

Computer Vision Syndrome (CVS) Among Hardware Store Workers in Glodok Retail Area (a Case Study)

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ABSTRACT

Background: In this Digital Era, we need computer devices to simplify our tasks. Inevitably, intense work in front of monitors put our visual systems fully utilized. Vision and eye-related problems at computer display are determined as Computer Vision Syndrome (CVS). In a Retail Business setting, the workers use computers to impute sales, orders, procurement, and merchandise inventories with full visual effort, without proper knowledge of computer usage best practice. This study aimed to determine the symptoms and severity of CVS among workers in a hardware store. Methods: A cross-sectional study with a total of fifty workers as generated with a total sampling technique. The CVS prevalence and severity data were collected using an online self-reported standardized questionnaire and analyzed using the chi-square test. Results: The prevalence of CVS among workers was 56%. The most common CVS symptoms were itching 56%, and 18% was severe, followed by blurred vision 54% with 14% was severe, and headache 54% with 28% was severe. There were significant associations between the duration of computer use, the duration of smartphone use, wearing glasses, and the viewing distance to monitor with CVS, with each P-value were <0.0001. Conclusions: Workers with ≥ 4 hours working in front of a computer, ≥ 8 hours of smartphone use, who wear corrective eyeglasses, with viewing distance from a monitor <50 cm, were the most susceptible amongst all. Suggestions for CVS preventions are health promotion that focuses on visual ergonomics working conditions, specific protection for workers using anti-glare computer monitors, blue-light filter glasses, and improve the physical ergonomics of the computer workstation.

Keywords: *Digital Eyestrain, Occupational Eye Disease, Visual Digital Terminal (VDT)*

1. INTRODUCTION

In this Digital Era, without any doubt, a computer becomes an essential part of our lives. Either students or workers, we depend on this device to simplify our tasks and deliver information. This computer displays intense work tasks that put our eyes and the visual system fully utilized. Vision and eye-related problems at computer display are categorized explicitly as Computer Vision Syndrome (CVS) [1]. That is also referred to as digital eyestrain, which describes as a group of eye and vision-related problems and discomfort resulting from the extensive computer, smartphone, tablet, and e-reader [2]. Symptoms of CVS are varied, sore eyes or eye fatigue, near blurred vision, eye irritation (burning, dryness, redness). Not only for vision, but prolonged computer usage can also cause another health problem, such as headache, neck and shoulder discomfort, back pain, adverse reproductive outcomes, skin disorders, and occupational-related stress [1], [3], illnesses that cannot be taken lightly. Virtually 60 million people globally suffered from CVS, with a million new cases occurs respectively [4]. In occupational settings, many of those problems resulted

from workplace ergonomic conditions [1]. Whether working seated or standing, there are proper positions regarding working with a computer. In a workplace setting such as Retail Business, the workers occupied with a computer to perform their daily tasks, such as imputing sales, orders, procurement, and merchandise inventories. Those tasks were performed on computers with full visual effort. Because of their lack of knowledge or less information given by the employer, some workers often neglect their discomfort at the very least because the symptoms can be ignored, whether it caused discomfort or other illnesses. Therefore, this study focused on CVS symptoms and severities among a hardware store worker in one of the bustling retail areas in Jakarta.

2. METHODS

This study case implemented the descriptive analysis method by using the Cross-sectional design. Glodok was chosen as the study location, as it is a bustling electronic retail area, if not the biggest in Indonesia. A total of fifty workers of a Hardware store in Glodok that use a computer

on their day to day work was included as research participants using the total sampling technique. To collect data, the research instrument used was The CVS Standardized Questionnaire. This is a self-administered questionnaire that can determine CVS symptoms and their severity. The data collection was conducted in June 2020 during the Covid-19 Pandemic in Indonesia and carried out with strict compliance with the Government's Health Protocol; thus, the participants filled the questionnaire using an online form. A bivariate analysis was performed to determine any associations related to CVS symptoms using the Chi-square test.

3. RESULTS

A majority of the participants were younger than 45 years old, mostly male with more than five years of employment. The participants categorized the lighting condition on their work premises were sufficient to perform their tasks without squinting. More participants wear prescription glasses daily compared to a contact lens.

Table 1. Characteristics of Research Participants

Variables	F	%
Age		
≥ 45 years	13	26%
< 45 years	37	74%
Gender		
Female	21	42%
Male	29	58%
Length of Employment		
≥ 5 years	36	72%
< 5 years	14	28%
Duration of computer use		
≥ 4 hours	25	50%
< 4 hours	25	50%

Duration of smartphone use		
≥ 8 hours	31	62%
< 8 hours	19	38%
Wearing glasses		
Yes	28	56%
No	22	44%
Wearing contact lens		
Yes	10	20%
No	40	80%
Lighting condition		
Sufficient	47	94%
Insufficient	3	6%
Viewing distance to monitor		
< 50 cm	23	46%
≥ 50 cm	27	54%
Total	50	100%

As shown in table 2, more than half of the participants suffered from CVS. Frequent symptoms the participants suffered from were itching (56%) with (18%) participants feel the itching was severe, followed by blurred vision (54%) of participants with (14%) of them had on the severe level, and headache (54%) of participants with (28%) of them had a severe headache. The less frequent symptoms were a circle of light around an object (12%).

Table 2 Prevalence of Computer Vision Syndrome (CVS)

CVS	F	%
Positive	28	56%
Negative	22	44%
Total	50	100%

Table 3. Frequency of Symptoms and Severity

No.	CVS Symptoms	Frequency of Symptoms						Severity			
		Never		Less Frequent		Frequent		Mild to Moderate		Severe	
		F	%	F	%	F	%	F	%	F	%
1.	Burning sensation	37	74%	11	22%	2	4%	11	22%	2	4%
2.	Itching	22	44%	16	32%	12	24%	19	38%	9	18%
3.	Foreign body sensation	38	76%	10	20%	2	4%	11	22%	1	2%
4.	Tearing	24	48%	20	40%	6	12%	17	34%	9	18%
5.	Excessive blinking	32	64%	14	28%	4	8%	14	28%	4	8%
6.	Eye redness	25	50%	19	38%	6	12%	12	24%	13	26%
7.	Eye pain	25	50%	14	28%	11	22%	18	36%	7	14%
8.	Heavy eyelids	26	52%	19	38%	5	10%	20	40%	4	8%
9.	Dryness	25	50%	19	38%	6	12%	16	32%	9	18%
10.	Blurred Vision	23	46%	23	46%	4	8%	20	40%	7	14%
11.	Double Vision	35	70%	12	24%	3	6%	13	26%	2	4%
12.	Difficulty Focusing for near	24	48%	20	40%	6	12%	20	40%	6	12%

13.	Increased sensitivity to light	25	50%	21	42%	4	8%	20	40%	5	10%
14.	Circle of light around an object	44	88%	4	8%	2	4%	4	8%	2	4%
15.	Feeling that sight is worsening	32	64%	16	32%	2	4%	8	16%	10	20%
16.	Headache	23	46%	17	34%	10	20%	13	26%	14	28%

The duration of computer use was determined by the workers based on their estimations on the total hours they spend working on a computer daily. It showed a strong association with CVS (p-value <0.0001). The duration of smartphone use was determined by workers based on their estimations on the total hours they spend using their smartphones during working hours and up until their after-hours. There was a strong association between workers' time spent on their smartphones with CVS (p-value <0.0001). There was a significant association between wearing glasses with CVS (p-value <0.0001). The participants viewing distances to monitor while working were measured and divided into two categories. There are less than 50 cm and 50 cm or farther based on OSHA recommendation [5]. There was a significant association between participants viewing distance to monitor with CVS (p-value <0.0001).

Table 4. Association between viewing distance to monitor with CVS

Variables	CVS						P-value
	Positive		Negative		Total		
	N	%	N	%	N	%	
Duration of Computer Use							
≥ 4 hours	24	96.0	1	4.0	25	100	<0.0001*
< 4 hours	4	16.0	21	84.0	25	100	
Duration of Smartphone use							
≥ 8 hours	27	87.1	4	12.9	31	100	<0.0001*
< 8 hours	1	5.3	18	94.7	19	100	
Wearing Glasses							
Yes	24	85.7	4	14.3	28	100	<0.0001*
No	4	18.2	18	81.8	22	100	
Viewing distance to monitor							
< 50 cm	23	100	0	0	23	100	<0.0001*
≥ 50 cm	5	18.5	22	81.5	27	100	

*significant if p-value <0.05

4. DISCUSSIONS

Many workers are suffered from CVS. This is a common problem in today's workplace. On day to day basis, workers from different workplace settings could suffer from this Digital Eyestrain. People who suffered the most are those

who work long hours, doing a particular task in front of the monitors [6]. Severe degree of CVS with symptoms like headache, blurred vision, and ocular congestion were persistent by long time use of gadgets [7]. Those symptoms also aligned with what was found in this research. What differs from this research, itching eyes were on top of the list for the most frequent symptom among the hardware store workers. A study done in India among Human Resource Department employees in a University [8] found that itching eyes was also one of the most frequent symptoms. The recent study among Health science students in Saudi Arabia [9] also found that those symptoms were the most common, with additional symptoms in a higher severity: burning sensation and excessive tearing, with more significantly suffered among female students.

Regarding CVS more affecting a particular gender, a study conducted in a developing country among computer office workers also found that CVS symptoms were more common among females. Despite what had been found in the previous studies, there was no significant difference acknowledged between both genders with CVS symptoms in this study. It could be based on tasks such as imputing sales, orders, procurement, and merchandise inventories were distributed equally among both gender in this workplace setting.

This study found that the hardware store workers were more likely to suffer from CVS when they work more than 4 hours a day in front of a computer monitor. Studies exposed major ocular complaints on eyestrain, itching, and burning in subjects using a computer for more than 6 hours during 24 hours span [8]. This also supports the prior research that determined a long duration of continuous computer work was predisposing a person to get CVS [10]. Joint effort to prevent CVS symptoms during prolonged computer use that worker suggested resting his/ her eyes regularly by focusing on farther objects. Computer users often less blinking while viewing the monitor, which may cause eye fatigue and dryness [5]. Likewise, for every twenty minutes of computer use, look into something within 20 feet distance for twenty seconds to allow the eyes to refocus, it is also known as the 20-20-20 rule [2]. A recent study found that blinking exercise regularly can protect eyes from adverse effects of digital device use [11].

The problem arisen is whether or not these workers know about how to avoid suffering this illness, let alone can identify what caused it. Workers tend to neglect or not consider this pain, and employers tend to overlook it. This kind of small retail business company like this hardware store, no proper annual medical examination is ever taken. It is proven that less knowledge about computer ergonomics practices strongly associated with workers suffered from CVS symptoms. Workers with ergonomics practices,

knowledge, and awareness of computer use safety measures had less severe CVS symptoms [12] [13]. Nevertheless, employers are content as long as they provide the workers with health insurance following the provisions of labor laws and regulations, that would be more than enough. They are more concerned about the money spent to improve the workplace without knowing that CVS could interfere with workers' productivity.

Since visual discomfort is not solely caused by computer use at the workplace, the employer was unaware that these symptoms have to be prevented from arising. However, a recent study suggested that accommodative asthenopia as a contributing factor to CVS can be categorized as a possible occupational disease [14].

Smartphone use during working hours and after-hours has a significant contribution to CVS symptoms among the hardware store workers. They were more likely to experience CVS symptoms to a severe degree when using their smartphone more than eight hours a day. In a research study [15], the ocular symptoms associated with viewing smart mobile devices for one hour increased asthenopia symptoms significantly. Specifically, such symptoms were tired eyes, sore/aching eyes, irritated eyes, watery eyes, and hot/burning eyes. However, this scenario is not always the case. A recent study showed different outcomes [9] regarding this matter; no significant association was found between a more prolonged duration of smartphone use with an increase in CVS symptoms. It might be caused by ergonomic effort applied, such as adjusting brightness based on surrounding lighting, taking breaks while using a smartphone, and putting the screen on the eye-level.

More than half of the total workers in this study wearing glasses, and a fifth of them wearing contact-lens. The glasses wearers were more susceptible to CVS symptoms. They were suffered from CVS to a severe degree in comparison with those who do not. Some studies reported that the number of CVS symptoms increased in those wearing glasses [9] [10] [16]. These findings showed that workers who wear correction lenses combined with continuous computer work more than 7 hours a day predispose a worker to get CVS symptoms.

Spectacles or contact-lenses prescribed for general use might not be sufficient for visually demanding work on a computer [2]. A computer emits electromagnetic radiation or high-energy blue light, that can stress the ciliary muscle in the eye; ultimately, prolonged exposure to computer screen led to eye strain [13]. Nowadays, a special lens designed with a blue-light filter is available for people who wear correction lenses and has intense computer use regularly. In some cases, it is suggested that the computer users who do not require eyeglasses for other daily activities could benefit from glasses prescribed specifically to wear for working in front of a monitor [2]. Spectacles with blue-light filter can protect the retina from a potential blue-light hazard that can cause eye-fatigue, one of the most typical symptoms of CVS without degrading visual performance [17] [18]. In the UK, employers must provide an eyesight

test for a computer user if they request one. The employer must also pay for a full eye and eyesight test by an optometrist or doctor, including a vision test and an eye examination [19]. This policy not only protecting the workers from the potential hazard in the workplace but also take the employer accountable for the quality assurance of the workplace.

The viewing distance to monitor has a significant association with CVS symptoms, with viewing distance less than 50 cm from the screen has a higher risk of developing CVS symptoms. The recommended minimum viewing distance is 50 cm from the monitor. If the screen was too close, or too far, it may lead to eyestrain [5]. Proper distance from the screen, adjustments on image size, and fonts on the screen, and proper height of the seat are all crucial factors to be considered. It is recommended that the screen should be placed 10-20 degrees below or that the middle of the screen 12-15 cm below eye level. Improved physical ergonomics of the computer workstation has been proven to reduce ocular discomfort and improve performance [20]. With adequate lighting, anti-glare filters, and regular work breaks may improve visual comfort [21].

Relevance to industry, the strong connection between satisfaction with visual ergonomic working conditions and productivity gives impacts to workplace profitability and staff satisfaction. Better visual ergonomic working conditions can enhance productivity, so that workers of workplaces may improve their work outcomes [22].

5. CONCLUSION

More than half of the workers experienced CVS. The most common CVS symptoms among the hardware store workers were itching, blurred vision, and headache. With headache and itching were severe. There were significant associations between the duration of computer use, the duration of smartphone use, wearing glasses, and the viewing distance to monitor with CVS.

In preventing CVS from arising among the hardware store workers, some approaches can be implemented. They are (a) Health promotion focusing on visual ergonomic working conditions. Such information can be displayed on counters, posters on the wall, and shared in a toolbox meeting. (b) Specific protection for workers using anti-glare computer monitors, and additional blue-light filter glasses for workers that wear prescribed glasses. (c) Improving the physical ergonomics of the computer workstation. All in all, those preventive measures can only take place if all parties work together.

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