

Factors associated with computer vision syndrome complaints in power plant employees

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World Journal of Advanced Research and Reviews, 2023, 19(01), 1421–1427

Publication history: Received on 16 June 2023; revised on 25 July 2023; accepted on 27 July 2023

Article DOI: <https://doi.org/10.30574/wjarr.2023.19.1.1489>

Abstract

PT X is one of the power plants that supplies electricity to the Java and Bali regions. One of the jobs at risk of CVS complaints at PT X is office workers because they have to deal directly with computer screens for a long time. The purpose of this study was to analyze the strength of the correlation between factors associated with CVS. This study is an observational study with a cross sectional approach. The population in this study were 57 respondents. The statistical test used was Gamma coefficient test and contingency coefficient test. The results showed that there was a strong correlation between age ($r=0.622$), work position ($r=0.770$), and eye distance to the monitor ($r=-0.742$) with CVS complaints and a very strong correlation between work period ($r=-0.840$) CVS complaints. Based on the results of the study, it can be concluded that age, work position, and eye distance to the monitor have a strong correlation with CVS complaints and a very strong correlation between Length of service CVS complaints. It is recommended that companies urge their workers who use computers not to forget to rest their eyes and maintain vitamin A intake, besides that workers also need to rearrange their work stations to avoid bad working positions.

Keywords: CVS; Work position; Length of service; Eye distance

1. Introduction

The era of technological development, especially information technology, requires humans to deal with computers. Generally 80% of office work is completed by utilizing a computer. The very broad role of computers in today's times, plus the increasingly popular use of the internet causes workers to spend time in front of computers for at least three hours a day (Zulaiha, 2018). In 2019, the percentage of laptop or computer use in Indonesia was 22% of the total population of Indonesia (Data Reportal, 2019). In 2020, the percentage of laptop or computer use in Indonesia has increased to 66% (Data Reportal, 2020). An increase in the percentage of computer use also occurred in 2021, which increased by 8.7% (Data Reportal, 2021). At present, it cannot be denied that the use of computers has become a necessity, including their use in the workplace. Workers will spend more time staring at the computer monitor to complete their work which can result in health problems, especially in the eyes.

The American Optometric Association (AOA) defines CVS or digital eyestrain as a group of eye and vision-related problems that result from prolonged use of computers, tablets, e-readers, and cell phones that cause increased stress on near vision (AOA, 2021). According to P2PTM of the Indonesian Ministry of Health (2018), computer vision syndrome (CVS) is a symptom that occurs in the eyes and neck caused by excessive computer use. Symptoms of computer vision syndrome (CVS) include blurred vision, double vision, red eyes, dry eyes, eye strain, eye irritation, and headache.

The prevalence of CVS reaches 64-90% in Visual Display Terminal (VDT) users with the number of sufferers worldwide estimated at 60 million people and every year 1 million new cases will continue to appear. (Amalia H., 2018). According to the findings of a 2004 survey conducted by the American Optometric Association (AOA), more than 10 million eye

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examinations for vision problems due to using electronic equipment are performed in the United States each year (Febrianti & Bahri, 2018). Office workers often complain of eye fatigue due to prolonged computer use and electromagnetic wave radiation generated by monitor screens (Putri & Mulyono, 2018). Computer use, although beneficial, must also pay attention to its impact on health. Although there are many factors that affect occupational health, computers are the most important factor that causes health problems for people who use computers frequently (Suhadri, 2008).

According to research by Zulaiha et al, (2018) in 41 active computer users working at PT Telkom Akses Jambi showed that 32 respondents (78.0%) had CVS complaints and 9 respondents (22.0%) did not have CVS complaints. The results of this study indicate that there is a significant relationship between lighting intensity and CVS complaints ($p=0.020$) and there is a significant relationship between monitor distance and CVS complaints ($p=0.006$). According to research by Fradisha et al. (2017) on Bank Sinarmas Jakarta employees, it shows that 46% of computer vision syndrome (CVS) complaints occur in employees who work on computers for >4 hours. In addition, there is a relationship between lighting and CVS complaints in RK Pekanbaru Bank employees ($p=0.001$) where as many as 54 respondents experienced CVS complaints with lighting intensity <280 lux. According to research by Valentina et al, (2019) on 56 students majoring in computer science, showed that 80.49% of CVS complaints also occurred in students who had used computers > 6 years. In addition, there is also a relationship between the period of computer use and CVS complaints ($p=0.007$).

PT X has an administration building, where the use of computers is also a must. One of the jobs that are at risk of computer vision syndrome (CVS) complaints at PT X is Office workers because they have to deal directly with computer screens for a long time. From the results of initial observations, it was seen that there were several employees who worked in a position bent / tilted to the side and looked at the monitor screen with a fairly close distance and the position of the monitor was too high and some were too low so that the position of the monitor was not in line with the eyes of the workers. Then, it was also found that some employees who had the possibility of experiencing CVS complaints were characterized by rubbing their eyes while working on the computer in the office. Workers who work using computers with poor working positions for a long time can experience muscle and eye problems. Workers who use computers choose uncomfortable positions without realizing it results in stress on the muscles and eyes. (Adane, Alamneh and Desta, 2022). Then from the results of a brief initial interview with fifteen employees, there were several employees who claimed to sometimes complain of hot and itchy eyes and blurred vision due to looking at the computer for too long.

Office workers at PT X have the potential to experience symptoms of Computer Vision Syndrome (CVS) complaints because they use computers while working, so that if no immediate treatment and prevention measures are taken, it can have a negative impact on workers and companies. Therefore, this study is to analyze the strength of the correlation between factors associated with CVS in office workers at PT X.

2. Material and methods

The type of research used is observational research with a cross sectional study design. The population in this study were all office workers of PT X with a total of 57 workers. The sampling technique used the total population so that the sample in this study amounted to 57. This research has been approved by the Health Research Ethics Clearance Commission of the Faculty of Dentistry, Airlangga University, Indonesia.

Sampling was carried out in stages in the office area of PT X, in December 2022 - January 2023. The data collection instruments used were a digital lux meter to measure the intensity of the work environment lighting, a meter to measure the distance between the worker's eyes and the computer monitor used, Rapid Office Strain Assessment (ROSA) used to assess the work position of office workers and Computer Vision Syndrome Questionnaire (CVS-Q). Data processing uses computerization, and data analysis is carried out univariate, bivariate with the Gamma coefficient test and the contingency coefficient test to explain the strength or weakness of the relationship and the direction of the relationship between the independent variable and the dependent variable.

3. Results and discussion

Workers in the office area of PT X work using computers with the same type and specifications of monitors and are not fitted with radiation filters in air-conditioned rooms. Most office workers do not have a history of vision problems so most do not use vision aids. Workers work from 07.00 - 16.00 WIB with a 1-hour break at 12.00 - 13.00 WIB. Based on Table 1 the results of the questionnaire, 32 respondents (56.1%) experienced CVS complaints, and 25 respondents

(42.9%) did not experience CVS complaints.

The results of data analysis with the Gamma Coefficient test show that there is a strong relationship between age and Computer Vision Syndrome (CVS) complaints. According to Suma'mur (2014), age has an influence on eye fatigue complaints because increasing age is usually offset by reduced visual acuity, especially in someone aged 40 years or more. Furthermore, Irma (2019) states that there is a relationship between age and CVS complaints in computer/VDT user workers with a p-value = 0.000. In addition, research conducted by Firdani (2020) states that there is a relationship between age and CVS complaints with a p-value = 0.025. He also stated that operators aged (>40 years) have a risk of experiencing eye fatigue complaints 6.7 times greater than workers aged (<40 years). This can be caused because most of the respondents in this study were >40 years old where workers over 40 years old will be more susceptible to visual impairment, in line with the process of physiological changes and aging in the eye (Tarwaka, 2019). In Sugarindra and Allamsyah's research (2017), it was also explained that the older the age of the workforce, the greater the likelihood of CVS complaints.

The results of the analysis using the Gamma Coefficient test show that there is a relationship with moderate strength and unidirectional direction between the length of work or duration of computer use in one day with CVS complaints. Workers who use computers ≥ 4 hours are more at risk of experiencing computer vision syndrome complaints (Maeda et al., 2020)). According to Saputro (2013), workers who use computers > 4 hours experience CVS complaints. In line with Dessie et al. (2018), workers who use computers > 4.6 hours a day will be more at risk of CVS complaints. In addition, based on research by Nadia et al. (2021), there is a relationship between the duration of computer use and CVS complaints where the duration of computer use ≥ 4 hours is more risky than computer use < 4 hours a day. This is also reinforced by research by Nopriadi et al. (2019) which states that computer use for 4 hours in the workforce is 13 times more at risk of experiencing CVS complaints than workers who use computers < 4 hours. The results of this study are in line with research conducted by Irma (2019) which states that there is a relationship between the length of work or duration of computer use with CVS complaints ($P = 0.002$). Furthermore, research by Pratiwi (2020), which also states that there is no relationship between the length of work or duration of computer use in one day with CVS complaints ($P = 0.000$).

Table 1 Frequency Distribution Table

Variables		n=57	%
CVS complaints	CVS complaints occur	32	56.1
	No CVS Complaints	25	43.9
Age	Not at Risk	27	47.4
	At Risk	30	52.6
Work Duration	Not at Risk	11	19.3
	At Risk	46	80.7
Length of Service	Not at Risk	18	31.6
	At Risk	39	68.4
Working Position	Not at Risk	22	38.6
	At Risk	35	61.4
Lighting Intensity	Not at Risk	24	42.1
	At Risk	33	57.9
Monitor Position	Not at Risk	33	57.9
	At Risk	24	42.1
Vision Distance	Not at Risk	35	61,4
	At Risk	22	38,6

Table 2 Relationship between Independent Variables and CVS

Variables	CVS				N=57	C
	Yes		No			
	n	%	n	%		
Age						
< 40 Years	20	74.1	7	25.9	27	0.622
> 40 Years	12	40.0	18	60.0	30	
Work Duration						
< 4 Hours	4	36.4	7	63.6	11	0.463
≥ 4 Hours	28	60.9	18	39.1	46	
Length of Service						
< 4 Years	16	88.9	2	11.1	18	-0.840
≥ 4 Years	16	41.0	23	59.0	39	
Working Position						
Not at Risk (Skor ROSA ≤ 5)	6	27.3	16	72.7	22	0.770
At Risk (Skor ROSA > 5)	26	74.3	9	25.7	35	
Lighting Intensity						
≥ 300 lux	9	37.5	15	62.5	24	-0.586
< 300 lux	23	69.7	10	30.3	33	
Monitor Position						
Not at Risk	13	39.4	20	60.6	33	0.368
At Risk	19	79.2	5	20.8	24	
Vision Distance						
Ideal (45 – 60 cm)	14	40.0	21	60.0	35	-0.742
At Risk (< 45 atau > 60 cm)	18	81.8	4	18.2	22	

The results of data analysis with the Gamma Coefficient test show that there is a strong relationship with an unidirectional relationship between tenure and CVS complaints. Long tenure is a risk factor for CVS complaints, the longer the work period of the workforce, the average time spent working using a computer in one day will increase (Ranasinghe et al., 2016). According to Nopriadi et al. (2019), tenure is related to CVS complaints where workers who use computers for 5 years are at risk of CVS compared to workers who use computers for less than 5 years. The results of this study are in line with research conducted by Valentina (2019) showing that there is a relationship between tenure and CVS complaints (P-value = 0.007).

The results of data analysis using the Gamma Coefficient test show that there is a strong relationship with a unidirectional relationship between lighting intensity and computer vision syndrome (CVS) complaints. According to Adane et al., (2022), work position is a risk factor for computer vision syndrome complaints. Assefa et al., (2017) stated that workers with inappropriate work positions are more at risk of 2.33 times experiencing CVS. Workers who have inappropriate work positions will experience discomfort and stress in the eye area due to the emphasis on eye muscles to get a better view. Working in an improper position for a long time can cause muscle tension (Aeni and Awaludin, 2017). This can be explained that workers who work in risky positions for a longtime cause stress on the muscles and eyes so that the possibility of CVS complaints will be even greater.

The results of data analysis using the Gamma Coefficient test show that there is a relationship with a strong moderate relationship and an unidirectional relationship between lighting intensity and computer vision syndrome (CVS)

complaints. Eye fatigue can occur due to excessive effort on the eyes to see an object with poor lighting (Suma'mur, 2014). In addition, lighting is a risk factor for CVS complaints, the more inappropriate the lighting in the workplace, the more likely the workforce is to experience CVS complaints (Nopriadi et al., 2019). The results of this study are in line with research conducted by Zulaiha (2018) which states that there is a relationship between lighting intensity and computer vision syndrome (CVS) complaints (P-value = 0.02). Tawil's research (2018) also states that there is a relationship between lighting intensity and computer vision syndrome (CVS) complaints (P-value = 0.00001). In addition, research conducted by Insani (2018) also states that there is a relationship between lighting intensity and computer vision syndrome (CVS) complaints (P-value = 0.027).

The results of data analysis using the Contingency Coefficient test show that there is a strong relationship with a weak relationship between monitor position and computer vision syndrome (CVS) complaints. Monitor position is one of the factors associated with the onset of CVS complaints (Nopriadi et al., 2019). In addition, according to the Regulation of the Minister of Manpower of the Republic of Indonesia Number 5 of 2018 concerning Occupational Safety and Health in the Work Environment, monitors that are too low can cause the onset of computer vision syndrome (non-vision) complaints such as neck and shoulder pain. Furthermore, in a study conducted by Valentina (2019), it was stated that there was a relationship between monitor position and computer vision syndrome (CVS) complaints (P-value = 0.047). In Shah's research (2022) it was also stated that there was a relationship between monitor position and computer vision syndrome (CVS) complaints (P-value = 0.03).

The results of data analysis using the Gamma Coefficient test show that there is a strong significant relationship with an unidirectional relationship between visibility and computer vision syndrome (CVS) complaints. One of the risk factors for CVS complaints is the distance of vision to the monitor Rochmayani and (Rochmayani and Cahyaningsih, 2021). In addition, according to Permenaker No. 5 (2018) states that the ideal distance between the operator and the monitor is between 45 - 60 cm. If the distance of the monitor is too close to the eyes it can cause eye strain, if the distance of the monitor is too far the eyes will try harder to focus the vision on the object being viewed and the eyes get tired faster, so there is potential for eye problems. The results of this study are in line with research conducted by Tawil (2018) which states that there is a relationship between eye distance to the monitor and computer vision syndrome (CVS) complaints (P-value = 0.0001), Irma's research (2019) also states that there is a relationship between eye distance to the monitor and computer vision syndrome (CVS) complaints (P-value = 0.000), in addition, research conducted by Abudawood (2020) also states that there is a relationship between eye distance to the monitor and computer vision syndrome (CVS) complaints (P-value = 0.02).

4. Conclusion

There is a strong correlation between age, working position and visibility with CVS and a very strong correlation between length of service and CVS.

Compliance with ethical standards

Acknowledgements

The author would like to thank Dr. Noeroel Widajati SKM, MSc. Department of Occupational Health and Safety, Faculty of Public Health, Universitas Airlangga, Indonesia as a supervisor who has supported this research. The authors declare no conflict of interest with the parties involved in this study.

Disclosure of conflict of interest

No conflict of interest to disclosed.

Statement of informed consent

All informants/respondents involved in this study have stated their consent to provide information/data according to the research needs.

References

- [1] Abudawood GA, Ashi HM, Almarzouki NK. Computer Vision Syndrome among Undergraduate Medical Students in King Abdulaziz University, Jeddah, Saudi Arabia. *Journal of Ophthalmology*. 2020. <https://doi.org/10.1155/2020/2789376>.

- [2] Adane F, Alamneh YM, Desta M. Computer vision syndrome and predictors among computer users in Ethiopia: a systematic review and meta-analysis. *Tropical Medicine and Health*. 2020; 50(1):1–12. <https://doi.org/10.1186/S41182-022-00418-3/FIGURES/5>.
- [3] Aeni HF, Awaludin A. Hubungan Sikap Kerja Duduk Dengan Keluhan Nyeri Punggung Bawah Pada Pekerja Yang Menggunakan Komputer. *Jurnal Kesehatan*, 2017; 8(1):887–894. <https://doi.org/10.38165/JK.V8I1.92>.
- [4] Amalia H. Computer vision syndrome. *Jurnal Biomedika dan Kesehatan*. 2018; 1(2):117–118. <https://doi.org/10.18051/JBIOMEDKES.2018.V1.117-118>.
- [5] AOA. Computer vision syndrome | AOA. 2021 [Cited 18 November 2022]. Available from <https://www.aoa.org/healthy-eyes/eye-and-vision-conditions/computer-vision-syndrome?sso=y>.
- [6] Assefa NL, Zenebe D, Weldemichael, Alemu HW, Anbesse DH. Prevalence and associated factors of computer vision syndrome among bank workers in Gondar city, Northwest Ethiopia, 2015. *Clinical Optometry*. 2017; 9:67–76.
- [7] Bilal M, Maeda I, Fitri AM, Amalia R, Faktor-faktor yang Berhubungan dengan Computer Vision Syndrome (CVS) pada Karyawan PT. Depoteknik Duta Perkasa Tahun 2020. In *Prosiding Seminar Nasional Kesehatan Masyarakat*. 2022; 1(1):223-239.
- [8] Valentina DCD, Yusran M, Wahyudo R, Himayani R. Faktor Risiko Computer Vision Syndrome pada Mahasiswa Jurusan Ilmu Komputer Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Lampung. *JIMKI: Jurnal Ilmiah Mahasiswa Kedokteran Indonesia*. 2019; 7(2):29-37. <https://doi.org/10.53366/JIMKI.V7I2.50>.
- [9] Data Reportal, Digital 2019: Indonesia. 2019 [Cited 13 September 2022]. Available from <https://datareportal.com/reports/digital-2019-indonesia>.
- [10] Data Reportal, Digital 2020: Indonesia. 2020 [Cited 13 September 2022]. Available from <https://datareportal.com/reports/digital-2020-indonesia>.
- [11] Data Reportal, Digital 2021: Indonesia. 2021 [Cited 13 September 2022]. Available from <https://datareportal.com/reports/digital-2021-indonesia>
- [12] Dessie A, Adane F, Nega A, Wami SD, Chercos DH. Computer vision syndrome and associated factors among computer users in Debre Tabor town, Northwest Ethiopia. *Journal of Environmental and Public Health*. 2018; <https://doi.org/10.1155/2018/4107590>.
- [13] Febrianti S, Bahri TS. Gejala Computer Vision Syndrome Pada Mahasiswa Keperawatan. *Jim Fkep*. 2018; 3(3):201–207
- [14] Firdani F. Faktor Yang Berhubungan Dengan Keluhan Kelelahan Mata Pada Pekerja Operator Komputer. *Jurnal Endurance: Kajian Ilmiah Problema Kesehatan*. 2020; 5(1):64-70. <https://doi.org/10.22216/JEN.V5I1.4576>.
- [15] Fradisha M, Wulandari RAS, Sari AAA. Hubungan Durasi Penggunaan Komputer Dengan Computer Vision Syndrome Pada Karyawan Bank Sinarmas Jakarta. *Nexus Kedokteran Komunitas*. 2017; 6(1):50-61.
- [16] Insani Y, Wunaini N. Hubungan Jarak Mata Dan Intensitas Pencahayaan Terhadap Computer Vision Syndrome. *Jurnal Manajemen Kesehatan Yayasan RS. Dr. Soetomo*. 2018; 4(2):153-162. <https://doi.org/10.29241/jmk.v4i2.120>.
- [17] Irma I, Lestari I, Kurniawan AR. Faktor Yang Berhubungan Dengan Keluhan Subjektif Kelelahan Mata Pada Pengguna Komputer. *JIKP Jurnal Ilmiah Kesehatan Pencerah*, 2019; 8(01):15-23.
- [18] Nadia AS, Paramita A, Rahman AO. Hubungan Durasi Penggunaan Komputer Portabel Dengan Kejadian Computer Vision Syndrome Pada Mahasiswa Fakultas Kedokteran Dan Ilmu Kesehatan Universitas Jambi Tahun 2020. *Medical Dedication (medic): Jurnal Pengabdian kepada Masyarakat FKIK UNJA*. 2021; 4(1):179–184. <https://doi.org/10.22437/MEDICALDEDICATION.V4I1.13480>.
- [19] Nopriadi N, Pratiwi Y, Leonita E, Tresnanengsih E. Faktor Yang Berhubungan Dengan Kejadian Computer Vision Syndrome Pada Karyawan Bank. *Media Kesehatan Masyarakat Indonesia*, 2019; 15(2):111–119. <https://doi.org/10.30597/MKMI.V15I2.5753>.
- [20] Pratiwi AD, Safitri A, Junaid J, Lisnawaty L. Faktor Yang Berhubungan Dengan Kejadian Computer Vision Syndrome (CVS) Pada Pegawai Pt. Media Kita Sejahtera Kendari. *An-Nadaa: Jurnal Kesehatan Masyarakat*. 2020; 7(1):41–47. <https://doi.org/10.31602/ANN.V7I1.3111>.

- [21] Putri DW, Mulyono, M. Hubungan Jarak Monitor, Durasi Penggunaan Komputer, Tampilan Layar Monitor, Dan Pencahayaan Dengan Keluhan Kelelahan Mata. *The Indonesian Journal of Occupational Safety and Health*. 2018; 7(1):1–10. <https://doi.org/10.20473/IJOSH.V7I1.2018.1-10>.
- [22] Ranasinghe P, Wathurapatha WS, Perera YS, Lamabadusuriya DA, Kulatunga S, Jayawardana N, Katulanda P. Computer Vision Syndrome Among Computer Office Workers in A Developing Country: An Evaluation of Prevalence And Risk Factors. *BMC Research Notes*. 2016; 9(1): 1–9. <https://doi.org/10.1186/S13104-016-1962-1/TABLES/3>.
- [23] Rochmayani DS, Cahyaningsih O. Risk Factors for The Incidence of Computer Vision Syndrome (CVS) In Lecturers During The Online Learning Period. *Journal of Health Education* 2021; 6(2):65-72. <https://doi.org/10.15294/jhe.v6i2.47513>.
- [24] Saputro EW. Hubungan Intensitas Pencahayaan, Jarak Pandang Mata Ke Layar Dan Durasi Penggunaan Komputer Dengan Keluhan Computer Vision Syndrome. *Jurnal Kesehatan Masyarakat Universitas Diponegoro*. 2013;2(1):18798. Available from <http://ejournals1.undip.ac.id/index.php/jkm>.
- [25] Shah M, Saboor A. Computer Vision Syndrome: Prevalence and Associated Risk Factors Among Computer-Using Bank Workers in Pakistan. *Turk J Ophthalmol*. 2022; 5(2):295–301.
- [26] Suhardi B. *Perancangan Sistem Kerja Dan Ergonomi Industri*. Jakarta: Direktorat Pembinaan Sekolah Menengah Kejuruan; 2008.
- [27] Sugarindra M, Allamsyah Z. Identifikasi Interaksi Manusia Dan Komputer Berbasis Computer Vision Syndrome Pada Unit Refinery Central Control Room. *Teknoin*, 2017; 23(1). <https://doi.org/10.20885/TEKNOIN.VOL23.ISS1.ART8>.
- [28] Suma'mur PK. *Higiene Perusahaan dan Kesehatan Kerja*. Edisi 2. 2nd ed. Jakarta: CV. Sagung Seto; 2014
- [29] Tarwaka. *Ergonomi Industri: Dasar-Dasar Pengetahuan Ergonomi Dan Aplikasi Di Tempat Kerja*. 2nd Ed. Surakarta: Harapan Press. 2019
- [30] Al Tawil L, Aldokhayel S, Zeitouni L, Qadoumi T, Hussein S, Ahamed SS. Prevalence of Self-Reported Computer Vision Syndrome Symptoms and Its Associated Factors Among University Students. *European Journal of Ophthalmology*. 2020; 30(1):189-195. <https://doi.org/10.1177/1120672118815110>.
- [31] Zulaiha S, Rachman I, Marisdayana R. Pencahayaan, Jarak Monitor, Dan Paparan Monitor Sebagai Faktor Keluhan Subjektif Computer Vision Syndrome (CVS). *Kes Mas: Jurnal Fakultas Kesehatan Masyarakat*. 2019; 12(1):38-44.