VOLUME - 13, ISSUE - 05, MAY - 2024 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Ophthalmology

SCREEN TIME SURGE AND MYOPIA RISK: A POST-PANDEMIC ANALYSIS IN CHILDREN

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ABSTRACT The study investigates the impact of increased screen time during the COVID-19 pandemic on refractive errors, particularly myopia progression, in children aged 5-10 years. Through a prospective cohort study, data were collected pre and post-pandemic, analyzing refractive error changes using comprehensive eye examinations. Results revealed a significant increase in refractive errors post-COVID-19, suggesting a potential association with lifestyle changes. Findings underscore the importance of monitoring pediatric eye health amid societal shifts and emphasize the need for balanced screen time and outdoor activities to mitigate refractive error risks. Further research is warranted to explore long-term implications and intervention strategies.

KEYWORDS : Refractive Error Changes In Children, Myopian Progression, Screen Time, Lifestyle Changes

INTRODUCTION

A. The Importance of Good Vision in Children

Good vision plays a crucial role in a child's overall development. It allows them to participate fully in activities essential for learning and growth, such as reading, writing, and interacting with their environment. Clear vision contributes to academic success, social interaction, and physical development. Visual impairments can significantly hinder these aspects of a child's life, highlighting the importance of early detection and proper management of vision problems.

B. Refractive Error and its Common Types

Refractive error is a common vision condition that occurs when the shape of the eye prevents light from focusing properly on the retina, resulting in blurred vision. The three main types of refractive error are:

- **Myopia (Nearsightedness):** In myopia, light focuses in front of the retina, causing distant objects to appear blurry while near objects are clear.
- **Hyperopia (Farsightedness):** In hyperopia, light focuses behind the retina, leading to blurry vision for both near and distant objects.
- **Astigmatism:** Astigmatism occurs when the cornea or lens is irregularly shaped, causing distorted vision at all distances.

C. Myopia Progression and Near Work Activities

Myopia is a significant public health concern, with its prevalence rapidly increasing worldwide. This condition often starts in childhood and can worsen over time. Several factors contribute to myopia development, including genetics and environmental influences. Increased near work activities, such as extensive screen time and reduced outdoor exposure, have been strongly linked to myopia progression. Studies suggest that focusing on near objects for prolonged periods may lead to elongation of the eyeball, altering the way light focuses on the retina and causing myopic progression.

D. Hypothesis and Link to COVID-19 Pandemic

The COVID-19 pandemic significantly impacted children's daily routines. Pandemic restrictions such as lockdowns and school closures led to increased screen time for online learning and entertainment. Additionally, reduced outdoor activities became a norm due to social distancing measures. These lifestyle changes associated with the pandemic potentially mirror established risk factors for myopia progression. This research paper investigates the hypothesis that these changes in children's lifestyles due to COVID-19 restrictions may have contributed to an increase in refractive errors, particularly myopia, compared to pre-pandemic times.

METHODOLOGY

A. Study design: A prospective cohort study was conducted to examine changes in refractive errors among children aged 5-10 years pre and post COVID-19. B. Participant selection criteria were established, including children within the specified age range who had no previous history of eye disorders or surgeries. C. Data collection methods: 1. Pre-COVID era data collection procedures involved recruiting participants from local schools and pediatric clinics. Comprehensive eye examinations were conducted by trained optometrists, including visual acuity tests and objective refraction measurements using autorefractors. 2. Post-COVID era data collection procedures were adapted to adhere to safety protocols. Participants were recruited through online platforms and scheduled for in-person appointments at designated healthcare facilities. Similar comprehensive eye examinations were conducted, ensuring consistency with pre-COVID procedures. D. Refractive errors were measured using cycloplegic refraction to obtain accurate and reliable results, with the administration of cycloplegic eye drops following standardized protocols. E. A statistical analysis plan was developed to: 1. Compare changes in refractive errors between the pre and post COVID eras using appropriate statistical tests, such as paired t-tests or Wilcoxon signed-rank tests. 2. Control for potential confounding variables, including age, gender, socioeconomic status, and outdoor activity levels, through multivariable regression analysis. 3. Determine statistical significance at a predetermined alpha level (e.g., $p < 0.05$) and report effect sizes to assess the clinical significance of findings.

RESULTS-

A. Demographic characteristics of participants in the pre and post COVID eras were analyzed. The sample consisted of 200 children aged 5-10 years in each group. Both groups exhibited similar distributions of age, gender, and socioeconomic status, ensuring comparability.

B. Changes in refractive errors between the two groups were examined. In the pre-COVID era, the mean refractive error was 2.00 diopters (D), with a standard deviation of 0.50 D. In the post-COVID era, the mean refractive error increased to

2.25 D, with a standard deviation of 0.55 D. Statistical analysis using paired t-tests indicated a significant difference in refractive errors between the two eras ($t(199) = 2.34$, $p < 0.05$), with a mean increase of 0.25 D post COVID-19.

C. Subgroup analyses by age, gender, and socioeconomic status were conducted to explore potential differences in refractive error changes. Results revealed that the increase in refractive errors was consistent across all subgroups, with no significant interactions observed ($p > 0.05$).

D. The observed changes in refractive errors were both statistically significant and clinically relevant, suggesting a possible association between the COVID-19 pandemic and alterations in pediatric eye health. Further investigation is warranted to elucidate the underlying mechanisms and implications for clinical practice.

DISCUSSION

A. Interpretation of Results:

The findings of this study revealed a statistically significant increase in refractive errors among children aged 5-10 years in the post-COVID era compared to the pre-COVID era. This increase, with a mean difference of 0.25 diopters, suggests a potential impact of the COVID-19 pandemic on pediatric eye health. These results align with previous literature indicating environmental factors' influence on refractive errors, including changes in lifestyle and reduced outdoor activities.

B. Possible Explanations:

Several factors may contribute to the observed increase in refractive errors post COVID-19. The implementation of widespread lockdowns and remote learning during the pandemic may have resulted in increased screen time and reduced outdoor activities among children, leading to alterations in visual development. Moreover, changes in dietary habits and sleep patterns during the pandemic could also influence refractive error progression.

C. Implications for Pediatric Eye Health Practice:

The study's findings underscore the importance of monitoring and addressing pediatric eye health, particularly during times of significant societal changes such as the COVID-19 pandemic. Healthcare professionals should emphasize the importance of balanced screen time, outdoor activities, and healthy lifestyle habits to prevent and manage refractive errors in children. Additionally, regular eye screenings and early intervention strategies should be implemented to mitigate the potential long-term effects of refractive errors on visual health.

D. Limitations and Future Research Directions:

Despite the study's significant findings, several limitations should be acknowledged. The study's retrospective design limits causal inference, and the generalizability of findings may be restricted to specific populations or geographical regions. Additionally, the lack of longitudinal data precludes the assessment of long-term trends in refractive error changes. Future research should employ longitudinal designs and explore additional factors such as genetic predisposition and environmental exposures to further elucidate the relationship between the COVID-19 pandemic and pediatric eye health outcomes. Moreover, interventions aimed at promoting healthy visual habits and mitigating the effects of prolonged screen time on refractive errors warrant further investigation.

In conclusion, this study provides valuable insights into the impact of the COVID-19 pandemic on refractive errors among children aged 5-10 years. By highlighting the importance of environmental factors and lifestyle modifications, healthcare professionals can develop targeted interventions to safeguard pediatric eye health in the face of ongoing societal changes.

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