords: Angul, Odisha, Refractive error, Government school children, Visual impairment.

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Introduction

Refractive error is an optical defect, intrinsic to the eye, which prevents light from being brought to a single point focus on the retina, thus reducing normal vision. Refractive error affects a large proportion of the world population, regardless of sex, age and ethnic group.[1] Refractive errors, such as hyperopia, myopia, and astigmatism, are the most common ocular disorders requiring spectacles or contact lenses for optimal vision. Refractive error is caused by a mismatch between the various optical elements of the eye, and the eye's axial length is one reason.[2] Visual impairment can significantly affect children's quality of life, affecting their physical, emotional and social functioning. Uncorrected refractive error remains a major cause of vision impairment worldwide.[3] Globally, the age-standardised prevalence of moderate to severe vision impairment was estimated to be around 37.4 (33.9- 41.2) cases per 1000 people.[4] In India, the prevalence of vision impairment varies. According to population-based and school-based studies, the prevalence of refractive error per 100 children under 15 years is estimated to be 8.0 (cl: 7.4-8.1) and 10.8 (cl:10.5-11.2), respectively.[5-9] The school children constitute a special group with an uncorrected refractive error cause a significant impact on student routine school work, physical, mental, behavioral development, as well as day-to-day activities.[10] Children may adjust to poor vision by strategies such as changing position in the classroom, moving objects closer and tending to avoid tasks that require more visual concentration. This warrants early detection and treatment to prevent permanent disability.[11] The solution to uncorrected refractive error is simple refraction and dispensing of the required spectacles, though challenges lie in an inadequate number of eye health personnel, training required for accurate

retinoscopy, and, in certain countries, the cost and supply of spectacles.[12] Between the strategies for screening for refractive error in children in the population and in the school, the latter is considered more cost-effective.[13]

School-based vision screening programs play a crucial role in the early detection and management of refractive error. Government school children are particularly vulnerable due to limited access to regular eye check-ups and a lack of awareness among parents. The national program for control of blindness and visual impairment (NPCBVI) was launched in 1976 in India to reduce the prevalence of blindness to 0.3% by 2020.[14] The screening of school children for refractive error and the distribution of free spectacles are key strategies under NPCBVI. Understanding the prevalence and pattern of refractive error in a specific region can help in planning targeted interventions. Therefore, this study was conducted to assess the prevalence and pattern of refractive error among government school children in the Angul district of Odisha.

Materials & Methods

Study Design: This study was a retrospective observational study. The data were collected from annual school eye screening programs conducted in urban and rural regions of Angul district, Odisha, from December 2025 to February 2026 under NPCBVI. Study was conducted on 10935 government school children of the age group 6-17 years. A convenience sampling approach was utilised to select schools with accessible data, leading to the inclusion of 44 schools of the Angul district, Odisha. Data were obtained from the medical record department of District Headquarters Hospital, Angul.

Inclusion Criteria

- Records of government school children who have undergone vision screening program.
- Complete data of visual acuity and refractive status are available.

Exclusion Criteria

- Incomplete or missing record.
- Children with ocular pathology other than refractive error.

It was a multistage screening program. In the first stage, vision screening was performed by trained school teachers in school by using Snellen's chart at a 6-meter distance with daylight illumination. Those children with visual acuity less than 6/6 were referred to the community health centre. A comprehensive eye examination was performed by an optometrist and ophthalmologist. Examination of the anterior segment was done. Objective refraction was done using an auto-refractor. Then, subjective correction was done by placing appropriate lenses in the trial frame. Those having high myopia, high astigmatism, strabismus and no improvement with glass referred to the Medical College Hospital. Spectacles were provided to all children with refractive error.

Operational definitions: Refractive error was considered as unaided distant VA of 6/9 or less, which improved with pinhole.[15]

Myopia was defined as spherical equivalent of at least - 0.25 D, and hypermetropia as spherical equivalent of at least +0.50 D.

Astigmatism was diagnosed when the difference in the refraction of the axis in one eye was greater than 0.50 DC.

Statistical analysis: Descriptive analysis was performed to study the demographic characteristics of the participants and the prevalence of refractive error. Continuous variables were reported as mean (standard deviation) and categorical variables as frequency and proportions.

A chi-square test was used to assess differences in proportion. A p-value of < 0.05% was considered statistically significant. Data were analysed using Stats 15.1 (StataCorp, USA).

Results

A total of 13,175 students were referred from 44 schools of Angul district after screening by teachers at the school. But only 10935 students (83% of 13,175) reached the community health centre. Out of this, 3937 were boys, and 6998 were girls. Refractive error was detected in 1006 students. So prevalence was 9.2%. The refractive error distribution was as follows: Myopia 725 students (prevalence 6.6%), Hypermetropia 8 students (prevalence 0.07%), Astigmatism 275 students (prevalence 2.5%). The prevalence of refractive error among boys were 9.2%, among girls 9.1%.

Table 1: Demographic distribution of students with Refractive Error (n= 1006)

Table 1 A: Age was distribution			
Age group (years)	**Total (n)**	**Boys (n%)**	**Girls(n%)**
6 - 8	37	21 (57%)	16 (43%)
9 - 11	184	84 (45%)	100 (55%)
12 - 14	635	214(34%)	421 (66%)
15 - 17	150	45 (30%)	105 (70%)
Total	1006	364 (36%)	642 (64%)

Table 1 B: Social category-wise distribution			
Social category	**Total (n)**	**Boys (n%)**	**Girls (n%)**
Scheduled tribe	100	27 (27%)	73 (73%)
Scheduled caste	131	38 (29%)	93 (71%)
General	775	279 (36%)	494 (64%)
Total	1006	364 (36%)	642 (64%)

The study population comprised 1006 students; of these, 36% were boys and 64% were girls. Among the selected students, 63% were in the age group 12 - 14 years. The least proportion of students (37%) was in the age group 6 - 8 years. Out of 1006 students, the general category students were 77%, the scheduled caste 13%, and the scheduled tribe 10%.

Table 2: The Prevalence of Different Types of Refractive Error

Types of Refractive Error	Prevalence (%)
Myopia	6.6%
Hypermatropia	0.07%
Astigmatisim	2.5%

Table 3: Gender Specific the Prevalence of Refractive Error

Gender	Total students	Refractive error	Myopia %	Hypermatropia %	Astigmatism %
Boys	3937	9.2%	6.6%	0.12%	2.41%
Girls	6998	9.1%	6.6%	0.04%	2.50%

The overall prevalence of refractive error was 9.2% among boys (95% CI:8.3 -10.1) and 9.1% among girls (95% CI: 8.4 -9.8). There was no statistically significant association between gender and the presence of refractive error ($x2 = 0.023$, $df = 1$, $p = 0.88$). No statistically significant difference was observed between genders for any refractive error types ($p > 0.05$ for all comparisons).

Discussion

The Angul district is located centrally in the state of Odisha. Based on the 2011 census, Angul district had 18.8% schedule caste population and 14% scheduled tribe population. In our study population, 13% were from the scheduled caste, 10% were from the scheduled tribe. A 2014 report had indicated 16.7% school dropouts in Odisha (17.5% boys and 21.3% girls), and the main reason was lack of interest in the students. [16]

Our study assessed the prevalence of refractive error among school-going children 6 - 17 years of age. In our study, 9.2% found the prevalence of refractive error. A study from Gujarat, India, by Basu et al found the prevalence of refractive error among school children 15.22%.[17] A study from Kolkata by Ghosh et al prevalence of refractive error 13.8%.[18] A study from the Udupi district of Karnataka found the prevalence of refractive error among school children 4.32%.[19] A study from the Rayagada district of Odisha by Panda et al. showed a prevalence of refractive error 9.7%.[20] A study from Haryana, Seema et al., found the prevalence rate 14% among school-going children.[21] A study from Andhra Pradesh shows the prevalence of refractive error 12.74%.[22] A study from Bihar found the prevalence rate 6.5%.[23] The prevalence of refractive error was less than that of comparable studies in different states of India.[17-21,23] However, the definition of refractive error was not uniform across the studies; a few studies considered any child with difficulty with distance and near vision as refractive error.[17] Whereas few others considered all plus power and minus power as hyperopia and myopia.[18]

In our study, the prevalence of myopia 6.6%, hypermetropia 0.07%, Astigmatism 2.5%. A study by Muthukrishnan et al from Villupuram and Puducherry shows the prevalence of myopia, hypermetropia, and astigmatism 6.85%, 0.61%, 1.64% respectively.[24] The study by Panda et al shows myopia (4.9%), hyperopia (0.2%) and astigmatism (5.4%).[20] A study from Madhya Pradesh by Basu et al. the prevalence of refractive error was 7.44%, myopia 5.87%, hypermatropia 0.45% and astigmatism 1.11%.[22] A study by Binod Kumar et al. showed Myopia 35.7%, hypermetropia 3.5%, astigmatisim 30.6%.[23] However, the prevalence of hypermetropia in our study is 0.07%, much lower compared to other studies, which report 1 - 4%. This difference may be due to the underdiagnosis of mild hypermetropia or a difference in diagnostic criteria. The age-wise increase in refractive error, particularly myopia, observed in the present study is also supported by previous research, which has shown that the risk of myopia increases with age due to factors such as increased academic workload and near work activities.

Gender wise analysis of our study showed that the prevalence of refractive error was almost equal in boys (9.2%) and girls (9.1%), suggesting that gender does not play a significant role in the overall occurrence of refractive error. A study from Madhya Pradesh shows that the prevalence of refractive error is higher in females (8.76%) and males (5.27%).[22] However, when examining specific types of refractive error by gender, some minor variations were observed. Myopia prevalence was identical in both boys and girls (6.6% each). But a study from Odisha shows myopia among male 5.6%, 4.4% among females.[20]

Limitations of this study

73% of referred students reached the community health centre, unequal gender distribution in the sample, Retrospective study design, limited to government school children, record based bias

The strength of the study was the large sample size.

Conclusion

Refractive errors are a significant health concern among government school children in Angul district, Odisha, with myopia being the most common type. Early detection through regular school screening is essential to reduce the burden of visual impairment and improve academic performance. Promoting awareness among parents, teachers and students, encouraging outdoor activities and reducing excessive screen time may help in controlling the increasing burden of refractive error among students.

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