Digital Eye Strain and Computer Vision Syndrome Among Doctors

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ABSTRACT

Purpose: To find the incidence and risk factors of digital eye strain among doctors.

Methodology: An online questionnaire was designed including the symptoms of digital eye strain. Based on the responses, digital eye strain score was calculated by using a pre-decided formula. If the participant's total digital eye strain (DES) score was greater than six points, it meant that they were experiencing digital eye strain.

Results: Within the allotted period, 228 doctors answered the questionnaire. The mean age of the doctors was 29 ± 2.58 years, out of which 147 (66.22%) were males. 54% were postgraduate residents (n=120), 20.3% were house officers (n=45) and 16.2% were consultants (n=36). A smart phone was the most often utilized digital device (n=216, 97.3%). Of the doctors, 35.6% spent 4-6 hours a day using digital devices, while 30.1% spent 6-8 hours a day using them. There was statistically significant association between digital eye strain score and screen time in hours per day (p=0.028). However no statistically significant association was found between the type of digital device used and the digital eye strain score (p=0.164).

Conclusion: The association between DES severity and screen time highlights the importance of moderating digital device usage to alleviate symptoms. While specific device preferences did not significantly influence DES severity, factors like screen brightness and viewing distance may play crucial roles.

Key Words: Asthenopia, Smart Phone, Physicians.

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INTRODUCTION

While the term 'computer vision syndrome (CVS)' has been prevalent in literature, the expanding use of

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various digital devices necessitates a more fitting term – 'digital eye strain' (DES). Over the past two decades, concerns about DES have grown, particularly with the widespread adoption of digital devices such as computers, laptops, tablets, and smartphones. The escalating screen time among millennials has contributed significantly to this issue.[1]

As many people don't consider devices such as tablets and smart phones to be computers, terms like digital eye strain (DES) and visual fatigue (VF) are now more commonly used for this condition. In recent times, usage of digital devices has become a critical part of daily life at home, work or in spare time.[2] Due to rapid increase in usage of digital devices, huge number of population among all age groups are at risk of DES.[3]As per the 2015 Digital Eye Strain report, nearly 9 out of 10 individuals spend over 2-3 hours per day on screen-based activities.[4]

There is an established relationship between severity of DES and screen time in hours per day.[5] Prolong exposure to smart phones can have negative effect on ocular health in all age groups.[6] Common symptoms of DES include dry eyes, itching, foreign body sensation, watering, eye strain, headache and blurred vision.[7,8] Different explanations have been given that why digital devices are associated with eye strain and ocular symptoms. Digital gadgets with poor definition are one of them. Unlike the print on paper, imprints are less sharply defined. In addition, viewing angles and distances typically vary from standard non-digital viewing. Thus, our visual processes are further strained by the eye focus and movement demands of digital viewing. High-energy visual (HEV) light, or blue light, which is released by digital devices and causes more eye strain than other colors with longer wavelengths, is thought to be another cause of DES.[1] Although many studies have been carried out to assess the prevalence of DES, no research is present to assess the magnitude of DES among doctors. The purpose of this study was be to find out the prevalence of DES and its association with screen time among doctors.

METHODOLOGY

It was a cross-sectional study with a questionnaire design that assessed DES in doctors. The authors created an online survey questionnaire with three sections: DES symptoms, information on digital devices, and a section on demography of the doctors. Participants were told of the study's goal and their anonymity prior to recruitment. Additionally, the participants were told that their identity would remain hidden and that their data would be used solely for research.

The relevant Institutional Review Board granted approval for the study, which was carried out in compliance with the Declaration of Helsinki. The doctors were asked to specify the type of digital devices they often use as well as the average number of hours they spend using them each day. The frequency and severity of DES symptoms were noted. The Google Forms app was used to create the online survey form, which was then shared as a Google link among doctors on social media. Responses were welcome for a week. Segui et al.'s Computer Vision Syndrome Questionnaire (CVS-Q) was utilized to assess the severity of the DES symptoms.[10]

The sixteen eye strain-related symptoms that the CVS-Q assessed were burning sensation, itching, foreign body sensation, difficulty in near vision, light intolerance, heaviness in the eyelids, dryness, double vision, watering, excessive blinking, redness, eye pain, colored halos, headache, and blurring of vision. The intensity of the symptoms was either moderate or intense, and the frequency was either never, occasionally, or always/often. The frequency was noted in this manner: "NEVER" denotes no symptoms at all; "OCCASIONALLY" denotes sporadic symptoms or once per week; "OFTEN OR ALWAYS" denotes two or three times per week or nearly every day.

Two rating scales were used to grade the 16 symptoms: one for intensity (moderate, intense) and another for frequency (never, occasionally, often, or always). A single scale known as

"symptom severity" was calculated by multiplying the responses to the two rating scales for each symptom. The outcome was noted as follows: 0 = 0; 1 or 2 = 1; 4 = 2.

The score was calculated by applying the following formula:

Score = 16 $\sum$ i=1 (frequency of symptom occurrence) i × (intensity of symptom) I

[Where Frequency: Never = 0, Occasionally = 1, Often or always = 2 and Intensity: Moderate = 1, Intense = 2].

The DES score is the final score which was calculated by adding up the severity score of all 16 symptoms. A person was deemed to have digital eye strain if their overall DES score was greater than or equal to six points. DES scores were further classified as mild (DES score = 6-12), moderate (DES score = 13-18), and severe (DES score = 19-32). All of the data that was collected from the respondents using the Google Drive link was exported as Microsoft Excel sheets. IBM SPSS Statistics was then used to conduct the statistical analysis. Qualitative variables were shown as percentages and numbers, and quantitative variables were shown as mean ± standard deviation. Using univariate logistic regression, the risk factors for DES were analyzed in relation to age, gender, kind of device used (smart phone, desktop, laptop/tablet), and amount of screen time. The associations between the qualitative variables were evaluated using the Chi-square or Fisher's exact test in the univariate analysis. P value $\leq$ 0.05 was considered as statistically significant.

RESULTS

A total of 228 doctors responded to the questionnaire within the set time frame. Of these, 222 responses were complete and included in the study analysis. The mean age of the doctors was 29 ± 2.58 years, of whom 147 (66.22%) were males. Of the respondents, 54% were postgraduate residents (n=120), 20.3% were house officers (n=45) and 16.2% were consultants (n=36). The most common digital device used was smart phone (n=216, 97.3%). The duration of digital device use was 4-6 hours per day in 35.6% and 6-8 hours per day in 30.1% of doctors.

In our study, the most prevalent symptoms linked to DES were headache (n = 117, 53.9%) and itching (n = 117, 53.9%). The least prevalent presenting symptoms were halos around objects (n = 44, 20.27%) and double vision (n = 24, 11.1%). In our cohort, the prevalence of DES was 70.27% (156/222) (Fig; I). Among them, 30.8% (n = 48) had moderate DES and 69.2% (n = 108) had mild DES.

Figure -1: Incidence of Digital Eye Strain (DES)

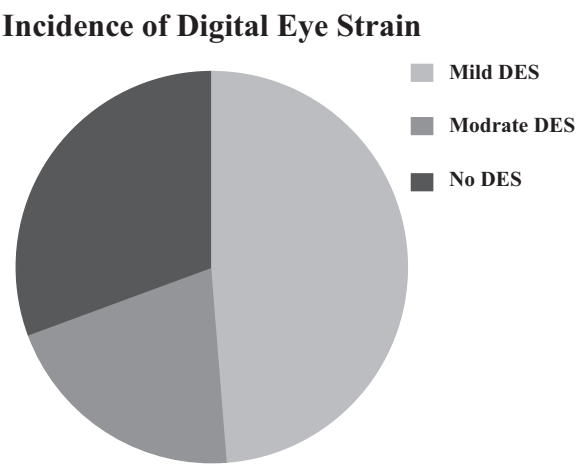

Table - 1: Association of Daily Screen time Per Hours with Digital Eye Strain

Screen Time in Hours Per Day	Digital Eye Strain Score			
	Less than 5	6-12	13-18	Total
less than 2 hours	0	3	0	3
2-4 Hours	21	15	6	42
4-6 Hours	24	33	18	75
6-8 Hours	15	33	15	63
More than 8 Hours	6	24	9	39
Total	66	108	48	222

Table - 2: Association Of Preferred Digital Device With Digital Eye Strain

Digital Device used Often by Doctors	Digital Eye Strain Score			
	Less than 5	6-12	13-18	Total
Smartphone	66	102	48	216
Tablet/iPad	0	3	0	3
Laptop	0	3	0	3
Total	66	108	48	222

There was statistically significant association between digital eye strain score and screen time in hours per day (p=0.028) (table I). The association between preferred digital device used by the doctors and digital eye strain score was found to be statistically insignificant (p=0.164) (table II).

DISCUSSION

The past decade has witnessed a substantial increase in digital device usage, leading to a heightened risk of Digital Eye Strain (DES). The proliferation of mobile devices has been particularly notable across all age groups. A 2016 report by the Vision Council highlighted that about two-thirds of adults between 30–49 years of age spend five or more hours on digital devices daily in the USA.[11] Similarly, in our study, the mean age of doctors was 29 ± 2.58 years, with two-thirds of the participants reported a screen time exceeding 5 hours. This surge in digital device usage can be attributed to various factors, including the growing prevalence of social media usage, online lectures for educational purposes, and the utilization of mobile devices for capturing clinical findings through images and videos.

The prevalence of itching (53.9%) and headache (53.9%) emerged as the most prominent symptoms associated with Digital Eye Strain (DES) in our study. These findings align with existing literature that emphasizes ocular discomfort and headache as frequent complaints among individuals experiencing prolonged digital device use .[12,13]

Interestingly, less common symptoms in our study included double vision (11.1%) and seeing halos around objects (20.27%). While these symptoms are less prevalent, their occurrence in a notable percentage of the study population underscores the varied and subjective nature of DES symptoms. This diversity in symptom presentation emphasizes the need for a comprehensive understanding of individual experiences with digital eye strain, considering factors such as visual habits, device usage patterns, and potential underlying visual anomalies.[2]

In our cohort, the prevalence of Digital Eye Strain (DES) was notably high, with 70.27% (156/222) of participants experiencing symptoms. This finding underscores the widespread impact of prolonged digital device usage on visual comfort and well-being. Moreover, our study revealed that a majority of individuals with DES experienced mild symptoms (69.2%), while a significant portion exhibited moderate symptoms (30.8%). These results are similar to previous research highlighting the prevalence of mild to moderate DES symptoms among individuals engaged in extensive screen time activities.[14,15]

Furthermore, our analysis revealed a statistically significant association between digital eye strain score and screen time in hours per day (p=0.028).

This observation corroborates existing literature emphasizing the direct relationship between prolonged screen exposure and the severity of DES symptoms.[2,8] Increased screen time has been consistently linked to heightened ocular discomfort and visual disturbances, underscoring the importance of monitoring and moderating screen usage habits to mitigate DES prevalence and severity. Interestingly, while preferred digital device usage among doctors varied, our study found no statistically significant association between the type of digital device used and the digital eye strain score (p=0.164). This suggests that factors beyond device preference, such as screen brightness, font size, and viewing distance, may contribute more significantly to DES symptomology.[12,10]

Factors that can reduce the risk of digital eye strain include daily screen time equal to or less than 4

hours, taking frequent breaks while using digital devices (20-20-20 rule - by looking at an object 20 feet away after every 20 minutes for 20 seconds), keeping the device 20 inches away and below the level of eyes, frequent blinking of eyes, maintaining upright posture and proper ambient lighting of device.[16,17,18]

A prospective interventional study concluded that use of single vision lenses with near addition may be helpful in coping and reducing the symptoms of Asthenopia secondary to digital devices.[19] Almari A and associates found a strong statistical association of Asthenopia and conjunctivitis with the use of digital devices.[20]

CONCLUSION

The association between DES severity and screen time highlights the importance of moderating digital device usage to alleviate symptoms. While specific device preferences did not significantly influence DES severity, factors like screen brightness and viewing distance may play crucial roles. Addressing DES requires comprehensive strategies, including awareness campaigns and ergonomic adjustments, to mitigate ocular discomfort and enhance visual well-being in the digital era.

Conflict of Interest: None to declare

Ethical Approval: The study was approved by the Institutional Review Board / Ethical Review Board Vide No.340/HEC/B&PSC/2023.

Author Contributions: Umaira Liaqat: Concept, Design, Data Collection.

Ahmed Usman Khalid: Data Collection, Literature Review.

Dhruval Ashok Khurana: Data Collection, Literature Review.

Ahmed Siddique Ammar: Data collection, Article Draft.

Ahmed Umer Sohaib: Data Analysis, Critical Review.

REFERENCES

1. Sanodiya I, Kujur A, Sirohi S, Khatri AK. A cross sectional overview of digital eye strain: a growing health concern in this digital age in central India (Madhya Pradesh). Int J Community Med Public Heal. 2019;6(11): 4828.
2. Rosenfield M. Computer vision syndrome (a.k.a. digital eye strain). Optom Pract. 2016;17(February):1–10.
3. Daum KM, Clore KA, Simms SS, Vesely JW, Wilczek DD, Spittle BM, et al. Productivity associated with visual status of computer users. Optometry. 2004;75(1):33–47.
4. 2015 Digital Eye Strain Report. 2015; Available from: https://www.michianaeye.com/storage/app/media/VC_DigitalEyeStrain_Report2015.pdf.
5. Maroof S, Mashhadi SF, Azam N, Haider K, Arshad N, Zulfiqar S, et al. Relationship of Screen Hours With Digital Eye Strain: a Cross Sectional Survey From Teenagers. Pakistan Armed Forces Med J. 2019;69(1):182–6.
6. Kim J, Hwang Y, Kang S, Kim M, Kim TS, Kim J, et al. Association between Exposure to Smartphones and Ocular Health in Adolescents. Ophthalmic Epidemiol. 2016;23(4):269–76.
7. Rashidi A, H S, Alhumaidan H. Computer vision syndrome prevalence, knowledge and associated factors among Saudi Arabia University Students: Is it a serious problem? Int J Health Sci (Qassim) [Internet]. 2017;11(5):17–9.
8. Sheppard AL, Wolffsohn JS. Digital eye strain: Prevalence, measurement and amelioration. BMJ Open Ophthalmol. 2018;3(1).
9. Rosenfield M. Computer vision syndrome: A review of ocular causes and potential treatments. Ophthalmic Physiol Opt. 2011;31(5):502–15.
10. Seguí MDM, Cabrero-García J, Crespo A, Verdú J, Ronda E. A reliable and valid questionnaire was developed to measure computer vision syndrome at the workplace. J

Clin Epidemiol. 2015;68(6):662–73.

11. Kaur K, Gurnani B, Nayak S, Deori N, Kaur S, Jethani J, et al. Digital Eye Strain- A Comprehensive Review. Ophthalmol Ther. 2022;11(5):1655–80.
12. Blehm C, Vishnu S, Khattak A, Mitra S, Yee RW. Computer vision syndrome: A review. Surv Ophthalmol. 2005;50(3):253–62.
13. Uchino M, Schaumberg DA, Dogru M, Uchino Y, Fukagawa K, Shimmura S, et al. Prevalence of Dry Eye Disease among Japanese Visual Display Terminal Users. Ophthalmology. 2008;115(11):1982–8.
14. Bababekova Y, Rosenfield M, Hue JE, Huang RR. Font size and viewing distance of handheld smart phones. Optom Vis Sci. 2011;88(7): 795–7.
15. Portello JK, Rosenfield M, Chu CA. Blink rate, incomplete blinks and CVS. Optom Vis Sci. 2013;90(5):482–7.
16. Jaschinski W, Heuer H, Kylian H. Preferred position of visual displays relative to the eyes: a field study of visual strain and individual differences. Ergonomics. 1998;41(7):1034–1049.
17. Borhany T, Shahid E, Siddique WA, Ali H. Musculoskeletal problems in frequent computer and internet users. J Family Med Prim Care. 2018;7(2):337–339.
18. Leung TW, Li RW, Kee CS. Blue-light filtering spectacle lenses: optical and clinical performances. PLoS ONE. 2017;12(1):e0169 114.
19. Alionis AC, Lui A, Netto TA, Alves MR. Evaluation of the effects of single vision lenses with additional near-power on computer-induced asthenopia. Revista Brasileira de Oftalmologia. 2020;79(5):325-9.
20. Alamri A, Alamri MM, Rashid FA, Alawashiz AS, Alqahtani FH, Alyami AA, et al. Association Between Digital Device Utilization and Asthenopia Among Medical Students at King Khalid University. Cureus. 2023;15(9). e45621. https://doi.org/10.7759%2Fcureus.45621