



Prevalence and Characteristics of Computer Vision Syndrome Among Nursing Students in Online Learning Environments: A Cross-Sectional Study

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A B S T R A C T

The increased use of digital devices in online learning poses health risks, one of which is Computer Vision Syndrome (CVS). Nursing students are among the vulnerable groups due to high visual load and long learning duration. This study aims to describe the symptoms of CVS in nursing students during online learning and evaluate the behaviour of using digital devices as a risk factor. The study used a quantitative descriptive design with a cross-sectional approach. A total of 399 nursing students from various universities in Indonesia participated through a total sampling technique. Data were collected online using a questionnaire based on the American Optometric Association guidelines, including demographic information, online learning behaviour, and CVS symptoms. The analysis was done descriptively with frequency distribution and percentage. The results showed that the majority of respondents experienced CVS symptoms in the mild to moderate category, such as headache (47.9% mild; 37.8% moderate), burning eyes (42% mild), and blurred vision (39.6% mild). Most students (62.9%) used smartphones and had been studying online for more than six months (94.9%). In conclusion, CVS is a common problem among nursing students in online learning. Educational and preventive interventions are needed to maintain students' visual health.

INTRODUCTION

The development of information and communication technology has driven a significant transformation in the world of education, especially since the COVID-19 pandemic. Lectures that were previously dominated by face-to-face learning have drastically changed to online learning based on digital devices. While online learning provides flexibility, time efficiency, and broad access to digital resources, prolonged exposure to computer screens, laptops, and smartphones has its health impacts (Jakhar et al., 2023). One of the most reported effects is visual fatigue or Computer Vision Syndrome (CVS), which can slowly reduce students' learning comfort and academic performance (L. Wang et al., 2021).

Various studies have shown that CVS is becoming an increasingly common health problem in the digital age. Data shows that around 50-90% of computer users experience symptoms of eyestrain due to intensive use of digital screens (Seresirikachorn et al., 2022). A study revealed that during the pandemic, the prevalence of CVS increased significantly, with around 70% of students and college students experiencing at least one symptom (C. Wang et al., 2023). In Indonesia, a study found that 74% of university students experienced eyestrain after following online learning for more than 4 hours per day, characterised by complaints of headache, dry eyes, and blurred vision (Noreen et al., 2021).

Although various studies have addressed Computer Vision Syndrome in the general population, there is limited research that evaluates this condition explicitly in nursing students, especially considering demographic characteristics and digital device usage behaviour in the context of online learning. In fact, understanding the prevalence and characteristics of CVS symptoms in this group is very important, given the strategic role of nursing students as future health workers who will be the pioneers of promotive and preventive education in the community (Iqbal et al., 2021). This lack of contextual data creates a gap in efforts to develop appropriate interventions in nursing higher education.

In response to this problem, this study was designed to provide a descriptive picture of CVS symptoms experienced by nursing students during online learning. This study is expected to provide a comprehensive mapping of the form, intensity, and distribution of visual symptoms experienced by students. The findings can also serve as a basis for designing promotive, educative, and ergonomic strategies for healthier digital learning in the nursing environment.

Based on the above background, the purpose of this study is to identify and describe the symptoms of Computer Vision Syndrome in nursing students during online learning. This study also aims to explore the relationship between demographic characteristics and digital learning behaviours with the intensity of visual symptoms experienced, to provide strategic recommendations for educational institutions in managing student visual health more optimally.

METHOD

This research is a quantitative study with a descriptive approach and cross-sectional design. The purpose of this study was to describe the symptoms of Computer Vision Syndrome (CVS) experienced by nursing students during online learning. The research was conducted in November 2020 - February 2021. The population in this study was all nursing study programme students from various public and private universities in Indonesia. The sampling technique used was non-probability sampling with a total sampling approach, where all students who met the inclusion criteria were asked to participate in the study. In this study, the inclusion criteria were (a) nursing students who participated in online learning for at least 1 month, (b) actively participated in learning activities, and (c) filled out the questionnaire completely. The exclusion criteria were students who did not complete the questionnaire.

The minimum sample size was calculated using the proportion estimation formula at the 95% confidence level and 5% margin of error, assuming an event proportion of 0.5 (Bujang, 2023). Based on these calculations, the minimum number of samples required is 385 respondents. In this study, 399 respondents met the inclusion criteria and were declared eligible for analysis.

The data collection procedure used an online questionnaire distributed through WhatsApp groups and nursing student forums. Before filling out the questionnaire, each participant was explained the objectives and methods of the study and asked to agree to the informed consent sheet. Confidentiality of respondents' identity and data was guaranteed throughout the research process. The research instrument was a structured questionnaire that was prepared based on CVS symptoms according to the guidelines of the American Optometric Association (Gadain Hassan, 2023). The questionnaire consisted of three main sections: (a) demographic data (age and gender), (b) behaviour during online learning (daily duration of learning, devices used, and total length of online learning), and (c) CVS symptoms, which included headache, burning eyes, blurred vision, double vision, eye strain, dry eyes, neck pain, and shoulder pain. Assessment of symptoms was conducted using a 4-point Likert scale: 1 = Never, 2 = Sometimes, 3 = Often, 4 = Always. Data were analysed descriptively with frequency distribution and percentage to describe demographic characteristics, online learning behaviour, and prevalence of CVS symptoms among respondents.

RESULT

Respondent Characteristics.

399 nursing students were participating in this study. Many respondents were between 17-20 years old (56.9%), while the rest were 21-25 years old (43.1%). Based on gender, most respondents were female (87.7%), and the rest were male (12.3%). Respondent demographics can be seen in table 1 below.

Table 1. Demographics of nursing student respondents

Demography	n	%
Age		
17 – 20	227	56.9
21 - 25	172	43.1
Gender		
Man	49	12.3
Woman	350	87.7

Behavior during online learning

Duration of online learning per day, more than half of the respondents (59.1%) follow online learning for less than 5 hours per day, while the other 40.9% spend more than 5 hours per day. In terms of devices used, many students use smartphones (62.9%), while the rest use laptops (37.1%). As for the overall duration of participation in online learning, almost half of the respondents have been participating in online learning for more than 12 months (48.6%), followed by those who have been learning online for more than 6 months (46.4%), and only a small proportion (5%) have been participating in online learning for less than 6 months.

Table 2. Student behaviour during online learning

Behaviour	n	%
Learning duration per day		
< 5 hours	236	59.1
> 5 hours	154	40.9
Equipment when online		
Smartphone	251	62.9
Laptop	148	37.1
The length of learning carried out		
< 6 Months	20	5
> 6 Months	185	46.4
> 12 Months	194	48.6

Visual fatigue symptoms

Visual fatigue symptoms experienced by university students showed variations in severity. The most common symptom reported was headache, with 47.9% of respondents experiencing mildness, 37.8% moderate, and 3.3% severe. Other symptoms that were reported quite frequently were: Eye burning: 42% mild, 25.1% moderate, 3.5% severe. Blurred vision: 39.6% mild, 30.3% moderate, 4.8% severe. Eye strain: 42.9% mild, 29.1% moderate, 4.3% severe. Dry eyes: 40.6% mild, 27.3% moderate, 4.5% severe. Some of the symptoms reported with lower intensity were double vision, with the majority (51.9%) not experiencing such symptoms, and neck and shoulder pain, which were significant with 14.3% and 11% of respondents reporting severe symptoms respectively.

Table 3. Prevalence of Computer Vision Syndrome (CVS) Symptoms Felt by College Students (N=399).

Symptoms of VCS	No Complaints		Minor Complaints		Moderate Complaint		Serious Complaints	
	N	%	N	%	N	%	N	%
Headache	44	11	191	47.9	151	37.8	13	3.3
Burning eyes	116	29.1	169	42	100	25.1	14	3.5
Blurred vision	101	25.3	158	39.6	121	30.3	19	4.8
Double vision	207	51.9	119	29.8	62	15.5	11	2.8
Strained eyes	95	23.8	171	42.9	116	29.1	17	4.3
Dry eyes	110	27.6	162	40.6	109	27.3	18	4.5
Sore neck	39	9.0	151	37.8	155	38.8	57	14.3
Shoulder core pain	49	12.3	162	40.6	144	36.1	44	11

DISCUSSION

Characteristics of respondents

This study involved 399 nursing students from various universities in Indonesia. The majority of respondents were between 17-20 years old (56.9%), while the rest were 21-25 years old (43.1%). This age range reflects that most participants are in the early to mid phase of higher education, which is cognitively and psychosocially still in an active stage of development. Young age is often associated with faster adaptation to digital technology, but can also increase the risk of visual fatigue due to intensive use of digital devices. Research shows that young students are prone to experiencing eyestrain during prolonged online learning (Kumar et al., 2022).

The proportion of respondents was dominated by women at 87.7%, while men only amounted to 12.3% based on gender. This is in line with the demographic trend in nursing study programs in Indonesia, where the nursing profession is still dominated by women. Some studies show that women are more likely to report symptoms of visual fatigue than men. For example, research found that women more often experienced symptoms of eyestrain during online learning (Abuallut et al., 2022).

This demographic composition provides an overview of the profile of nursing students targeted in this study, and is an important basis for analyzing the relationship between individual characteristics with learning behavior and the prevalence of Computer Vision Syndrome (CVS) symptoms experienced (Noreen et al., 2021). With the productive age background and the dominance of female respondents, it can be anticipated that visual load during online learning may have different impacts based on age group and gender, which needs to be further analyzed at a later stage.

Behavior during Online learning

The change of learning system to online mode during the COVID-19 pandemic has brought major implications to the learning behavior of students, including nursing students. In this study, it was found that most respondents (59.1%) participated in online learning for less than 5 hours per day, while the rest (40.9%) spent more than 5 hours per day in front of digital devices. This duration of exposure has the potential to increase the risk of visual fatigue, especially when online activities are carried out continuously without adequate breaks. Previous research has shown that screen exposure of more than 4 hours per day can significantly worsen symptoms of Computer Vision Syndrome (CVS), especially when not accompanied by good device ergonomics (Nowik, 2020).

In addition, the type of device used also contributes to the level of visual comfort during learning. Most respondents in this study (62.9%) used smartphones as their main device, while only 37.1% used laptops. Prolonged use of smartphones tends to increase eye strain due to the small screen size, contrasting lighting, and closer viewing distance compared to the use of laptops or external monitors (Chu et al., 2023). The study noted that intensive use of devices with small screens is associated with complaints such as dry eyes, eye strain, and decreased visual accommodation (Minarni Wartinarsih, 2023). This is an important concern in the context of online education, especially among nursing students who are busy with visual-based learning activities and academic reading.

The overall duration of participation in online learning was 48.6% of respondents had participated in online learning for more than 12 months, and 46.4% for more than 6 months. This means that the majority of students have experienced prolonged exposure to screen-based learning activities. Long-term exposure to screens, especially without eye health interventions such as periodic breaks, screen filters, or the application of the 20-20-20 rule (take an eye break every 20 minutes, looking at objects 20 feet away for 20 seconds), can lead to the accumulation of visual fatigue (Alghamdi & Alrasheed, 2020). This fact

reinforces the importance of understanding and educating digital learning ergonomics in order to prevent long-term visual impairment, including CVS, in nursing students.

Prevalence of Computer Vision Syndrome (CVS) Symptoms felt by students

Based on the results of the study, most nursing students experienced various forms of visual complaints during online learning. The most commonly reported symptom was headache, which was experienced by almost all respondents in varying degrees of severity. In addition, complaints such as burning eyes, blurred vision, eye strain, and dry eyes were also commonly found. While mild to moderate complaints predominated, the presence of severe complaints in some respondents is noteworthy. This situation indicates the visual stress experienced by students during prolonged interaction with digital screens, both in synchronous lecture activities and independent assignments.

Various factors can influence the appearance of CVS symptoms in students, including the long duration of screen exposure, the use of devices with small screen sizes such as smartphones, and learning environments that do not necessarily support visual comfort (Lindo-Cano et al., 2022). In this study, the majority of respondents used smartphones as their main device for online learning, which tends to pose its own challenges to eye comfort. The close proximity of the screen, the small font size and the lack of appropriate lighting also make the work of visual accommodation more difficult. In addition, the habit of studying without taking breaks or stretching the eyes can also accelerate the appearance of visual fatigue. This result is in line with the findings, who mentioned that prolonged use of digital devices can trigger various symptoms of eye discomfort (Pavel et al., 2023).

Not only limited to visual symptoms, some respondents also reported neck and shoulder complaints, which are thought to be related to posture while studying. A less ergonomic sitting position during online learning can cause repetitive stress on the neck and shoulder muscles. These complaints often co-occur with CVS symptoms and suggest that the impact of screen use is not only limited to the visual system, but can also affect general physical comfort. Therefore, a preventive approach to CVS needs to include a thorough organization of the learning environment, from the aspects of lighting, sitting position, study duration, to the type of device used.

In terms of prevention, nursing students are advised to implement strategies that have been proven to help reduce visual fatigue, such as the 20-20-20 rule, use of screen filters, and adjusting the distance and viewing angle of digital devices. It is also important to take regular breaks during online learning sessions and maintain adequate hydration to support eye moisture. Considering that nursing students have a role as future health educators, an understanding of the ergonomics of using digital devices and their impact on eye health needs to be strengthened through relevant education and training. This effort is expected to not only support the sustainability of a healthy learning process, but also equip students with responsible digital literacy.

CONCLUSION

This study revealed that the majority of nursing students who participated in online learning experienced various symptoms of Computer Vision Syndrome (CVS), with the highest prevalence in complaints of headache, eye strain, eye burning, and blurred vision. The main risk factors identified included prolonged use of digital devices, predominant use of smartphones with small screens, and lack of visual breaks during the learning process. In addition to visual symptoms, some respondents also experienced musculoskeletal complaints such as neck and shoulder pain, indicating ergonomic disturbances during online learning.

It is recommended to implement healthier online learning practices, such as using devices with larger screens, maintaining ideal viewing distances, adjusting room lighting, and following the 20-20-20 rule (rest your eyes every 20 minutes by looking at objects 20 feet away for 20 seconds). It is also important to do light stretches periodically and maintain good posture while studying.

REFERENCES

- Abuallut, I., Qumayi, E. A., Mohana, A. J., Almalki, N. M., Ghilan, M. E., Dallak, F. H., Mahzari, S. M., Makrami, A., Tawhari, A., Ajeebi, R. E., & Bakri, S. M. (2022). Prevalence of Asthenopia and Its Relationship with Electronic Screen Usage During the COVID-19 Pandemic in Jazan, Saudi Arabia: A Cross-Sectional Study. *Clinical Ophthalmology*, Volume 16, 3165–3174. <https://doi.org/10.2147/OPHTH.S377541>
- Alghamdi, W. M., & Alrasheed, S. H. (2020). Impact of an educational intervention using the 20/20/20 rule on Computer Vision Syndrome. *African Vision and Eye Health*, 79(1). <https://doi.org/10.4102/aveh.v79i1.554>
- Bujang, M. A. (2023). An Elaboration on Sample Size Planning for Performing a One-Sample Sensitivity and Specificity Analysis by Basing on Calculations on a Specified 95% Confidence Interval Width. *Diagnostics*. <https://doi.org/10.3390/diagnostics13081390>
- Chu, G. C. H., Chan, L. Y. L., Do, C., Tse, A. C. Y., Cheung, T., Szeto, G. P. Y., So, B. C. L., Lee, R. L. T., & Lee, P. H. (2023). Association between time spent on smartphones and digital eye strain: A 1-year prospective observational study among Hong Kong children and adolescents. *Environmental Science and Pollution Research*, 30(20), 58428–58435. <https://doi.org/10.1007/s11356-023-26258-0>
- Gadain Hassan, H. A. (2023). Computer Vision Syndrome Among Medical Students at the University of Khartoum, Sudan: Prevalence and Associated Factors. *Cureus*. <https://doi.org/10.7759/cureus.38762>
- Iqbal, M., Elzembely, H., Elmassry, A., Elgharieb, M., Assaf, A., Ibrahim, O., & Soliman, A. (2021). Computer Vision Syndrome Prevalence and Ocular Sequelae among Medical Students: A University-Wide Study on a Marginalized Visual Security Issue. *The Open Ophthalmology Journal*, 15(1), 156–170. <https://doi.org/10.2174/1874364102115010156>
- Jakhar, F., Rodrigues, G. R., Mendonca, T. M., Nayak, R. R., Kamath, G., Kamath, S. J., & Kamath, A. (2023). Dry eye symptoms and digital eyestrain - Emerging epidemics among university students due to online curriculum amid the COVID.19 pandemic-A cross.sectional study. *Indian Journal of Ophthalmology*. https://doi.org/10.4103/IJO.IJO_2760_22
- Kumar, K. U. D., Shetty, S., Amin, H., Rashmitha, A. P., & Rani, P. S. (2022). Trataka Kriya in

- Individuals with Digital Eye Strain: A Pre–Post Experimental Design. *Journal of Health and Allied Sciences NU*, 12(01), 53–56. <https://doi.org/10.1055/s-0041-1732811>
- Lindo-Cano, E. F., García-Monge, V. A., Castillo-Cadillo, K. J., Sánchez-Tirado, E. A., Távara, I. M., & Morales, J. (2022). Computer-digital Vision Syndrome Among University Students of Lima City. *The Open Public Health Journal*, 15(1). <https://doi.org/10.2174/18749445-v15-e2208104>
- Minarni Wartiningih. (2023). Analysis of Screen Based Activity on Digital Eye Strain in School-Age Children in Peniwen Village, Malang, East Java. *Asian Journal of Health Research*, 2(1), 50–56. <https://doi.org/10.55561/ajhr.v2i1.98>
- Noreen, K., Ali, K., Aftab, K., & Umar, M. (2021). Computer Vision Syndrome (CVS) and its Associated Risk Factors among Undergraduate Medical Students in Midst of COVID-19. *Pakistan Journal of Ophthalmology*. <https://doi.org/10.36351/PJO.V37I1.1124>
- Nowik, K. E. (2020). The Influence of Work Ergonomics and The Use of Lubricating Drops on the Improvement of the Subjective and Objective Ocular Parameters in Patients with Computer Vision Syndrome. *Biomedical Journal of Scientific & Technical Research*, 32(3). <https://doi.org/10.26717/BJSTR.2020.32.005243>
- Pavel, I. A., Bogdanici, C. M., Donica, V. C., Anton, N., Savu, B., Chiriac, C. P., Pavel, C. D., & Salavastru, S. C. (2023). Computer Vision Syndrome: An Ophthalmic Pathology of the Modern Era. In *Medicina (Lithuania)*. <https://doi.org/10.3390/medicina59020412>
- Seresirikachorn, K., Thiamthat, W., Sriyuttagrai, W., Soonthornworasiri, N., Singhanetr, P., Yudtanahiran, N., & Theeramunkong, T. (2022). Effects of digital devices and online learning on computer vision syndrome in students during the COVID-19 era: an online questionnaire study. *BMJ Paediatrics Open*, 6(1), e001429. <https://doi.org/10.1136/bmjpo-2022-001429>
- Wang, C., Joltikov, K. A., Kravets, S., & Edward, D. P. (2023). Computer Vision Syndrome in Undergraduate and Medical Students During the COVID-19 Pandemic. *Clinical Ophthalmology*, Volume 17, 1087–1096. <https://doi.org/10.2147/OPTH.S405249>
- Wang, L., Wei, X., & Deng, Y. (2021). Computer Vision Syndrome During SARS-CoV-2 Outbreak in University Students: A Comparison Between Online Courses and Classroom Lectures. *Frontiers in Public Health*, 9. <https://doi.org/10.3389/fpubh.2021.696036>