The Effects of Excessive Use of Computer Screen on Visual Acuity among Non-Academic University Staff

Abstract

Background: The increasing prevalence of computer vision syndrome (CVS) necessitates a thorough understanding of its impact on visual health among users. This study aimed to investigate the adverse effects of long-term computer usage on the visual acuity of non-academic staff at the University of Port Harcourt, Nigeria. **Methods:** This cross-sectional study involved 321 non-academic staff members aged 18-45 years with at least two years of computer usage experience. The participants were randomly selected and completed a structured questionnaire assessing demographic details, computer usage habits, and visual health status. Visual acuity was measured using the Snellen eye chart, and the data were analysed using SPSS version 25, applying descriptive statistics and chi-square tests for significance. **Results:** Among the 159 computer users, 32.7% reported using screens for more than six hours daily. Common symptoms included eye strain (17.6%), blurred vision (14.7%), and headaches (13.2%). Visual acuity assessments indicated that 66.9% of computer users had normal vision in the left eye, whereas 82.6% of computer users exhibited abnormal visual acuity compared with non-users ($X^2 = 29.89$, $p = 0.00$). A significant association was found between increased screen time and reduced normal visual acuity, with 27.3% of users with over five years of screen time reporting normal vision. **Conclusion:** This study highlighted the adverse effects of prolonged computer usage on visual acuity among non-academic staff, emphasizing the need for awareness and preventive measures to mitigate the risk of CVS in this population.

Keywords: Computer Vision Syndrome (CVS), Visual Acuity, Non-Academic Staff, Long-Term Computer Usage, Eye Health, Computer

Introduction

Over the years, continuous and rapid technological advancements have resulted in a heightened dependence on highly sophisticated technologies, further eradicating the analogue era. These innovations, such as computers, have reduced the burden of human operations and rendered processes more efficient, rapid and seamless. The use of computers for professional and personal purposes gained worldwide popularity in the early twentieth century [1]. As a result, computers have also become widely used in various sectors, including the educational sector, where they are used to study, teach, and store students' information and record exam grades. The increasing number of computer users has led to an increase in individuals experiencing ocular and non-ocular symptoms associated with computer usage, and these symptoms are collectively referred to as computer vision syndrome (CVS) [2]. The American Optometric Association defines CVS as a collection of ocular and vision disorders resulting from prolonged computer, tablet and cell phone usage [3-4]. Amy and James [5] state that CVS is also called visual fatigue or digital eye strain. According to Bali et al. [2], the symptoms of CVS can be categorized into extra-ocular symptoms, ocular surface-related symptoms, and accommodative and visual symptoms. The rate at which these symptoms occur is determined by the relationship between a computer user's visual ability and the visual demands of the activities being performed [6].

Mowry and Ison [7] reported that the CVS problem has posed a threat to frequent computer users and is recognized as a major occupational hazard. While CVS symptoms are usually temporary, this condition can lead to persistent discomfort in individuals and economic consequences, especially for those who use computers professionally [5]. CVS may also lead to diminished productivity and elevated error rates. A study conducted by Assefa et al. [8] in Ethiopia reported a 73% prevalence of CVS, with blurred vision, headache and redness of the eyes identified as the most common symptoms. Furthermore, they reported that an inappropriate sitting position is more likely to be associated with CVS. Similarly, Iqbal et al. [9] reported that 86% of medical students in Sohag, Egypt, have symptoms of CVS.

The significance and application of computers in educational institutions cannot be overstated. Universities utilize computers across multiple offices, including academic and non-academic staff such as administrative departments, information technology departments, and library keepers. Their responsibilities require excellent vision, and there is less research on the impact of extended computer use on the ocular health of non-academic staff; hence, this study was conducted with the primary objective of examining and documenting the adverse effects of prolonged computer use on the ocular health of employees at the University of Port Harcourt, Rivers State, Nigeria.

Materials and methods

Study design

This was a cross-sectional study designed to investigate the potential adverse effects of long-term computer usage on the visual acuity of non-academic staff at the University of Port Harcourt.

Study setting

The study was conducted at the University of Port Harcourt, Rivers State, Nigeria. The non-academic staff working across various administrative departments and units of the university were sampled for participation. The University of Port Harcourt, a public research university in Aluu and Choba, Port Harcourt, Rivers State, Nigeria, was established in 1975 as University College, Port Harcourt, and granted university status in 1977.

Participants

The study participants consisted of non-academic staff members who are computer users, both male and female, working at the University of Port Harcourt. The inclusion criteria required participants to be non-academic staff members aged 18 years and 45 years, with a minimum of 2 years of working experience with the use of computers at the University of Port Harcourt. Staff members with pre-existing visual impairments or conditions (e.g., eye surgeries or known eye diseases), individuals with chronic conditions such as diabetes or hypertension that could affect visual acuity, and pregnant women, due to possible hormonal changes affecting vision, were excluded from the study.

Sample size determination

The sample size was determined using Cochran's formula for sample size estimation [10], which is particularly useful for achieving a statistically valid representation of a finite population; this formula is expressed as follows:

$$n = \frac{Z^2.p.(1-p)}{e^2} \qquad \text{equation (1)}$$

In equation (1), n represents the required sample size, Z is the Z-score corresponding to the desired confidence level (e.g., 1.96 for a 95% confidence level), p is the estimated proportion of the population (0.5), and e is the margin of error (0.05). The estimated sample size was 321 participants.

Data collection

To ensure that each staff member had an equal chance of being included in the study, the participants were randomly selected using a simple random sampling technique. Data were collected using a structured questionnaire to gather information on participants' demographic details, work history, and visual health status. The questionnaire was divided into several sections: computer usage (hours spent using a computer daily, duration of computer use in years, and work environment factors such as screen brightness and distance from the screen) and visual acuity symptoms (self-reported symptoms such as eye strain, headaches, blurred vision, and the need for corrective lenses). The questionnaire was pre-tested on a small group of 20 non-academic staff to ensure clarity and relevance. Additionally, visual acuity assessments were performed using the Snellen eye chart to detect any refractive errors or changes in visual acuity.

Data analysis

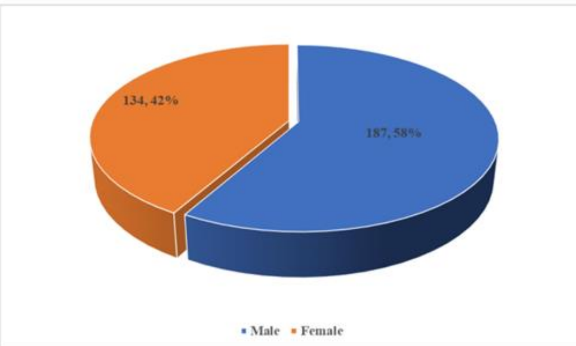
The data were analysed using SPSS version 25. Descriptive statistics, including means, frequencies, and percentages, were calculated for the demographic and exposure variables. The chi-square test was applied to assess associations between computer usage and visual symptoms and between the mean visual acuity scores of computer users and non-computer users. A p-value of ≤ 0.05 was considered statistically significant.

Results

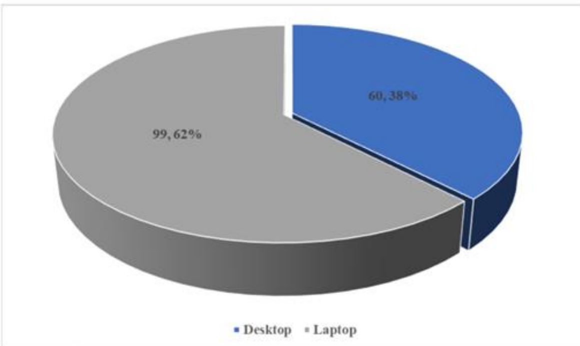
Screen usage, symptoms of CVS, and eye health among computer users

The results presented in Figures 1-3 and Tables 1--8 consider subjects aged between 18 and 43 years who were employees of the University of Port Harcourt, Rivers State, Nigeria. As presented in Table 1, among 159 computer users, the majority (32.7%) spent more than 6 hours daily on screens, while 20.1% spent 4-6 hours, and only 10.7% used screens for less than an hour. The most common symptoms of computer vision syndrome reported were eye strain (17.6%), blurred vision (14.7%), headache (13.2%), and neck/back/shoulder pain (13.2%). Other symptoms included dry eyes (7.4%), fatigue (8.8%), eye redness/irritation (8.8%), double vision (10.3%), and difficulty refocusing (5.9%).

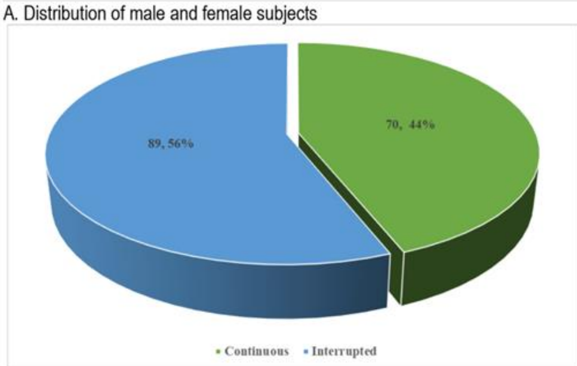
As presented in Table 2, 2.9% of the subjects reported a history of eye disease, whereas the majority (97.1%) had no previous eye conditions. Topical eye drop usage was minimal, with only 0.7% of the subjects using it. Concerning refractive error, 2.2% of the subjects were aware of having one, whereas 55.4% were unsure. Additionally, only 2.9% of the participants used glasses. Visual acuity assessments revealed that 66.9% of the patients had normal vision in the left eye, whereas 33.1% had abnormal vision. In the right eye, 70.5% had normal vision, and 29.5% had abnormalities.



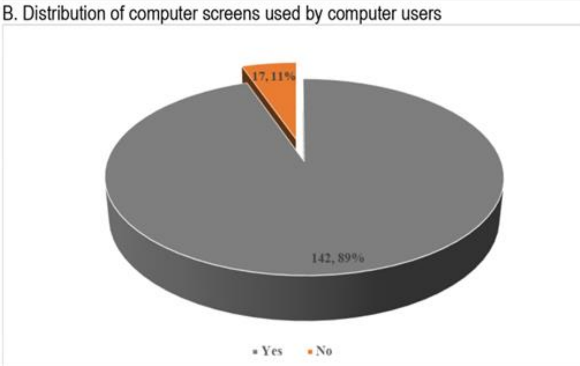
A. Distribution of male and female subjects



B. Distribution of computer screens used by computer users

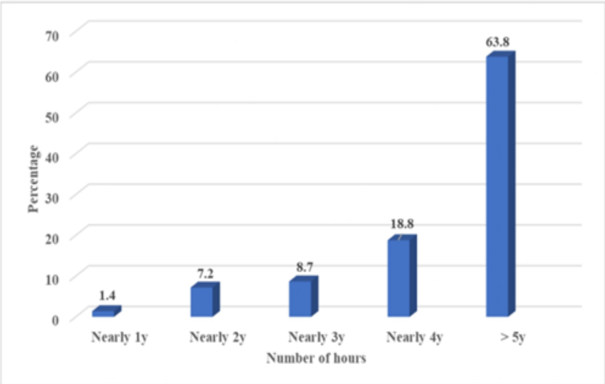


C. Mode of usage of computer screens

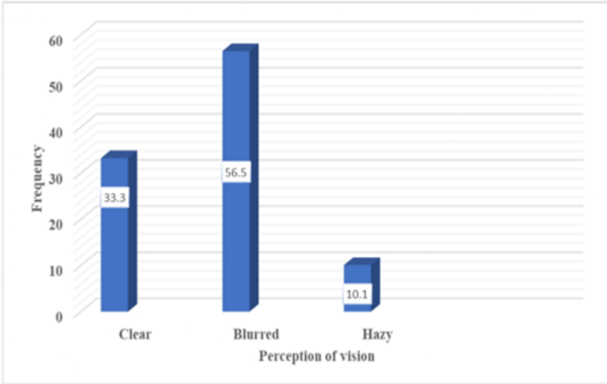


D. Subjects' opinions concerning whether CVS affects them or not

Figure 1. Distribution of subjects, Computer screen usage, and perceptions of CVS



E. Number of years subjects have spent on a computer screen



F. The perception of vision after long hours on the computer screen.

Figure 2. Duration of Computer screen use and perception of vision after prolonged use

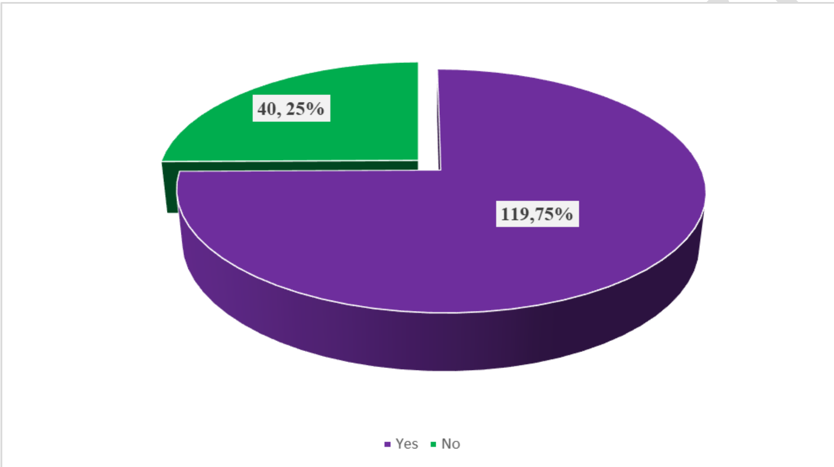


Figure 3. The willingness to decrease the rate at which they use computers

Table 1. Distribution of hours spent on Computer screens and CVS among Users

Hours spent on the computer screen (n=321)		
Hours spent	**Frequency**	**Percentage (%)**
<1 hr	34	10.7
1-2 hrs.	32	10.1
2-3 hrs.	38	11.9
3-4 hrs.	47	14.5
4-6 hrs.	65	20.1
>6 hrs.	105	32.7
Symptoms of computer vision syndrome (n=321)		
Headache	42	13.2

Blurred vision	47	14.7
Dry eyes	24	7.4
Fatigue	28	8.8
Eye strain	56	17.6
Difficulty refocusing	19	5.9
Eye redness/irritation	28	8.8
Double vision	33	10.3
Neck/back/shoulder pain	42	13.2

Table 2: Distribution of Eye Conditions and Visual acuity among the subjects

History of eye condition/disease among the subjects (n=321)		
History of eye disease	**Frequency**	**Percentage (%)**
Previous eye disease		
Yes	9	2.9
No	312	97.1
Topical eye drop usage		
Yes	2	0.7
No	319	99.3
Refractive error		
Yes	7	2.2
No	136	42.4
I do not know	178	55.4
Use of glasses		
Yes	9	2.9
No	312	97.1
Visual acuity of the subjects (n=321)		
Left		
Normal	215	66.9
Abnormal	106	33.1
Right		
Normal	226	70.5
Abnormal	95	29.5

Associations between Visual Acuity and Computer Usage among Users

The analysis presented in the tables indicates significant associations between visual acuity and various factors related to computer usage. As shown in Table 3, a significant association was found between visual acuity and computer use, with a higher percentage of computer users exhibiting abnormal visual acuity in both the left (82.6%) and right (82.9%) eyes than non-computer users did, where only 17.4% had abnormal left eye acuity and 17.1% had abnormal right eye acuity. The chi-square test yielded significant results for both the left ($X^2 = 29.89$, $p = 0.00$) and right ($X^2 = 25.78$, $p = 0.00$) eyes. Table 4 further elucidates this relationship by examining the hours spent on screens among computer users. For the left eye, all the subjects who spent less than 1 hour and those who spent between 2 and 3 hours on the computer had normal visual acuity; however, those who spent 3-4 hours exhibited a notable decrease in normal acuity (62.5%). A significant proportion of participants who spent 4–6 hours (70.6%) or more than 6 hours (59.5%) had abnormal visual acuity, as indicated by the chi-square test ($X^2 = 11.11$, $p = 0.05$). In the right eye, while 100% of the users who spent less than 1 hour reported normal visual acuity, only 50% of those who spent between 2-3 hours and 3-4 hours reported normal visual acuity, with a chi-square value of 3.76 ($p = 0.58$).

Table 5 shows a significant association between the number of years spent on screens and visual acuity. In the left eye, all the subjects with nearly 1 year of screen time had normal acuity, whereas those with more than 5 years reported a decrease in normal visual acuity (27.3%). The chi-square test indicated a significant association for the left eye ($X^2 = 16.18$, $p = 0.00$). Similarly, for the right eye, subjects with nearly 1 year of screen time also reported normal acuity (100%), whereas those with more than 5 years of screen time had a significantly lower normal acuity rate (36.4%), as confirmed by the chi-square value ($X^2 = 13.36$, $p = 0.01$). As presented in Table 6, a significant association was also found between computer vision syndrome (CVS) symptoms and visual acuity among computer users. In the left eye, among those with normal visual acuity, 33.3% reported headaches, 40% reported blurred vision, and 60% reported dry eyes. In contrast, those with abnormal visual acuity reported higher frequencies of CVS symptoms, such as headaches (66.7%), blurred vision (60%), and notably eye strain (83.3%), with a significant chi-square value ($X^2 = 16.12$, $p = 0.04$). For the right eye, the association was not significant ($X^2 = 7.66$, $p = 0.47$), with normal visual acuity showing a 44.4% incidence of headaches and 50% for blurred vision. Table 7 shows the associations between the mode of usage, type of computer screen, and visual acuity among computer users. For the left eye, those using screens continuously had a normal visual acuity rate of 38.7%, whereas interrupted users had a higher rate of 61.3%; however, this difference was not significant ($X^2 = 0.68$, $p = 0.47$). In the right eye, continuous users had 45.7% normal acuity, whereas interrupted users had 54.3% normal acuity, with no significant association ($X^2 = 0.08$, $p = 0.81$). When considering the type of screen, desktop users for the left eye had a normal visual acuity of 51.6%, whereas laptop users had a lower rate of 48.4%. The chi-square test revealed a significant association with the type of screen ($X^2 = 4.653$, $p = 0.05$), whereas for the right eye, desktop users had 48.6% normal visual acuity compared with 51.4% for laptop users, which was not significant ($X^2 = 3.59$, $p = 0.08$).

Finally, Table 8 focuses on the relationship between CVS symptoms and the type of computer screen used. Desktop users reported symptoms such as headaches (66.7%) and blurred vision (60%), whereas laptop users experienced a notably higher incidence of dry eyes (100%). Although laptop users reported a higher prevalence of symptoms, the chi-square test did not indicate a significant association ($X^2 = 13.09$, $p = 0.11$). Overall, the findings across the tables underscore the complex interplay between computer usage, screen time, and visual health.

Table 3. Association between visual acuity and the use of computers

Group	Visual Acuity		Chi-square	
	Normal (%)	Abnormal (%)	X^2	p-value
Left				
Computer users	72 (33.3)	87 (82.6)	29.89	**0.00***
Non-computer users	143 (66.7)	19 (17.4)		
Right				
Computer users	81 (35.7)	78 (82.9)	25.78	**0.00***
Non-computer users	145 (64.3)	17 (17.1)		

*X^2 = chi-square, *significant at p-value ≤ 0.05*

Table 4. Associations between hours spent on screens and visual acuity among computer users

Visual Acuity	Hours spent on the computer screen						Chi-square	
	<1 hr	1-2 hr	2-3 hr	3-4 hr	4-6 hr	>6 hr	X^2	p-value
Left								
Normal	5 (100)	0 (0)	9 (100)	12 (62.5)	11 (29.4)	34 (40.5)	11.11	**0.05***
Abnormal	0 (0)	2 (100)	0 (0)	7 (37.5)	28 (70.6)	51 (59.5)		
Right								
Normal	5 (100)	0 (0)	5 (50)	9 (50)	23 (58.8)	39 (45.9)	3.76	0.58
Abnormal	0 (0)	2 (100)	5 (50)	9 (50)	16 (41.2)	46 (54.1)		

*X^2 = Chi-square, *significant at p-value ≤ 0.05*

Table 5. Associations between years spent on screens and visual acuity among computer users

Visual Acuity	Years spent on computer screen (%)					Chi-square	
	nearly 1yr	nearly 2yr	nearly 3yr	nearly 4yr	>5yr	X^2	p value
Left							
Normal	2 (100)	7 (60)	12 (83.3)	23 (76.9)	28 (27.3)	16.18	**0.00***
Abnormal	0 (0)	4 (40)	2 (16.7)	7 (23.1)	74 (72.7)		
Right							
Normal	2 (100)	4 (40)	12 (83.3)	25 (84.6)	37 (36.4)	13.36	**0.01***
Abnormal	0 (0)	7 (60)	2 (16.7)	5 (15.4)	65 (63.6)		

X^2 = Chi-square, **significant at p-value ≤ 0.05*

Table 6. Associations between CVS and visual acuity among computer users

Visual acuity	Headache	Blurred vision	Dry eyes	Fatigue	Eye strain	Difficulty refocusing	Eye redness/ irritation	Double vision	Neck/back/ shoulder pain	Chi-square

										X^2	p-*value*
Left											
Normal	7 (33.3)	9 (40)	7 (60)	9 (66.7)	5 (16.7)	0 (0)	5 (33.3)	14 (85.7)	14 (66.7)	16.12	**0.04***
Abnormal	14 (66.7)	14 (60)	4 (40)	5 (33.3)	23 (83.3)	9 (100)	9 (66.7)	2 (14.3)	7 (33.3)		
Right											
Normal	9 (44.4)	12 (50)	7 (60)	5 (33.3)	9 (33.3)	2 (25)	9 (66.7)	14 (85.7)	12 (55.6)	7.66	0.47
Abnormal	12 (55.6)	12 (50)	4 (40)	9 (66.7)	19 (66.7)	7 (75)	5 (33.3)	2 (14.3)	9 (44.4)		

X^2 = chi-square, **significant at p-value ≤0.05*

Table 7. Associations among mode of usage, type of computer screen and visual acuity among computer users

Mode of usage	Visual acuity		Chi-square	
	normal (%)	abnormal (%)	X^2	p-value
Left				
Continuous	28 (38.7)	42 (48.6)	0.68	0.47
Interrupted	44 (61.3)	44 (51.4)		
Right				
Continuous	37 (45.7)	33 (42.4)	0.08	0.81
Interrupted	44 (54.3)	44 (57.6)		
Type of screen				
Left				
Desktop	37 (51.6)	23 (26.3)	4.653	**0.05***
Laptop	35 (48.4)	65 (73.7)		
Right				
Desktop	39 (48.6)	21 (26.5)	3.59	0.08
Laptop	42 (51.4)	68 (73.5)		

X^2 = chi-square, **significant at p-value ≤ 0.05*

Table 8. Association between computer vision syndrome (CVS) and the type of computer screen used

Computer screen used	Symptoms of CVS presenting among computer users									Chi-square	
	Headache	Blurred vision	Dry eyes	Fatigue	Eye strain	Difficulty refocusing	Eye redness/irritation	Double vision	Neck/back/shoulder pain	X^2	p-value
Desktop	14 (66.7)	14 (60)	0 (0)	5 (33.3)	7 (25)	0 (0)	2 (33.3)	5 (28.6)	13 (55.6)	13.09	0.11

Laptop	3 (33.3)	9 (40)	11 (100)	9 (66.7)	21 (75)	9 (100)	9 (66.7)	11 (71.4)	9 (44.4)		

X^2 = chi-square, **significant at p-value ≤ 0.05*

Discussion

Symptoms of CVS are increasingly prevalent in the modern digital era, where prolonged screen use has become ubiquitous in daily activities. Physiologically, the visual discomfort associated with CVS can be attributed to various factors, including the continuous demand on the eyes to adjust focus (accommodation) and track objects (saccadic movements) [11-12]. During extended near-work tasks, such as reading or interacting with screens, the ciliary muscles responsible for accommodation remain contracted for prolonged periods, leading to visual fatigue. Additionally, excessive saccadic eye movements – rapid, small movements between points of fixation – are necessary during screen-based tasks, further contributing to ocular strain [12-13].

Our study confirmed that prolonged exposure to digital devices is strongly associated with CVS, such as eye strain, blurred vision, and headaches, with 32.7% of users spending more than six hours on screens daily. Similarly, there was a correlation between extended screen time, particularly beyond 6 hours per day, with increased incidences of visual discomfort and fatigue [11]. Notably, a survey by Bhatnagar et al. [14] among medical students revealed that 92% experienced at least one symptom of CVS during digital device use, with eye strain (49%) and headaches (37%) being the most frequently reported issues. The continuous near-work activities performed while using screens contribute to excessive demand on the visual system, exacerbating symptoms even after screen use has ceased. Chronic exposure, as suggested by Von Stroh [15], can cause lasting discomfort, which persists even when screen usage is reduced, implying that long-term screen habits may have cumulative negative effects on visual health.

Ergonomic conditions were also found to play a critical role in the prevalence of CVS. Poorly designed workstations, particularly those with inappropriate screen distances and lighting, are linked to higher rates of discomfort [16-17. This reinforces the importance of proper ergonomic adjustments, which can help alleviate strain on the eyes and improve user comfort. In particular, maintaining an ideal screen distance of 50–70 cm from the eyes has been suggested to allow the eyes to rest in a more natural state of accommodation and vergence [15][17]. Therefore, inadequate ergonomic setups, such as poor screen height, inappropriate lighting, and seating, intensify symptoms of CVS. Hence, there is a need for workstation adjustments and breaks to reduce the impact of prolonged screen use.

The nature of visual tasks performed on screens was another significant factor contributing to CVS. Tasks requiring intense focus and sustained attention, such as reading small font or processing detailed images, lead to eye fatigue and discomfort. The study revealed high rates of symptoms such as headaches and neck pain among users engaged in these visually demanding activities [15][19]. This suggests that not only the duration of screen use but also the complexity of the visual tasks involved exacerbates the onset of CVS symptoms. Users performing highly detailed visual tasks may experience greater strain on their visual system because of continuous accommodation changes, making breaks and proper task management essential [20-22].

A significant observation from the study is the lack of awareness and underutilization of eye care among the participants. Although the majority of users reported normal visual acuity (66.9% and 70.5% in the left and right eyes, respectively), very few reported the use of corrective measures such as glasses (2.9%) or topical eye drops (0.7%). This low level of corrective eye care use aligns with previous studies indicating that many individuals, even those experiencing symptoms, fail to seek necessary eye care interventions [23-24]. The results also revealed that many individuals remained unaware of their eye health status, as demonstrated by 97.1% of the subjects reporting no previous eye conditions. This gap in awareness suggests a critical need for increased public education and routine screenings to promote eye health and address unrecognized visual issues.

Furthermore, there was a significant association between screen time and visual acuity. Participants with extended screen exposure, especially those using computers for more than 6 hours daily, were more likely to exhibit abnormal visual acuity. Additionally, individuals with more than five years of screen use were significantly more likely to report abnormal acuity. This finding indicates that prolonged and consistent screen exposure, over time, compromises visual health, and proper interventions, such as breaks and ergonomic adjustments, are essential for reducing this risk [20][25-27].

Interestingly, while there was a significant association between screen type and visual acuity for the left eye, no such association was observed for the right eye. Continuous screen users, particularly those using desktop computers, reported higher incidences of CVS such as blurred vision and dry eyes. The disparity in the association between screen type and visual acuity may suggest that different types of screens, such as laptops versus desktops, influence visual health in various ways. Moreover, users who engaged in continuous screen use without regular breaks experienced more visual discomfort than did those who interrupted their usage [22][28].

It is imperative to address CVS, especially in populations with heavy screen usage, such as students and office workers. The significant associations between prolonged screen time, poor ergonomic conditions, and visual acuity emphasize the need for targeted interventions, including ergonomic workspace design, frequent breaks, and eye health education. Institutions, particularly those that rely heavily on digital learning or remote work, should promote awareness about CVS and provide guidelines on optimal screen usage and workstation setup. Additionally, public health campaigns should focus on increasing awareness of the importance of regular eye screenings and the use of corrective measures such as glasses or eye drops when necessary. Given the underutilization of eye care observed in this study, it is vital to improve access to eye health services and encourage individuals to prioritize their visual health as part of their overall well-being.

Strengths and weaknesses of the study

This study's strength lies in its comprehensive assessment of the relationship between prolonged computer use and visual health, particularly CVS. The inclusion of diverse variables, such as screen time, ergonomic factors, and visual acuity, allowed for a nuanced analysis that revealed significant associations between prolonged screen exposure and abnormal visual acuity. The large sample size and the use of robust statistical methods, such as chi-square tests, enhanced the reliability of the findings, providing a strong basis for understanding the prevalence of visual discomfort in computer users. Additionally, the detailed breakdown of screen time and its correlation with visual symptoms offered valuable insights into the importance of usage patterns in the development of CVS, which has practical implications for workplace and educational settings.

However, the study also has some limitations that could impact the generalizability of the findings. One significant limitation was the reliance on self-reported data for screen time and visual symptoms, which may have introduced recall bias or inaccuracies in reporting. Additionally, the study did not account for the sociodemographic and lifestyle characteristics of the sample population. This omission limited the ability to conduct regression analyses that could establish the influence of various factors, such as age, socioeconomic status, and lifestyle habits, on visual health outcomes. Without this information, it was challenging to determine whether the observed visual impairments were directly caused by screen use or influenced by other unmeasured factors. Furthermore, while the study revealed significant associations, it did not establish causality, making it difficult to ascertain whether the visual impairments were a direct result of screen exposure. Finally, the cross-sectional design restricted the assessment of the long-term effects of screen exposure on visual health. Future studies employing longitudinal designs and objective measures of screen time and visual health, along with a thorough examination of sociodemographic variables, would provide a clearer understanding of the cause–and–effect relationship between computer use and visual impairment.

Conclusion

The study established a widespread prevalence of CVS among sampled university employees with prolonged screen time, compounded by inadequate ergonomic conditions and visually demanding tasks. The lack of awareness and underutilization of eye care services further exacerbates this issue; hence, there is a need for comprehensive interventions to mitigate the impact of screen use on visual health. Addressing these challenges will result in a reduced burden of CVS and improve overall quality of life for frequent screen users.

Recommendations

Given the high prevalence of CVS among users with prolonged screen exposure, it is crucial to implement targeted interventions at both the individual and institutional levels. Employers and educational institutions should prioritize the optimization of ergonomic workstations by ensuring proper screen positioning, appropriate lighting, and encouraging regular breaks, as recommended by the 20–20–20 rule, taking a 20-second break to look at something 20 feet away every 20 minutes. Additionally, providing training on ergonomic best practices and the use of adaptive technologies such as antiglare screens or computer eyewear can help reduce visual strain and improve overall comfort during extended screen use. These interventions play a critical role in reducing the physiological burden on the visual system, thereby lowering the risk of long-term visual health issues among users.

Furthermore, public health campaigns should focus on raising awareness about the importance of routine eye exams and promoting the use of corrective lenses or eye drops for individuals experiencing symptoms of CVS. Health education efforts can also include the dissemination of information on the physiological mechanisms behind eyestrain, fostering a better understanding among the general population of how to prevent visual discomfort. Policies that support workplace eye health initiatives, such as offering subsidized eye care services and promoting healthy screening habits, could also be implemented to ensure a healthier visual environment for all users. These recommendations, if adopted, could significantly reduce the prevalence and impact of CVS, contributing to improved visual health and overall well-being in screen-intensive settings.

Availability of data and materials

The data used in this study can be made available to eligible researchers upon request, to enable the replication of methods and findings. To request access, interested individuals should reach out to the corresponding author.

Ethical considerations

This study adhered to the ethical standards outlined in the Declaration of Helsinki. Ethical approval was obtained from the University of Port Harcourt Ethics Committee prior to the commencement of the research. The participants were fully informed about the study's purpose, procedures, and potential risks, and written consent was obtained before their inclusion. Confidentiality was maintained throughout the study, ensuring that all the data were anonymized and securely stored. The participants were informed of their right to withdraw from the study at any point without any repercussions. The research aimed to maintain the dignity and rights of all individuals involved, prioritizing their welfare and ensuring that the findings contributed positively to the understanding of computer vision syndrome.

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