

Prevalence and Effect of Computer Vision Syndrome during COVID-19: among Bangladeshi People

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DOI: [10.36347/sasjm.2024.v10i04.001](https://doi.org/10.36347/sasjm.2024.v10i04.001)

| Received: 18.11.2023 | Accepted: 27.12.2023 | Published: 03.04.2024

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Abstract

Original Research Article

Background: Global pandemic has devastated almost every aspect of life. "Spatial distancing" involves creating and maintaining safe social distance, shifting the world away from public locations and toward isolation. Remote working has become a demand in these historically unique times, and technology is a need for human life as a link to the outside world. People use technology to interact, communicate, and complete activities. Online meetings, audio and video conferencing, and leisure activities like online gaming, blogging, and social networking have virtualized human interaction, leading to a rapid digitalization of human life. The increased usage of video display terminals (VDTs) predisposes to a range of problems. Digital eye strain (DES) or computer vision syndrome (CVS) refers to a group of health disorders that include not only visual issues but also musculoskeletal issues. **Objective:** The aim of this study is to determine the prevalence of CVS and to examine the use of digital screens, common symptoms, and related variables. The findings could in the future provide vital, detailed health information to all online users. **Methods and Materials:** A descriptive cross-sectional study was conducted from 1st July to 31st December, 2021. A total of 429 people participated in the study and majority of the participants were students and teachers involved in digital class rooms for academic purposes. A survey questionnaire was distributed on social media channels. Regular users of digital screens were provided with Google forms through social media. It includes both a questionnaire and an informed consent form. **Results:** Out of 429 participants in, 59.9% were females and 36.13% males. The maximum age group were from between 18-27, 58.9%, while the least were from 58 and above, 2%. The major digital screen platforms used by them were smartphone/tablet, 97.9%, television, 70.8% and computer laptop, 66.8%. The utilization of digital screens was categorized under entertainment (95.8%), academic (83.0%) and official purpose (35.8%). Among all participants 23.5% had previous history of dry eyes and among them, 19.9% were female while for male, 11.1%. A total of 92.5% were using spectacles or contact lens wherein, 18.96% were male and 30.56% were females. More than 28% reported that the CVS has not affected their lifestyle or ophthalmological health. 31.5% were not willing to reduce the usage of digital screen to prevent the CVS. Assessment of the timings of digital screen usage showed that the majority of them were continuous users, 52.9%. The duration of digital technology used was between 2 and 11 hours, 72.2%. However, the majority do not prefer to use digital screens in the dark room. Continuous screen usage is between 1-2 hours, 28.2%, with 46.1% of users using digital screens with a brightness level of 1-15%. More than 85% of participants maintained their brightness below 50%. The time at which the maximum number of people used the digital screen was at night (7.8%). Among 429 people, 7.2% didn't experience any kind of symptoms. 79.9% of respondents reported headaches, followed by neck/shoulder/back pain (54.5%), which could be due to improper posture or position. The association between age and gender with symptoms had significant association, however double vision was not significantly associated with both age and gender. There was no statistically significant between watering and light sensitivity with gender while eye redness is not associated with age. There was statistically significant with the continuous usage of digital technology and the symptoms. Similarly, hour spent on digital technology is also associated with symptoms, except eye pain. Except for double vision, itching, eye pain and eye redness, other symptoms were significantly associated with usage and digital screen in the dark room. **Conclusion:** During the COVID-19 pandemic, isolation was crucial. As screen time increased, CVS frequency climbed among Bangladeshi individuals under 28. Smartphones are most common usage and symptoms impacted many. Digital screens' high visual demands may cause eyesight issues. Time and position affect CVS intensity. Ophthalmologists or other healthcare experts could educate regular digital screen users about clinical symptoms and prevention strategies to reduce vision-related disorders. Avoid digital screen exposure and care for eyes. Follow 20-20-20 rules for healthy vision.

Keywords: Computer vision syndrome (CVD), Digital eye strain (DES), COVID-19.

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Citation: Shahed Haider Chowdhury, Mahfuza Pathan, Khondoker Ehsanul Arefin, Deen Mohd. Noorul Huq. Prevalence and Effect of Computer Vision Syndrome during COVID-19: among Bangladeshi People. SAS J Med, 2024 Apr 10(4): 204-211.

INTRODUCTION

Globally, the number of Internet users has expanded tremendously. According to WHO, in 2021, 65 % of the world's population, or five billion people, accessed the internet [1]. During the COVID-19 pandemic, rapid digital transformation increased the number of digital display device users worldwide [2]. On March 11, 2020, WHO labeled this outbreak a global pandemic [3]. The worldwide epidemic has had catastrophic effects on almost every facet of existence. "Spatial distancing" has become a globally endorsed technique involving the creation and maintenance of safe social distance, which has shifted the world away from public areas and shared locales and toward solitude [4].

This behavior resulted in the implementation of numerous regulations and suggestions, which led to the closure of all significant locations for public gathering and interaction, including schools, colleges, offices, airports, railway stations, shopping centers, mosques, temples, sports arenas, and has had an impact on nearly every aspect of life. Work from home (remote working practices) has become a need in these historically unique times, and technology has become a necessity for human existence as it is a necessary component for connection to the outside world [5]. People are now reliant on technology alone to engage, communicate, and carry out their tasks. In the form of online meetings, audio and video conferencing, and leisure activities such as online gaming, blogging, and social networking, human connection has become virtual, leading in a fast expansion in the digitization of all aspects of human existence. The education sector is yet another field in which long-standing educational traditions were disturbed, hence necessitating the adoption of alternative instructional tactics during the pandemic [2]. E-learning evolved as an alternate method for continuing education. Global educational institutions have been using various instructional platforms like as Google classroom, Zoom, and Microsoft teams. On these sites, a rapid increase in Internet traffic has also been noticed [6].

The increased usage of video display terminals (VDTs) predisposes to a range of problems. Digital eye strain (DES) or computer vision syndrome (CVS) refers to a group of health disorders that include not only visual issues but also musculoskeletal issues [7]. During the lockout period, the use of digital displays rose, which affected the incidence rate of CVS with significant demand for ophthalmological treatment. Almost all professionals were required to work from home using a digital platform, academic sessions were converted to a digital platform, and so on, resulting in extended use of digital displays. The usage of a digital screen is not limited to any age group [8]. According to studies, children are also using digital platforms for enjoyment and developing eye strain-related concerns. Recent studies have shown that 50 to 90% of persons exhibit certain computer vision syndrome symptoms [9, 10].

The American Optometric Association defines computer vision syndrome as a "complex of eye and vision disorders associated with activities that stress close vision and are encountered in connection to or while using a computer" [11]. The symptoms associated with CVS have been classified as follows: I ocular-surface symptoms such as dry eye, excessive watering, and eye irritation; (ii) asthenopic-eye fatigue, eye strain, and sore eyes; (iii) visual-related problems such as double vision, difficulty in focus change, and blurred vision; and (iv) extra-ocular symptoms such as back and neck pain and headache [12]. The primary causes of CVS or digital eye strain include illumination, use length, posture, glare, brightness, vision issues, etc [13]. Less evidence suggests that CVS causes chronic visual damage, although it may create inefficiency in everyday activities and can recur at the same sporadic intervals [14].

In January 2022, there are 52.58 million internet users in Bangladesh, according to a study. Beginning of 2022, 31.5 % of Bangladesh's entire population was connected to the internet. Analysis conducted by Kepios suggests that the number of internet users in Bangladesh rose by 5.5 million (+11.6%) between 2021 and 2022 [15]. During the COVID-19 pandemic, excessive internet usage seemed to be more prevalent among young adults than among elderly individuals, who were most susceptible to problematic internet use [16]. The younger generation is more likely to suffer from CVS since they are increasingly dependent on digital technologies. Eye strain and a general sensation of exhaustion were somewhat common among users, according to prior research conducted in Bangladesh [17]. However, no prior in-depth study was conducted on the prevalence and effect of CVS on Bangladeshi population during Covid-19.

The aim of this study is to determine the prevalence of CVS and to examine the use of digital screens, common symptoms, and related variables. The findings could in the future provide vital, detailed health information to all online students.

METHODS AND MATERIAL

A descriptive cross-sectional survey was conducted from 1st July to 31st August, 2021. Sample size was calculated using WHO sample size calculator taking prevalence as 74.3% from a recent study [18]. A total of 429 people participated in the study and majority of the participants were students and teachers involved in digital class rooms for academic purposes.

A survey questionnaire was distributed on social media channels. Regular users of digital screens were provided with Google forms through social media. It includes both a questionnaire and an informed consent form.

A standardized and verified survey questionnaire with both open- and closed-ended questions was used. The questionnaire was developed in English based on several research and recommendations. A pilot study was done with a small sample of the population to verify that they could grasp the questions and provide trustworthy responses. Before the start of the research, any errors in the questionnaire were corrected. Age, gender, purpose of use, platforms used, varied time of use, usage in a dark room, symptoms experienced, severity and frequency of symptoms, etc., were queried. According to many publications and the American optometric association, twenty symptoms were included in the research. Included were all the primary and widely seen eye-related symptoms and concomitant difficulties caused by prolonged screen usage, such as back discomfort, neck or shoulder pain, wrist or finger pain, etc.

Participants in the research were required to be at least 18 years old and to use digital screens continuously. Prior to the implementation of lockdown,

exclusions were made for those who used digital screens for more than six hours a day as part of their employment or other work.

Statistical Analysis

The statistical analysis was done using SPSS version 23. The variables were expressed in both frequencies and percentage and Pearson's Chi-square test was used to compare the various factors, with CI 95% and $P < 0.05$.

RESULTS

Out of 429 participants in table 1, 59.9% were females and 36.13% males. The maximum age group were from between 18-27, 58.9%, while the least were from 58 and above, 2%. The major digital screen platforms used by them were smartphone/tablet, 97.9%, television, 70.8% and computer laptop, 66.8% (*Fig 1*). The utilization of digital screens was categorized under entertainment (95.8%), academic (83.0%) and official purpose (35.8%) (*Fig 2*).

Table 1: Demographic variables

Variables	n	%
Age		
18-27	253	58.9
28-37	150	34.9
38-47	124	29
48-57	22	5.1
59 <	9	2
Gender		
Male	172	40.1
Female	257	59.9
Usage of digital screen		
Computer/laptop	287	66.8
Television	304	70.8
Smartphone/tablet	420	97.9
Purpose of use		
Academic	356	83.0
Entertainment	411	95.8
Job	154	35.8

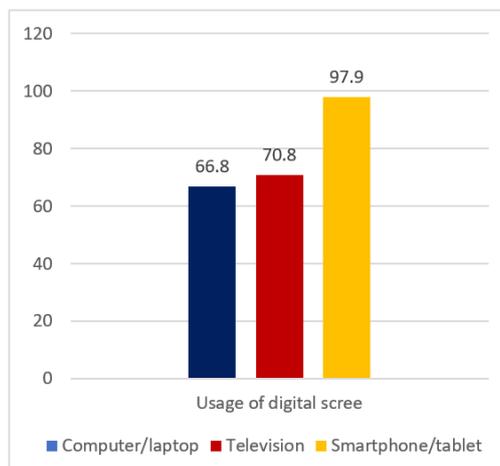


Fig. 1: Usage of digital screen

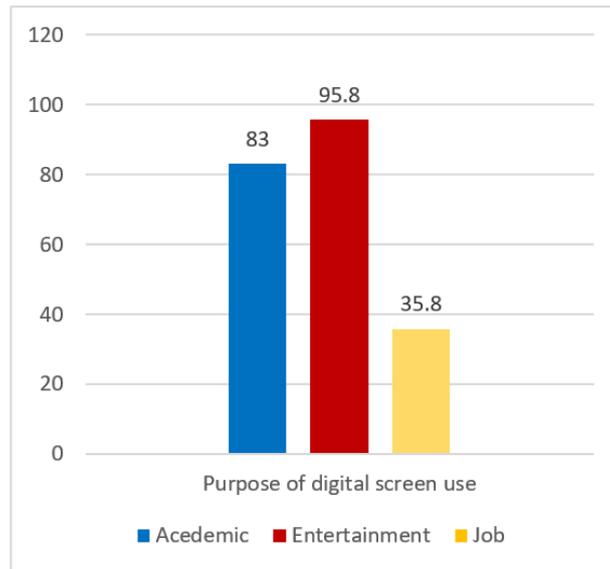


Fig. 2: Purpose of digital screen use

Among all participants 23.5% had previous history of dry eyes (table 2). In this cases the female community had higher rate of incidence of 19.9% while for male, 11.1%. A total of 92.5% were using spectacles or contact lens wherein, 18.96% were male and 30.56%

were females. More than 28% reported that the CVS has not affected their lifestyle or ophthalmological health. 31.5% were not willing to reduce the usage of digital screen to prevent the CVS.

Table 2: Medical history and lifestyle

Variable	n	%
Previously diagnosed with dry eyes	101	23.5
Wearing glasses or contact lens	397	92.5
Concepts of CVS in lifestyle and eyes		
Affect	308	71.8
Not affect	121	28.2
Willing to decrease use of digital screen	135	31.5

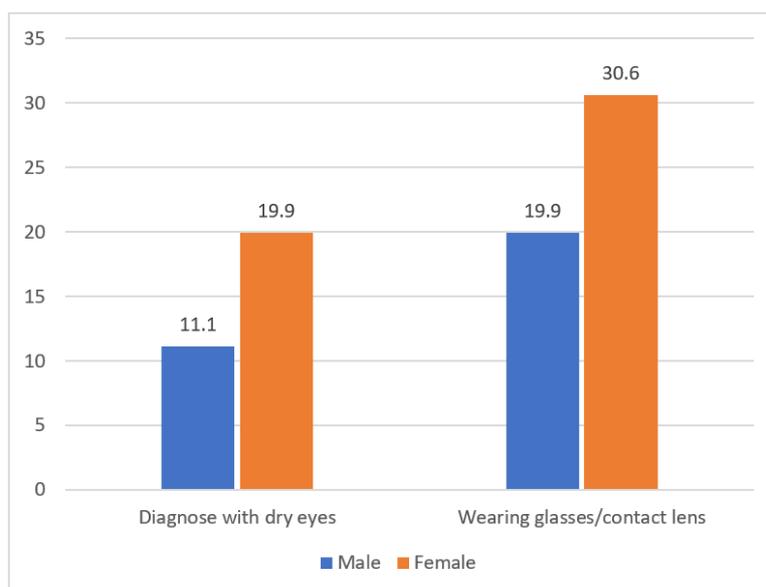


Fig. 3: Prevalence of medical history among the gender

Assessment of the timings of digital screen usage showed that the majority of them were continuous users, 52.9%. The duration of digital technology used was between 2 to 11 hours, 72.2%. However, the majority do not prefer to use digital screens in the dark room. Continuous screen usage is between 1-2 hours, 28.2%, with 46.1% of users using digital screens with a brightness level of 1 to 15%. Many of them were concerned about the brightness due to power issues and light. More than 85% of participants maintained their

brightness below 50%. As the brightness is linked with day light and room light, in the outdoors it should be increased for exact visibility but in the indoors it can affect eyes and sometimes even lead to headaches with a short duration of use. The time at which the maximum number of people used the digital screen was at night (7.8%). However, even after midnight, there was a moderately high number of users which in turn could affect the sleep pattern. In the morning and noon, it was 3.03% and 4.7%, respectively (Table 3).

Table 3: Digital screen timing and brightness

	n	%
On continuous basis		
No	39	9.1
Occasionally	227	52.9
Always	163	37.0
Hours spent		
≤ 2	22	5.1
2-6	167	38.9
7-11	143	33.3
12≤	97	22.6
Hours of usage of screen in dark room		
≤ 2	253	58.9
2-6	101	23.5
7-11	56	13.1
12≤	19	4.4
Continuous usage of screen (Hr)		
<1	133	31
1-2	121	28.2
2-3	111	25.9
>3	64	14.9
Level of brightness (%)		
0-10	97	22.6
11-25	198	46.1
26-50	86	20.0
51-75	30	6.9
76-100	18	4.2
Most spending time throughout the day		
Morning	13	3.03
Noon	20	4.7
Evening	115	26.8
Night	205	47.8
Midnight and after	76	17.7

Among 429 people, 7.2% didn't experience any kind of symptoms. Based on observation, we couldn't ignore any one of the responses as some of the symptoms have the potential to affect our lifestyle or can lead to permanent damage. 79.9% of respondents reported

headaches, followed by neck/shoulder/back pain (54.5%), which could be due to improper posture or position. Eye pain, tearing, itching, and blurred vision were the other reported symptoms (table 4, fig. 4).

Table 4: Prevalence of symptoms

Symptoms	n	%
Blurred vision	60	13.9
Burning	3	0.7
Colures halos	19	4.4
Difficulty focusing for near vision	12	2.7
Double vision	9	2.1
Dryness	20	4.7

Symptoms	n	%
Excessive blinking	14	3.3
Eye pain	56	13.1
Eye redness	25	5.8
Fatigue	47	10.9
Feeling of a foreign body	2	0.5
Feeling of sight worsening	7	1.6
Headache	343	79.9
Heavy eyelid	87	20.3
Inability to hold object wells	10	2.3
Increase sensitivity to light	48	11.2
Itching	97	22.6
Finger and wrist joint pain	118	27.5
Neck/shoulder/back pain	234	54.5
Tearing	43	10.0
No symptoms	31	7.2

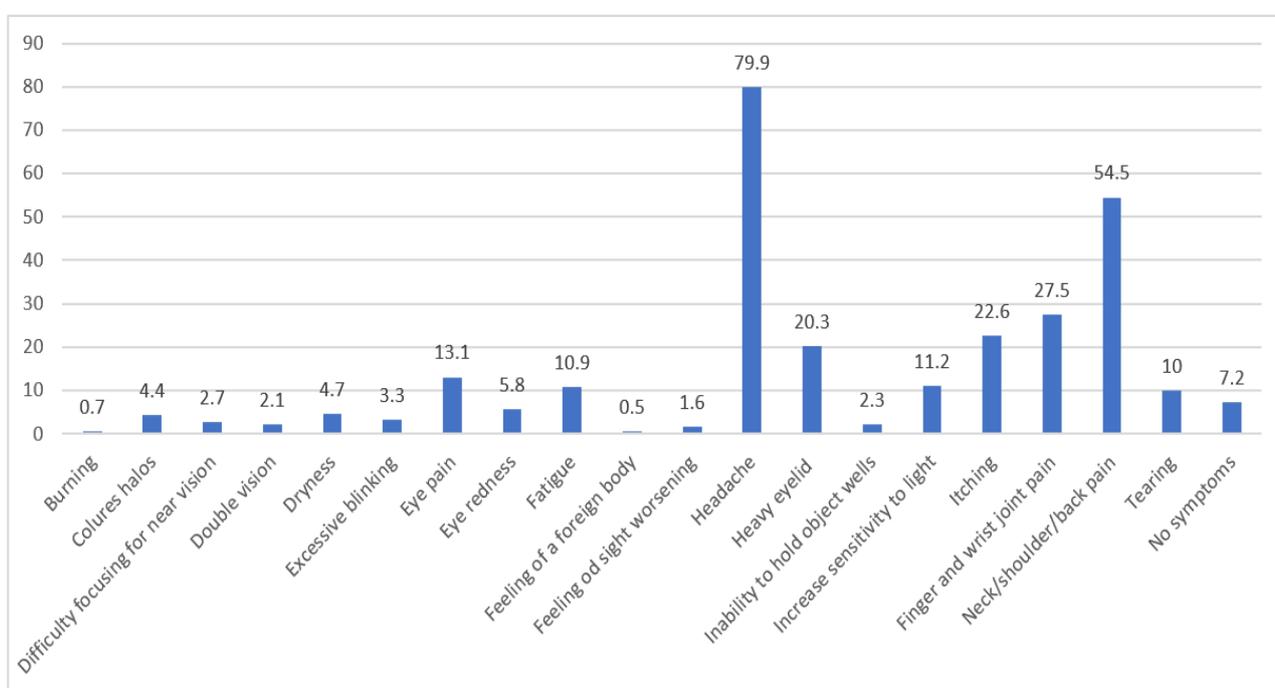


Fig. 4: Prevalence of symptoms

To analyze the association between the variables. Pearson correlation was used. The association between age and gender with symptoms had significant association, however double vision was not significantly associated with both age and gender. There was no statistically significant between watering and light sensitivity with gender while eye redness is not

associated with age. There statistically significant with the continuous usage of digital technology and the symptoms. Similarly, hour spent on digital technology is also associated with symptoms, except eye pain. Except for double vision, itching, eye pain and eye redness, other symptoms were significantly associated with usage od digital screen in the dark room (table 5).

Table 5: Association of age, gender and computer usage with symptoms CVS

Symptoms	P value				
	Age	Gender	Continuous usage	Hour spent on digital technology	Usage in dark room
Blurred vision	0.001	0.000	0.002	0.049	0.000
Burning	0.021	0.013	0.005	0.004	0.023
Double vision	0.082	0.193	0.022	0.034	0.123
Dryness	0.021	0.011	0.028	0.001	0.045
Itching	0.012	0.029	0.000	0.002	0.984

Symptoms	P value				
	Age	Gender	Continuous usage	Hour spent on digital technology	Usage in dark room
Wrist and finger joint pain	0.043	0.921	0.001	0.045	0.020
Neck/Shoulder/back pain	0.000	0.030	0.002	0.002	0.001
Tearing	0.043	0.054	0.023	0.000	0.003
Headache	0.004	0.005	0.000	0.004	0.000
Fatigue	0.022	0.490	0.060	0.001	0.034
Increase sensitivity to light	0.005	0.089	0.000	0.003	0.012
Eye pain	0.001	0.001	0.000	0.893	0.290
Eye redness	0.053	0.000	0.000	0.014	0.058

DISCUSSION

The present era's emphasis on digitalization has profound roots in this age of repression. The implementation of courses, employment, and other tasks via digital media includes children, youth, and all other demographic groups. Current conditions compel the whole planet to transition everything, including education, employment, etc., to a digital platform. During this period, the number of portable systems and various displays rose. This research was primarily concerned with the relationship between digital media and the prevalence of chronic obstructive pulmonary disease (CVS) among Bangladeshi residents. Smartphones were found to be the most extensively utilized device. Participants younger than 28 years of age reported an increase in the frequency and severity of symptoms. Even though the majority of the symptoms were transitory, prolonged exposure to them might result in lasting eye issues. According to a number of studies, between 70 and 90% of long-term screen users have some of the symptoms associated with CVS [19, 20].

The suggested amount of screen time for adults is eight hours, while for children it is two [21]. However, the current environment requires more, which might cause digital eye strain. In this research, age, gender, and length of use were shown to be significantly linked with symptoms. CVS is not seen as a condition that affects people dwelling in a specific geographical place or whose employment position is dependent on their occupation, such as IT workers, computer-oriented authorities, etc., but rather as a global issue impacting all demographic groups.

In 2018, Iqbal M. *et al.*, conducted research on CVS among medical students [22], which revealed a much lower incidence of symptom occurrence than our study. Reddy Setal performed second research on eye strain at a university in 2013 that had lower results than the first [23]. According to *et al.*, 2018 research, 33% of the population in Northwest Ethiopia had symptoms [24]. In all research, headache was the most common symptom. A study by Logaraj M. *et al.*, found that as use duration rises, so do the risks of CVS and the intensity of symptoms [25]. In contrast to all previous studies, our study found that usage rose along with accompanying symptoms.

The primary cause of CVS might be a lack of understanding about this illness or ignorance of precautions for the safe use of digital screens. Self-reported symptoms and ocular examination may have yielded more accurate findings, which were the significant constraints. More research is needed, particularly from ophthalmologic clinics, to determine the incidence, severity, and frequency of CVS, as well as the factors influencing its development. The main limitations of this study were the lack of ophthalmic examination to measure CVS and the self-reporting of symptoms. As a result, symptoms that may not have been recognized by users would not have been reported. To reduce the impact of self-reported measurements, we have established and implemented standard methodology. Although we have employed a procedure to quantify CVS symptoms that might occur when using a computer, some CVS symptoms, such as blurred vision and eye strain, may be caused by uncorrected refractive error, which could possibly overstate the prevalence. According to the present research, the incidence of CVS among risk categories such as the elderly, who do not use eyeglasses/spectacles was not statistically different from that of their peers who exhibited no significant bias.

CONCLUSION

Distancing oneself from others was necessary during the COVID-19 pandemic. The prevalence of CVS grew among Bangladeshi citizens, particularly adults under the age of 28, as screen time increased. The majority of individuals favor using smartphones. Many people experienced various symptoms. It is advisable to schedule a doctor's consultation if the symptoms do not go away. High visual demands from digital screens might cause eyesight difficulties and other related concerns. The intensity of CVS can alter as exposure time and position change. In order to lessen the frequency and severity of vision-related issues, ophthalmologists or other healthcare professionals should properly educate regular digital screen users about the clinical manifestations and prevention techniques. Additionally, unwelcome digital screen exposure should be avoided, and the eyes should receive the proper care.

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