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Frequency of Dry Eye Diseases among Children During the COVID-19 Pandemic in Pakistan

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ABSTRACT

Objective: To assess the frequency of dry eye among children during the COVID-19 pandemic.
Study Design: Cross-sectional study.
Place and Duration of Study: Pakistan Naval Ship Hafeez Hospital, Islamabad Pakistan, from Mar to Aug 2021.
Methodology: Children aged 7-15 years reporting to the PNS Hafeez Hospital, OPD were included in the study. A proforma was used to record the demographics and screen time of the children. In addition, an ophthalmic examination was conducted to assess the dry eye status of the children using the Schirmer-II test.
Results: Seventy-three children participated in the study. Their mean age was 11.08±2.42 years. There were 40(54.8%) boys and 33 (45.2%) girls. These children had a mean daily screen time of 7.23±2.77hours. Children with dry eye had a greater amount of screen time (8.75±2.11hours) as compared to those with normal tear function (6.05±2.66 hours; p<0.001). In addition, the screen time of children with dry eyes was significantly greater than those with normal tear functions (p=0.001).
Conclusion: Children with dry eyes were reported to have more screen time and more online classes than their counterparts with normal tear functions. Authorities should consider resuming face-to-face sessions for all school children.

Keywords: Abnormal tear function, Dry eyes, Online classes, Screen time, Schirmer-II test.

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INTRODUCTION

Dry eye disease (DED) is a common but under-diagnosed, multifactorial problem with an increasing prevalence worldwide.[1] The prevalence of DED has been reported to range from 5-50% across different areas. The disease involves the eyelids, tear film, ocular surface, lacrimal apparatus and the autonomic nervous system. The prevalence increases with various factors, including increasing age, contact lens wear, and low blinking rate. Nowadays, prolonged use of computers also plays a major role.[2]

According to the American Optometric Association, only two hours of uninterrupted use of digital devices or screens can lead to developing a range of eye and vision-related problems, referred to as digital eye strain.[3,4] Moreover, prolonged device usage also strains the musculoskeletal system and disturbs the biological clock of affected individuals.[5,6] Computer vision syndrome is the blanket term used to describe these problems.[7]

With the emergence of the COVID-19 pandemic in December 2019 and lockdown measures in place, people have been forced to live a confined lifestyle with the cessation of most outdoor activities. Many educational institutions worldwide, including Pakistan, have started e-learning programs, and children have been taught via online platforms for almost a year and a half.[8] According to UNESCO, approxim-ately 80% of the world's student population, from more than 130 countries worldwide, are affected by these lockdown measures and digital or e-learning approaches are replacing face-to-face, classroom-based learning.[9,10] In our country, online classes generally last 6-8 hours daily. Prolonged screen time is a serious risk factor which could lead to dry eyes, especially in children. The study aimed to assess the frequency of dry eyes in children attending online classes in Pakistan.

METHODOLOGY

This cross-sectional study was conducted at the Department of Ophthalmology at Pakistan Naval Ship Hafeez Hospital, Islamabad Pakistan, from March to August 2021. Ethical approval was taken from the Hospital Ethics Committee. OpenEpi Calculator was used for sample size calculation. With a confidence level of 95% and an estimated 77.3% proportion of children with DED among high screen time users.[11] the sample of 114 was estimated. Non-probability convenience sampling was used. Informed consent was taken from the parents of the children.

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Inclusion Criteria: Children of either gender, aged 7-15 years with a minimum daily screen time of five hours were included in the study.

Exclusion criteria: Children with a history of acute or chronic conjunctivitis/blepharitis; any ocular disease other than refractive error; injury or an ocular foreign body; use of a recent topical ocular medication; or use of any oral and systemic antihistamines was excluded from the study.

Patients' medical history, age, presenting complaints, presence of any refractive or ocular disease, medication history and daily screen time were recorded. An ocular examination was then conducted to look for any refractive error, conjunctivitis, keratitis and Schirmer II test for assessing DED. For the Schirmer II test, sterile paper strips were applied to the patients' conjunctival sacs of both eyes, and they were asked to close their eyes. The wet length was measured after five minutes.[12] Patients with a wet length greater than 15mm were considered to have 'normal tear function. Any patient with a wet length of 15 mm or less was classified as having DED. The patients were further classified as follows: severe dry eyes (wet length 0-5mm), moderately dry eyes (wet length 6-10mm), and mildly dry eyes (wet length 11-15mm).[13]

Statistical Package for Social Sciences (SPSS) version 26.0 was used for the data analysis. Mean and standard deviation were calculated for quantitative variables, such as age and screen time. In addition, frequencies and percentages were calculated for categorical variables such as gender, outdoor time and occurrence of dry eyes. In order to calculate any difference in the mean screen time between children with different categories of dry eyes, the one-way ANOVA test was applied. The *p*-value lower than or up to 0.05 was considered as significant. mean differences, post-hoc Tukey analysis was conducted.

RESULTS

A total of 73 children were recruited for this study. The mean age of the children was 11.08±2.42 years. There were 40(54.8%) boys and 33(45.2%) girls. These children had a mean daily screen time of 7.23±2.77 hours. A total of 56(76.7%) children took online classes. Only five (6.85%) children spent 6-8 hours in outdoor activities. While 35(47.9%) children reported spending 3-5 hours in outdoor activities, 33(45.2%) spent 0-2 hours.

32(43.84%) children were diagnosed with dry eye disease (DED). Out of these, 11(15.1%) had severe dry eyes, 14(19.2%) had moderately dry eyes, and seven (9.6%) had mildly dry eyes.

Children with dry eyes were significantly older than those with normal tear function (p=0.004). In addition, there was a female predominance among children with dry eyes (p=0.002). Furthermore, as illustrated in Table-I, a greater number of children with dry eyes were engaged in online classes (p=0.013).

Table-I: Characteristics of Children with Dry and Normal Eye (n=73)

Characteristics		Dry Eye (n=32)	Normal Eye (n=41)	*p*-value
Age (years)		12.00±2.42	10.37±2.19	0.004
Gender	Male	11(34.4%)	29(70.7%)	0.002
	Female	21(65.6%)	12(29.3%)	
Screen Time (Hours)		8.75±2.11	6.05±2.66	<0.001
Online Classes		29(90.6%)	27(65.9%)	0.013
Outdoor Time (Hours)	0-2	16(50%)	17(41.5%)	0.503
	3-5	13(40.6%)	22(53.7%)	
	6-8	3(9.4%)	2(4.9%)	

The intergroup mean differences in screen time were significant for children with different severity of dry eyes (p<0.001; Table-II).

Table-II: Mean Screen Time for Children with Different Categories of Dry Eye and Normal Tear Function (n=73)

Parameters	Severely Dry Eyes (n=11)	Moderately Dry Eyes (n=14)	Mildly Dry Eye (n=7)	Normal Teal Function (n=41)	*p*-value
Mean Screer Time (Hours)	8.46±2.34	8.79±1.81	9.14±2.54	6.05+2.66	<.001

The mean screen time of children with severe (8.46±2.34 hours), moderately (8.79±1.81 hours) and mildly dry eyes (9.14±2.54 hours) was found to be significantly greater than that of children with normal tear function (6.05±2.66 hours) (Table-III).

DISCUSSION

Screen time has significantly increased since the pandemic, especially among the young population. A

Table-III: Intergroup Comparison of Mean Screen Time (n = 73)

Group Comparison	Severely vs Moderately Dry Eye	Severely vs Mildly Dry Eyes	Severely Dry Eyes vs Normal Tear Function	Moderately vs Mildly Dry Eyes	Moderately vs Normal Tear Function	Mildly Dry Eyes vs Normal Tear Function
Mean Screen Time (Hours)	0.987	0.939	0.027	0.989	0.003	0.016

study conducted in Canada reported an increase in screen time among mothers (74%), fathers (61%) and children (87%) during the pandemic.[13] Similarly, a study conducted in Turkey during the final days of lockdown reported that nearly 72% of children had a higher screen time compared to previous years, with an average screen time of 6.4 hours per day.[14] The children in our study had a mean daily screen time of 7.23+2.77 hours. A study by Prescott *et al.* reported that most children and adults spent more than three hours looking at a computer, tablet or smartphone every day during the pandemic, which led to significant stress on the visual system.[15]

Mineshita *et al.* conducted a study to determine the effects of screen time duration and timing on physical health in elementary school children. They found a significant association between screen time and duration with physical health, indicating that a longer screen time duration may lead to obesity, decreased physical activity and poor academic performance. Moreover, they reported that the timing of screen time, especially before bed, is associated with obesity, dry eyes and reduced academic performance.[16] Similarly, a study by Schmidt *et al*. reported a decline in sports activity among boys and girls of all age groups paralleled by an increase in recreational screen time during the pandemic.[17] The use of digital devices has been reported in the literature to be associated with dry eye symptoms and tear film instability. Moreover, the time between blinking and tear film instability increases during highly focused work. Studies show that when concen-trating on a near object, the blink rate declines from the normal 20 times per minute to about ten times per minute, leading to dry eyes.[15,18] In our study, 32 (43.84%) children were diagnosed with having DED. Out of these, 11(15.1%) had severe dry eyes, 14(19.2%) had moderately dry eyes, and seven (9.6%) had mildly dry eyes.

We observed that children with dry eyes were significantly older than those with normal tear functions (p=0.004). Similarly, a study by Bhatt *et al*. reported the prevalence of dry eyes due to computer screen and mobile phone usage to be highest in the age group of 7-12 years (53.34%).[19] Also, there was a female predominance among children with dry eyes (p=0.002). Furthermore, more children with dry eyes were engaged in online classes (p=0.013).

CONCLUSION

Children and the younger population are vulnerable to increased screen time and its adverse consequences. Even though screen-based activities in moderation do not pose harm, the younger population may lack the discipline and insight to limit screen time on their own. Therefore, it is essential to specify safe age-specific screen time by analyzing the evidence available and ensuring a consensus among doctors, parents and teachers.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

SF & HA: Conception, study design, drafting the manuscript, approval of the final version to be published.

KB & AR: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

SP & IH: Critical review, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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