

PREVALENCE OF DRY EYE IN CHILDREN AGED 5 TO 15 YEARS AND ITS PATTERN WITH DURATION OF SCREEN TIME IN THE EASTERN PART OF BIHAR

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ABSTRACT

Objectives: Dry eye disease (DED) is increasingly recognized as a significant health problem in children, particularly about screen time exposure. However, detailed epidemiological data on DED in young populations, especially in regions such as Eastern Bihar, are sparse. This study aims to assess the prevalence of DED among children aged 5–15 years and explore the relationship between the duration of screen time and the occurrence of DED.

Methods: A cross-sectional study at M.G.M. Medical College and L.S.K. Hospital, Kishanganj, Bihar, examined 140 children with DED symptoms. Diagnostic tests such as tear film breakup time and Schirmer's test were conducted during comprehensive ocular examinations. The association between DED prevalence and parental and self-reported screen usage was examined.

Results: The prevalence of DED among the participants was 12.1%. There was a significant association between higher screen time and increased prevalence of DED, with the severity of symptoms correlating positively with a longer duration of screen exposure. Children with severe DED reported significantly more screen time compared to those with milder forms.

Conclusion: The study confirms a notable prevalence of DED among children in Eastern Bihar, closely linked to excessive screen time. These findings highlight the need for public health strategies to manage screen exposure in children to prevent the onset of DED.

Keywords: Dry eye disease, Screen time, Children, Prevalence.

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INTRODUCTION

In children, dry eye disease (DED) is becoming a major concern. It is made worse by the changes in modern living that involve a lot of screen time [1]. DED, which is characterized by tear film instability and other ocular symptoms, not only lowers the quality of life but also makes daily tasks more difficult for those who have it. The Eastern part of Bihar's prevalence of dry eye in children ages 5–15 and its pattern with duration of screen time is an important step in comprehending and treating this condition in a population that is both at risk and frequently ignored in epidemiological studies [2,3]. Children's screen time has grown due to the widespread usage of digital gadgets, increasing their chance of acquiring DED. Due to lower blink rates and increased tear evaporation, this study postulates that prolonged screen times are associated with a higher incidence of dry eye symptoms [4]. Taking into consideration local socioeconomic and cultural factors that may influence screen time and ocular health, this study looks at children in Eastern Bihar to shed light on the regional consequences of this global health concern [5,6].

The need to close the large research gap on DED in children, especially in particular regional contexts such as Bihar, is what spurred our work. With this targeted strategy, the research advocates for ways to reduce the hazards associated with children's excessive screen use and aims to improve local health-care policy and educational practices [7,8]. The scope and impact of your research are summarized in this introduction, which also links it to more general public health programs and emphasizes the value of focused investigations in particular, understudied populations.

METHODS

Study design and setting

This cross-sectional study was conducted at the Department of Ophthalmology, M.G.M. Medical College and L.S.K. Hospital, Kishanganj,

Bihar. The study spanned from September 01, 2022, to April 30, 2024, focusing on children who visited the eye outpatient department with symptoms indicative of DED.

Study population

Children aged 5–15 years presenting with symptoms such as foreign body sensation, burning, sandy or gritty feeling, and itching were included in the study. The sample size was calculated based on the expected prevalence of dry eye, amounting to 140 participants.

Inclusion and exclusion criteria

Inclusion criteria

The following criteria were included in the study:

- Aged between 5 and 15 years
- Symptoms suggestive of DED.

Exclusion criteria

The following criteria were excluded from the study:

- Outside the age range of 5–15 years
- History of ocular surgery, trauma, acute ocular infection, eyelid issues, or congenital autoimmune disorders
- Use of contact lenses or topical steroids.

Data collection and ophthalmic examination

Participants underwent a comprehensive ophthalmic examination, which included assessments of visual acuity, refraction, and an examination of the eyelids for conditions such as allergic conjunctivitis and keratitis. The presence of DED was initially suspected based on symptoms and confirmed through specific diagnostic tests.

Diagnostic tests for DED

1. Tear film breakup time: This test was conducted first to avoid interference with subsequent tests. Fluorescein dye was applied,

and the time until the first appearance of a dry spot after blinking was measured

- Schirmer's test (type 1): This test assessed tear production by placing a filter paper strip on the lower eyelid. After 5 min, the wetted length of the paper indicated tear volume, with <15 mm indicating potential DED.

Statistical analysis

Data were recorded and analyzed using Statistical Packages for the Social Sciences version 21.0. The analysis included means and standard deviations for quantitative variables and frequencies and percentages for categorical data. The Chi-square test and unpaired t-tests were used to examine the association between screen time and DED symptoms. A $p < 0.05$ was considered statistically significant.

RESULTS

Prevalence of DED

The study included 140 children, among whom 17 (12.1%) were diagnosed with DED. The prevalence of DED highlighted the impact of environmental and lifestyle factors on ocular health in the pediatric population of Eastern Bihar.

Demographic distribution

- Age: The distribution showed that DED was most prevalent in the 9–12 year age group
- Gender: There was no significant difference in DED prevalence between males and females.

Risk factors and screen time

- Use of digital devices: Significant associations were found between DED and the use of smartphones, computers, and televisions. The children with DED had higher average daily screen times compared to those without DED:
 - Smartphone use: 3.87 h for those with DED versus 0.84 h for those without DED
 - Computer use: 1.14 h for those with DED versus 0.68 h for those without DED
 - Television use: 1.45 h for those with DED versus 0.80 h for those without DED.

Severity of DED

- Mildly dry eyes: Represented 23.5% of cases
- Moderately dry eyes: Accounted for 47.1% of cases
- Severely dry eyes: Comprised 29.4% of cases.

Correlation between screen time and severity

- Total screen time: The severity of DED correlated with longer screen time. Children with severe DED averaged 6.55 h of screen time per day, compared to 4.69 h for moderate cases and 4.00 h for mild cases.

Statistical analysis

The statistical tests confirmed significant differences between the screen times of children with and without DED, particularly emphasizing the role of extensive screen use as a risk factor for developing DED.

DISCUSSION

The results of this study provide crucial light on the risk factors and prevalence of DED in Eastern Bihar in children ages 5–15. The study emphasizes the substantial influence of lifestyle and environmental factors, especially screen time, on pediatric ocular health, given the prevalence rate of 12.1%.

Prevalence and demographic factors

Although it is lower than global estimates, which can reach 50% in some groups, the prevalence of DED found in this study is consistent with other pediatric investigations [9]. The age groups examined and various diagnostic criteria are probably to blame for this variability. The study found that youngsters between the ages of 9 and 12 had the highest

Table 1: Prevalence and demographics of dry eye disease

Description	With dry eye disease (n=17) (%)	Without dry eye disease (n=123) (%)	Total (n=140) (%)
Total prevalence (%)	12.1	87.9	100
Age group: 5–8 years	4 (23.5)	31 (25.2)	35
Age group: 9–12 years	9 (52.9)	65 (52.8)	74
Age group: 13–15 years	4 (23.5)	57 (46.3)	61
Gender: Male	9 (52.9)	58 (47.2)	67
Gender: Female	8 (47.1)	65 (52.8)	73

This table shows the prevalence of dry eye disease among the pediatric population aged 5–15 years, categorized by age group and gender. It illustrates the proportion of children with and without dry eye symptoms

Table 2: Association between dry eye disease and digital device use

Risk factor	With dry eye disease (n=17)	Without dry eye disease (n=123)	p-value
Use of smartphone	15 (88.2)	70 (56.9)	0.013
Use of computer	12 (70.6)	50 (40.7)	0.019
Use of television	13 (76.5)	55 (44.7)	0.014

This table presents the correlation between dry eye disease and the usage of digital devices such as smartphones, computers, and televisions. The significant p-values suggest a strong association between DED and higher screen time

Table 3: Screen time duration and severity of dry eye disease

Severity of dry eye	Average daily screen time (hours)	Percentage of cases
Mildly dry eyes	4.00	23.5
Moderately dry eyes	4.69	47.1
Severely dry eyes	6.55	29.4

This table details the average daily screen time in hours associated with different severities of dry eye disease. It shows that more severe cases tend to have longer screen exposure times, highlighting a dose-response relationship between screen time and DED severity

prevalence. The rising demand and use of digital gadgets as kids get older, especially for educational purposes, is in line with this conclusion. The prevalence of DED did not significantly differ by gender, indicating that boys and girls are equally affected by the external variables affecting eye health in this age range, particularly screen usage [10,11].

Impact of screen time

Children with DED reported greater average daily screen time durations on cellphones, laptops, and televisions, indicating a statistically significant correlation between screen time and DED. This is consistent with previous research that indicates extended screen time may result in decreased blinking rates, which ultimately lower tear film stability and increase tear film evaporation, ultimately causing dry eye symptoms [12]. In addition, there was a correlation between screen time and the severity of DED. Compared to children with mild or moderate DED, children with severe DED spent significantly more time on screens. The necessity of public health initiatives targeted at controlling screen time to prevent ocular surface disorders is highlighted by this dose-response connection [13].

Clinical and public health implications

The findings underscore the importance of incorporating eye health safety measures in digital usage guidelines for children. Interventions such as regular screen breaks, ergonomic setup of computer workstations, and parental control of screen time could mitigate the risk of DED [14,15].

Health-care providers should consider routine screenings for DED in school-aged children who report high levels of screen time. Early

detection and intervention can prevent the progression of DED, which can lead to more serious complications and impact academic performance due to visual discomfort and fatigue [16,17].

Limitations and future research

Although the study offers insightful information, it is constrained by its cross-sectional methodology, which makes it impossible to prove a link between screen usage and DED. To validate these results and comprehend the long-term effects of early-onset dry eye syndrome, longitudinal research is required. In addition, the study was only carried out in one region, which might have limited how broadly the results can be applied in other areas. Future studies should concentrate on treatments that can successfully cut down on screen time and control children's DED symptoms [18]. Further strategies for reducing DED in pediatric populations may also be found by investigating the effects of screen light exposure on the ocular surface and the possible advantages of blue light filters [19,20].

CONCLUSION

With a prevalence rate of 12.1%, the study on the prevalence of DED in children in Eastern Bihar between the ages of 5 and 15 shows a strong correlation between DED and more screen usage. According to the research, children who use digital devices such as computers, smartphones, and televisions for extended periods are more likely to develop DED, and the severity of the disorder is closely correlated with the amount of time spent in front of a screen. These findings highlight the urgent need to put policies in place that restrict children's screen time, encourage routine eye examinations, and carry out public health initiatives to lessen the risks connected to using digital devices. To maintain eye health and avoid the early start of DED, which can negatively impact children's visual acuity and quality of life, the study highlights the significance of balanced screen time.

ETHICAL APPROVAL

This study was reviewed and approved by the Ethical Committee of Mata Gujri Memorial Medical College.

CONFLICT OF INTEREST

Nil.

FUNDING

No financial interest.

CONSENT

Written informed consent of the patient's guardian was taken.

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