

# Self-reported Computer Vision Syndrome Among Bank Workers in Onitsha, Nigeria

## Abstract

**Objectives:** This study aimed to determine the awareness, prevalence, and pattern of ocular problems related to computer [computer vision syndrome (CVS)] use among bank workers in Onitsha, Nigeria. **Materials and Methods:** This was a cross-sectional study involving bank staff in Onitsha metropolis who were selected using a simple random technique. A validated CVS questionnaire was used to obtain information on sociodemographic characteristics, frequency and duration of computer use, eye symptoms, and preventive measures. **Results:** There were 150 bank staff selected: 81 (54.0%) females and 69 (46.0%) males, aged 20–49 years (mean =  $33.2 \pm 7.2$  years). All participants used computer daily. Daily computer use was 1–16 h. Seventy-nine (53.4%) workers were aware of CVS; 127 (84.7%) used preventive measures which included anti-reflective eye glasses (12.7%) and computer screen guard (22.3%). Symptoms with computer use were reported by 103 (68.7%) participants. The prevalence of CVS was 29.3%. Headache (45.4%), itching (38.6%), photophobia (38.0%), visual blur (37.3%), and eye pains (28.0%) were the commonest symptoms. There was a trend towards CVS being commoner in female gender ( $P = 0.059$ ), with prolonged computer use, and failure to use preventive measures. CVS is 6-fold more likely to occur in individuals who wear corrective lenses. **Conclusion:** CVS is common among the bank workers studied. Use of protective measures that minimize exposure to electromagnetic force radiation from computer screens is suggested. A computer screen guard is recommended as a minimum preventive measure for long-term computer users.

**Keywords:** Bank workers, computer use, Nigeria, ocular problems

## Introduction

Computer use has become commonplace in many workplaces.<sup>[1]</sup> They help make work easier, improve efficiency, and improve work output. Computers are used in virtually all aspects of banking, including recording and storing account information of customers, financial transactions, trade, marketing, customer services, and communication with staff.<sup>[2]</sup>

The use of computers, however, leads to some health problems such as the computer vision syndrome (CVS).<sup>[3]</sup> CVS, also known as digital eye strain, refers to a group of eye and vision-related problems resulting from prolonged usage of computers and digital or electronic screens which cause increased stress to near vision.<sup>[3]</sup> It also describes a range of ocular, visual, and musculoskeletal symptoms due to prolonged computer use.<sup>[3]</sup>

Symptoms of CVS include blurred vision, double vision, poor near vision, slowness

in changing focus, eye strain, eye aches, periocular aches, tired eyes, burning sensation, dryness, gritty sensation, redness, tearing, and irritation.<sup>[3,4]</sup> Ergonomical or work position when using computer includes extraocular symptoms such as headaches, neck pain, shoulder pain or stiffness, and back ache.<sup>[3,4]</sup> These symptoms constitute occupational health problems that could negatively impact the well-being of workers leading to reduced work efficiency, low productivity, poor job satisfaction, and diminished quality of life.<sup>[5,6]</sup>

Several factors have been linked to CVS, such as female gender, longer work hours, prolonged computer use, poor sitting posture, preexisting eye disease, and contact lens use. Other risk factors include not using a video display terminal filter, not adjusting computer brightness, and angle of gaze at computer monitor.<sup>[5,7-10]</sup>

It is estimated that nearly 60 million people suffer from CVS globally and approximately one million new cases occur every year.<sup>[11]</sup> Many studies have been done in various

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populations on the prevalence of CVS with varying results (54.6–89.5%<sup>[12,13]</sup>). Studies in Ghana,<sup>[7]</sup> Ethiopia,<sup>[14]</sup> and Egypt<sup>[8]</sup> reported CVS in 71.2%, 74.6%, and 85.2% of bankers, respectively. The prevalence of CVS specifically among bankers has not been reported in this environment.

Our study aimed to determine the prevalence of CVS and associated risk factors among bankers in Onitsha, a commercial city in Anambra State, South-East Nigeria. Information obtained will be vital in raising awareness about CVS and also in formulating health education measures that will drive behavioural changes, leading to the prevention or amelioration of CVS among computer or digital screen users.

## Materials and Methods

This cross-sectional study of commercial bank workers in Onitsha, Nigeria was conducted in accordance with provisions of the Helsinki Declaration on research involving human subjects.<sup>[15]</sup> Written consent was obtained from all participants, and the confidentiality of the information assured. Each participant was assured that the findings of this study will not affect his or her career. A minimum sample size of 138 was calculated with 89.5% prevalence of CVS reported by Sanodiya *et al.*<sup>[13]</sup> in Central India using 95% confidence interval. Based on the estimate that an average of 10 workers per bank branch use computer, it was decided to select 14 bank branches out of 42 using a simple random sampling technique as described in the subsequent sentences. The list of all the commercial bank offices including their addresses in Onitsha metropolis constituted the sampling frame. The name of each bank and its address written on a 2 × 2 cm plain paper was folded and placed in a bag. The bag was churned several times. An assistant naive (blind) to the selection process picked 14 of the folded papers from the bag.

All the workers in the 14 selected banks involved in core banking duties who use computers in doing their work at the bank were included in the study. Excluded were supportive staff like the drivers, cleaners, and security personnel.

The study instrument was a self-administered modified questionnaire on CVS developed and validated by del Mar Seguí *et al.*,<sup>[16]</sup> which sought information on sociodemographic data, awareness of CVS, computer use practices including duration of computer use and protective measures employed while using the computers. Information on presence, frequency, and severity (intensity) of computer vision symptoms was also obtained. For frequency of symptoms, the participants were expected to respond “never” if the symptoms do not occur at all; “occasionally” if they experience symptoms once a week or less; “often or always” if symptoms occur two or more times in a week. Participants were requested to express the intensity (how severe they felt their symptoms were) as either “moderate” or “intense.” The ocular and adnexal symptoms assessed

were burning sensation, itching, foreign body sensation, watering, excessive blinking, redness, pains, heaviness of the eyelids, dryness, blurring of vision, double vision, difficulty in near vision, intolerance to light, coloured halos, worsening of vision, and headache.

The frequency of symptoms was graded as follows: “never” was scored 0; “occasionally” was scored 1, and “often/always” was scored 2.<sup>[16]</sup> For the intensity of symptoms, “moderate” was assigned a score of 1, whereas “intense” was scored 2. The total score was calculated using the formula<sup>[16]</sup>:

$$\text{Score} = \sum_{i=1}^{16} (\text{frequency symptom of occurrence})_i \times (\text{intensity of symptoms})_i$$

where  $\sum_{i=1}^{16}$  stands for the summation of the 16 symptoms.

The score for each symptom was calculated by multiplying the frequency of the symptom with the intensity. A symptom was scored 0 if the result of the calculation was 0, scored 1 if the result was 1 or 2, and when the result was 4, a score of 2 was given for the symptom.<sup>[16]</sup>

For example, if a participant has pain occasionally which he described as intense, his frequency score is 1 and his intensity score is 2. Multiplying  $1 \times 2$  gives 2. From the result of this calculation (that is 2), the symptom score that will be assigned for pain is 1. This is repeated for all symptoms and the total obtained.

A participant with a total score of  $\geq 6$  on the symptom questionnaire is defined as having CVS.<sup>[16]</sup>

Grading of CVS score is as follows: none: 0–5, mild: 6–9, moderate: 10–14, and severe: 15–18.

Information obtained were entered into a spreadsheet and analysed using STATA package version 15. Descriptive statistics were presented as frequencies, mean, median, etc.; inferential statistics included the  $\chi^2$  test, 95% confidence interval, and logistic regression with an alpha level at 0.05.

## Results

All the 150 bank workers within the selected banks who met the inclusion criteria were studied. Table 1 shows the sociodemographic characteristics of the participants. There were slightly more females than males with a female to male ratio of 1.2: 1. The age range was 20–49 years with a mean of  $33.2 \pm 7.2$  years. Those aged 30–39 years constituted majority of the participants (47.3%). Eleven (7.3%) were of the managerial cadre. All the workers attained post-secondary education.

All the 150 bankers use computer at work daily. Their work experience in the bank ranged between 6 months and 23 years. Cumulative duration of computer use was 1 month to 23 years; the median was 6 (2–11 IQR) years, and hours of use in a day was 1–16 with a median of 8 (4–10 IQR) h. The mean duration of the number of hours spent by the

**Table 1: Sociodemographic profile of the study participants**

Variable	No.	%
Age group		
20–29	49	32.7
30–39	71	47.3
40–49	30	20.0
Total	150	100.0
Gender		
Female	81	54.0
Male	69	46.0
Total	150	100.0
Official rank		
Branch manager	11	7.3
Customer service officer	17	11.4
Operation manager	18	12.0
Teller	44	29.3
Marketing staff	60	40.0
Total	150	100.0
Educational level		
Diploma	52	34.7
Bachelor’s degree	76	50.7
Master’s degree	20	13.3
Doctorate (PHD)	2	1.3
Total	150	100.0
Work experience in the bank (years)		
1–5	69	46.0
5–10	43	28.7
11–15	33	22.0
16–20	3	2.0
>20	2	1.3
Total	150	100.0

staff on the computer was  $7.23 \pm 3.81$  h. Sixty-eight (45.3%) of them had used computer at work for more than 7 years and 72% of the staff spent more than 5 hours per day on the computer. Thirty-six (24%) were using corrective lens or optical aids; of these, 32 were using eyeglasses and 4 contact lenses.

One hundred and twenty-eight (85.3%) of the workers thought that prolonged use of computer could affect the eyes, whereas 10.6% were not sure if prolonged use had any adverse effect on the eyes. Seventy-nine (52.7%) of them were aware of CVS and their major sources of information were the internet and the mass media (59.5%). Although 127 (84.7%) applied protective measures including anti-reflective eye glasses (12.7%) and computer screen guard (22.3%), 23 (15.3%) did not use any preventive measure as shown in Table 2. Fifteen (10%) of the participants placed their computers below their eye level.

Table 3 shows the symptoms reported in 103 (68.7%) of the study participants, whereas 31.3% did not report any symptoms. The most common symptoms reported were headache (45.4%), itching (38.6%), photophobia (38.0%), blurred vision (37.3%), and eye pain (28.0%).

**Table 2: Preventive measures taken by respondents**

Precaution/preventive measure	No.	%
Taking regular breaks	69	46.0
Antireflective/antiglare eyeglasses	19	12.7
Lubricant eye drops	5	3.3
Screen filters/guards	34	22.3
None	23	15.3
<b>Total</b>	<b>150</b>	<b>100.0</b>

**Table 3: Participants symptoms\***

Symptoms	No. with symptoms (%)**
Headache	68 (45.4)
Itching	58 (38.6)
Photophobia	57 (38.0)
Blurred vision	56 (37.3)
Eye pains	42 (28.0)
Excessive blinking	40 (27.0)
Tearing	34 (22.6)
Eye redness	32 (21.3)
Difficulty focusing for near vision	29 (19.4)
Worsening eye problem	27 (18.0)
Heavy eyelids	26 (17.4)
Double vision	26 (17.4)
Foreign body sensation	22 (14.7)
Burning sensation	17 (11.4)
Dryness of the eyes	15 (10.0)
Coloured halos around objects	14 (9.3)

\*Some participants had more than one symptom

\*\*% based on 150

**Table 4: Distribution of CVS scores**

Grading	No. (%)
None	106 (70.7)
Mild	27 (18.0)
Moderate	13 (8.7)
Severe	4 (2.6)
Total	150 (100)

A total score of  $\geq 6$  was obtained in 44 study participants and thus, the prevalence of CVS among the study participants was 29.3%, as shown in Table 4. The risk factors for CVS assessed in Table 5 showed that there was a statistically significant difference between the use of corrective lenses and presence of CVS ( $P = 0.001$ ). Although CVS was found more in females, those who use computer for  $>5$  h, and those not using any protective measure, no statistically significant difference was found ( $P > 0.05$ ). Those using corrective lenses were six times more likely to have CVS [adjusted odds ratio (aOR) of 6.511;  $P < 0.001$ ; 95% confidence interval (CI) = 2.51–16.86], as shown in Table 6.

## Discussion

Previous studies on CVS were based frequently on the presence of one or more symptoms. It has been of concern

**Table 5: Risk factors for computer vision syndrome**

Variable	Total (%)	Presence of CVS		$\chi^2$ -value	P-value
		CVS	No CVS		
Gender					
Female	81 (54.0)	29 (65.9)	52 (49.1)	3.555	0.059
Male	69 (46.0)	15 (34.1)	54 (50.9)		
Age					
20–29	49 (32.7)	16 (36.4)	33 (33.1)	2.034	0.362
30–39	71 (47.3)	17 (38.6)	54 (50.9)		
40–49	30 (20.0)	11 (25.0)	19 (17.9)		
Hours on computer					
0–7	49 (32.7)	10 (22.7)	39 (36.8)	2.797	0.094
>7	101 (67.3)	34 (77.3)	67 (63.2)		
Do you wear glasses?					
Yes	36 (24.0)	24 (54.5)	12 (11.3)	23.076	0.001*
No	114 (76.0)	20 (45.5)	94 (88.7)		
Duration of years using computer					
0–7	82 (54.7)	22 (50.0)	60 (56.6)	0.547	0.459
>7	68 (45.3)	22 (50.0)	46 (43.4)		
Placement of computer level					
Above/at eye level	135 (90.0)	38 (86.4)	97 (91.5)	0.915	0.339
Below eye level	15 (10.0)	6 (13.6)	9 (8.5)		
Protective measures					
Use of protective measures	23 (15.3)	6 (13.6)	17 (16.0)	0.138	0.710
No use of protective measures	127 (84.7)	38 (86.4)	89 (84.0)		

\*Significant P-value<0.05

**Table 6: Multivariate logistic regression showing association between risk factors and CVS**

Associated factors	Adjusted odds ratio (aOR)	Std. error	P-value	95% CI	
				Lower	Upper
Gender					
Female	—	—	—	—	—
Male	0.521	0.220	0.124	0.227	1.195
Age					
20–29	—	—	—	—	—
30–39	0.683	0.361	0.472	0.242	1.925
40–49	0.493	0.381	0.361	0.108	2.248
Hours on computer					
0–5	—	—	—	—	—
Above 5	1.708	0.821	0.266	0.665	4.386
Do you wear glasses?					
No	—	—	—	—	—
Yes	6.511	3.161	0.000	2.514	16.866
Duration of years using computer					
0–7	—	—	—	—	—
>7	1.084	0.611	0.885	0.359	3.275
Placement of computer level					
Above/at eye level	—	—	—	—	—
Below eye level	1.750	1.166	0.401	0.474	6.465
Protective measures					
Use of protective measures	—	—	—	—	—
No use of protective measures	0.840	0.475	0.758	0.276	2.549

—, Reference category

\*Significant P-value < 0.05

that there are many gaps in the knowledge of CVS due to lack of validated instrument,<sup>[16]</sup> hence the rationale to employ a validated CVS questionnaire by del Mar Seguí *et al.*<sup>[16]</sup> in the study. The prevalence of CVS in the present study was 29.3%. This means that CVS is common among this group of workers, and therefore measures will need to be put in place to address it. The prevalence of CVS found in the present study falls within the range of 20% to over 89.5% reported in previous studies.<sup>[13,17,18]</sup> It is higher than that reported in a study done in Japan and lower than what was reported in India and Mexico.<sup>[13,17,18]</sup>

The computer and internet are major instruments in bank transactions, and bank workers spend substantial time on the computer. Awareness and prevention of CVS by bank workers should become imperative so as to prevent its troubling effect that can result in low productivity. This study has shown that 85.3% of the bank workers knew that prolonged use of computer could affect the eyes, although slightly more than half of them had heard about CVS. This suggests that there is still some knowledge gap about CVS, and there is need for targeted health education. The awareness level in this study is higher than the 40% reported by Akinbinu and Mashalla<sup>[1]</sup> in Abuja. In contrast to our findings, it is lower than the awareness level of 90.2% reported by Mersha *et al.*<sup>[19]</sup> among bank workers in Northwest Ethiopia. The differences in the awareness level may be related to the different study population characteristics.

In this study, all the 150 study participants worked on the computer on a daily basis and majority of them spent over 5 h per day viewing the computer screen. Several studies have shown that the development of CVS often depends on the amount of time spent looking at the computer digital screen predisposing one to eye fatigue.<sup>[2,3,8,14]</sup> Although there was no statistically significant association between CVS and duration of computer use, CVS was recorded in 77.3% of those that spent >5 h on the computer in the present study. A similar finding was documented by Assefa *et al.*<sup>[20]</sup> in Ethiopia.

It has been shown that females are more likely to develop CVS due to the high tear film evaporation rate.<sup>[21]</sup> Studies by Abudawood *et al.*<sup>[22]</sup> and Ranasinghe *et al.*<sup>[11]</sup> showed an association between CVS and female gender. In the present study, there was a trend towards females having more CVS, although not statistically significant ( $P = 0.05$ ). Findings from Owunna *et al.*<sup>[23]</sup> likewise revealed no gender difference.

CVS comprises complex eye and vision problems related to near work which are experienced during or related to computer use.<sup>[3]</sup> It can manifest with a variety of symptoms which can be misinterpreted or misdiagnosed. A wide range of symptoms have been reported by computer users in several studies.<sup>[1,24,25]</sup> The most common ocular and vision-related symptoms in CVS reported were eyestrain, headache, blurring of vision, and dry eye symptoms.<sup>[23]</sup>

This is similar to the findings of the present study in which the commonest symptoms were headache, itching, photophobia, visual blur, and eye pains. The symptoms manifested in CVS can occur when the vision demand of the task exceeds the visual abilities of the user, leading to inability to focus properly on computer images, and as such the eyes cannot remain focused on the pixel-generated images on a computer screen.<sup>[26]</sup> Some CVS symptoms mimic those associated with dry eye disease. The dry eye symptoms may be a result of decreased blink rate and increased ocular exposure, leading to desiccation.<sup>[27]</sup>

Coloured halos around objects reported in the present study may be as a result of intermittent angle closure, leading to increase in intraocular pressure. However, intraocular pressure was not measured among the participants in the present study. Some studies have documented an increase in intraocular pressure during prolonged use of a computer or any other digital device.<sup>[28,29]</sup> The mechanism has been postulated to be as a result of increase in accommodation resulting from increased visual demand to focus on near object while working on computer screens. During accommodation, there is protrusion of the anterior part of lens which pushes the iris forward with resultant temporary hindrance to the trabecular meshwork.<sup>[30]</sup> It will be important to investigate this further so as to prevent the development of glaucoma among individuals who spend long periods on the computer.

This study found that there was an association between CVS and use of corrective lenses. Bank staff who used corrective lenses were six times more likely to develop CVS. This may be a result of the underlying refractive error inducing more fatigue on the eyes. Assefa *et al.*<sup>[20]</sup> reported that bank workers who wore eye glasses were three times (AOR=3.19, 95% CI=1.07, 9.51) more likely to have CVS when compared with those not wearing eye glasses. They justified this attribution with use of incorrect prescription by the workers. Similar associations were also documented by Ranasinghe *et al.*<sup>[11]</sup> and Reddy *et al.*<sup>[30]</sup> However, Abudawood *et al.*<sup>[22]</sup> found no significant association between use of corrective lenses and presence of CVS.

Recommendations have been made on protective measures such as taking regular breaks while using the computer such as the 20/20/20 rule where an individual is to look into a far distance of 20 ft every 20 min for at least 20 s.<sup>[30]</sup> Dessie *et al.*<sup>[31]</sup> reported that the odds of developing CVS among computer users who took regular breaks were significantly lower compared with those who did not. Also important is the use of lubricating agents to enhance the tear film stability, which has been shown to relieve computer users of ocular discomfort.<sup>[27]</sup>

Similarly, use of antireflective/antiglare eyeglasses can block the blue light rays from the computer screen which causes increase in light sensitivity.<sup>[31]</sup> The antireflective component

has a role to play in helping the eyes relax while working on the computer by reducing glare and enhancing better contrast definition.<sup>[26]</sup>

CVS was absent in the majority of the bank workers who employed protective measures; up to 15.3% of the participants in the present study did not use any preventive measure including computer screen guard. The non-use of the screen guard may be due to the feeling of not having any need for it. But it is known that use of digital screen guard protects against CVS.<sup>[32]</sup> It is therefore recommended that the computer screen guard should be the minimum preventive measure for long-term computer users.<sup>[32]</sup>

In conclusion, the present study shows that CVS is common among bank workers. We therefore recommend that more elaborate research should be carried out especially on the risk factors that predispose to development of CVS and how to curb them with the advent of dependency on visual display units at workplaces.

Limitation of this study is that the symptoms reported by the participants were mainly recalled. In addition, these symptoms reported may be due to other ocular surface diseases unrelated to computer use.

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#### Conflicts of interest

There are no conflicts of interest.

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**Appendix**

**Computer Vision Syndrome Questionnaire**

**Section C: Frequency and severity of symptoms**

Indicate whether you experience any of the following symptoms during the time you use the computer at work. For each symptom, mark with an X:

a. First, the frequency, that is, how often the symptom occurs, considering that:

NEVER = the symptom does not occur at all

OCCASIONALLY = sporadic episodes or once a week

OFTEN OR ALWAYS = 2 or 3 times a week or almost every day

b. Secondly, the intensity of the symptom: MODERATE or INTENSE

Remember: if you indicated NEVER for frequency, you should not mark anything for intensity.

Symptom	Frequency			Intensity	
	Never 0	Occasionally 1	Often or always 2	Moderate 1	Intense 2
1. Burning					
2. Itching					
3. Feeling of a foreign body					
4. Tearing					
5. Excessive blinking					
6. Eye redness					
7. Eye pain					
8. Heavy eyelids					
9. Dryness					
10. Blurred vision					
11. Double vision					
12. Difficulty focusing for near vision					
13. Increased sensitivity to light					
14. Coloured halos around objects					
15. Feeling that eyesight is worsening					
16. Headache					