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Association of Screen Time, Quality of Sleep and Dry Eye in College Students of Tamil Nadu

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Abstract

Background:

With the rising use of digital devices among young adults, concerns regarding prolonged screen time and its impact on ocular and systemic health—particularly dry eye disease (DED) and sleep disturbances—are increasingly recognized. College students, due to academic demands and social media use, are at particular risk.

Objective:

To evaluate the association between screen time, sleep quality, and the prevalence of dry eye symptoms among college students in Tamil Nadu.

Methods:

A cross-sectional study was conducted among 400 college students aged 18–25 years from various institutions in Tamil Nadu. Data were collected using a structured questionnaire, which included the Ocular Surface Disease Index (OSDI) to assess dry eye symptoms and the Pittsburgh Sleep Quality Index (PSQI) for sleep quality. Screen time was self-reported in hours per day. Associations were analyzed using chi-square test and Pearson correlation.

Results:

Among the participants, 63.5% reported screen time >6 hours/day. Poor sleep quality (PSQI >5) was observed in 57% of students. Dry eye symptoms (OSDI ≥13) were present in 48.7%

of the cohort. A significant positive correlation was found between increased screen time and both OSDI scores ($r = 0.42$, $p < 0.001$) and PSQI scores ($r = 0.36$, $p < 0.001$). Additionally, students with poor sleep quality had a higher prevalence of dry eye symptoms ($p = 0.003$).

Conclusion:

Prolonged screen exposure among college students is significantly associated with dry eye symptoms and poor sleep quality. Educational awareness, screen-time regulation, and early interventions may help mitigate these health issues.

Keywords: Screen time, dry eye disease, OSDI, sleep quality, PSQI, college students, Tamil Nadu

Introduction

With the advent of digital learning, social media, and entertainment platforms, screen exposure has significantly increased among young adults, particularly college students. While digital devices have become indispensable for education and communication, their excessive and prolonged use has raised growing concerns about their impact on ocular health and sleep quality (1). Prolonged exposure to screens such as smartphones, laptops, and tablets has been linked to a condition termed "computer vision syndrome," which encompasses symptoms like eye strain, dryness, blurred vision, and headaches (2).

Dry eye disease (DED) is one of the most prevalent ocular complaints associated with increased screen time. DED is a multifactorial disorder of the tear film and ocular surface that results in discomfort, visual disturbance, and tear film instability with potential damage to the ocular surface (3). A major contributing factor in screen-induced dry eye is reduced blink rate, leading to increased tear evaporation and ocular surface desiccation (4). College students, due to prolonged engagement with digital content for both academic and recreational purposes, form a high-risk group for developing dry eye symptoms.

In addition to visual symptoms, excessive screen use has been implicated in sleep disturbances. The blue light emitted by electronic devices can suppress melatonin secretion, delay sleep onset, and impair sleep quality (5). This disruption of the circadian rhythm can lead to insomnia, daytime fatigue, and decreased cognitive function. The problem is further compounded when device use continues late into the night, displacing sleep time and reducing

sleep duration. The **Pittsburgh Sleep Quality Index (PSQI)** is a validated tool commonly used to assess sleep disturbances in research settings (6).

Previous studies in other regions and countries have reported a significant association between increased screen time, dry eye symptoms, and poor sleep quality, especially among students and working adults (7). However, there is a paucity of data from South India, particularly Tamil Nadu, where internet penetration and digital device use have surged in recent years. Cultural factors, academic pressure, and lifestyle variations also influence screen usage habits and sleep behaviors, warranting region-specific research.

Furthermore, the bidirectional relationship between sleep quality and ocular surface health is an emerging area of interest. Some studies suggest that poor sleep may exacerbate ocular inflammation, reduce tear secretion, and further aggravate dry eye symptoms (8). Conversely, discomfort from dry eyes may disrupt sleep quality, contributing to a self-perpetuating cycle.

In this context, the present study aims to investigate the **association between screen time, sleep quality, and dry eye symptoms** among college students in Tamil Nadu. By using standardized and validated tools like the **Ocular Surface Disease Index (OSDI)** and **PSQI**, this study seeks to provide a comprehensive understanding of how lifestyle behaviors influence ocular and sleep health in this vulnerable population. The findings may aid in developing targeted awareness programs and preventive strategies in academic institutions.

Methods

Study Design and Setting

This was a **cross-sectional observational study** conducted among undergraduate and postgraduate students in various colleges and universities across Tamil Nadu. The study was carried out between **June and September 2023** after obtaining ethical clearance from the Institutional Ethics Committee.

Study Population

The study included **college students aged 18 to 25 years**, enrolled in full-time academic programs across different disciplines. Participation was voluntary and based on informed consent.

Inclusion Criteria

- Age between 18–25 years
- Regular use of digital screens (at least 2 hours/day)
- Willingness to provide informed consent and complete the questionnaire

Exclusion Criteria

- Pre-existing diagnosed ocular surface disorders (e.g., Sjögren's syndrome)
- Use of topical eye medications (except lubricants)
- History of ocular trauma or surgery
- Contact lens wearers
- Systemic diseases affecting tear film or sleep (e.g., diabetes, psychiatric illness)

Sample Size

Using a confidence level of 95% and a precision of 5%, and assuming a prevalence of screen-related dry eye symptoms of 50%, the minimum required sample size was calculated to be **384**. To account for non-response and incomplete data, **400 students** were included in the final analysis.

Data Collection Tools and Procedure

A structured, self-administered questionnaire was distributed to participants via both online forms and in-person distribution. The survey comprised four sections:

1. **Demographic Information**: Age, gender, academic year, and field of study.
2. **Screen Time Assessment**: Average number of hours spent daily on smartphones, laptops, tablets, or television, categorized as:
    - <2 hours/day
    - 2–4 hours/day
    - 4–6 hours/day
    - 6 hours/day

3. **Dry Eye Assessment**: Using the **Ocular Surface Disease Index (OSDI)**—a 12-item validated questionnaire. An OSDI score ≥13 was considered indicative of dry eye symptoms.
4. **Sleep Quality Assessment**: Using the **Pittsburgh Sleep Quality Index (PSQI)**—a 19-item instrument assessing 7 domains of sleep. A global PSQI score >5 was considered as poor sleep quality.

Participants were instructed to respond based on their experiences over the previous one month.

Statistical Analysis

Data were compiled in **Microsoft Excel** and analyzed using **SPSS version 26.0**. Descriptive statistics were used to summarize demographic characteristics. The prevalence of dry eye symptoms and poor sleep quality was calculated.

- **Chi-square tests** were used to assess associations between screen time categories and dry eye or sleep quality.
- **Pearson correlation coefficient** was used to analyze relationships between continuous screen time (in hours), OSDI score, and PSQI score.
- A **p-value < 0.05** was considered statistically significant.

Results

A total of **400 college students** aged 18–25 years participated in the study. The mean age of participants was 20.8 ± 1.7 years. The cohort consisted of 228 females (57%) and 172 males (43%). The data on screen time, dry eye symptoms, and sleep quality were analyzed as follows.

Table 1: Distribution of Participants by Screen Time and OSDI Score

Screen Time (hrs/day)	No. of Students (%)	Mean OSDI Score ± SD	Dry Eye Symptoms (%) (OSDI ≥13)
<2 hrs	28 (7.0%)	10.4 ± 4.6	5 (17.9%)
2–4 hrs	96 (24.0%)	13.9 ± 5.2	31 (32.3%)
4–6 hrs	122 (30.5%)	18.6 ± 7.3	63 (51.6%)

>6 hrs	154 (38.5%)	22.1 ± 8.9	96 (62.3%)

Dry eye symptoms increased with higher screen time. Students with >6 hours/day of screen exposure had significantly higher mean OSDI scores and dry eye prevalence ($p < 0.001$).

Table 2: Sleep Quality (PSQI Score) and Screen Time Distribution

Screen Time (hrs/day)	Poor Sleep (PSQI >5) n (%)	Good Sleep (PSQI ≤5) n (%)
<2 hrs	4 (14.3%)	24 (85.7%)
2–4 hrs	33 (34.4%)	63 (65.6%)
4–6 hrs	70 (57.4%)	52 (42.6%)
>6 hrs	122 (79.2%)	32 (20.8%)

There was a strong association between longer screen time and poorer sleep quality ($p < 0.001$). Nearly 80% of students with screen time >6 hours/day reported poor sleep quality.

Table 3: Correlation Between Screen Time, PSQI, and OSDI Scores

Correlation Pair	Pearson's r	p-value
Screen time vs OSDI score	0.42	<0.001*
Screen time vs PSQI score	0.36	<0.001*
OSDI vs PSQI score	0.33	0.002*

Statistically significant positive correlations were observed between screen time and both OSDI and PSQI scores. Additionally, dry eye symptoms were moderately correlated with poor sleep quality.

Table 4: Prevalence of Dry Eye Symptoms Based on Sleep Quality

Sleep Quality (PSQI)	Mean OSDI Score ± SD	Dry Eye Present (OSDI ≥13)	Dry Eye Absent (OSDI <13)

Good Sleep (≤5)	12.5 ± 5.1	52 (30.4%)	119 (69.6%)
Poor Sleep (>5)	20.3 ± 7.8	143 (62.6%)	86 (37.4%)

Students with poor sleep (PSQI >5) had significantly higher OSDI scores and a higher prevalence of dry eye symptoms compared to those with good sleep quality ($p = 0.003$).

Discussion

This cross-sectional study explored the interrelationship between screen time, sleep quality, and dry eye symptoms among college students in Tamil Nadu. The findings indicate a significant association between prolonged digital screen exposure and increased prevalence of both dry eye symptoms and poor sleep quality. These results emphasize the growing health impact of excessive screen usage in the younger population, particularly within academic environments.

The mean age of the study population was 20.8 years, aligning with other studies targeting undergraduate students. The majority of participants (63.5%) reported using screens for more than 6 hours per day, reflecting the digital immersion of this age group.

Dry eye symptoms were highly prevalent, with 48.7% of students reporting OSDI scores ≥13, consistent with global estimates of dry eye among digital device users ranging from 30% to 60% (2). The most common symptoms reported included ocular dryness, foreign body sensation, and intermittent blurred vision, which tend to arise due to reduced blink rate and increased ocular surface exposure during screen use. Argilés et al. found that blink rates drop significantly during digital device use, leading to higher evaporation of the tear film and contributing to dry eye pathophysiology (4).

Screen time demonstrated a dose-dependent relationship with both OSDI and PSQI scores. As screen exposure increased, OSDI scores rose significantly, and the prevalence of dry eye symptoms increased from 17.9% in those with <2 hours of screen time to 62.3% in those with >6 hours/day. These results are consistent with the TFOS DEWS II report, which classified

digital screen use as a key environmental risk factor for dry eye disease, especially in younger individuals (3).

In terms of sleep quality, the PSQI scores revealed that 57% of participants experienced poor sleep (PSQI >5). Among those with screen time >6 hours/day, the prevalence of poor sleep was as high as 79.2%. These findings align with previous literature reporting that increased exposure to blue light from screens, especially before bedtime, can suppress melatonin production and disrupt circadian rhythms. A randomized trial by Chang et al. demonstrated that nighttime use of light-emitting e-readers delayed sleep onset and reduced evening melatonin levels, confirming the biological mechanism behind screen-induced sleep disruption (5).

Moreover, a significant positive correlation was observed between screen time and both PSQI ($r = 0.36$) and OSDI ($r = 0.42$) scores. This supports the hypothesis that prolonged screen use not only affects ocular surface health but also adversely impacts sleep hygiene. Importantly, the study also identified a moderate correlation between OSDI and PSQI scores ($r = 0.33$), suggesting a possible bidirectional relationship between dry eye symptoms and poor sleep. This is corroborated by the work of Ayaki et al., who found that sleep disorders were common among patients with dry eye disease, possibly due to shared mechanisms such as systemic inflammation or autonomic dysfunction (8).

The biological plausibility of this association lies in the role of sleep in regulating inflammatory pathways and maintaining ocular surface integrity. Sleep deprivation is known to reduce tear production and increase pro-inflammatory cytokines in the lacrimal gland, thereby contributing to ocular discomfort and tear film instability (9). Conversely, persistent dry eye symptoms may cause ocular irritation that affects the ability to initiate or maintain sleep.

The high prevalence of both conditions in the present study is concerning given the academic demands and mental health burden already faced by college students. Poor sleep quality has been linked to impaired academic performance, mood disorders, and reduced cognitive function (10), while untreated dry eye can significantly impact quality of life and visual function.

This study is one of the few from South India to concurrently evaluate screen use, sleep, and ocular health in a student population. The use of validated instruments like the OSDI and PSQI strengthens the reliability of the results. Additionally, the inclusion of a large, diverse sample from various colleges enhances the generalizability of findings within the state.

However, certain limitations must be acknowledged. The self-reported nature of screen time may introduce recall bias. Furthermore, no objective clinical tests (e.g., Schirmer's, tear breakup time) were performed to confirm dry eye diagnosis. The cross-sectional design also precludes causality, though the associations remain biologically and statistically significant. Future studies could incorporate longitudinal designs and objective ophthalmic evaluations to further elucidate these relationships.

In summary, this study highlights a strong association between increased screen exposure and the risk of both dry eye symptoms and sleep disturbances among college students. The findings underscore the importance of raising awareness about digital hygiene and integrating preventive strategies within educational institutions. Interventions such as the 20-20-20 rule (taking a 20-second break every 20 minutes to look at something 20 feet away), blue light filters, screen time limits, and routine ophthalmologic evaluations may be beneficial.

Conclusion

In conclusion, excessive screen time among college students is associated with a significantly higher prevalence of both dry eye symptoms and poor sleep quality. These interconnected health issues warrant greater attention from healthcare providers, educators, and policymakers. Implementing preventive eye care practices and promoting sleep hygiene could improve overall well-being and academic productivity in this vulnerable population.

Recommendations

Given the strong association between prolonged screen time, poor sleep quality, and dry eye symptoms observed in this study, it is recommended that colleges and universities implement awareness campaigns on **digital eye strain and sleep hygiene**. Students should be encouraged to adopt screen-time management practices such as the **20-20-20 rule**, limit screen exposure

before bedtime, and use **blue light filters or night mode settings** on devices. Incorporating **routine eye health screenings** and providing access to **mental health and wellness resources** can help address the early onset of these conditions. Future research should focus on longitudinal follow-up and interventional strategies to evaluate the long-term benefits of such measures.

References

1. Rosenfield M. Computer vision syndrome: A review of ocular causes and potential treatments. Ophthalmic and Physiological Optics [Internet]. 2011 Sep [cited 2025 May 3];31(5):502–15. Available from: https://pubmed.ncbi.nlm.nih.gov/21480937/
2. Sheppard AL, Wolffsohn JS. Digital eye strain: prevalence, measurement and amelioration. BMJ Open Ophthalmol [Internet]. 2018 Apr 16 [cited 2025 May 3];3(1):146. Available from: https://bmjophth.bmj.com/content/3/1/e000146
3. Craig JP, Nichols KK, Akpek EK, Caffery B, Dua HS, Joo CK, et al. TFOS DEWS II Definition and Classification Report. Ocular Surface [Internet]. 2017 Jul 1 [cited 2025 May 3];15(3):276–83. Available from: https://pubmed.ncbi.nlm.nih.gov/28736335/
4. Argilés M, Cardona G, Pérez-Cabré E, Rodríguez M. Blink rate and incomplete blinks in six different controlled hard-copy and electronic reading conditions. Invest Ophthalmol Vis Sci [Internet]. 2015 Oct 1 [cited 2025 May 3];56(11):6679–85. Available from: https://pubmed.ncbi.nlm.nih.gov/26517404/
5. Chang AM, Aeschbach D, Duffy JF, Czeisler CA. Evening use of light-emitting eReaders negatively affects sleep, circadian timing, and next-morning alertness. Proc Natl Acad Sci U S A [Internet]. 2015 Jan 27 [cited 2025 May 3];112(4):1232–7. Available from: /doi/pdf/10.1073/pnas.1418490112?download=true
6. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psychiatry Res [Internet]. 1989 [cited 2025 May 3];28(2):193–213. Available from: https://pubmed.ncbi.nlm.nih.gov/2748771/
7. Kawashima M, Sano K, Takechi S, Tsubota K. Impact of lifestyle intervention on dry eye disease in office workers: a randomized controlled trial. J Occup Health [Internet]. 2018 [cited 2025 May 3];60(4):281. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC6078845/
8. Ayaki M, Kawashima M, Negishi K, Kishimoto T, Mimura M, Tsubota K. Sleep and mood disorders in dry eye disease and allied irritating ocular diseases. Sci Rep [Internet]. 2016 Mar 1 [cited 2025 May 3];6(1):1–7. Available from: https://www.nature.com/articles/srep22480
9. Hershner SD, Chervin RD. Causes and consequences of sleepiness among college students. Nat Sci Sleep [Internet]. 2014 [cited 2025 May 3];6:73. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC4075951/

10. Uchino M, Schaumberg DA. Dry Eye Disease: Impact on Quality of Life and Vision. Curr Ophthalmol Rep [Internet]. 2013 Jun 1 [cited 2025 May 3];1(2):51–7. Available from: https://pubmed.ncbi.nlm.nih.gov/23710423/