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Research Article

CORRELATION OF DRY EYES WITH ON-SCREEN TIME AMONG MEDICAL STUDENTS

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ABSTRACT

Objective: An increased global dependence on digital screen use has resulted in a tremendous increase in screen-related ocular complaints such as dryness, ocular strain, burning sensation, grittiness, and transient blurring. This study aims to focus on the correlation between the duration of screen exposure and dry eyes among young medical students with the help of the combination of a questionnaire based on subjective symptoms of dry eyes and screen time and further tests to confirm dry eyes in those having symptoms. Numerous mechanisms have been mentioned in screen-associated evaporative dry eyes, including reduced blink rate, hazardous effects of blue light emitted from digital screens, and inflammatory changes.

Methods: A cross-sectional study was conducted among 253 medical students at MIMS, Uttar Pradesh, from January 2021 to December 2022. Upon obtaining informed consent, all participants were given Schirmer 1 and tear film breakup time (TBUT) test. Patients with Schirmer 1 and TBUT reading <10 mm were identified as dry-eye patients. After that, a pre-designed questionnaire was applied to all dry-eye participants that asked about different symptoms of dry eyes and screen time and the correlation between subjective symptoms of dry eyes, dry-eye tests, and screen time was evaluated.

Results: About 20.8% of medical students had dry eyes, and those who used their phones for 2–5 h had statistically higher rates of the condition. The length of breaks was also found to be strongly correlated with dry eye.

Conclusion: Prolonged duration of digital screen exposure in any form (laptop and mobile phones, etc.) is directly related to the risk of dry-eye disease in the long term. Majority of the students (75%) were willing to reduce their screen time as a preventive measure toward dry eye.

Keywords: Dry-eye disease, Visual display terminals, Tear film breakup time.

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INTRODUCTION

Dry eyes are also known as dry-eye disease (DED), dry-eye syndrome, and keratoconjunctivitis sicca. According to the Tear Film and Ocular Surface Society Dry-Eye Workshop II, a dry-eye is defined as: "Dry eye is a multifactorial disease of the ocular surface characterized by a loss of tear film homeostasis and ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiologic roles [1]."

Aqueous deficiency dry eye and evaporative dry eye are two types of DEDs. The most frequent subtype of DED is evaporative dry eye. Dry-eye signs and symptoms may be at odds, with indicators being more widespread and changeable than symptoms [2].

The etiology of dry eye might be difficult to pinpoint because it can be caused by a variety of circumstances. Intrinsic factors such as growing age, female gender, ocular disorders, and certain underlying systemic and autoimmune diseases are all known risk factors for DED [3]. The availability of smartphones, tablets, and other mobile devices has made studying easier, particularly during the lockdown period. Our eyes, however, were not designed to stare at a digital screen all day, resulting in digital eye strain, which causes fatigue, blurred vision, wetness, and redness in the eyes, as well as a variety of musculoskeletal ailments. Computer vision syndrome is a collection of several symptoms (CVS) [4-6].

There are two types of computer-related symptoms: Those relating to near work (blurred vision in an attempt to focus again, eye fatigue and stain, and frontal headache) and those due to evaporative dryness of eyes (foreign body sensation, excessive watering, burn sensation, and dryness) [7]. Because of the decreased and partial blinks caused by digital media use, dry-eye develops, resulting in an unstable tear film [8].

During the COVID-19 pandemic, people were forced to stay at home, especially during statewide lockdowns, to protect themselves from the fatal virus [9], and there were few investigations on the relationship between dry eyes and screen usage among Indian medical students.

This study, therefore, aims to evaluate the influence of digital screens on the ocular health of medical students and the occurrence of dry eye, and to see if there is an association between prolonged hours of usage of digital screens and the occurrence of dry eye, in an attempt to create awareness about the disease and to detect the DED early to intervene and stop the progression of the disease according to their symptoms and tests performed as per DEWS classification.

METHODS

This cross-sectional study was conducted among 253 medical students at Mayo Institute of Medical Sciences, Barabanki, Uttar Pradesh, from January 2021 to December 2022 after approval from the Institute Ethical Committee. Informed consent was taken from the participants and then a pre-validated questionnaire was given to them. The questionnaire was explained to the participants. The questionnaire mainly includes special demographic data such as name, age, sex, duration of usage, screen type used, and symptoms of dry eyes.

Since no single test is sufficient for the diagnosis and therefore a combination of the subjective symptoms and objective tests are used for diagnosis. The Schirmer 1 test and the tear film breakup time

Table 1: Correlation of dry eyes with screen time

Screen time	Dry eye				p-value
	Yes		No		
	Frequency	%	Frequency	%	
<2 h	3	5.7	17	8.4	0.001
> 5 h	11	20.8	103	50.9	
2–5 h	39	73.5	82	40.6	
Total	53	100.0	202	100.0	

Table 2: Correlation of dry eye with break in between

Break	Dry eye				p-value
	Yes		No		
	Frequency	%	Frequency	%	
Yes	14	26.4	2	0.9	0.001
May be	21	39.6	65	32.2	
No	18	33.9	135	66.8	
Total	53	100.0	202	100.0	

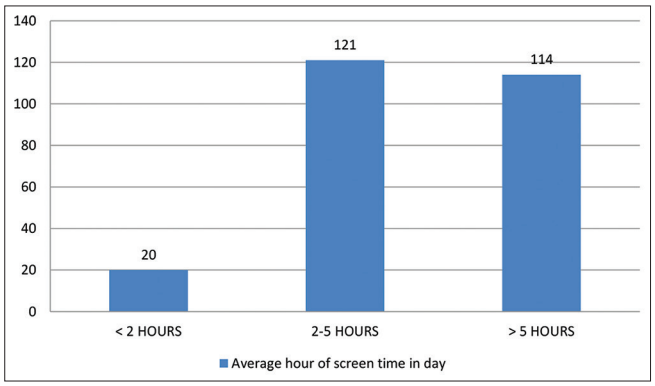

Fig. 1: Distribution of the study participants according to screen exposure duration per day

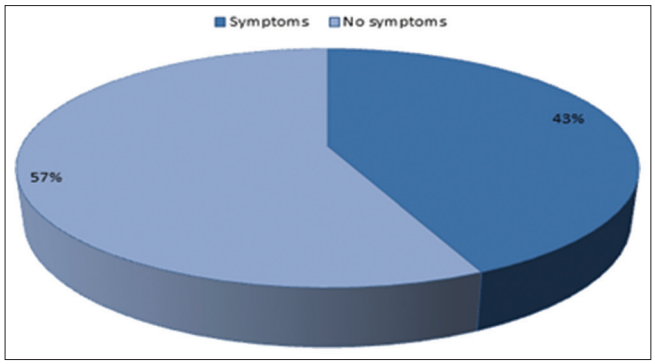

Fig. 2: Percentage of participants with symptoms

(TBUT) were performed after taking all aseptic precautions, on both the eyes of all participants.

Schirmer's test

The participants would be comfortably seated. Each strip is folded at the 5 mm mark, and the person is asked to look up, the lower lid is gently pulled down using the index finger and the Schirmer's strip is then carefully inserted at the junction of lateral one-third and medial two-third of lower lid margin. The participants are asked to keep their eyes closed for 5 min after which the strip is removed and the length of the wet strip is recorded. Schirmer's test measures secretion of lacrimal

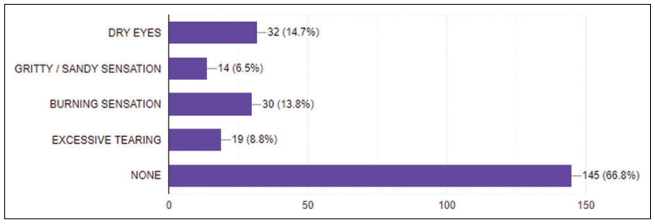

Fig. 3: Distribution of symptoms experienced by patients

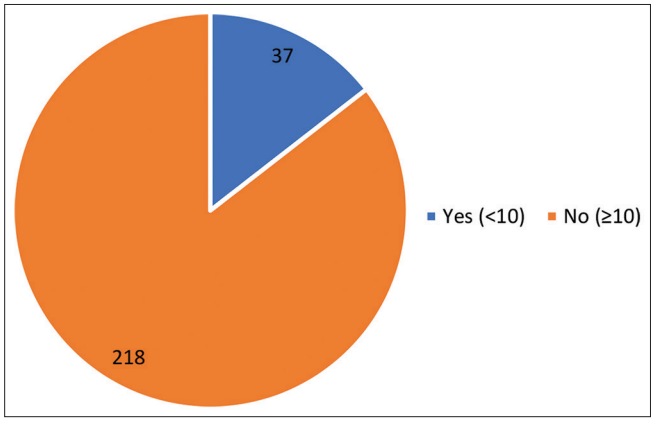

Fig. 4: Distribution of participants having dry eye according to Schirmer's score

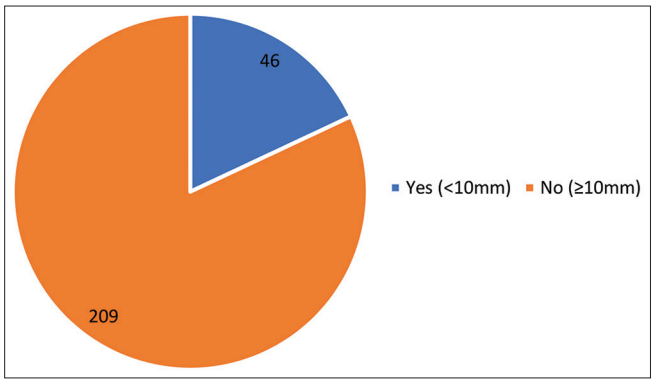

Fig. 5: Distribution of dry eyes according to tear film breakup time

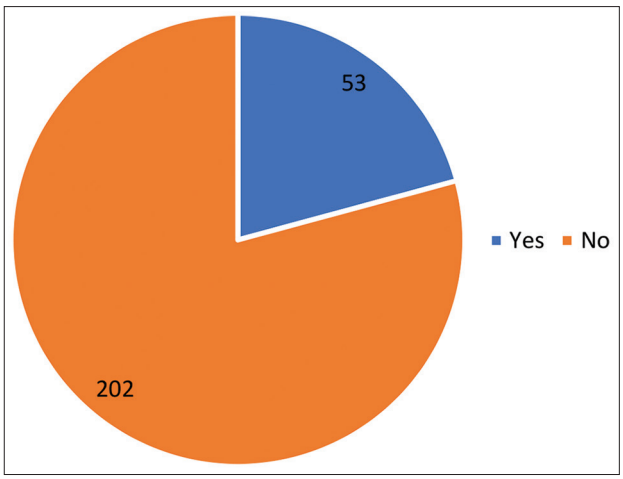

Fig. 6: Distribution of dry eye disease overall

gland by stimulation of lacrimal reflex arc [10] and wetting of <10 mm after 5 min is considered abnormal. Values >10 mm are considered

normal. The Schirmer 1 test is an indicator of both basic and reflex tearing [11].

Tear Film Breakup Time

The time required for the appearance of the first dry spot on the corneal surface after blinking is called TBUT. This test evaluates the tear film stability and detects the presence of evaporative dry eyes. The normal time for tear film breakup is 15–20 s. The fluorescein dye is added to the lower fornix of the eye using a strip, the participants is then asked to blink several times for even distribution of the dye and is then advised to stop blinking. The tear film is then observed using a slit lamp under cobalt blue filter for the presence of the first dry spot on the corneal surface. TBUT values <5–10 s indicate moderate-to-severe dry eye [12,13].

Inclusion criteria

The inclusion criteria of this study were as follows:

1. Both the male and female participants.
2. The age between 20 and 40 years of age.
3. Using screen for 2 h or more in a day for at least a year.
4. Willing to give prior consent for evaluation.

Exclusion criteria

The exclusion criteria of this study were as follows:

1. Contact lens users
2. Participants taking systemic medications known to cause dry eye like antihistaminics
3. Participants with a history of allergic conjunctivitis
4. Participants with ocular surface diseases
5. Participants with previous ocular surgeries such as LASIK.

Statistical analysis

The questionnaires were initially checked for completeness, and data were cleaned for errors and missing values. The corrected data were then entered into Microsoft Excel after preparing a master-chart. After data entry of every ten questionnaires, one random form was picked and data entry was re-checked. An independent person verified the data entry of two randomly chosen forms after the entry of every 10^{th} questionnaire.

Data analysis was done using licensed SPSS software version 21.0 (Chicago, Illinois). A univariate analyses was done initially and the results were presented with the help of tables, text, bar-diagrams, and pie-charts. Descriptive statistics were used to calculate frequencies of categorical variables, and measures of central tendencies and dispersion were used to describe continuous variables. Independent *t*-test was used to compare the continuous variable and the Chi-square test was used for categorical variables. Non-parametric Mann–Whitney test and Kruskal–Wallis test were used in case of data did not follow a normal distribution. Data are presented as mean (standard deviation) or number or proportions.

A $p<0.05$ was considered statistically significant.

RESULTS

In the present study, out of the 255 participants, 246 were in the age group of 20–30 years and the rest were in the age group of 30–40 years

- 20–30 years - 96.5 % (n=246)
- 31–40 years - 3.5% (n=9)

Distribution of participants according to gender

- Total medical students -255
- Female -133 (52.2%)
- Male -122 (47.8%)

In the present study, among 255 participants, 135 were undergraduates followed by 93 interns and 27 postgraduates. Out of the 255 participants, a maximum of 121 participants had screen time between 2 and 5 h followed by 114 who had >5 h screen time, out of which 57% of participants experienced symptoms associated with dry eyes. Thirty-seven participants (14.5%) had dry eyes according to Schirmer's score whereas 46 (18.0%) had dry eye according to TBUT.

The distribution of DED overall was found to be 53 out of 256 by combining the results of Schirmer's test and TBUT. Out of these 53, a statistically significant screen time association was found in dry-eye participants. DED was significantly high (39 out of 53, i.e., 73.5% among the participants used screen 2–5 h).

In our study, 37 (14.5%) had dry eye according to Schirmer's score.

In our study, 46 (18.0%) had dry eye according to TBUT.

In our study, a statistically significant screen time difference was found in dry-eye participants. DED was significantly high among the participants used screen 2–5 h.

In our study, a statistically significant impact of break difference was found in dry-eye participants. DED was significantly high among the participants who did not take break in between.

DISCUSSION

Out of the 255 participants in our study, a maximum of 121 participants had screen time between 2 and 5 h, followed by 114 participants who had screen time greater. According to our research, 20.8% of medical students had dry eyes, and those who used their phones for 2–5 h had statistically higher rates of the condition.

The length of breaks was also found to be strongly correlated with dry-eye prevalence than 5 h. 153 participants used to take breaks between sessions, whereas 86 participants were unsure and among them, 124 participants took breaks lasting longer than 20 min.

In a related study by Faruqui *et a*l. 9, 20.8% of college students who use smartphones have dry-eye illness. Asthenopia symptoms as well as tear film measurements Schirmer's test, tear film breakup time, Tear meniscus height, and corneal staining were used to identify DED. Mohammed Iqbal *et al*. 10 observed that among 100 patients, 86% of the medical students used to spend 3 h or more daily thus were complaining of one or more of CVS manifestations. Dry eye was recorded in 28% of students.

Sezen Akkayaetall studied the effect of long-term computer use on eye dryness. The study group consisted of 30 individuals who used computers for 8 h per day. The control group had 30 healthy people whose daily computer use did not exceed 1 h examined. Long-term computer use did not significantly alter the results of the Schirmer test, but there were statistically significant alterations in the TBUT results of the evaporative type of ocular dryness.

CONCLUSION

The present study was a cross-sectional observational study conducted among the medical students at Mayo Institute of Medical Sciences, Barabanki. The study aimed to find the prevalence and DED severity among young medical students who spend a good amount of time on digital screens. A total of 255 medical students were included in the study. In our study, dry-eye prevalence was calculated to be 20.8% among medical students and it was found to be statistically high among the students who used phone 2–5 h and also it was significantly associated with the duration of break. It was found significantly less among the students who took a break of 1 h or more. DED was not associated significantly with age, gender, and educational status.

CONFLICT OF INTEREST

None declared.

AUTHORS FUNDING

Self.

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