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A Survey Project on Prevalence of Digital Eye Strain among College Students after COVID 19 Outbreak

Debolina Kumar

Assistant Professor, The Neotia University, Sarisha, West Bengal, India
Address – 24C S. S. PALLY, Kolkata – 700061

Abstract: ***Purpose of this study: The main aim of this study is to assess the relationship between digital eye strain and exposure to digital devices among college students post covid outbreak in the year 2021. Methodology: For the above study, sixty three students are selected purposively and surveyed using a pre designed self - administered questionnaire on digital eye strain. Results: Sixty three students are studied and tables and charts are made accordingly. From the table we can see that, digital eye strain is associated with number of hours exposed to the screen and number of days of device used. Conclusion: Digital eye strain (DES), also known as computer vision syndrome, encompasses a range of ocular and visual symptoms, and estimates suggest its prevalence may be 50% or more among computer users. Symptoms fall into two main categories: those linked to accommodative or binocular vision stress and external symptoms linked to dry eye. At greatest risk for developing DES are those persons who spend two or more continuous hours at a computer or using a digital screen device every day. Solutions to digital screen - related vision problems are varied. However, they can usually be alleviated by obtaining regular eye care and making changes in how the screen is viewed. In some cases, individuals who do not require the use of eyeglasses for other daily activities may benefit from glasses prescribed specifically for computer use. In addition, persons already wearing glasses may find their current prescription does not provide optimal vision for viewing a computer.***

Keywords: Digital eye strain, COVID - 19, digital devices, asthenopia.

1. Introduction

Digital device usage has increased substantially in recent years across all age groups, so that extensive daily use for both social and professional purposes is now normal. Digital eye strain (DES), also known as computer vision syndrome, encompasses a range of ocular and visual symptoms, and estimates suggest its prevalence may be 50% or more among computer users. Symptoms fall into two main categories: those linked to accommodative or binocular vision stress and external symptoms linked to dry eye. Although symptoms are typically transient, they may be frequent and persistent, and have an economic impact when vocational computer users are affected.[1]

Smartphone and tablet use in worldwide is reaching saturation levels and associated visual and ocular discomfort such as headaches, eyestrain, dry eyes and sore eyes are widespread. Eye discomfort with smartphones and tablets is discussed alongside similar symptoms reported with desktop computer use. Handheld devices differ from computers in viewing position and distance, screen size and luminance, and patterns of use. Accommodation is altered with handheld device use, with increased lag and decreased amplitude. Smartphone and tablet use results in reduced fusional convergence and possibly a receded near point of convergence. This is similar to what happens with computer use. Use of handheld digital devices, like computers, may adversely impact tear stability.[2]

2. Risk Factors

Viewing a computer or digital screen often makes the eyes work harder. As a result, the unique characteristics and high visual demands of computer and digital screen viewing make many individuals susceptible to the development of vision - related symptoms. Uncorrected vision problems can increase the severity of computer vision syndrome (CVS) or digital eyestrain symptoms. Viewing a computer or digital screen is different than reading a printed page. Often the letters on the computer or handheld device are not as precise or sharply defined, the level of contrast of the letters to the background is reduced, and the presence of glare and reflections on the screen may make viewing difficult.

Viewing distances and angles used for this type of work are also often different from those commonly used for other reading or writing tasks. As a result, the eye focusing and eye movement requirements for digital screen viewing can place additional demands on the visual system. In addition, the presence of even minor vision problems can often significantly affect comfort and performance at a computer or while using other digital screen devices. Uncorrected or under corrected vision problems can be major contributing factors to computer - related eyestrain. Even people who have an eyeglass or contact lens prescription may find it's not suitable for the specific viewing distances of their computer screen. Some people tilt their heads at odd angles because their glasses aren't designed for looking at a computer or they bend toward the screen in order to see it clearly. Their postures can result in muscle spasms or pain in the neck, shoulder or back. In most cases, symptoms of CVS occur because the visual demands of the task exceed the visual abilities of the individual to comfortably perform them. At greatest risk for developing CVS are those persons who spend two or more continuous hours at a computer or using a digital screen device every day. The most common symptoms associated with digital eyestrain are eyestrain, headaches, blurred vision, dry eyes, and neck and shoulder pain. These symptoms may be caused by poor lighting,

Glare on a digital screen, improper viewing distances, poor seating posture, uncorrected vision problems, a combination of these factors. The extent to which individuals experience visual symptoms often depends on the level of their visual abilities and the amount of time spent looking at a digital screen. Uncorrected vision problems like farsightedness and astigmatism, inadequate eye focusing or eye coordination abilities, and aging changes of the eyes, such as presbyopia, can all contribute to the development of visual symptoms when using a computer or digital screen device. Many of the visual symptoms experienced by users are only temporary and will decline after stopping computer work or use of the digital device. However, some individuals may experience continued reduced visual abilities, such as blurred distance vision, even after stopping work at a computer. If nothing is done to address the cause of the problem, the symptoms will continue to recur and perhaps worsen with future digital screen use.[3]

Suggestions for computer vision syndrome sufferers

- **Don't take a vision problem to work:** Even if glasses are not needed for driving, reading or other activities, they still may offer benefits for a minor vision problem that is aggravated by computer use. A mild glasses prescription may be needed to reduce vision stress on the job. It's a good idea for computer users to get a thorough eye exam every year.
- **Glasses should meet the demand of the job:** If glasses are worn for distant vision, reading or both, they may not provide the most efficient vision for viewing a computer screen, which is about 20 to 30 inches from the eyes. Tell the doctor about job tasks and measure on - the - job sight distances. Accurate information will help get the best vision improvement. Patients may benefit from one of the new lens designs made specifically for computer work.
- **Minimize discomfort from blue light and glare:** Blue light from LED and fluorescent lighting, as well as monitors, tablets and mobile devices, can negatively affect vision over the long term. Special lens tints and coatings can reduce the harmful impact of blue light. Minimize glare on the computer screen by using a glare reduction filter, repositioning the screen or using drapes, shades or blinds. Also, keeping screens clean; dirt - free and removing fingerprints can decrease glare and improve clarity.
- **Adjust work area and computer for comfort:** When using computers, most people prefer a work surface height of about 26 inches. Desks and tables are usually 29 inches high. Place the computer screen 16 to 30 inches away. The top of the screen should be slightly below horizontal eye level. Tilt the top of the screen away at a 10 - to 20 - degree angle.
- **Use an adjustable copyholder:** Place reference material at the same distance from eyes as the computer screen and as close to the screen as possible. That way the eyes won't have to change focus when looking from one to the other.
- **Take alternative task breaks throughout the day:** Make phone calls or photocopies. Consult with co - workers. After working on the computer for an extended period, do anything in which the eyes don't have to focus on something up close.[5]

3. Aims and objectives

The aims of this study are:

- To assess the prevalence of digital eye strain among college students.
- To find out the correlation between daily use of digital devices with digital eye strain.

4. Methodology

All students in the age group of nineteen to twenty two, studying in the state university are selected purposively. Total sixty three students are being considered. They are carefully assessed using a pre designed self - administered questionnaire on digital eye strain.

1) Inclusion criteria

The respondents should be enrolled in any of the undergraduate programs at the state university (West Bengal)

2) Exclusion criteria

The students below 18 years of age will be excluded from the study since consent from the parents of those students will not be feasible to obtain. To identify the ineligible participants, a screening question about age was included in the questionnaire.

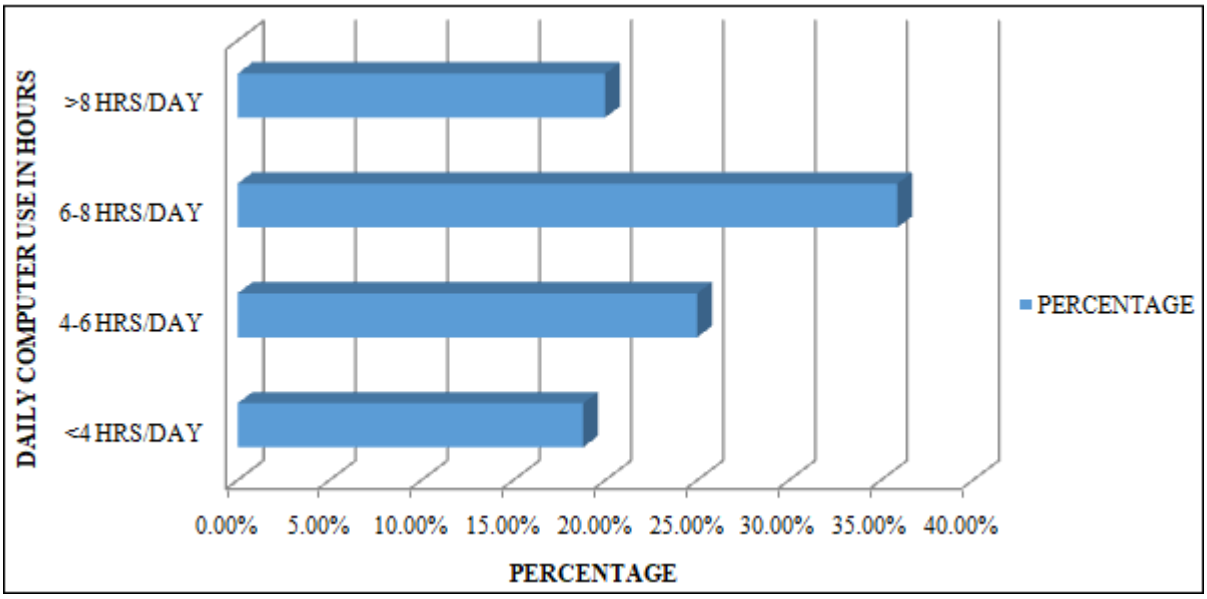
3) Study Variables

The dependent variable of the study is the presence of DES.

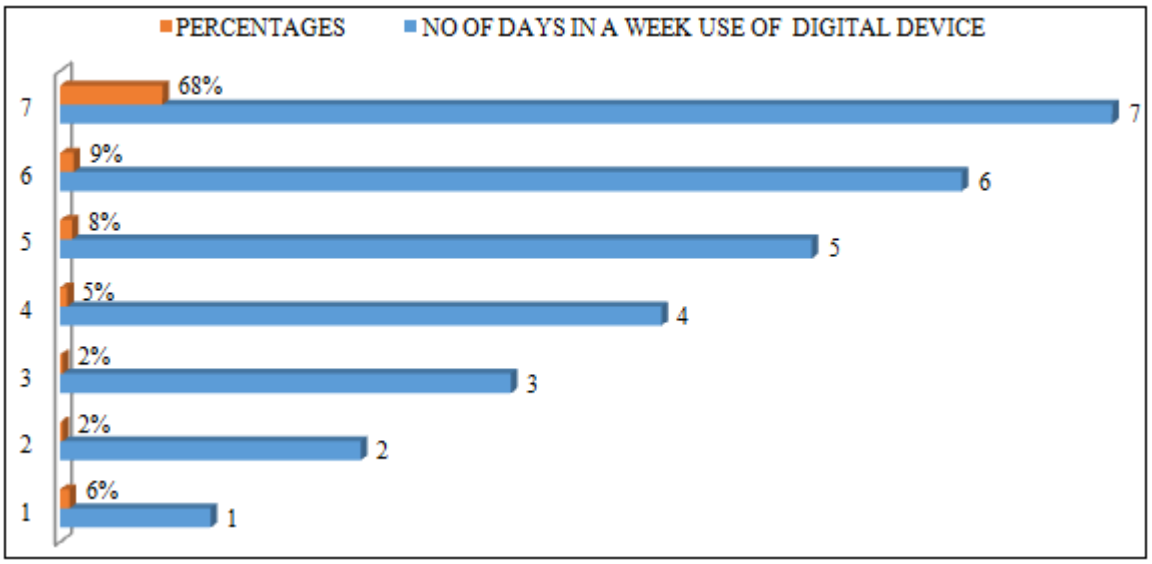
The independent variables will include age, gender, duration of computer use, frequent blinking of eyelids, viewing distance of the screen, level of top of the computer screen, seating position, glare on the computer screen, brightness of the surroundings, CVS awareness, taking breaks, wearing glass, screen brightness adjustment, use of VDT filter, use of eye lubricants, presence of chronic eye diseases, medication use, presence of other chronic diseases, presence of refractive errors.

5. Results

Computer Use	Percentage
<4 HRS/Day	18.80%
4 - 6 HRS/Day	25%
6 - 8 HRS/Day	35.90%
>8 HRS/Day	20%



No. of Days in a Week Use of Digital Device	Percentages
1	6%
2	2%
3	2%
4	5%
5	8%
6	9%
7	68%



Contingency Table

	digital device used 4 - 8hrs daily	digital device use <4hrs daily	Total
Digital eye strain	34	3	37
No digital eye strain	5	3	8
Total	39	6	

Calculation of Expected Value

	Digital device used 4 - 8hrs daily	digital device use <4hrs daily	Total
Digital eye strain	32	5	37
No digital eye strain	7	1	8
Total	39	6	

Chi Square Test

f_0	f_e	$(f_0 - f_e)^2$	$(f_0 - f_e)^2/f_e$
32	49	289	9.0
3	5	4	0.8
5	7	4	0.6
3	1	4	4
			χ^2=14.4

Critical χ^2 0.001 (1) = 10.828

As the computed χ^2 far exceeds the critical χ^2 square for the 0.001 level, the computed χ^2 is highly significant ($p<0.001$). So, we conclude that there is a significant correlation between duration and days of digital device use with digital eye strain.

6. Discussion

Digital eye strain is the temporary discomfort that follows two or more hours of digital device use. A variety of electronic devices can cause digital eye strain, including televisions, desktop and laptop computers, smart phones, e - readers, tablets, and gaming systems, especially when they are used simultaneously or when switching repeatedly from one device to another. Digital - related eye strain affects people of all ages. If you spend hours a day using digital devices, you might notice your vision blurs, and your eyes feel achy and tired. You may also find your eyes become dry, and will tear or sting.

Finally the statistical analysis shows that there exist a significant correlation between duration and days of digital device use with digital eye strain, using $\mathcal{X}^2$ test.

From the contingency table we can see that 34 Students, who are using digital devices for 4 to 8 hours every day, are suffering from dry eye, neck pain, headache, and shoulder pain and eye fatigue. So, we can see that the students are suffering from digital eye strain.

Duration in front of a screen of >5 h was found to be a significant risk factor for higher DES scores in our study, which is a well - known factor for asthenopia among digital device users. A study reported that the prevalence of DES was significantly higher in individuals who spent >4 h per day on digital devices. Similar results were found in another study, which reported that the duration in front of a screen was directly proportional to the DES symptoms. Shortening the duration of digital device use has a great effect on the symptoms of DES. The 20/20/20 rule has been suggested to minimize asthenopia symptoms during computer use. After every 20 minutes of digital device use, look at a distance of 20 feet for at least 20 seconds.[9]

7. Conclusion

Digital device usage has increased substantially in recent years across all age groups, so that extensive daily use for both social and professional purposes is now normal.

From the above study we can conclude that the prevalence of DES among the undergraduate students of the state university is more than 50%. There is also a correlation between duration and daily use of digital devices with Digital Eye Strain. Students those who are using digital devices for 4 to 8 hours daily for a continuous week have already developed DES. This is based on their visual complaints as surveyed through questionnaire.

Assessing the prevalence of DES and the factors that contribute to it among the university undergraduates can support the development of recommendations for specific DES prevention strategies in the student population.

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Sample Questions

1) How often do you take a break while using computer/other digital devices?
2) Do you use eyeglasses?
3) What is the purpose of your eyeglasses?
4) Does your eyeglasses contain anti - reflecting and/or blue light filter coating?
5) What for do you use digital devices?
6) Do you adjust your lighting conditions while working at night
7) Do you have a habit of frequent voluntary blinking?
8) Do you have neck pain?
9) Do you have shoulder pain?
10) Do you have burning of eyes?
11) Do you have Itching eyes?
12) Do you have Tearing eyes?
13) Do you have Excessive blinking?
14) Do you have Eye redness?
15) Do you have Eye Pain?
16) Do you have Dryness in eyes?
17) Do you have blurred vision at near?
18) Do you have blurred vision at distance?
19) Do you have Double vision?
20) Do you have difficulty refocusing from one distance to other?