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Original Research Article

Prevalence of Dry Eye Among Medical Students: An Assessment Using the Ocular Surface Disease Index Questionnaire

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Abstract:

Background: Dry eye disease (DED) is a multifactorial ocular surface disorder increasingly recognized among young populations with high digital device exposure. Despite several regional studies, data from Maharashtra remain limited.

Aim: To assess the prevalence of DED among medical students in northeast Maharashtra using the Ocular Surface Disease Index (OSDI) questionnaire and to evaluate its association with visual display terminal (VDT) use and refractive correction.

Methods: A descriptive, cross-sectional study was conducted among 250 medical students (aged 18–26 years) between January and April 2025. Data on screen exposure, spectacle and contact lens use, and ocular symptoms were collected via Google Form–based OSDI questionnaires. Dry eye was defined and graded according to OSDI scores. Statistical analysis was performed using the Chi-square test, with significance set at $P < 0.05$.

Results: The prevalence of DED was 60.8% (152/250), with 25.2% mild, 11.6% moderate, and 24.0% severe cases. Dry eye was slightly more common in males (56%) than females (44%) ($P = 0.14$). Among spectacle users (163/250), 54.0% reported dry eye, a statistically significant association ($P < 0.0001$). Contact lens use was not significantly associated with DED (47.8%, $P = 0.53$). Students with screen exposure >6 hours daily had a significantly higher prevalence of DED (73.6%, $P < 0.001$).

Conclusion: The burden of DED among medical students in northeast Maharashtra is high, with prolonged screen exposure emerging as a major determinant. Preventive awareness and ergonomic interventions are warranted to mitigate the impact of digital device use on ocular health.

Keywords: Dry Eye Disease, Refractive Errors, Screen Time, Medical Students, Screen Time, Digital Eye Strain, Ocular Surface Disease Index.

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Introduction

Dry eye disease (DED) is a complex condition of the ocular surface, arising from multiple mechanisms such as tear film instability, elevated tear osmolarity, ocular surface inflammation, and neurosensory dysfunctions, all of which contribute to its development [1]. A variety of external and individual factors can predispose to DED, including climatic conditions, prolonged exposure to sunlight or wind, contact lens wear, use of air conditioning, refractive errors, certain medications like cyclosporine and isotretinoin, and extended digital screen use [2,3,4]. Clinically, patients often complain of watery eyes, a gritty or sandy sensation in eyes, foreign body sensation, photophobia, ocular redness, and burning discomfort.

Research exploring the prevalence of DED among medical students was relatively limited. Notably, studies assessing DED prevalence have been conducted in states such as Bihar, Karnataka, and Telangana, while similar investigations from Maharashtra remain absent, highlighting a geographic gap in the literature. Competency-Based Medical Education (CBME) guidelines, which emphasize a more comprehensive teaching approach through seminars and greater reliance on audiovisual aids, coupled with the rapid advancement of digital gadgets and the easy availability of internet access, have significantly increased the use of display screen devices among adolescents. These factors collectively contributed to heightened visual display terminal exposure among medical students, thereby reinforcing the need for focused research on DED prevalence in this population. Studies by Aberame et al. (2023), Reddy et al. (2024), and Gupta et al. (2025), collectively highlight the finding that increased screen exposure and lifestyle habits place medical students at significant risk for DED,

underscoring the need for preventive awareness and ergonomic interventions [5,6,7]. We undertook an ocular surface disease index (OSDI)–based evaluation in our own cohort to provide additional evidence and address the existing geographic gap in the literature.

Materials and Methods

This study employed a descriptive, cross-sectional observational approach to examine patterns of digital display device usage and their association with the prevalence of dry eye syndrome (DES) among medical students. The design enabled concurrent evaluation of the exposure variables (screen use behaviours) and the outcomes (ocular symptoms and clinical indicators of dry eye) using ocular surface disease index (OSDI)-based questionnaire within a defined study period. The sample size was calculated using G*Power software (version 3.1.9.7). Assuming a moderate effect size of 0.25, a type I error of 0.05, and a study power of 80%, the minimum required sample size was estimated to be 240 participants. To account for possible non-response and incomplete data, approximately 260 medical students were approached. After applying eligibility criteria and excluding incomplete responses, the final analysis included 250 consenting students.

Study Area and Duration: The study was conducted among medical students at a tertiary care teaching hospital in northeast Maharashtra by administering Google Form–based OSDI questionnaires during the period from January 2025 to April 2025.

Inclusion and Exclusion Criteria: Eligibility criteria included medical students aged 18–26 years from the college who provided informed consent to participate. Exclusion criteria comprised students who declined consent, those with ocular conditions such as allergic or infective conjunctivitis during the study period, and individuals with systemic illnesses or on systemic medications, as these factors could interfere with the assessment of dry eye.

Definition of Dry Eye: Dry eye was defined and graded exclusively using the Ocular Surface Disease Index (OSDI) questionnaire. Each of the 12 items was scored on a 0–4 scale, where 0 denoted "none of the time," 1 "some of the time," 2 "half of the time," 3 "most of the time," and 4 "all the time." The overall OSDI score was derived using the formula: OSDI = [(sum of all item scores) × 100] ÷ [(number of questions answered) × 4], yielding a value between 0 and 100, with higher scores reflecting greater disability. Based on these scores, dry eye disease was categorized as mild (13–22), moderate (23–32), or severe (33–100).

Alongside the OSDI questionnaire, additional information was collected on participants' gender, patterns of visual display unit use (including laptops and mobile phones), presence and duration of refractive errors and corrective measures such as spectacles.

Among contact lens users, in addition to the duration and frequency of usage, was also asked.

The data were analyzed statistically using the Chi-square test, with a P-value less than 0.05 considered indicative of a significant association between the variables and dry eye disease (DED).

Results

The google form-based questionnaire was administered to 260 medical students studying in 1st and 2nd MBBS of a medical college in northeast Maharashtra. Of the 260 students who were approached, 10 students did not consent to undergo evaluation and hence excluded from the present study.

According to the predefined OSDI grading, dry eye was seen in 60.8% (152/250) of students, of whom mild dry eye was seen in 25.2% (63/250), moderate dry eye in 11.6% (29/250), and severe dry eye in 24.0% (60/250) students.

Grade of Dry eye	No. of students (n= 250)	Percentage
Normal	98	39.2%
Mild	63	25.2%
Moderate	29	11.6%
Severe	60	24.0%

Dry eye was found more prevalent amongst males, 56.0% (85/152) compared to females, 44.0% (67/152) **(P value = 0.14).**

	No. of students (250)		Percentage
Normal (39.2%)	Male	64	65.3 %
	Female	34	34.7 %
Mild (25.2%)	Male	38	60.3 %
	Female	25	39.7 %
Moderate (11.6%)	Male	16	55.2 %
	Female	13	44.8 %
Severe (24.0%)	Male	31	51.7 %
	Female	29	48.3 %

Out of the 250 medical students, 163 (65.2%) were spectacle users. Among them, 88 (54.0%) did not report dry eye, 36 (22.1%) had mild symptoms, 14 (8.6%) had moderate symptoms, and 25 (15.3%) experienced severe dry eyes. P-value = < 0.0001 **(Statistically significant).** Among the 23 medical students who reported wearing contact lenses, 11 (47.8%) experienced dry eye symptoms. Of these, 3 (13.0%) had mild, 2 (8.7%) had moderate, and 6 (26.1%) had severe dry eye. This association was not statistically significant (P = 0.53).

Screen time	Normal (0–12)	Mild (13–22)	Moderate (23–32)	Severe (33–100)	Total
< 3 Hours	24	13	6	9	**52**
3–6 Hours	60	37	16	32	**145**
> 6 Hours	14	13	7	19	**53**
Grand Total	**98**	**63**	**29**	**60**	**250**

Students reporting more than six hours of daily screen exposure demonstrated the highest burden of dry eye, with only 14.3% remaining in the normal OSDI range, while 24.1% were classified as moderate and 31.7% as severe, indicating a strong association between prolonged screen use and clinically significant disease.

Discussion

Dry eye disease (DED) is recognized as one of the most common ocular surface disorders, exerting a considerable impact on patients' quality of life. Individuals with DED frequently report symptoms such as ocular burning, a gritty or foreign-body sensation, photophobia, ocular fatigue even after short periods of reading, conjunctival redness, and in severe cases, significant ocular pain. Beyond its symptomatic burden, DED can adversely influence the outcomes of corneal, cataract, and refractive surgical procedures, thereby underscoring its clinical relevance [8].

The Ocular Surface Disease Index (OSDI) is one of the most widely adopted instruments for evaluating the severity of ocular surface disease in dry eye research. Designed specifically for DED, it captures both the presence and frequency of characteristic symptoms as well as their impact on vision-related daily functioning. The questionnaire has consistently demonstrated strong psychometric properties, including high reliability, validity, sensitivity, and specificity, making it a robust tool for both clinical and epidemiological studies [9].

The OSDI questionnaire was utilized in our study using google forms to evaluate dry eye disease among medical students, offering the advantages of quick electronic distribution, rapid completion, straightforward comprehension, and cost-free administration, thereby making it an efficient and practical screening tool.

Globally, the estimated prevalence of dry eye disease (DED) is around 11.6%, reflecting its significance as a public health concern [10]. Regional studies, however, report higher rates among young populations with intensive digital exposure. For instance, a study conducted at Gandaki Medical College, Nepal, involving 200 medical students (mean age 21.7 ± 1.4 years), documented a prevalence of 46%, with 19.5% classified as mild, 1% as moderate, and 13.5% as severe [11]. In comparison, our study among medical students in northeast Maharashtra revealed a prevalence of 60.8%, with 25.2% mild, 11.6% moderate, and 24.0% severe cases. These findings suggest that the burden of DED among medical students in our cohort is higher than global estimates and broadly consistent with regional reports, underscoring the influence of lifestyle and screen-related factors.

Several studies have reported that dry eye disease (DED) tends to be more common among females. For example, studies. Sahai et al. (2005) screened 500 adults over the age of 20 and found a significantly higher prevalence in women (22.8%) compared to men (14.9%) (P = 0.024) **[12].** Similarly, Aberame et al. (2023), in their study of medical students in Karnataka, reported a higher burden of DED among females, with an overall prevalence of 46% **[5].** In contrast, our study among medical students demonstrated a slightly higher proportion of DED in males (56%) compared to

females (44%), though this difference did not reach statistical significance (P = 0.14). These findings suggest that gender-related differences in DED prevalence may vary across populations, possibly influenced by age, lifestyle, and digital device usage patterns.

Among the 250 medical students evaluated, 163 (65.2%) were spectacle users. Within this subgroup, 54.0% (88/163) did not report dry eye symptoms, while 22.1% (36/163) had mild, 8.6% (14/163) had moderate, and 15.3% (25/163) experienced severe dry eye. The association between spectacle use and dry eye was found to be statistically significant (P < 0.0001), indicating that refractive correction with spectacles may contribute to the burden of DED in this population. In our study, there was no statistically significant association between contact lens users and dry eye (P = 0.53). In total, 47.8% (11/23) of the students wearing contact lenses suffered from dry eyes. Previous studies by Begley et al. and Doughty et al. demonstrated a significant association between contact lens wear and dry eye, with approximately 50% of lens users reporting symptoms [13,14]. The mechanism is thought to involve reduced oxygen transmission to the cornea, contributing to ocular surface instability. In our study, the prevalence of dry eye among contact lens users was, 47.8% (11/23), which is comparable to their findings. Notably, the prevalence of dry eye among spectacle users was higher, with 54.0% (88/163) reporting symptoms. This pattern suggests that in our population, the method of refractive correction alone was not a major determinant of dry eye disease, and other factors such as digital screen exposure and lifestyle habits likely played a more prominent role.

Multiple studies have demonstrated a significant association between dry eye disease (DED) and prolonged laptop or visual display terminal (VDT) use, though prevalence rates vary across populations [12,15,16]. For example, Lograj et al. (2020) [15] reported a prevalence of 81.9% among engineering students and 78.6% among medical students, with ergonomic factors such as screen height, viewing distance, ambient lighting, and use of antiglare filters influencing symptom severity [6]. Consistent with these observations, our study found that students with screen exposure exceeding six hours daily had a significantly higher prevalence of DED (39/53; 73.6%) compared to those with shorter exposure (113/197; 57.4%), and this association was statistically significant (P < 0.001). These findings reinforce that extended digital exposure is a major determinant of DED in medical students, while also underscoring the importance of ergonomic and lifestyle factors in modulating disease severity.

Increased screen exposure has been linked to infrequent and incomplete blinking, which accelerates tear film evaporation and contributes to dry eye disease (DED). The hypothesis that digital devices alter blinking dynamics is supported by several studies [17,18]. Blink rates during reading tasks on digital screens have consistently been shown to decrease compared to rest conditions [19,20]. For example, Tsubota and Nakamori reported that the mean blink rate among office workers was 22 blinks per minute under relaxed conditions, but dropped to 10 per minute while reading a book and further to 7 per minute while viewing text on a video display terminal [18]. Similarly, blink frequency has been found to decline during active computer tasks compared to relaxed conversation [17]. Cardona et al. observed that the proportion of incomplete blinks increased significantly during video game play compared to baseline [16].

Given the increasing reliance on digital devices among students, the younger population is particularly vulnerable to developing dry eye disease. We therefore included medical students in our study to enable early detection and management of this condition. The assessment was limited to the Ocular Surface Disease Index (OSDI) questionnaire, without additional diagnostic tests, which represents a limitation of our methodology. However, since this was an undergraduate, questionnaire-based investigation primarily aimed at estimating the prevalence of dry eye among medical students, the use of OSDI alone was considered adequate for the study objectives.

Conclusion

In summary, the prevalence of dry eye disease among medical students in our study was 60.8% A significant association was observed between dry eye and prolonged screen exposure, with 73.6 % of students reporting screen use beyond six hours daily affected (P < 0.001). These findings emphasize that, increased screen time remains a key factor contributing to the burden of DED in this population.

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