

Original Research Article

A comparative analysis of dry eye disease prevalence among undergraduate and postgraduate medical students in Darbhanga, North Bihar

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ABSTRACT

Background: This study aimed to compare the prevalence and severity of dry eye disease among undergraduate (UG) and postgraduate (PG) medical students in Darbhanga, North Bihar.

Methods: A prospective cross-sectional study was conducted among medical students of a tertiary medical college in Darbhanga. Participants completed a structured questionnaire including demographic details, risk factors and the Ocular Surface Disease Index (OSDI). Clinical evaluation consisted of tear break-up time (TBUT) and Schirmer's test. DED was diagnosed using OSDI scores ≥ 13 in combination with at least one abnormal clinical parameter. Data were analysed to compare prevalence, mean OSDI scores and associated risk factors between UG and PG groups.

Results: Of the 200 participants, the overall prevalence of dry eye was 38.5%. Undergraduate students showed a significantly higher prevalence (49%) compared to postgraduate students (28%). The difference was statistically significant ($\chi^2 = 10.18$, $p = 0.0014$). Undergraduates had 1.75 times higher risk and 2.46 times higher odds of developing dry eye than postgraduates.

Conclusions: Undergraduate medical students in Darbhanga have a significantly higher burden of dry eye disease compared to postgraduate trainees. Excessive screen exposure and lifestyle habits are important contributors. Awareness programs and preventive strategies are essential to reduce the rising incidence of DED in this population.

Keywords: Dry eye disease, Medical students, Postgraduate, Prevalence, Undergraduate

INTRODUCTION

Dry eye disease (DED) is one of the most common ocular surface disorders encountered in clinical practice and is increasingly recognized as a significant public-health concern. Dry eye disease (DED) is a multifactorial disorder of the ocular surface characterized by loss of tear film homeostasis, accompanied by symptoms such as dryness, irritation, and fluctuating vision. The Tear Film & Ocular Surface Society (TFOS) Dry Eye Workshop II (DEWS II) defines DED as a condition involving tear film instability, hyperosmolarity, ocular surface inflammation,

and neurosensory abnormalities, making it a significant global public-health concern.¹

With the rapid rise of digital device use, the burden of dry eye has increased substantially among young adults. Prolonged screen exposure reduces blink rate and increases incomplete blinks, leading to tear film instability and evaporative dry eye.² Medical students are particularly vulnerable due to extended reading hours, continuous use of smartphones and laptops, stress, and irregular sleep schedules.³

As little as two hours of continuous digital device use per day can lead to a range of vision-related problems, including “digital eye strain,” according to the American Optometric Association.⁴ The prevalence of dry eye disease (DED) varies widely, ranging from 5% to 50% depending on the diagnostic criteria, age, sex, and population studied. Additional research has reported that approximately 3-34% of adults worldwide suffer from DED.⁵ Asian populations tend to show higher prevalence rates than Caucasian populations, and the prevalence further increases with age.⁶ Considering that DED is a largely preventable ocular condition, early preventive strategies are crucial to reducing its overall burden.⁷ Although numerous studies have examined various aspects of DED, relatively few have focused on its characteristics specifically among healthcare workers. Increased levels of psychological stress was associated with increased risk of DED.⁸

North Bihar, including academic centres such as Darbhanga, has a large population of medical trainees, yet dry eye prevalence in this subgroup remains under-reported. Identifying differences in dry eye burden between UG and PG students can help design targeted preventive strategies and promote early management.

Therefore, the present study aimed to compare the prevalence of dry eye disease among undergraduate and postgraduate medical students in North Bihar and determine the group at higher risk.

METHODS

A cross-sectional, questionnaire-based study was conducted to assess and compare the prevalence of dry eye disease among undergraduate and postgraduate medical students in North Bihar. The study was carried out over a period of six months, from January 2025 to June 2025.

The study was conducted in a medical college located in Darbhanga, Darbhanga Medical College and Hospital (North Bihar), and included students enrolled in both undergraduate (MBBS) and postgraduate (MD/MS) programs.

A total of 200 medical students participated, comprising 100 undergraduate (UG) and 100 postgraduate (PG) students. A convenience sampling method was used.

Inclusion criteria

Students who were willing to participate and provided informed consent were included in the study.

Exclusion criteria

Students with active ocular infections, recent ocular surgery (<6 months), contact lens use, or systemic illnesses known to affect tear production were excluded.

Participants completed a validated questionnaire that recorded demographic information (age, gender), daily screen time (mobile/laptop).

Participants were divided into two groups based on daily screen exposure: <4 hours/day and \geq 4 hours/day .

Dry eye assessment included:

Ocular Surface Disease Index (OSDI) questionnaire

The severity of dry eye symptoms was assessed using the Ocular Surface Disease Index (OSDI) questionnaire. Based on the OSDI score, subjects were categorized as having normal ocular surface status if the score was less than 13, mild disease if the score ranged from 13 to 22, moderate disease if the score ranged from 23 to 32, and severe disease if the score was greater than 33.

Clinical evaluation

Tear Film Break-Up Time (TBUT)

An impregnated fluorescein strip moistened with normal saline is instilled into the lower fornix. The patient is then asked to blink several times, and the tear film is examined under a cobalt blue filter using a slit lamp. The time between the last blink and the first appearance of a dry spot is recorded as the TBUT. A breakup time of less than 10 seconds is considered abnormal. The test is performed three times, and the average value is calculated.

Schirmer's test

Schirmer's test measures aqueous tear production by assessing the amount of wetting on a Whatman No. 41 filter paper strip. Five millimetres of the strip are folded and placed at the junction of the lateral one-third and medial two-thirds of the lower eyelid, with the eyes kept open. After five minutes, the strip is removed, and the length of wetting is measured.

Dry eye severity was graded based on the measured values as follows: normal if the value was greater than 15 mm, mild dry eye if it ranged between 11 and 15 mm, moderate dry eye if it ranged between 5 and 10 mm, and severe dry eye if it was less than 5 mm.

Dry eye disease (DED) was diagnosed when an OSDI score \geq 13 was associated with at least one abnormal clinical parameter (TBUT <10 seconds or Schirmer's <15 mm).

Data were analyzed to compare prevalence, mean OSDI scores, and associated risk factors between UG and PG groups. All data were entered in Microsoft Excel and analyzed using SPSS software.

Prevalence of DED was calculated separately for both groups. The Chi-square test was used to compare

proportions. Risk Ratio (RR) and Odds Ratio (OR) were calculated to assess relative risk. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 200 medical students were included in the study, comprising 100 undergraduate (UG) and 100 postgraduate (PG) students.

Of the 200 participants, 97 (48.5%) were males and 103 (51.5%) were females. UG group had 46 males and 54 females, while the PG group had 51 males and 49 females (Figure 1).

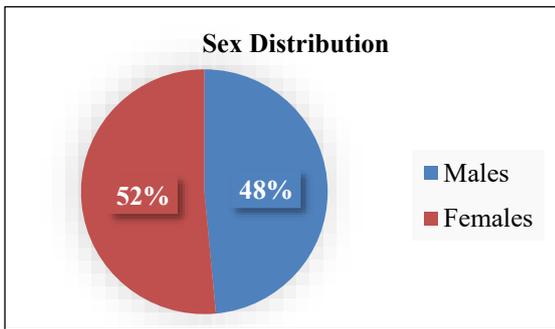


Figure 1: Showing sex distribution.

The overall prevalence of dry eye disease (DED) among the study population was 38.5%. Dry eye was significantly

Table 1: Showing associations of OSDI, TBUT and Schirmer with screen time in UG students.

Screen time	UG (n=100)	OSDI score >13	TBUT <10sec	Schirmer <15mm	Patients with DED (OSDI +Schirmer/TBUT)
>4 hours a day	58	58	29	45	46
<4 hours a day	42	29	2	5	3

Table 2: Showing associations of OSDI, TBUT and Schirmer with screen time in PG students.

Screen time	PG (n=100)	OSDI>13	TBUT <10 sec	Schirmer <15 mm	Patient with DED (OSDI +TBUT/Schirmer)
>4 hours a day	35	35	23	19	27
< 4 hours a day	65	20	5	7	1

The risk of dry eye disease (DED) among individuals with screen time of ≥4 hours per day was 78.5% (73/93), compared to 3.7% (4/107) among those with screen time of <4 hours per day. This corresponds to a risk ratio (RR) of 21.2 and an odds ratio (OR) of 94.0. This indicates a very strong association between prolonged screen exposure and the development of dry eye disease.

Out of 100 undergraduate students, 58 had a daily screen time of more than 4 hours, while 42 had screen time less than 4 hours. Among students with screen time exceeding 4 hours, all 58 had an OSDI score >13, 29 had TBUT <10 seconds, and 45 had Schirmer’s test values <15 mm. Dry eye disease, defined by the presence of symptoms (OSDI

more common among UG students than PG students. The prevalence of DED among UG students was 49% (49/100), whereas among PG students it was 28% (28/100).

A statistically significant difference in dry eye prevalence was observed between the two groups. Chi-square value: 10.18 and p-value: 0.0014 (significant). Undergraduate students were at a higher risk of developing DED compared to postgraduate students, with a Risk Ratio (RR) of 1.75 and an Odds Ratio (OR) of 2.46.

Association between screen time and dry eye disease

Screen time was categorized into two groups: <4 hours/day and ≥4 hours/day. Among the 200 participants, 93 students (58 UGs and 35 PGs) reported screen exposure ≥4 hours/day. Prolonged screen exposure (≥4 hours/day) was more common among undergraduate students compared to postgraduate students (58% vs 35%).

Out of the 77 students diagnosed with dry eye disease, 73 cases (94.8%) were observed among students with screen time ≥4 hours/day, while only 4 cases (5.2%) were found among students with screen exposure <4 hours/day.

Students with screen exposure ≥4 hours/day showed a markedly higher risk of developing DED compared to those with <4 hours/day exposure.

>13) along with abnormal TBUT and/or Schirmer’s test, was diagnosed in 46 (79.3%) students in this group.

In contrast, among students with screen time less than 4 hours, only 2 had TBUT <10 seconds, 5 had Schirmer’s values <15 mm, and 3 (7.1%) fulfilled the diagnostic criteria for dry eye disease. The prevalence of dry eye disease was significantly higher in students with prolonged screen exposure

DISCUSSION

Dry eye disease (DED) is increasingly being recognized as a significant ocular surface disorder among young adults,

particularly in populations with extensive digital device use. In the present study, the overall prevalence of DED was 38.5%, indicating a substantial burden of disease even in a relatively young and otherwise healthy population. This finding aligns with recent literature reporting a rising prevalence of dry eye symptoms among students and digital device users worldwide.

A notable observation in this study was the significantly higher prevalence of DED among undergraduate (UG) students (49%) compared to postgraduate (PG) students (28%), with a statistically significant difference ($p=0.0014$). Undergraduate students were found to have a 1.75-fold higher risk of developing DED than postgraduate students. Similar trends have been reported in earlier studies, where younger students demonstrated higher symptom prevalence, possibly due to increased recreational screen use, irregular sleep habits, and lower awareness regarding ocular health and ergonomic practices.⁹

The association between screen time and dry eye disease was particularly strong in the present study. Among students with screen exposure of ≥ 4 hours/day, nearly 79% were diagnosed with DED, whereas only 3.7% of students with screen exposure of < 4 hours/day fulfilled the diagnostic criteria. The very high risk ratio (21.2) and odds ratio (94.0) highlight prolonged screen exposure as a major and potentially modifiable risk factor for DED. These findings are consistent with previous studies that have demonstrated a strong correlation between digital screen use and the development of dry eye symptoms and signs.¹⁰

The pathophysiology underlying this association can be explained by reduced blink rate and increased incomplete blinking during prolonged visual display terminal use, leading to tear film instability and increased evaporation.¹¹ This mechanism is reflected in the present study by the higher prevalence of reduced tear film break-up time (TBUT) and abnormal Schirmer's test values among students with prolonged screen exposure. The coexistence of abnormal TBUT and Schirmer's test results suggests the presence of both evaporative and aqueous-deficient components of dry eye disease in this population.

The findings of this study are in agreement with the TFOS DEWS II reports, which emphasize the multifactorial nature of DED and identify digital device use as an important environmental risk factor.

Studies conducted among medical students and computer users in India and other countries have reported comparable prevalence rates, further supporting the external validity of the present study.¹²

In the present study, the prevalence of dry eye disease (DED) was 38.5%, which is lower than the prevalence reported by Logaraj et al (approximately 70%).¹³ One possible explanation for this difference is the inclusion of both undergraduate and postgraduate students in our study

population. Postgraduate students may have greater awareness regarding ocular health, more regulated screen usage, or better access to preventive measures, which could have contributed to a comparatively lower prevalence of DED in our cohort.

Iqbal et al reported that nearly 68% of students using electronic devices for more than three hours daily experienced dry eye symptoms, reinforcing the strong association between prolonged screen exposure and DED.¹⁴ Despite the lower overall prevalence observed in our study, the relationship between increased digital device use and dry eye symptoms remained consistent.

Additionally, Patel et al demonstrated a significant association between prolonged screen exposure and reduced precorneal tear film stability, a crucial factor in the pathogenesis of DED.¹⁵ This finding supports the results of the present study and underscores the importance of screen time as a modifiable risk factor for dry eye disease among medical students.

The strengths of this study include a balanced inclusion of undergraduate and postgraduate students, adequate sample size, and the use of both symptom-based (OSDI) and objective clinical tests (TBUT and Schirmer's test) for diagnosing DED. However, certain limitations should be acknowledged. The cross-sectional design precludes establishing a causal relationship, and factors such as environmental conditions, air conditioning exposure, and contact lens use were not separately analyzed. Despite these limitations, the strong statistical association observed underscores the clinical relevance of screen time as a key risk factor for dry eye disease.

CONCLUSION

The present study demonstrates a high prevalence of dry eye disease among medical students, particularly among undergraduates and those with prolonged screen exposure. Early screening, increased awareness, and preventive strategies such as screen time regulation and ergonomic practices are essential to reduce the burden of dry eye disease in this vulnerable population.

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REFERENCES

1. Craig JP, Nichols KK, Akpek EK, Caffery B, Dua HS, Joo CK, et al. TFOS DEWS II Definition and Classification Report. *Ocul Surf*. 2017;15(3):276-83.
2. Rosenfield M. Computer vision syndrome: a review of ocular causes and potential treatments. *Ophthalmic Physiol Opt*. 2011;31(5):502-515.
3. Gowrisankaran S, Sheedy JE. Computer vision syndrome: A review. *Work*. 2015;52(2):303-14.

4. Yuvashree, Indhu C, Bhuvaneswari KN. Prevalence of Symptomatic Dry Eye Disease Among Undergraduate Medical Students After Covid 19 Pandemic In A Tertiary Care Hospital Kanchipuram- A Cr0ss Sectional Study. *J Pharm Negat Results.* 2022;13(4):2139-44.
5. Stapleton F, Alves M, Bunya V, Jalbert I, Lekhanont K, Malet F. TFOS DEWS II epidemiology report. *Ocul Surf.* 2017;15(3):334-65.
6. Yang I, Wakamatsu T, Sacho I, Fazzi J, DeAquino A, Ayub G. Prevalence and associated risk factors for dry eye disease among Brazilian undergraduate students. *PLoS One.* 2021;16(11).
7. Donthineni P, Shanbhag S, Basu S. An evidence-based strategic approach to prevention and treatment of dry eye disease, a modern global epidemic. *Healthcare (Basel).* 2021;9(1).
8. Hyon J, Yang H, Han S. Dry eye symptoms may have association with psychological stress in medical students. *Eye Contact Lens.* 2019;45(5):310-4.
9. Uchino M, Schaumberg DA. Dry eye disease: impact on quality of life and vision. *Curr Ophthalmol Rep.* 2013;1:51-57.
10. Sheppard JD, Wolffsohn JS. Digital eye strain: prevalence, measurement and amelioration. *BMJ Open Ophthalmol.* 2018;3:e000146.
11. Portello JK, Rosenfield M, Bababekova Y, Estrada JM, Leon A. Computer-related visual symptoms in office workers. *Ophth Physiol Optics.* 2012;32(5):375-82.
12. Gupta N, Prasad I, Jain R, D'Souza P. Estimation of dry eye disease in computer users. *Ind J Ophthalmol.* 2014;62(7):773-6.
13. Logaraj M, Madhupriya V, Hegde SK. Computer vision syndrome and associated factors among medical and engineering students in Chennai. *Ind J Commu Med.* 2014;39(2):101-4.
14. Iqbal M, El-Massry A, Elagouz M, Elzembely H. Computer vision syndrome survey among medical students in Sohag University Hospital, Egypt. *Ophthalmol Res.* 2018;8(1):1-8.
15. Patel S, Henderson R, Bradley L, Galloway B, Hunter L. Effect of visual display unit use on blink rate and tear stability. *Optom Vis Sci.* 1991;68(11):888-92.

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