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Impact of Online Classes on Refractive Errors among School-Going Children: A Cross-Sectional Study

Ram Chander[1], Alka Gupta[2], Lokesh Kumar Singh[3], Jaishree Dwivedi[4] , Aditya Sharma[5]

Abstract: ***Background: Uncorrected refractive errors are a major cause of visual impairment worldwide, with a growing number of affected individuals. Children, especially those in the pediatric age group, are particularly vulnerable. The increase in screen time due to online education during the COVID-19 pandemic has raised concerns about its impact on children's vision. This study aims to assess the impact of online classes on refractive errors among school-going children. Methods: A cross-sectional study was conducted among school-going children aged 10-17 years presenting to the OPD with complaints of visual disturbances and related symptoms between January and March 2023. A total of 116 children attending online classes were selected. They completed a questionnaire regarding digital device use, and a complete visual assessment, including refraction by wet retinoscopy, was performed. Data were compared with a similar cohort from January to March 2019. Results: A total of 178 children presented with visual disturbances in 2023, of which 116 participated in the study. In 2019, 122 children presented with visual disturbances, and 116 were selected for comparison. There was a 35% increase in OPD visits due to visual disturbances from 2019 to 2023. Among the 2023 cohort, 33% of children were newly diagnosed with refractive errors, 41% experienced worsening of pre-existing errors, and 27% reported asthenopic symptoms. Myopia was the most prevalent refractive error, with a 16% increase in newly diagnosed cases and a 15% increase in worsening of pre-existing myopia cases. Conclusion: The transition to online education during the COVID-19 pandemic significantly impacted the ocular health of school-going children. Prolonged screen exposure led to increased cases of refractive errors, particularly myopia, as well as associated symptoms like eye strain and headaches. Strategies such as reducing screen time, promoting outdoor activities, and educating parents about digital eye strain are recommended to mitigate these effects.***

Keywords: Refractive errors, myopia, online education, digital eye strain, pediatric ophthalmology

1. Introduction

Uncorrected refractive errors have been a major cause of visual impairment worldwide, with increasing prevalence in pediatric populations [1]. The shift to online education, particularly during the COVID-19 pandemic, has intensified this issue [2, 3]. Increased screen time and reduced outdoor activities contribute significantly to worsening visual health among children [4-7]. This study aims to assess the impact of online classes on refractive errors among school-going children and compare it with pre-pandemic data.

Aims

To evaluate the impact of online classes on refractive errors among school-going children aged 10-17 years, particularly after the increased screen time due to the COVID-19 pandemic.

Objectives:

1) To assess the prevalence of refractive errors among children attending online classes.
2) To compare the incidence and progression of refractive errors between children examined in 2019 (before the pandemic) and 2023 (post-pandemic).
3) To analyze the effects of increased screen time (due to online education) on visual disturbances, including myopia, asthenopia, and worsening of pre-existing refractive errors.
4) To highlight the role of outdoor activities in preventing refractive error progression.
5) To propose preventive measures such as reducing screen time, encouraging frequent breaks, and educating parents about digital eye strain risks.

2. Materials and Methods

Study Design and Setting: This cross-sectional study was conducted in a tertiary healthcare center between January and March 2023. Children aged 10-17 years presenting to the OPD with visual complaints were included.

Patient Selection: A total of 116 children attending online classes were selected. Inclusion criteria were:

- School-going children (10-17 years)
- Complaints of visual disturbances
- History of online class attendance

Exclusion criteria included:

- Children with known ophthalmic pathologies unrelated to refractive errors
- Children with congenital or systemic conditions affecting vision

Data Collection and Analysis: Participants completed a questionnaire regarding screen time, type of digital device used, and frequency of use. A complete ophthalmic assessment, including refraction by wet retinoscopy, was conducted. The data were compared with a similar cohort from January to March 2019.

3. Results

Patient Demographics: A total of 116 children participated in 2023, compared to 116 selected from 2019 data. The gender distribution in 2023 was 67% girls and 33% boys, while in 2019, it was 46% girls and 54% boys.

Key Findings:

- **35% increase** in children presenting with visual disturbances from 2019 to 2023
- **33% newly diagnosed** with refractive errors in 2023
- **41% had worsening** of pre-existing refractive errors
- **27% reported asthenopic symptoms.**
- **16% rise in newly diagnosed myopia cases.**
- **15% increase in worsening of pre-existing myopia.**

Table 1

Symptoms	116 children in 2023 (%)	116 children in 2019(%)
1.Asthnopic symptoms		19 (16%)
2.Newly diagnosed with refractive error	38 (33%)	20 (17%)
3.Worsening of their pre-existing refractive errors	47 (41%)	29 (25%)
4.symptoms with no change in their pre-existing refractive errors	8 (7%)	6 (5%)
5.visual blurring due to other causes such as lacrimation , conjunctivitis	0	42 (37%)

Table 2: Worsening of Pre-Extisting Refractive Error (%)

Symptoms	47 children who had worsening of their pre-existing refractive errors in 2023(%)	29 children who had worsening of their preexisting refractive errors in 2019(%)
1.Only myopia	38 (81%)	19 (66%)
2.Compound myopic astigmatism	7(15%)	10 (34%)
3.simple myopic astigmatism	2 (4%)	-------

4. Discussion

The findings highlight the negative impact of prolonged screen exposure due to online education. Increased screen time reduces outdoor activity, which has been associated with higher risks of developing myopia. Digital eye strain, characterized by headaches, blurred vision, and eye fatigue, was also prevalent among the study participants.

The comparison with 2019 data reveals a sharp increase in refractive error cases post-pandemic, aligning with global concerns about digital device overuse among children. The gender disparity in 2023 may suggest that girls engaged more in screen-based learning, leading to a higher prevalence of visual complaints in this group.

5. Conclusion

The shift to online education during the COVID-19 pandemic has contributed to a significant rise in refractive errors among school-going children, particularly myopia. The findings underscore the need for preventive strategies, such as controlled screen exposure, regular eye check-ups, and increased outdoor activities to safeguard children's ocular health.

6. Recommendations

1) **Limit screen time:** Schools and parents should implement shorter online sessions with frequent breaks.
2) **Encourage outdoor activities:** Time spent outdoors is linked to lower myopia progression rates.
3) **Parental awareness programs:** Educating parents on digital eye strain can help in monitoring children's screen habits.
4) **Regular eye check-ups:** Early detection and corrective measures can prevent long-term visual impairment.

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Conflicts of Interest: None declared

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