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Original Research

The Relationship Between Computer Vision Syndrome and Sleep Quality of Undergraduate Nursing Students

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ABSTRACT

Background: *Complex vision problems experienced when using digital devices are called Computer Vision Syndrome (CVS). The use of digital devices at night affects the delay of the circadian phase and the suppression of melatonin as a sleep facilitator which causes changes in sleep quality and optimizes cognitive abilities. This study aims to determine the relationship between computer vision syndrome and student sleep quality.*

Methods: *This research uses a correlational design with a cross-sectional approach. Sampling used proportionate stratified random sampling technique with a total of 198 respondents. The incidence of CVS was measured by the Computer Vision Syndrome-Questionnaire (CVS-Q) and sleep quality by the PSQI (Pitssburgh Sleep Quality Index) questionnaire. Bivariate analysis was conducted with CVS as the independent variable and sleep quality as the dependent variable, using the continuity correction test.*

Results: *The research results show that 80.8% of respondents experienced CVS-Positive and 80.8% of respondents experienced poor sleep quality. The statistical test results obtained p-value = <0.001 (< α 0.05) with an OR value of 71.25.*

Conclusion: *Thus, it can be concluded that computer vision syndrome is related to student sleep quality, where positive computer vision syndrome has the potential to cause disruption to student sleep quality 71.25 compared to students who have negative CVS. Nursing students are advised to limit excessive use of digital devices and to adopt healthy habits in screen usage to prevent CVS, which can affect sleep quality.*

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INTRODUCTION

The vague of information technology has experienced development for 20 years and a lot of success, one of which is the discovery of digital devices that help ease work or activities and are able to provide faster results (Septiyanti et al., 2022). Digital

devices are widely used by people to work, open emails, and access social media. The latest data shows that in 2022 around 5.3 billion or 66% of the world's population are active internet users. The number of internet users who use the web increases by 4% or about 196 people every day. Some of these digital devices have a very small text size that requires a closer viewing distance compared to print media (Ramya et al., 2023).

Digital devices basically have many advantages for their users, but if not used properly, they can cause several adverse health risks. Continuous use of digital devices will force the eyes to work to see the screen which causes eye strain (Ramya et al., 2023). About 90% of digital device users complain of visual symptoms such as headaches, dry eyes, eye strain, eye discomfort, and blurred vision (Tesfaye et al., 2022). This collection of visual symptoms is known as Computer Vision Syndrome(CVS) (Ramya et al., 2023).

The American Optometric Association defines CVS as a complicated issue related to vision (eyes) related to activities that focus on close vision and are experienced while using digital devices (Ahmad et al., 2021). Occupational Safety and Health Administration (OSHA) defines CVS as vision syndrome when working with digital devices (Amelia Septiyanti et al., 2022). CVS includes redness, irritation, dry eyes, eye strain, eye fatigue, temporary blurred vision and sensitivity to light stimuli. CVS symptoms also encompass ocular surface abnormalities or accommodative spasms, along with extra-ocular (ergonomic) factors related to poor posture, such as headaches and pain in the back and neck (Ramya et al., 2023).

The high incidence of CVS is related to prolonged use of digital equipment with incorrect actions. Prolonged close-up viewing leads to a lack of blinking speed, unaddressed refraction, poor posture, poor light and environment, among other factors that make a person prone to CVS. The American Optometric Association (AOA) says that problems referring to CVS can arise when a person uses digital devices for prolonged periods of 2 hours a day (Alma et al., 2023). Surveys estimate that more than 60 million people globally suffer from CVS and each year there is an increase of 1 million new cases. The prevalence of CVS in developing countries is higher than in developed countries due to limited access to and use of personal protective equipment, high workloads, and insufficient rest time during computer use (Tesfaye et al., 2022).

A World Health Organization (WHO) study found that universally at least 2.2 billion people experience vision problems at both long and short distances. Research on health science students in Jeddah, Saudi Arabia showed that out of 334 respondents, 97.3% (325 people) had at least one CVS symptom. The most common complaints were headaches (68%), feelings of impaired vision (i.e. nearsightedness or temporary blindness) (65%), and itchy eyes (63%), in 651 King Abdulaziz University students obtained the results of 558 students (95%) experiencing at least one CVS symptom while using a computer (Abudawood et al., 2020; Altalhi et al., 2020). In 137 students in India, it showed that only 44.7% of students understood CVS and 60% of students did not understand CVS as a result of excessive use of digital devices (Ramya et al., 2023).

Research in Indonesia indicates that the most common symptoms of CVS are eye strain and fatigue. At Ibn Khaldun University Bogor, these symptoms were reported by 69.1% of workers. Meanwhile, among 95 medical students in Bandung, 82.5% did not experience CVS, while the remaining 18% did. Additionally, 64% reported poor sleep quality, while 36% indicated good sleep quality. Among 85 nursing undergraduate students, 53 individuals (62.4%) reported experiencing CVS; in contrast, a survey of

362 high school students in Bali found that 217 students (59.9%) exhibited symptoms of CVS (Amelia Septiyanti et al., 2022; Febryan et al., 2022; Jundiah et al., 2022; Kartika et al., 2023).

Research conducted on employees at Bengkulu University shows that out of 69 employees, 49 individuals (71%) experienced CVS. In Palembang, among 82 employees of the Department of Communication and Information, 59 individuals (72.0%) experienced CVS. Meanwhile, at the University of North Sumatra, a study on medical students indicated that 68 respondents (75.6%) experienced symptoms of CVS (Agusti et al., 2021; Wijaya et al., 2022; Yolanda et al., 2020).

The handling of CVS is often viewed as a minor issue by many individuals. Although it has not been proven to cause permanent damage to the eyes, CVS can diminish productivity and performance, one of which is a decrease in sleep quality (Alma et al., 2023; Haryati et al., 2020). Poor sleep quality can lead to physiological effects such as fatigue and lack of concentration, as well as psychological impacts such as anxiety, stress, and even depression (Alma et al., 2023; Novianti Tantri & Sundari, 2019). The National Sleep Foundation recommends that young adults get 7 to 9 hours of sleep per day; however, research indicates that many individuals do not achieve this (Gunawan et al., 2021).

A study in China found that 31% of 6.284 participants experienced poor sleep quality. In Japan, mobile phone usage is associated with shorter sleep duration, decreased sleep quality, and daytime sleepiness. In India, only 24.5% of students reported having good sleep quality. Meanwhile, at Riau University, 71% of nursing students with CVS reported poor sleep quality. The findings of the research indicate the importance of greater attention to the issues of CVS and sleep quality, particularly among nursing students (Alma et al., 2023).

This research presents a novelty in examining the relationship between CVS and sleep quality among undergraduate nursing students at STIKes Santa Elisabeth Medan. The study employs standardized instruments, namely the Computer Vision Syndrome Questionnaire (CVS-Q) and the Pittsburgh Sleep Quality Index (PSQI) and calculates the odds ratio (OR). This research contributes new insights to the literature on digital health and nursing. Specifically, it aims to expand the understanding of the impact of excessive use of digital devices on sleep disturbances. The study provides a foundation for promotional and preventive efforts among nursing students.

MATERIALS AND METHOD

This study employed a correlational design with a cross-sectional approach to examine the relationship between CVS and sleep quality among Bachelor of Nursing Students at Santa Elisabeth College of Health Sciences Medan in 2024. The target population consisted of all regular undergraduate nursing students enrolled in the 2023/2024 academic year, totaling 391 individuals. The study was conducted on-campus from March 4 to 14, 2024. The site was chosen because no prior research had been conducted on this topic within the institution, and because students frequently use digital devices in their academic activities.

Sampling was carried out using proportionate stratified random sampling, appropriate for populations with diverse characteristics and balanced strata (Oktafiani et al., 2023). The sample size was calculated using the Slovin formula, resulting in 198 participants across levels I to IV. Sample distribution per level was determined through proportional allocation. Inclusion criteria were regular undergraduate nursing students

who owned and used at least one digital device, such as a smartphone, tablet, notebook, or laptop. Exclusion criteria included students with eye conditions like conjunctivitis or hordeolum, those using corrective glasses or contact lenses, and individuals diagnosed with chronic insomnia.

The independent variable in this study is computer vision syndrome. The dependent variable in this study is sleep quality. The instrument for the independent variable was the CVS-Q. This questionnaire was developed by Seguí et al., (2015) and translated into Indonesian. This instrument consists of 16 statements. The instrument used Busyee et al's 1989 PSQI questionnaire. Researchers used demographic data questionnaire instruments, CVS-Q questionnaire for computer vision syndrome variables to assess the frequency and intensity of 16 symptoms experienced when using digital devices (Seguí et al., 2015).

The CVS-Q Indonesian questionnaire has been tested valid and reliable in research conducted on computer science students in Lampung by Valentina. From this study, the validity test showed a sensitivity of 75.0% and a specificity of 70.2%. The ROC curve analysis yielded an Area Under The Curve (AUC) of 0.826 (95% CI: 0.779–0.874; $p < 0.001$), indicating good diagnostic accuracy. Reliability test with a value of 0.69 (pearson separation) and 0.78 (Cronbach's alpha) (Damiri Valentina et al., 2019). The sleep quality variable uses the Indonesian PSQI questionnaire from the research of vocational high school students in Madiun by Feriani with the results of the validity test r count (0.410-0.831) > r table (0.361) and Chronbach's Alpha reliability value of 0.83 (Feriani, 2020).

The univariate analysis of this study includes the dissemination of demographic data of respondents consisting of gender, age and description of the nature of each variable both CVS and sleep quality. Bivariate analysis aims to describe the relationship between two variables that are thought to be connected, including computer vision syndrome as the independent variable and sleep quality as the dependent variable. The statistical analysis employed is the continuity correction test. This research has passed the ethical test from the Health Research Ethics Commission of the Santa Elisabeth Medan Health Sciences College with number 008/KEPK-SE/PE-DT/II/2024.

RESULTS

The results of this research will be described as the characteristics of nursing students and an analysis of the relationship between CVS and the sleep quality of undergraduate nursing students. The description of the research findings is as follows:

Table 1. Demographic Characteristics of Respondents Among Undergraduate Nursing Students (n = 198 Students)

Characteristics	n	%
Age		
17-19 years (Teenagers)	75	37.9
20-25 years (Young Adults)	123	62.1
Total	**198**	**100.0**
Gender		
Male	10	5.1
Female	188	94.9
Total	**198**	**100.0**
Class		

Characteristics	n	%
Level 1	50	25.3
Level 2	50	25.3
Level 3	49	24.7
Level 4	49	24.7
Total	**198**	**100.0**

Note: n = number of observations; % = percentage

Table 1 describes the characteristics of nursing students based on age, gender, and class level. The majority of nursing students are aged between 20-25 years (young adults) at 62.1% and are female at 94.9%. The distribution of nursing students across class levels is nearly even, with 25.3% in classes 1 and 2, while classes 3 and 4 comprise 24.7%.

Table 2. Distribution of Computer Vision Syndrome (CVS) Symptoms Among Undergraduate Nursing Students (n=198 Students)

Symptoms	n	%
Burning eyes	62	31.3
Itchy eyes	170	85.8
Foreign body sensation in the eye	116	58.6
Watery eyes	168	84.8
Excessive eye blinking	81	40.9
Red eyes	132	66.7
Pain in the eye	120	60.6
Heavy eyelids	135	68.2
Dry eyes	70	35.3
Blurred vision	113	57.0
Double vision	55	27.8
Difficulty focusing on close distances	49	24.7
Photosensitivity (sensitivity to light)	123	62.2
Halo effect (rainbow-colored halo around viewed object)	49	24.7
Eyesight feels worse	80	40.4
Headache or dizziness	163	82.4
CVS Negative (-)	38	19.2
CVS Positive (+)	160	80.8

Note: n = number of observations; % = percentage

Table 2 shows that the majority of undergraduate nursing students experience symptoms of CVS, with the highest prevalence being itchy eyes (85.8%), watery eyes (84.8%), and headaches or dizziness (82.4%). Other common symptoms include red eyes, heavy eyelids, and eye pain. A total of 80.8% of respondents were identified as having CVS, indicating that high exposure to digital devices significantly impacts the eye health of students.

Table 3. Relationship between Computer Vision Syndrome (CVS) and Sleep Quality of Undergraduate Nursing Students (n=198 Students)

Variable	Sleep Quality				Total		p-value*	OR
	Healthy		Poor					
	n	%	n	%	n	%		
Computer Vision Syndrome (CVS)								
Negative (-)	30	78.9	8	21.1	38	100.0	**<0.001**	**71.25**
Positive (+)	8	5.0	152	95.0	160	100.0		

Note: n = number of observations; % = percentage; *The Continuity Correction Test

Table 3 shows that students with negative CVS (-) and healthy sleep quality are 30 people (78.9%), and those with poor sleep quality are 8 people (21.1%). While students with positive CVS (+) and have healthy sleep quality are 8 people (5.0%), and those with poor sleep quality are 152 people (95.0%). The statistical test results showed a p-value of <0.001, which is less than the significance level (α) of 0.05, indicating a significant relationship between CVS and sleep quality among undergraduate nursing students at Santa Elisabeth College of Health Sciences Medan in 2024. The table also shows the OR value of 71.25 which means that positive CVS + has a risk of 71.250 times resulting in poor sleep quality compared to respondents with negative CVS (-).

DISCUSSION

Excessive use of digital devices especially more than two hours continuously each day has been linked to CVS. Symptoms commonly associated with CVS include burning, itching, watery, red, dry, and painful eyes; excessive blinking; the sensation of a foreign body in the eye; blurred or double vision; heavy eyelids; difficulty focusing on near objects; photosensitivity; halos around lights; declining vision; and even headaches or dizziness (Wangsan et al., 2022). Studies have consistently identified specific symptoms as most prevalent.

Wijaya et al., (2022) reported that watery eyes, headaches, and itching were the most frequently experienced complaints, while symptoms such as double vision and halos were less common. Similarly, Kartika et al., (2023) found that itchy eyes, sore eyes, headaches, and watery eyes were the most reported symptoms. These visual complaints are primarily caused by prolonged screen exposure, which increases spontaneous eye activity and tear production, especially due to the intensity of light emitted from digital devices.

Students are particularly vulnerable to CVS due to their high frequency of screen use for academic activities, including attending online classes, completing assignments, and engaging in social media. Staring at screens requires continuous contraction and relaxation of the eye muscles, which leads to eye fatigue and discomfort. Over time, this strain can trigger various symptoms associated with CVS. Prolonged exposure to screens especially in the evening also disrupts sleep quality. This study found that 80.8% of respondents had poor sleep quality, consistent with findings by Hastuti et al., (2019) who linked sleep disturbances to stress, environmental factors, diet, illness, activity level, substance use, and lifestyle particularly screen-related habits common among students.

Febryan et al., (2022) also observed that poor sleep quality was significantly more common in students with CVS. Exposure to digital screens at night, especially before

bedtime, suppresses melatonin production the hormone responsible for regulating sleep due to the blue light emitted by screens. Gupta et al., (2021) found that women experiencing dry eye symptoms often had sleep disturbances, which may relate to hormonal or emotional factors. Similarly, Magno et al., (2021) and Vehof et al., (2020) reported that individuals with CVS are 1.5 times more likely to experience poor sleep quality, with dry eye symptoms closely linked to sleep disorders such as insomnia and sleep apnea.

This disruption is compounded by student behaviors, such as staying up late to complete assignments or using digital devices for entertainment. Even after a full day of academic screen use, many students continue screen exposure into the night, reducing the time available for restorative sleep. As a result, they often fail to meet the recommended sleep duration, which negatively affects their cognitive performance, concentration, and overall physical and mental health. The results of this study reinforce the link between CVS and sleep quality: 152 respondents (95.0%) with CVS had poor sleep quality, compared to only 8 respondents (21.1%) without CVS.

Statistical analysis using the continuity correction test showed a significant association between CVS and sleep quality among undergraduate nursing students at Santa Elisabeth College of Health Sciences Medan. Supporting evidence from Ahmad et al., (2021) also shows a significant relationship between poor sleep quality and frequent tablet use. This is particularly relevant for students, as tablets and other digital devices are integral to their academic and personal routines. Ahmad et al., (2021) further emphasized that the time-consuming nature of digital device use often cuts into students' sleep time.

Overall, the findings suggest that CVS is strongly associated with poor sleep quality, likely due to a technology-driven lifestyle. Prolonged use of digital devices for academic work and social interaction contributes to both visual strain and insufficient sleep, with blue light exposure further disrupting natural sleep rhythms by affecting melatonin secretion. This study has several limitations that need to be considered. The diagnosis of CVS was based solely on questionnaires without direct clinical examinations, so its objective validity remains limited.

Additionally, the scope of the study was confined to students at a single institution, namely STIKes Santa Elisabeth Medan, so the results cannot yet be generalized to a broader population. Furthermore, this study did not examine other factors that might influence CVS and sleep quality, such as the duration of digital device usage, screen lighting, ergonomics, as well as psychological factors like stress or anxiety.

CONCLUSION

The study conducted on 198 nursing students at STIKes Santa Elisabeth Medan in 2024 found that CVS is significantly associated with poor sleep quality, with CVS sufferers being 71.25 times more likely to experience sleep disturbances. Common symptoms included burning eyes, watery eyes, headaches, and dizziness, worsened by blue light exposure that disrupts melatonin production. The improvement of digital literacy concerning the impact of excessive screen usage on health needs to be implemented as part of promotive efforts in the nursing education environment.

REFERENCES

Abudawood, G. A., Ashi, H. M., & Almarzouki, N. K. (2020). Computer vision

syndrome among undergraduate medical students in King Abdulaziz University, Jeddah, Saudi Arabia. *Journal of Ophthalmology*, 7, 1-7. https://doi.org/https://doi.org/10.1155/2020/2789376

Agusti, M. S., Windusari, Y., Novrikasari, Sitorus, R. J., Noviadi, P., & Dahlan, M. H. (2021). Analysis of the relationship between the duration of visual display terminal use and the incidence of Computer Vision Syndrome (CVS) in employees of the communication and informatics office of Palembang City. *Indonesian Health Promotion Publication Media*, 4(4), 554-564. https://doi.org/ISSN 2597-6052

Ahmad, A., Alshehri, B., Almalki, A., Albaradi, A., Almalki, M., & Alattas, K. (2021). Eyeing computer vision syndrome: Awareness, knowledge, and its impact on sleep quality among health sciences students during the COVID-19 pandemic in Taif, Kingdom of Saudi Arabia. *International Journal of Medicine in Developing Countries*, 5(August), 1647-1654. https://doi.org/10.24911/ijmdc.51-1627643005

Alemayehu, A. M., & Alemayehu, M. M. (2019). Pathophysiologic mechanisms of computer vision syndrome and its prevention: A review. *World Journal of Ophthalmology & Vision Research*, 2(5), 1-7. https://doi.org/10.33552/wjovr.2019.02.000547

Alma, D. B., Rizka, Y., & Nopriadi. (2023). The Relationship between the incidence of Computer Vision Syndrome (CVS) and the quality of sleep of nursing students. *Indonesian Journal of Medical and Health Sciences*, 3(1), 01-12. https://doi.org/10.55606/jikki.v2i2.861

Altalhi, A. A., Khayyat, W., Khojah, O., Alsalmi, M., & Almarzouki, H. (2020). Computer vision syndrome among health sciences students in Saudi Arabia: Prevalence and risk factors. *Cureus*, 12(2), 10-13. https://doi.org/10.7759/cureus.7060

Amelia Septiyanti, R., Fatimah, A., & Asnifatima, A. (2022). Factors Associated with the incidence of computer vision syndrome in computer user workers at Ibn Khaldun University of Bogor in 2020. *Promotor*, 5(1), 32-50. https://doi.org/10.32832/pro.v5i1.6127

Amelia, W., Despitasari, L., & Alisa, F. (2023). Guided imagery therapy for sleep quality in breast cancer patients undergoing chemotherapy (R. N. Brilliant & N. Ardyanto (eds.); I). PT. Pena Persada Kerta Utama. Accessed on June 24, 2024 from https://www.google.co.id/books/edition/TERAPI_GUIDED_IMAGERY_UNTUK_KUALITAS_TID/jI7LEAAAQBAJ?hl=id&gbpv=1&dq=kualitas+sleep&pg=PA32&printsec=frontcover

American Optometric Association/AOA (2023). Computer vision syndrome. Accessed on June 24, 2024 from https://www.aoa.org/healthy-eyes/eye-and-vision-conditions/computer-vision-syndrome?sso=y

Artime-Ríos, E., Suárez-Sánchez, A., Sánchez-Lasheras, F., & Seguí-Crespo, M. (2021). Computer vision syndrome in healthcare workers using video display terminals: An exploration of the risk factors. *Original Research: Empirical Research- Quantitative*, 78 (7), 2095-2110. https://doi.org/10.1111/jan.15140

Badrus, A. R., & Khairoh, M. (2019). Effleurage massage aromatherapy lavender as a night sleep quality therapy for pregnant women (B. Daz & D. Wandana (eds.)). Jakad Publishing Surabaya. Accessed on June 24, 2024 from https://www.google.co.id/books/edition/Effleurage_Massage_Aromatherapy_Lavender/6C7ZDwAAQBAJ?hl=id&gbpv=1&dq=tahap+sleep&pg=PA27&printsec=frontcover

Ciputra, F., & Dwipayani, N. M. (2022). Computer vision syndrome: A literature review. *Al-Iqra Medical Journal: Journal of Scientific Medical Periodicals*, 5 (1), 49-59. https://doi.org/10.26618/aimj.v5i1.8023

Darma, B. (2021). Research statistics using SPSS (validity test, reliability test, simple linear regression, multiple linear regression, T Test, F Test, R2) (Guepedia (ed.)). Guepedia The First On-Publisher in Indonesia.

Derbew, H., Nega, A., Tefera, W., Zafu, T., Tsehaye, K., Haile, K., & Temesgen, B. (2021). Assessment of computer vision syndrome and personal risk factors among employees of commercial bank of Ethiopia in Addis Ababa, Ethiopia. *Journal of Environmental and Public Health*, 2021, 1-8. https://doi.org/10.1155/2021/6636907

Dewi, R. (2021). *Five-finger relaxation technique on sleep quality, fatigue and pain in breast cancer patients* (D. Novidiantoko (ed.); I). Deepublish.

Febryan, S. F., Alie, I. R., & Putra, A. R. (2022). Differences in sleep quality between students who experience and those who do not experience Computer Vision Syndrome (CVS). *Bandung Conference Series: Medical Science*, 564-568. https://doi.org/https://doi.org/10.29313/bcsms.v3i1.6320

Feriani, D. A. (2020). The relationship between sleep quality and learning concentration of students in class X TKJ 2 and XI TKJ 1 at SMK Negeri 1 Jiwan Madiun Regency. *Jurnal STIKes Bhakti Husada Mulia Madiun*, 167(1). https://www.e-ir.info/2018/01/14/securitisation-theory-an-introduction/

Gondol, B. N., Areba, A. S., Kanno, G. G., & Mamo, T. T. (2020). Prevalence of visual and posture related symptoms of computer vision syndrome among computer user workers of Ethiopian roads authority. *Journal of Environmental and Occupational Health,*10(3), 79-90. https://www.researchgate.net/publication/347911656

Gunawan, J. P., Palit, H. C., & Aysia, D. A. Y. (2021). Students' sleep quality level during online learning. *National Seminar on Industrial Engineering and Management,*1 (1), 345-351. https://doi.org/10.28932/sentekmi2021.v1i1.51

Gupta, P. C., Rana, M., Duggal, M. R. M., Agarwal, A., Khurana, S., Jugran, D., Bhargava, N., & Ram, J. (2021). Association of screen time, quality of sleep and dry eye in college-going women of Northern India. *Indian Journal of Ophthalmology*,70 (1), 1. https://doi.org/10.4103/ijo.IJO

Hardani. (2020). Qualitative & quantitative research methods book (1st Printing). CV Science Library.

Haryati, Yunaningsi, S. P., & RAF, J. (2020). Factors affecting sleep quality of students of the faculty of medicine, Halu Oleo University. *Surya Medika Journal*, 5 (2), 22-33. https://journal.umpr.ac.id/index.php/jsm/article/view/1288

Hidayat, R., & Amir, H. (2021). The Effect of Benson relaxation technique on sleep quality in the elderly. *An Idea Health Journal*, 1(1), 21-25. https://doi.org/10.53690/ihj.v1i1.14

Jundiah, R. S., Ulum, M. A. Bachrul, & Rifa'i, S. I. (2022). The relationship between individual factors and the incidence of computer vision syndrome in undergraduate nursing students. 4(November), 1377-1386.

Kaiti, R., Shah, P., Bogati, B., Shyangbo, R., Dahal, M., & Hamal, B. (2020). Computer vision syndrome: Is it being diagnosed and managed properly? *Acta Scientific Ophthalmology*, 3 (June), 2582-3191.

Kartika, P. A. A., Juliari, I. G. A. M., Suryaningrum, I. G. A. R., & Sutyawan, I. W. E. (2023). Characteristics of computer vision syndrome in high school students with internet gaming disorder. *Medical Science Digest*, 14 (1), 350-357. https://doi.org/P-ISSN:2503-3638E-ISSN:2089-9084

Krishnan, B., Krishna, R., Sanjeev, & Latti, R. G. (2020). Alloimmunization in thalassemia patients: New insights for healthcare. *International Journal of Preventive Medicine*, 8, 1-5. https://doi.org/10.4103/ijpvm.IJPVM

Li, Y., Bai, W., Zhu, B., Duan, R., Yu, X., Xu, W., Wang, M., Hua, W., Yu, W., Li, W., & Kou, C. (2020). Prevalence and correlates of poor sleep quality among college students: A cross-sectional survey. *Health and Quality of Life Outcomes*,18 (1), 1-11. https://doi.org/10.1186/s12955-020-01465-2

Magno, M. S., Utheim, T. P., Snieder, H., Hammond, C. J., & Vehof, J. (2021). The relationship between dry eye and sleep quality. *Ocular Surface*, 20 (December 2020), 13-19. https://doi.org/10.1016/j.jtos.2020.12.009

Murwani, A., & Utari, H. S. (2021). Relationship between anxiety and sleep quality in students who prepare thesis at Stikes Surya Global Yogyakarta. *Jurnal Formil (Scientific Forum) Kesmas Respati*, 6(2), 129. https://doi.org/10.35842/formil.v6i2.353

Nursalam. (2020). *Nursing science research methodology practical approach* (A. Suslia

(ed.); 5th ed.). Salemba Medika.

Oktafiani, D., Qomariyah, U., Qurniyawati, E., Ekaningrum, A. Y., Pratiwi, L. L., Putri, F. A. D., Musdalifah, Sholihin, R. M., Fitriyah, H., Jumain, Lumentut, G. P. I., Pamela, D. D. A., & Pati, D. U. (2023). *Introduction to epidemiology*. Sada Kurnia Pustaka.

Pujianto, A., & Rahmawati, A. (2022). *Sleep rest needs of critical patients*. Eureka Media Aksara. Accessed on June 24, 2024 from https://repository.penerbiteureka.com/media/publications/356873-kebutuhan-istirahat-tidur-pasien-kritis-bae03f73.pdf

Ramya, K., Purushothaman, S., T, T., & S, P. (2023). Knowledge, awareness and practice towards computer vision syndrome among medical students. *International Journal of Academic Medicine and Pharmacy*, 1415–1419. https://doi.org/10.47009/jamp.2023.5.2.297

Rif'an, A. R. (2020). *Productive generation*. PT ELex Gramedia Komputindo.

Saragih, J., & Damanik, D. W. (2022). *Basic nursing* (M. Deswita (ed.); 1st ed.). Publisher Mitra Cendekia Media.

Tesfaye, A. H., Alemayehu, M., Abere, G., & Mekonnen, T. H. (2022). prevalence and associated factors of computer vision syndrome among academic staff in the University of Gondar, Northwest Ethiopia: An institution-based cross-sectional study. *Environmental Health Insights*, 16. https://doi.org/10.1177/11786302221111865

Tripathy, K. (2022). *Computer vision syndrome (digital eye strain)*. American Academy of Ophthalmology. Accessed on June 24, 2024 from https://eyewiki.aao.org/Computer_Vision_Syndrome_(Digital_Eye_Strain).

Vehof, J., Snieder, H., Jansonius, N., & Hammond, C. J. (2020). Prevalence and risk factors for dry eye in 79.866 participants of the population-based lifelines cohort study in the Netherlands. *Ocular Surface*, 19, 83-93. https://doi.org/10.1016/j.jtos.2020.04.005.S1542-%0A0124(20)30069-0

Wangsan, K., Upaphong, P., Assavanopakun, P., Sapbamrer, R., Sirikul, W., Kitro, A., Sirimaharaj, N., Kuanprasert, S., Saenpo, M., Saetiao, S., & Khamphichai, T. (2022). Self-reported computer vision syndrome among Thai University students in virtual classrooms during the COVID-19 pandemic: Prevalence and associated factors. *International Journal of Environmental Research and Public Health*,19 (7). https://doi.org/10.3390/ijerph19073996

Wijaya, V., Anggraini, D. R., Lumongga, F., & Siregar, R. S. (2022). Relationship between the duration of use of visual display terminal and computer vision syndrome in medical students at the University of North Sumatra. *Scientific Medical Journal*, 4(2), 19–26. https://doi.org/10.32734/scripta.v4i2.10534

Yolanda, M., Ali, R. S., & Wicaksono, S. (2020). The Relationship between duration of computer use and eye distance with computer monitors to the incidence of Computer Vision Syndrome (CVS) in employees at Bengkulu University in 2020. *JKR (Raflesia Medical Journal)*, 8(2), 76-86. https://doi.org/ISSN(print):24773778;ISSN(online):2622-8344

Zenbaba, D., Sahiledengle, B., Bonsa, M., Tekalegn, Y., Azanaw, J., & Kumar Chattu, V. (2021). Prevalence of computer vision syndrome and associated factors among instructors in Ethiopian Universities: A web-based cross-sectional study. *Scientific World Journal*, 2021, 8. https://doi.org/10.1155/2021/3384332