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Original Research Article

Digital Eye Strain among Undergraduate Medical Students: A Cross-Sectional Study

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Abstract:

Background: The increased use of online educational platforms among undergraduate medical students may lead to digital eye strain (DES). This study aimed to evaluate the patterns of digital device use, the prevalence of DES symptoms, and the awareness of DES among these students.

Materials and Methods: This cross-sectional study was conducted among undergraduate medical students at GMERS Medical College, Junagadh, Gujarat, using a self-administered online questionnaire.

Results: Out of 1,000 students, 600 responded to the questionnaire. Among these, 89.33% (536 students) reported experiencing ocular and extra-ocular symptoms of DES, with headaches, watering, and redness of the eyes being the most common. Although 46.16% (277 students) were aware that digital device use can cause eye strain, less than 10% were aware of the ideal viewing distance for screens.

Conclusion: The study found a high prevalence of DES among undergraduate medical students. The lack of regular breaks and improper glare control from screens were linked to DES symptoms. Awareness of ergonomic measures during device use was notably low among the students.

Keywords: Undergraduate Students, Digital Eye Strain, Digital Device Use.

Introduction

The rapid advancement in digital technology has revolutionized the educational landscape, particularly in medical education. With the increased reliance on online platforms for lectures, assignments, and examinations, undergraduate medical students spend considerable time on digital devices. [1] While this shift has enhanced learning opportunities and accessibility, it has also led to a rise in digital eye strain (DES) among the student community. [2] DES, characterized by symptoms such as dry eyes, blurred vision, headaches, and neck pain, has become a growing concern for students who often endure long hours of screen time without adequate breaks or preventive measures. [3]

Digital eye strain results from prolonged exposure to digital screens, which emit blue light and require intense visual focus. [4] Medical students, who are already under significant academic pressure, may not prioritize eye health, exacerbating the issue. [5] The constant use of laptops, tablets, and smartphones for studying and accessing online resources, combined with poor ergonomic practices and insufficient breaks, increases the risk of developing DES. Despite the growing prevalence of this condition, awareness about its prevention and management remains low among students. [6] This study aims to investigate the pattern of digital device usage, the prevalence of DES symptoms, and the level of awareness about DES among undergraduate medical students.

By understanding usage patterns, it seeks to determine how frequently and for how long students use digital devices. The study also aims to estimate the prevalence of DES symptoms and assess awareness and preventive practices, highlighting the need for educational interventions to promote healthier digital habits.

Material and Methods

This cross-sectional questionnaire-based study was conducted at a tertiary care teaching institute in Junagadh from May to June 2024. The institute, G.M.E.R.S. Medical College, Junagadh, has a population of 1,000 undergraduate medical students. The study aimed to understand the digital device usage patterns, the prevalence of digital eye strain (DES) symptoms, and the awareness level about DES among these students. Given the rise in digital learning, it was essential to evaluate how

frequently and for how long students use digital devices, and whether this has led to increased instances of DES symptoms such as dry eyes, headaches, and blurred vision. This evaluation would provide valuable insights into the extent of the problem within this specific population.

To achieve a representative sample, a population size of 1,000 students was considered, leading to a calculated sample size of 600 respondents. This sample size was determined to ensure sufficient statistical power to detect significant findings regarding the prevalence of DES and associated factors. The selection of 600 respondents aimed to balance the need for comprehensive data collection with the feasibility of managing the survey within the given timeframe.

The study included undergraduate medical students of G.M.E.R.S. Medical College who regularly used online platforms. This inclusion criterion ensured that the participants were actively engaged in digital learning environments, making them relevant subjects for the study on DES. Students with pre-existing eye conditions, such as allergic eye diseases, glaucoma, or any retinal diseases, were excluded from the study. This exclusion was necessary to ensure that the DES symptoms evaluated were primarily related to digital device usage, and not confounded by other underlying eye conditions.

The primary outcome of the study was to determine the prevalence of DES symptoms among the students. Additionally, the study aimed to assess the level of awareness regarding DES and the preventive practices adopted by the students. Understanding these factors is crucial for prioritizing awareness activities and implementing preventive measures to mitigate DES symptoms. This data would help in formulating strategies to educate students about the risks associated with prolonged digital device usage and the importance of adopting preventive practices to maintain ocular health.

Data collection was carried out using a self-administered questionnaire, which was designed based on the common symptoms and risk factors associated with DES. The questionnaire was distributed electronically via email and student groups, ensuring wide reach and convenience for the respondents. It comprised six sections: user information, device usage, purpose of use, physical and mental health, social and behavioral impact, and control and awareness. These sections were structured to gather comprehensive information on the students' digital habits, the impact on their health, and their awareness and practices regarding DES.

Participants were informed about the study verbally and assured of their right to refuse participation at any point without any consequences. This was to ensure that participation was entirely voluntary and to address any ethical concerns.

No incentives were offered for participation, and the confidentiality of the respondents' data was strictly maintained, ensuring that personal information was protected. Ethical clearance was obtained from the Institutional Review Board of the institution, ensuring that the study adhered to ethical guidelines and standards. This ethical consideration was paramount to maintain the integrity of the study and the trust of the participants.

Results

The study assessed the awareness of digital eye strain (DES) and its preventive measures among 600 undergraduate medical students, aged 18 to 26 years, categorized by their year of study. The data revealed a high prevalence of digital eye strain (DES) symptoms associated with daily digital device usage. Headaches were reported by 536 students (89.33%), with the majority using devices for more than four hours daily. Watering eyes affected 354 students (59%), redness was observed in 58 students (9.6%), and sleep deprivation was reported by 26 students (4.3%). These findings highlight the significant impact of prolonged screen time on students' ocular health and overall well-being.

Table 1: Prevalence of Digital Eye Strain Symptoms among Students by Daily Screen Time

Symptom	<1 hr	1 to 2 hr	3 to 4 hr	>4 hr	Total (Percentage)
Headache	78	95	124	239	536 (89.33%)
Watering	56	76	94	128	354 (59%)
Redness	4	11	19	24	58 (9.6%)
Sleep deprivation	1	4	9	12	26 (4.3%)

Awareness of DES symptoms varied, with first-year students having the lowest awareness (16.07%) and third-year students the highest (60%).

Overall, 277 students (46.16%) were aware of DES symptoms, showing a strong association with the year of study. Awareness of the 20-20-20 rule was low across all years, with only 25 students (4.16%) familiar with it, and no significant variation by year. Similarly, knowledge about the ideal working distance from screens was limited, with 54 students

(9%) aware, and no significant difference based on the year of study.

These findings highlight the need for educational interventions to improve awareness about DES and its prevention, especially among early-year students.

Table 2: Level of Awareness among Undergraduate Medical Students Classified According to Year of Study

Awareness	First Year (n=112)	Second Year (n=118)	Third Year (n=130)	Fourth Year (n=117)	Final Year (n=123)	Total Students (n=600)	n (%)
Aware of symptoms of Digital Eye Strain	18	40	78	65	76	277	46.16%
Aware of 20-20-20 rule	2	8	5	6	4	25	4.16%
Aware of ideal working distance	8	10	12	13	11	54	9%

Discussion

In our study, a significant proportion of undergraduate medical students reported symptoms of digital eye strain (DES), with 89.33% experiencing headaches, 59% experiencing watering eyes, 9.6% reporting redness, and 4.3% experiencing sleep deprivation. These findings align with several other studies, highlighting the pervasive impact of prolonged digital device usage on ocular health. For instance, the study by Noreen et al. [7] among medical students found an overall CVS frequency of 98.7%, with symptoms such as eye irritation and neck-shoulder pain significantly associated with device distance and infrequent breaks. Similarly, Karmacharya et al. [8] reported a DES prevalence of 68.1% among Nepalese medical students during the COVID-19 pandemic, with burning sensation and eyesight worsening as common symptoms. These studies underscore the role of ergonomic factors and screen time in the prevalence of DES symptoms.

Similarly, Imran's [9] study found that DES was more prevalent among female students and those with pre-existing eye conditions like myopia, highlighting screen time duration and break frequency as significant risk factors. Our findings of high headache incidence among students using devices for more than four hours daily support this correlation. Additionally, Mohammed et al. [10] in Kerala reported that 90.3% of students experienced DES symptoms, with continuous device use without breaks being a significant factor. This aligns with findings from other studies, such as Shrestha and Pradhan [11], who reported a 90.8% prevalence of DES among medical students in Nepal during the COVID-19 pandemic. The increased screen time due to online classes was a significant factor, with their average screen time rising by 91.54% to nearly 8 hours daily. Similarly, Agarwal et al. [12] found that computer users with more than six hours of daily usage reported higher rates of ocular complaints, underscoring the impact of prolonged digital exposure on eye health. Further supporting our findings, Rahman and Sanip [13] observed that university staff using computers for more than five hours daily had significantly higher odds of developing computer vision syndrome. In a related study by Harshika et al. [14], 56.99% of medical students in Bihar with symptomatic DES used digital devices for more than four hours a day, with headaches being the most frequent symptom. These consistent results across various studies highlight the critical need for awareness and preventive measures, such as taking regular breaks and using ergonomic practices, to mitigate the adverse effects of prolonged digital device usage. The strong association between extended screen time and DES symptoms emphasizes the necessity for educational interventions to promote healthier digital habits among students.

In our study, awareness of digital eye strain (DES) symptoms varied, with first-year students at 16.07% and third-year students at 60%. Overall, 46.16% were aware of DES symptoms, 4.16% knew about the 20-20-20 rule, and 9% were aware of the ideal screen distance. Similarly, Noreen et al. [7] found that ergonomic factors and screen time were crucial in DES prevalence among medical students. Imran's study at Majmaah University [9] highlighted significant gaps in preventive measure awareness among Saudi students, linking extended screen time with more DES symptoms. Karmacharya et al. [8] reported inadequate DES prevention awareness among Nepalese students, worsened by increased digital usage during the pandemic. These consistent findings across studies emphasize the need for better educational interventions on ergonomic practices and screen time management to reduce DES among medical students.

This study's limitations include its reliance on a self-administered, anonymous, opt-in survey without ophthalmic examinations to verify the accuracy of submitted information. Additionally, as the study was confined to a single institution, the findings may not be generalizable to the broader population of medical students.

Conclusion

Our study concludes that while awareness of digital eye strain (DES) symptoms increases with academic progression among medical students, there is a significant gap in knowledge regarding preventive measures. This underscores the necessity for targeted educational interventions to enhance understanding and implementation of effective strategies to prevent DES, ensuring better ocular health and reducing the adverse effects of prolonged screen time among students.

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