

Computer Vision Syndrome among Undergraduate Medical Students of Nepal: a cross-sectional study

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DOI :

<https://doi.org/10.3126/jpsn.v3i2.65284>

ABSTRACT

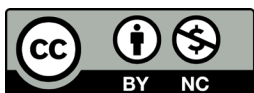
Background : Prolonged computer use can lead to Computer Vision Syndrome (CVS), a group of symptoms that affects work efficiency and productivity. Medical students are at high risk for CVS. This study aimed to assess the frequency of CVS among undergraduate medical students in Nepal.

Methods : A descriptive cross-sectional study was conducted among 190 first and second-year medical students at Nepalgunj Medical College. Data were collected using a semi-structured questionnaire and analyzed using descriptive and analytical statistics.

Results : Among 190 participants, most (86.3%) reported symptoms of CVS, with headache (49.5%) and neck/shoulder pain (47%) being the most common, and double vision (3.7%) the least common ones. Blue filters (51.6%) and correction glasses (49.5%) were the most common preventive measures, while only 15.8% of students followed the 20/20/20 rule. Female students had higher rates of refractive errors ($p=0.016$) and headache ($p=0.041$), but lower rates of redness ($p=0.019$), compared to males. Symptoms were significantly associated with longer duration of device use ($p<0.001$).

Conclusion : CVS is prevalent among medical students and was related to device use habits. Increased awareness of the effects of computer use and its preventive measures is needed in medical colleges.

Keywords: Digital devices, medical students, Nepal, ocular symptoms, syndrome



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INTRODUCTION

Computer Vision Syndrome (CVS) is a group of symptoms that are common to those with eye and vision-related discomfort due to prolonged use of computer devices.¹ Common manifestations include dry eyes, eye strain, blurred vision, double vision, red eyes, burning eyes, excessive tearing, headache, and neck and shoulder pain.² Such temporary discomfort reduces the efficiency of work and productivity.³ Online lectures and ebooks are popular among medical students as digital devices like tablets, mobile phones, and laptops have become affordable, portable, and easily accessible compared to high priced bulky medical books. Students are encouraged to use digital devices for their studies.^{3,4,5} Such practices increase the risk of CVS in medical students. Despite its growing frequency, this problem has not been studied well in the Nepali medical population. The objective of this study is to assess the frequency of CVS and the use of preventive measures among undergraduate students of a medical college in Nepal.

MATERIALS AND METHODS

This study was carried out at Nepalgunj Medical College (NGMC), Basic Science Campus, Chisapani, Banke, Nepal from 16th April 2022 to 12th June 2022. Out of 200 students of the 23rd and 24th batch, 190 provided written consent and participated in the study. The participants were given a questionnaire in person, and were verbally explained about the study design, objectives, and aims. The questions were built based on a literature review, and were also reviewed by experts.

Subjects with known systemic diseases and those taking medications with visual side effects, such as diabetes and hypertension, were excluded from the study. In addition, participants using topical eye drops or medication with ocular side effects were also excluded. The questionnaire, along with consent form were distributed to all participants. The questionnaire consisted of demographic information, refractive errors, use of digital devices, ocular and extra-ocular symptoms related to CVS, and preventive measures used.

Data were collected anonymously and confidentially. The data was entered and analyzed using Statistical Package for Social Sciences (IBM® SPSS®) version 16. Descriptive statistics were expressed as frequency and proportion, and inferential statistics

were calculated using the Chi-Square test. A p-value of less than 0.05 was considered statistically significant. The research proposal was approved by the Institutional Review Committee (NGMCTH-IRC, Ref no. 731/078-079) on 16th March 2022, and ethical clearance was obtained before the start of the study.

RESULTS

Total 190 students participated from first and second year MBBS course. Their mean age was 21±1.36 years. Sex ratio was 1.53:1, with more number of males. The parameters documented in students and their sex comparison is shown in table 1. It shows that females had higher frequency of refractory errors, visited the clinic for eye check-up regularly more often, but also reported higher frequency of headache as a symptom of CVS. Males had higher frequency of using devices with higher brightness and in lying position, but also reported higher frequency of redness of eyes.

Preventive measures

As shown in figure 2, more than half of the students (51.58%) used blue light filter in their devices. Other common preventive measures used were correction glass, blinking eyes frequently, regular eye check-up and use of antiglare filter in the screen. Most of the students (54.2%) were not aware of the rule of 20-20-20 to be followed during any screen use, and only 30 students practised it. Forty (21%) did not use any form of preventive measures.

Association

We tested the association among the CVS symptoms, the preventive measures used and the different parameters of device usage (Table 2).

The result shows that a higher prevalence of CVS symptoms was observed among students who used computers for extended periods of time on a daily basis, particularly for over two hours. The use of correction glasses for refractive errors, blue light filters on screens, and adherence to the 20/20/20 rule were found to be significant protective factors against CVS symptoms. However, factors such as years of computer usage, screen brightness, distance from the eyes, use of antiglare filters, regular eye exams, frequency of blinking, and the frequency of taking breaks were not found to be significantly associated with the presence of CVS symptoms.

Table 1. Demography and the computer usage parameters in participants

| Characteristics | Total (percent) | Frequency Male (percent) | Frequency Female (Percent) | Chi Square | P value |
|-----------------------------------------------|-----------------|--------------------------|----------------------------|------------|---------|
| Total students | 190 (100) | 115 (60.5) | 75 (39.5) | | |
| First year | 95 (50) | 47 (40.87) | 48 (64) | | |
| Second year | 95 (50) | 68 (59.13) | 27 (36) | | |
| Duration of device use | | | | | |
| <1 year | 14 (7.4) | 9 (7.83) | 5 (6.66) | 0.86 | 0.651 |
| 1-2 years | 16 (8.4) | 8 (6.96) | 8 (10.67) | | |
| >2 years | 160 (84.2) | 98 (85.21) | 62 (82.67) | | |
| Duration of device use per day | | | | | |
| 1-2 hours | 23 (12.1) | 15 (13.05) | 8 (10.67) | 4.998 | 0.172 |
| 2-4 hours | 66 (34.7) | 39 (33.91) | 27 (36) | | |
| 4-6 hours | 71 (37.4) | 38 (33.04) | 33 (44) | | |
| >6 hours | 30 (15.8) | 23 (20) | 7 (9.33) | | |
| Types of device use | | | | | |
| Mobile/tab | 92 (48.4) | 56 (48.69) | 36 (48) | 0.222 | 0.974 |
| Laptop/desktop | 6 (3.2) | 4 (3.48) | 2 (2.67) | | |
| Multiple devices | 92 (48.4) | 55 (47.83) | 37 (49.33) | | |
| Brightness setting used in the screen | | | | | |
| <10% | 25 (13.2) | 11 (9.57) | 14 (18.67) | 11.55 | 0.021* |
| 11-25% | 66 (34.7) | 35 (30.43) | 31 (41.33) | | |
| 26-50% | 81 (42.6) | 53 (46.09) | 28 (37.33) | | |
| >50% | 18 (9.5) | 16 (13.91) | 2 (2.67) | | |
| Minimum distance of screen from eyes | | | | | |
| < forearm length | 133 (70) | 75 (65.22) | 58 (77.33) | 3.173 | 0.075 |
| > forearm length | 57 (30) | 40 (34.78) | 17 (22.67) | | |
| Preferred position during device use | | | | | |
| Mostly sitting | 40 (21.1) | 17 (14.78) | 23 (30.67) | 10.046 | 0.007* |
| Mostly lying | 49 (25.8) | 37 (32.18) | 12 (16) | | |
| Both | 101 (53.2) | 61 (53.04) | 40 (53.33) | | |
| Methods of studying | | | | | |
| Conventional books | 30 (15.8) | 18 (15.65) | 12 (16) | 0.107 | 0.95 |
| Digital devices | 9 (4.7) | 5 (4.38) | 4 (5.33) | | |
| Both | 151 (79.5) | 92 (80) | 59 (78.67) | | |
| Other diagnoses (previously diagnosed) | | | | | |
| Refractory errors | 96 (50.5) | 50 (43.48) | 46 (61.33) | 5.789 | 0.016* |
| Dry eyes | 64 (33.7) | 35 (30.43) | 28 (37.33) | 2.65 | 0.27 |

Table 2. Symptoms of Computer Vision Syndrome and its gender comparison in students

| Symptom category | Total Frequency (percent) | Symptoms | Total Frequency (percent) | Male Frequency (percent) | Female Frequency (percent) | Chi Square | P value |
|------------------------|---------------------------|----------------------|---------------------------|--------------------------|----------------------------|------------|---------|
| Asthenopic | 114 (60) | Eye strain | 62 (32.6) | 33 (28.7) | 29 (38.67) | 2.053 | 0.152 |
| | | Red eyes | 36 (19) | 28 (24.35) | 8 (10.67) | 5.533 | 0.019* |
| | | Dry eyes | 70 (37) | 36 (31.3) | 34 (45.33) | 3.84 | 0.051 |
| Ocular surface related | 108 (57) | Watery eyes | 78 (41) | 50 (43.48) | 28 (37.33) | 0.708 | 0.40 |
| | | Burning | 64 (33.7) | 35 (30.43) | 29 (38.67) | 1.377 | 0.241 |
| Visual problems | 75 (39.5) | Blurred vision | 73 (38.4) | 45 (39.13) | 28 (37.33) | 0.062 | 0.80 |
| | | Double vision | 7 (3.7) | 5 (4.35) | 2 (2.67) | 0.362 | 0.548† |
| Extra ocular | 136 (71.5) | Neck & Shoulder pain | 89 (47) | 56 (48.7) | 33 (44) | 0.402 | 0.526 |
| | | Headache | 94 (49.5) | 50 (43.48) | 44 (58.67) | 4.189 | 0.041* |
| | | | 44 (23.2) | 27 (23.48) | 17 (22.67) | 0.017 | 0.897 |
| Any CVS symptom | 164 (86.32) | | | 96 (83.48) | 68 (90.67) | 1.986 | 0.159 |

DISCUSSION

Although CVS is commonly referred to as a syndrome, it does not meet the medical definition of a true syndrome, as CVS is just a series of signs and symptoms related to prolonged computer use. The problem occurs due to the difference in the composition of images displayed on computer screens compared to printed images. Computer images are made up of pixels with bright centers and ill-defined edges that can strain the eyes and make it difficult to focus. The prevalence of CVS is increasing, particularly among young students, as technology becomes increasingly integrated into our daily lives.

Of the 190 students participated in our study, 86.32% reported experiencing some form of CVS symptom at the time of data collection. This prevalence rate is comparable to previous studies in India (66%)⁶ and Pakistan (98.7%)⁷, indicating that this issue is a widespread health concern among young individuals. A study on the

employees of Nobel Medical College Biratnagar in 2020 gave the prevalence of CVS symptoms to be 92.4%,⁸ whereas another study on the students of Kist Medical College showed the figure to be 67%.⁹ The higher proportion of CVS symptoms in females (90.7%) compared to males (83.5%) was not significant ($p=0.16$) in this study, as was seen in other studies.^{2,10,11} A larger sample size study is necessary to clarify the potential sex difference.

Among the symptoms of CVS, common ones reported were headaches (49.5%), followed by neck and shoulder pain (46.8%) and watery eyes (41%). Literature review shows a high frequency of such extraocular symptoms^{2, 3, 8, 11, 12, 17-19} along with asthenopic symptoms like eye strain and dry eyes.^{6,9,12-16} The least common symptom was diplopia (double vision) followed by redness of eyes, similar to other studies.^{2,3}

Our results also suggest that the daily duration of computer use is a significant risk factor for the development of CVS symptoms.^{3, 4, 6, 7, 9, 14-16, 18-21} This

Table 3: Association of presence of CVS symptoms and the different parameters of computer use and the preventive measures taken by students

| | Characteristics | Frequency Male (percent) | Frequency Female (Percent) | Chi Square | P value |
|---------------------------------------|------------------|--------------------------|----------------------------|------------|---------|
| Duration of device use | <1 year | 1 (7.14) | 13 (92.86) | 0.855\$ | 0.652 |
| | 1-2 years | 3 (18.75) | 13 (81.25) | | |
| | >2 years | 22 (13.75) | 138 (86.25) | | |
| Duration of device use per day | 1-2 hours | 7 (30.4) | 16 (69.6) | 18.383\$ | <0.001* |
| | 2-4 hours | 15 (22.7) | 51 (77.3) | | |
| | 4-6 hours | 2 (2.8) | 69 (97.2) | | |
| | >6 hours | 2 (6.7) | 28 (93.3) | | |
| Brightness setting used in the screen | <10% | 2 (8) | 23 (92) | 1.833\$ | 0.767 |
| | 11-25% | 10 (15.15) | 56 (84.85) | | |
| | 26-50% | 12 (14.81) | 69 (85.19) | | |
| | 50-75% | 1 (7.14) | 13 (92.86) | | |
| | >75% | 1 (25) | 3 (75) | | |
| Minimum distance of screen from eyes | < forearm length | 16 (12) | 117 (88) | 1.027 | 0.311 |
| | > forearm length | 10 (17.54) | 47 (82.46) | | |
| Antiglare filter | Not used | 17 (14.53) | 100 (85.47) | 0.184 | 0.668 |
| | Used | 9 (12.33) | 64 (87.67) | | |
| Regular eye check up | Not done | 18 (15.38) | 99 (84.62) | 0.745 | 0.388 |
| | Done | 8 (11) | 65 (89) | | |
| Frequent eye blinking | Not done | 17 (15.6) | 92 (84.4) | 0.791 | 0.374 |
| | Done | 9 (11.1) | 72 (88.9) | | |
| Frequency of breaks | Every hour | 16 (16.84) | 79 (83.16) | 2.772\$ | 0.428 |
| | Every 2 hours | 3 (7) | 40 (93) | | |
| | Every >2 hours | 5 (15.63) | 27 (84.37) | | |
| | none | 2 (10) | 18 (90) | | |
| Using correction glass | No | 19 (20.2) | 75 (79.8) | 6.713 | 0.01* |
| | Yes | 7 (7.3) | 89 (92.7) | | |
| Using blue light filter | No | 19 (20.7) | 73 (79.3) | 7.332 | 0.007* |
| | Yes | 7 (7.1) | 91 (92.9) | | |
| Rule of 20/20/20 | Not followed | 4 (7) | 53 (93) | 12.038\$ | 0.002* |
| | Followed | 0 (0) | 30 (100) | | |
| | Don't know | 22 (21.4) | 81 (78.6) | | |

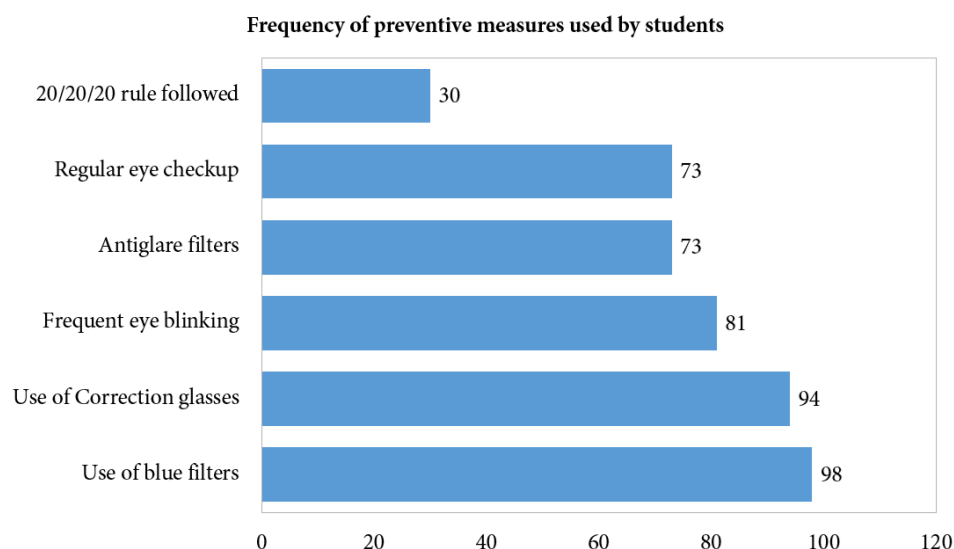


Figure 2: Frequency (number) of students utilizing different preventive measures (multiple responses).

highlights the importance of reducing prolonged computer usage, particularly for 2 hours or more a day, which is common among young students. In addition, other risk factors for CVS, including years of device use, high brightness, and myopia,^{6, 10, 16} should also be considered when evaluating and addressing the issue of CVS.

While some students in our study reported using preventive measures, such as screen filters and correction glasses, many were unaware of or did not follow other recommended measures, such as the 20/20/20 rule. This means there is a need for increased education and awareness among students and health professionals about the importance of ergonomic practices and the use of preventive measures to reduce the impact of CVS. It is interesting to note that more CVS positive students used some of the preventive measures such as screen filter and 20/20/20 rules. It is possible that presence of symptoms in the students made them aware of the problem and started using the preventive measures. A longitudinal study is necessary in this regard to evaluate the causal association among these factors.

Given the high prevalence of CVS symptoms among college students and the impact it can have on their health and academic performance, it is essential that steps are taken to address this issue. Recommendations for the prevention of CVS include correction of refractive errors, modification of the work station, reduction of brightness, proper device and body positioning, anti-glare screen

filters, regular eye check-ups, and exercise.^{5, 20} The display screen should have a high resolution, matte type and high refresh rate, and breaks in computer use should be taken as per 20/20/20 rule, i.e., break every 20 minutes for 20 seconds, looking 20 feet (6 meter) away, as suggested by the American Optometric Association¹. Additionally, proper lighting and seating position and placement of the computer in relation to the head should be adjusted, as a part of ergonomic awareness recommendation.^{3, 15, 21}

Limitations

The cross-sectional design of the present study precludes the establishment of causality between device use patterns and CVS symptoms. Additionally, the grading/severity and duration of symptoms were not recorded, which could have provided further insights into the relationship between CVS and device use. The study also lacked Schirmer's test and tear film breakup time test, due to resource limitations.

CONCLUSION

Our study suggests a high prevalence of CVS symptoms among college students, with the daily duration of computer use identified as a significant risk factor. To address this issue, it is important to promote healthy computer use habits in medical colleges. Further research is needed to determine the causal relationship between CVS symptoms and preventive measures, and to evaluate the impact of

different preventive measures.

CONFLICT OF INTEREST

None.

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