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Original Research Article

Correlation of Screen Time with Dry Eye Symptoms among Undergraduate Medical Students

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Abstract

Background: The ubiquity of digital devices has led to a surge in screen-related health issues, with dry eye disease (DED) being a prominent concern. DED, a multifactorial condition of the ocular surface, significantly impairs quality of life. Medical students represent a particularly vulnerable population due to their intensive academic demands, which necessitate prolonged engagement with digital screens for learning and research. However, the quantitative relationship between screen time and symptom severity in this specific group is not fully established.

Methods: A descriptive, cross-sectional study was conducted on 100 undergraduate medical students. Participants were recruited using a convenience sampling method. Data were collected through a self-administered questionnaire that recorded sociodemographic details, average daily screen time (hours/day), and dry eye symptoms using the validated Ocular Surface Disease Index (OSDI) questionnaire. An OSDI score >12 was considered indicative of symptomatic dry eye. Data were analyzed using SPSS version 26.0, employing Pearson's correlation, Independent Samples t-test, and the Chi-square test. A p-value <0.05 was considered statistically significant.

Results: The mean age of the participants was 20.8 ± 1.9 years. The average daily screen time was 7.8 ± 2.5 hours. The prevalence of symptomatic dry eye (OSDI >12) was 65.0% (n=65). The overall mean OSDI score was 25.5 ± 15.1. A strong, statistically significant positive correlation was found between daily screen time and OSDI scores (Pearson's r = 0.65, p<0.001). The mean OSDI score for students with >6 hours of daily screen time was significantly higher than for those with ≤6 hours (31.1 ± 13.9 vs. 14.8 ± 10.2; p<0.001). Severe dry eye symptoms (OSDI ≥33) were present in 35.4% of students with high screen time (>6 hours/day) compared to only 5.9% of those with lower screen time (≤6 hours/day) (p=0.002).

Conclusion: A high prevalence of symptomatic dry eye exists among undergraduate medical students, and the severity of symptoms is strongly correlated with increased daily screen time. These findings highlight a significant occupational health issue within medical education and underscore the need for targeted awareness programs and preventative strategies, such as promoting regular breaks and proper screen ergonomics, to protect the ocular health of future physicians.

Keywords: Dry Eye Disease, Screen Time, Digital Eye Strain, OSDI, Medical Students, Visual Display Terminal.

Introduction

Dry eye disease (DED) is a multifactorial disorder of the tears and ocular surface that results in symptoms of discomfort, visual disturbance, and tear film instability, with potential damage to the ocular surface [1]. It is one of the most common ophthalmological conditions encountered in clinical practice, affecting millions worldwide and leading to a significant reduction in vision-related quality of life, work productivity, and overall well-being [2]. While traditionally associated with aging, hormonal changes, and autoimmune diseases, a modern etiologic factor has emerged with startling prominence: the use of digital screens. The proliferation of visual display terminals (VDTs), including smartphones, tablets, and laptops, has fundamentally altered modern lifestyles and educational paradigms. This has given rise to a constellation of ocular and visual symptoms collectively known as "digital eye strain" or "computer vision syndrome," with dry eye symptoms being a core component [3]. The pathophysiology linking screen use to DED is well-supported. Focused attention on a digital screen is known to drastically reduce the blink rate, in some

cases by more than 50%, and often results in incomplete blinks [4]. This reduced and inefficient blinking disrupts the normal distribution of the tear film, leading to increased tear evaporation and subsequent ocular surface desiccation and inflammation [5].

Undergraduate medical students are in a unique position of vulnerability. Their rigorous curriculum requires the assimilation of vast amounts of information, much of which is now delivered and accessed through digital platforms—e-books, online lectures, virtual dissections, and research databases [6]. This academic necessity, compounded by the recreational use of digital devices for social networking and entertainment, results in exceptionally high cumulative daily screen time. Several studies have reported a high prevalence of dry eye symptoms among university students in general [7, 8]. For instance, a study in Saudi Arabia found that 72% of medical students reported symptoms of digital eye strain [9].

Despite this growing body of evidence, there is a need for more quantitative data that specifically correlates the duration of screen exposure with the severity of dry eye symptoms using a standardized and validated tool. While many studies have documented the prevalence, few have established a strong dose-response relationship within the high-risk medical student population. Quantifying this association is crucial for developing evidence-based guidelines and preventative recommendations for this group of future healthcare professionals, whose own visual health is paramount to their ability to provide patient care. Therefore, this study was undertaken to assess the correlation between self-reported daily screen time and the severity of dry eye symptoms, as measured by the Ocular Surface Disease Index (OSDI), among undergraduate medical students.

Materials and Methods

The study population consisted of undergraduate medical (MBBS) students from all academic years. An exploratory sample size of 100 students was targeted for this study. A non-probability, convenience sampling technique was used to recruit participants from the college campus, including the library and common study areas.

Inclusion and Exclusion Criteria: All MBBS students between the ages of 18 and 25 who were willing to provide informed written consent were included. The exclusion criteria were: (1) current use of contact lenses, (2) a pre-existing diagnosis of ocular surface disease (e.g., allergic conjunctivitis, blepharitis), (3) history of ocular surgery within the last year, (4) presence of any systemic autoimmune disease known to cause dry eye (e.g., rheumatoid arthritis, Sjögren's syndrome), and (5) regular use of systemic medications that could affect tear production (e.g., antihistamines, antidepressants).

Data Collection Tool and Procedure: Ethical approval for the study protocol was obtained from the Institutional Ethics Committee. The purpose of the study was clearly explained to potential participants, and they were assured of the confidentiality and anonymity of their data.

A pre-tested, self-administered questionnaire was used for data collection. The questionnaire was divided into two sections:

1. Section A: Demographics and Screen Time: This section collected information on age, gender, and average daily screen time. Participants were asked to estimate their total hours spent per day using any digital screen (smartphone, laptop, tablet, desktop computer) for both academic and recreational activities over a typical week.

2. Section B: Ocular Surface Disease Index (OSDI): The OSDI is a validated 12-item questionnaire designed to provide a rapid assessment of the symptoms of ocular irritation consistent with DED and their impact on vision-related functioning. The total OSDI score ranges from 0 to 100, with higher scores representing greater disability. The scores were categorized as normal (0–12), mild (13–22), moderate (23–32), and severe (33–100).

Statistical Analysis: Data were entered into Microsoft Excel and subsequently analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Descriptive statistics, including mean, standard deviation (SD), frequencies, and percentages, were used to summarize the data. The relationship between daily screen time (a continuous variable) and the OSDI score (a continuous variable) was assessed using Pearson's correlation coefficient (r).

For comparative analysis, participants were divided into two groups based on screen time (≤6 hours/day and >6 hours/day). The Independent Samples t-test was used to compare the mean OSDI scores between these two groups. The Chi-square test was used to assess the association between the categorical severity of DED and the screen time groups. A p-value of less than 0.05 was considered to be statistically significant.

Results

A total of 100 students participated in the study. The sociodemographic and screen time characteristics of the participants are presented in Table 1. The mean age was 20.8 ± 1.9 years, with a slight female preponderance (58.0%). The mean daily screen time for the entire cohort was 7.8 ± 2.5 hours. A majority of the students (68.0%) reported using digital screens for more than 6 hours per day.

Table 1: Sociodemographic and Screen Time Characteristics of Study Participants (N=100)

Characteristic	Category	Frequency (n)	Percentage (%)
Age (years)	18–20	54	54.0
	21–23	46	46.0
Mean Age ± SD		20.8 ± 1.9	
Gender	Male	42	42.0
	Female	58	58.0
Daily Screen Time (hours)	≤ 6 hours	32	32.0
	> 6 hours	68	68.0
Mean Screen Time ± SD		7.8 ± 2.5	

The prevalence and severity of dry eye symptoms based on the OSDI scores are shown in Table 2. The mean OSDI score for the entire group was 25.5 ± 15.1, falling within the moderate severity range. Overall, 65.0% of the students were found to have symptomatic dry eye (OSDI score > 12). Among these, 24.0% had mild, 19.0% had moderate, and 22.0% had severe DED symptoms.

Table 2: Prevalence and Severity of Dry Eye Symptoms Based on OSDI Scores (N=100)

OSDI Category	OSDI Score Range	Frequency (n)	Percentage (%)
Normal	0–12	35	35.0
Mild	13–22	24	24.0
Moderate	23–32	19	19.0
Severe	33–100	22	22.0
Total Symptomatic	**>12**	**65**	**65.0**
Mean OSDI Score ± SD		25.5 ± 15.1	

The correlation and comparison of daily screen time with OSDI scores are presented in Table 3. A strong, positive, and statistically significant correlation was observed between daily screen time and the OSDI score (Pearson's r = 0.65, p<0.001). The mean OSDI score was significantly higher in the group with >6 hours of screen time compared to the group with ≤6 hours (31.1 ± 13.9 vs. 14.8 ± 10.2, p<0.001).

Furthermore, the severity of symptoms was significantly associated with the duration of screen time, with severe DED symptoms being much more common in the high screen time group (p=0.002).

Table 3: Correlation and Comparison of Daily Screen Time with OSDI Scores

Analysis	Result	p-value
Pearson's Correlation (r)	0.65	**<0.001**
(Screen Time vs. OSDI Score)		
Mean OSDI Score ± SD by Screen Time		
≤ 6 hours/day (n=32)	14.8 ± 10.2	**<0.001***
> 6 hours/day (n=68)	31.1 ± 13.9	
Severity of DED vs. Screen Time Group	**≤ 6 hrs/day (n, %)**	**> 6 hrs/day (n, %)**
Normal/Mild (OSDI ≤ 22)	26 (81.3%)	33 (48.5%)
Moderate/Severe (OSDI > 22)	6 (18.7%)	35 (51.5%)

***p-value from Independent Samples t-test. †p-value from Chi-square test.**

Discussion

This study provides compelling evidence of a high burden of dry eye symptoms among undergraduate medical students, establishing a strong dose-response relationship with daily screen time. The finding that 65% of students had symptomatic dry eye is alarming and aligns with the upper range of prevalence rates reported in similar student populations globally [10, 11]. The mean screen time of nearly 8 hours per day is a testament to the digital-heavy nature of modern medical education, which appears to be taking a toll on students' ocular health. The cornerstone of our findings is the strong, positive correlation between the hours spent in front of a screen and the severity of DED symptoms, as measured by the OSDI. This quantitative link reinforces the pathophysiological understanding of screen-induced DED.

As students focus intently on digital text and images, their blink rate decreases, leading to tear film instability and evaporative dry eye [4, 5]. Our results, showing a significantly higher mean OSDI score in students with over 6 hours of screen time, mirror the findings of other researchers who have identified similar thresholds for increased risk [12, 13]. This suggests that beyond a certain duration of

daily exposure, the ocular surface's homeostatic mechanisms may be overwhelmed.

The implications of these findings for medical students are profound. DED is not a benign condition; its symptoms of pain, grittiness, blurred vision, and light sensitivity can severely hamper concentration, reading speed, and the ability to perform academic tasks effectively [14,15]. For a student population already under immense academic and psychological stress, the added burden of chronic eye discomfort can be detrimental to both their learning and their mental well-being. Furthermore, if these habits and symptoms persist, they may pose long-term risks to ocular surface health and could potentially impact their professional lives as physicians, where clear vision is essential.

Our study has several strengths, including the use of a standardized and internationally recognized tool (OSDI) to quantify symptom severity, and its focus on a highly relevant and at-risk population. However, we must also acknowledge its limitations. First, the cross-sectional design establishes an association but cannot prove causation. Second, both screen time and symptoms were self-reported, which introduces the possibility of recall bias and subjective variability. Objective clinical assessments, such as tear break-up time (TBUT) and Schirmer's test, were not performed to clinically confirm the DED diagnosis. Third, the convenience sampling method and the single-center nature of the study may limit the generalizability of the findings. Finally, other potential confounding factors, such as environmental conditions (e.g., humidity, air conditioning) and sleep patterns, were not assessed. Future research could incorporate longitudinal designs and objective clinical measures to build upon these findings.

Conclusion

The prevalence of symptomatic dry eye among undergraduate medical students is significantly high, and the severity of these symptoms is strongly and positively correlated with the duration of daily screen time. This study highlights a critical occupational health concern within medical education that warrants immediate attention. There is an urgent need for medical colleges to integrate ocular health awareness into their student wellness programs. Simple, evidence-based preventative strategies, such as promoting the "20-20-20 rule" (looking at something 20 feet away for 20 seconds every 20 minutes), encouraging proper screen ergonomics, and advising students on the importance of conscious blinking and adequate hydration, could significantly mitigate this growing problem and help preserve the visual health of the next generation of physicians.

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