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**Original Research Article**

# Digital eye strain among university students: a cross-sectional study from Hyderabad, India

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## ABSTRACT

**Background:** Digital eye strain (DES) or computer vision syndrome (CVS) represents a growing public health concern as digital device usage increases globally, particularly among university students. This study aimed to assess the prevalence and characteristics of digital eye strain among university students in Hyderabad, India.
**Methods:** A descriptive cross-sectional study was conducted among 112 university students in Hyderabad, India, from November to December 2024. Data was collected using a self-administered questionnaire. Non-probability convenience sampling was employed, and statistical analysis included calculation of percentages and means using statistical package for the social sciences (SPSS).
**Results:** All participants (100%) owned smartphones, while 60.7% owned laptops. The mean age was 22.3±2.5 years, with 65.2% female participants. The most common symptoms reported were headache (75.0%), burning or itching sensation in eyes (50.0%), and watering from eyes (49.1%). Significant increases in screen time were observed over the preceding three years.
**Conclusions:** Digital eye strain symptoms are highly prevalent among university students, with headaches being the predominant complaint. Preventive measures and awareness programs are essential to mitigate the effects of prolonged digital device usage on ocular health.

**Keywords:** Digital eye strain, Computer vision syndrome, University students, Ocular symptoms, Screen time

## INTRODUCTION

Digital eye strain (DES), also known as computer vision syndrome (CVS), encompasses a constellation of eye and vision-related problems resulting from prolonged usage of digital devices.[1,2] The condition manifests through various nonspecific symptoms, including eye fatigue, blurred vision, headaches, neck pain and in some cases, double vision.[3-5]

In recent years, there has been a substantial increase in the utilization of digital devices such as computers, laptops, tablets, e-readers, and smartphones in all age groups.[6,7] While the integration of computers across various domains has undoubtedly enhanced productivity and simplified numerous tasks, it has simultaneously introduced considerable health risks, particularly for individuals who engage with these devices extensively.[8]

The prolonged usage of various electronic devices adversely affects the health with multiple problems of which visual are prominent.[9,10] Research indicates that even moderate computer use of three hours daily can precipitate health issues including CVS, low back pain, tension headaches, and psychological stress.[11] Given the indispensable role of digital technology in academic settings, university students represent a population particularly vulnerable to developing digital eye strain. The rapid technological transformation of educational environments has created an urgent need to understand the

health implications of increased screen time among college students. With significant advancements in technology, they extensively use digital learning resources, increasing their vulnerability for DES.[12] This has led to the emergence of CVS as a common public health concern of ophthalmic origin demanding urgent attention.[13] While digital devices offer unprecedented access to information and educational resources, the potential ocular health consequences remain inadequately characterized in the academic literature. This knowledge gap is particularly concerning given that habits formed during college years may establish lifetime patterns of digital device usage.

With this backdrop the present study was conducted with the objective to assess the proportion and characteristics of digital eye strain among university students in Hyderabad, India.

## METHODS

### *Study design and setting*

This descriptive cross-sectional study was conducted at a university college in Hyderabad, India, over a two-month period from November to December 2024.

### *Study population and sampling*

The study population comprised students attending the university college. Minimum required sample size was calculated as 83 at 95% confidence interval, margin of error 10% and prevalence of DES 68.53% based on the reference study.[14] However, responses were received from total 112 college students. Non-probability convenience sampling was employed to recruit the study participants. Inclusion criteria encompassed students who could read, write, and understand English and were willing to participate in the study.

### *Data collection*

A predesigned, pre-structured printed self-administered questionnaire was utilized to gather data on digital eye syndrome among participants. The questionnaire included sections on demographics, digital device ownership and usage patterns, and ocular symptoms associated with digital device usage. As the study was done in the college itself, only rapid eye examination was carried out to identify the refractive errors. Symptoms pertaining to the digital eye strain were addressed.

### *Ethical considerations*

Prior to commencing the study, institutional ethics committee clearance was obtained (vide number 3622EC/PHARMAC/GMC), and permission was secured from college authorities. Written informed consent was obtained from all participants after explaining the nature and purpose of the study. Participation was entirely voluntary, and participants were assured of confidentiality and anonymity.

### *Data analysis*

Completed questionnaires were checked for completeness, and data was cleaned, coded, and entered into Microsoft excel. Statistical analysis was performed using statistical package for the social sciences (SPSS), with calculations of percentages and means to describe the findings.

## RESULTS

### *Demographic characteristics and digital device ownership*

A total of 112 university students participated in the study, with a mean age of 22.3±2.5 years. The detailed age-wise distribution of the students is shown in Table 1. Of these total 112 students, 73 were female and 39 were male. The gender-wise distribution of the study participants is shown in figure 1. Regarding residential background, 81 (72.3%) students reported urban areas as their original place of residence, while 31 (27.7%) originated from rural areas. All participants (100%) owned smartphones. Regarding laptop ownership, 68 (60.7%) students possessed their own laptops, while 44 (39.3%) did not.

**Table 1: Age-wise distribution of the students.**

| Age in years | Number | Percentage |
|---|---|---|
| **18** | 5 | 4.5 |
| **19** | 13 | 11.6 |
| **20** | 14 | 12.5 |
| **21** | 11 | 9.8 |
| **22** | 21 | 18.8 |
| **23** | 15 | 13.4 |
| **24** | 10 | 8.9 |
| **25** | 8 | 7.1 |
| **26** | 9 | 8.0 |
| **27** | 6 | 5.4 |
| **Total** | 112 | 100 |

### *Screen time patterns*

Participants reported a notable increase in screen time over the preceding three years, with significant proportions reporting daily usage exceeding 5 hours for both mobile phones and laptops/computers. Details on overall increase in the screen time usage is depicted in Figure 1.

### *Ocular symptoms*

Refractive errors on vision testing were detected in 34 (30.4%) of the students whereas 78 (69.6%) did not have refractive errors. Headache emerged as the most prevalent symptom, reported by 75.0% of students, followed by burning or itching sensation in the eyes (50.0%) and watering from eyes (49.1%). Less commonly reported

symptoms included double vision (5.4%), redness in eyes (13.4%), and eye fatigue (19.6%). Table 2 presents the distribution of ocular symptoms reported by participants.

**Table 2: Ocular symptoms due to digital eye strain.**

| Symptom | Number | Percentage |
|---|---|---|
| **Headache** | 84 | 75.0 |
| **Burning or itching sensation in eyes** | 56 | 50.0 |
| **Watering from eyes** | 55 | 49.1 |
| **Dryness of eyes** | 38 | 33.9 |
| **Light or glare sensitivity** | 29 | 25.9 |
| **Slowness in changing focus** | 24 | 21.4 |
| **Eye fatigue** | 22 | 19.6 |
| **Redness in eyes** | 15 | 13.4 |
| **Double vision** | 6 | 5.4 |

*Indicates multiple responses

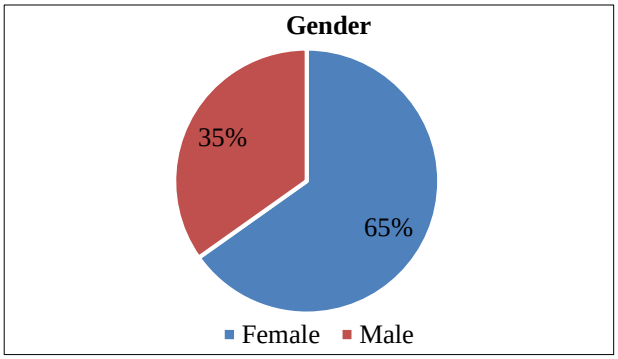


**Figure 1: Gender-wise distribution.**

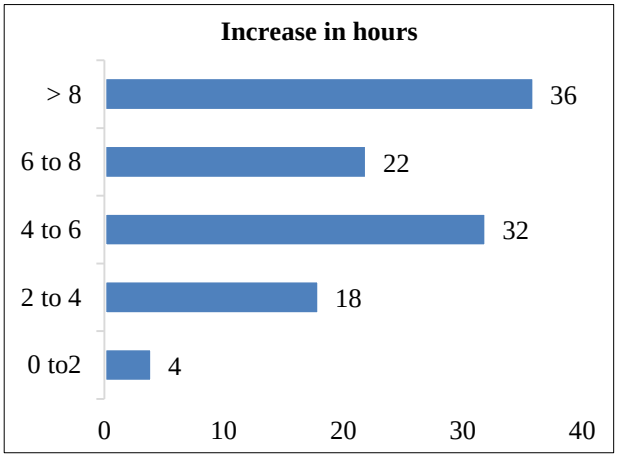


**Figure 2: Increase in hours of screen time.**

## DISCUSSION

This study provides valuable insights into the prevalence and characteristics of digital eye strain among university students in Hyderabad, India. The findings reveal universal smartphone ownership among participants, with a substantial proportion also owning laptops, highlighting the ubiquity of digital devices within this demographic.

The demographic profile indicates a predominance of female participants who constituted almost two-third of the study participants. Majority of the students were from urban backgrounds. This distribution may reflect the enrollment patterns of the university or could potentially influence digital device usage behaviors and subsequent symptom manifestation.

The study identified a remarkably high prevalence of DES symptoms among college students, with multiple ocular manifestations reported across the participant population. Headache emerged as the most common symptom, affecting three fourth of the study participants. This striking prevalence underscores the significant burden that DES places on student well-being and potentially on academic performance, as headaches can substantially impair concentration and cognitive function during study periods or lecture attendance. The high prevalence of reported ocular symptoms is concerning, with three-quarters of participants experiencing headaches attributed to digital device usage. This finding aligns with previous research identifying headache as a common manifestation of digital eye strain.[1,2,6] The substantial prevalence of other symptoms such as burning or itching sensation in eyes noted in half of the study participants and watering from eyes in almost half further underscores the significant impact of prolonged digital device usage on ocular health. This is similar to as reported by other researchers.[10,13,16]

The reported increase in screen time over the preceding three years suggests an escalating trend in digital device usage, potentially exacerbating the risk and severity of digital eye strain among university students. This trend may have been influenced by the COVID-19 pandemic, which necessitated a shift toward online learning and increased reliance on digital platforms for educational purposes.[1,14-16]

These findings highlight the need for preventive measures and interventions targeted at mitigating digital eye strain among university students. Strategies may include promoting awareness about healthy digital device usage practices, implementing the 20-20-20 rule (taking a 20-second break every 20 minutes to look at something 20 feet away), ensuring proper ergonomics, and regular eye examinations.

### *Limitations*

The study has inbuilt limitations of its cross-sectional nature. The findings from the study can be generalized only to similar study population. Detailed eye examination was not carried out considering the study setting.

## CONCLUSION

Digital eye strain represents a significant health concern among university students, with a high prevalence of ocular symptoms, particularly headaches, burning or itching sensation in eyes, and watering from eyes. The

universal ownership of smartphones and substantial ownership of laptops, coupled with increasing screen time, contribute to the risk of developing digital eye strain in this population.

Educational institutions should consider implementing awareness programs about digital eye strain and promoting healthy digital device usage practices. Additionally, regular eye examinations and consultations with eye care professionals should be encouraged, particularly for students experiencing persistent symptoms.

Future research should explore interventional strategies to reduce digital eye strain among university students and evaluate their effectiveness in improving ocular health outcomes. Longitudinal studies examining the long-term impact of digital device usage on visual function would also provide valuable insights.

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