Discover Public Health

RESEARCH

Open Access

Prevalence, knowledge and awareness of computer vision syndrome among students in a tertiary academic institution

Michael Agyemang Kwarteng[1,2,4], Selassie Tagoh[3,4,6*], Vongai Carol Chisayinyerwa[4], Rutendo Enia Chashamba[4] and Lynett Erita Masiwa[5]

*Correspondence:
Selassie Tagoh
Selassie.tagoh@otago.ac.nz;
stagoh@buse.ac.zw
[1]Optometry Unit, Department of Clinical Surgical Sciences, Faculty of Medical Sciences, The University of the West Indies, St. Augustine Campus, St. Augustine, Trinidad and Tobago
[2]Centre for Vision across the Life Span, Department of Optometry and Vision Sciences, School of Applied Sciences, University of Huddersfield, Huddersfield, United Kingdom
[3]Department of Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand
[4]Department of Optometry, Faculty of Science, Bindura University of Science Education, Bindura, Zimbabwe
[5]Optometry Unit, Faculty of Medicine and Allied Sciences, University of Zimbabwe, Harare , Zimbabwe
[6]Save Sight Institute, University of Sydney, Sydney, Australia

Abstract

Computer vision syndrome (CVS) is a common oculo-visual problem reported among active screen users. This study reports the prevalence of CVS among university students in a tertiary institution in Zimbabwe.

The study used a descriptive cross-sectional survey design with eligible participants recruited using convenience sampling. Data was collected using a self-administered online questionnaire comprising three sections: socio-demographic information, verified prevalence of computer vision syndrome (CVS-Q), and knowledge and awareness of CVS.

Data was collected from 374 undergraduate students, the majority of whom were from the Faculties of Science and Engineering (30.7%) and were in their second year (32.1%). The prevalence of CVS was 35.6% ($n=133$), with a slightly higher prevalence among females (38.7%) compared to males (31.5%, $p=0.158$). Most affected students reported moderate symptoms, with headaches, dryness, and blurred vision being the most frequent complaints. Although 48.4% of participants had heard of CVS, detailed knowledge remained limited. While significant associations were found between CVS symptoms and several variables tested, using a digital device ($p=0.009$) and a history of refractive errors ($p=0.010$) were the main independent predictors of CVS knowledge.

A considerable number of university students experience CVS with various common symptoms. The presence of limited knowledge and common modifiable risk factors among these students underscores the importance of targeted education and ergonomic interventions, in addition to routine vision screening within university settings, to mitigate the burden of CVS.

Keywords Dry eye disease, Health knowledge, Prevalence, Computer vision syndrome, Students, Zimbabwe

1 Introduction

The rapid integration of digital technology into everyday life has significantly altered patterns of visual task performance worldwide. The widespread adoption of computers, smartphones, tablets, and other digital devices has created a new public health concern about Computer Vision Syndrome (CVS), also referred to as Digital Eye Strain [1]. CVS encompasses a range of ocular and extraocular symptoms, such as eye strain, blurred vision, headache, neck and shoulder pain, resulting from prolonged screen use [2]. According to the American Optometric Association, CVS is defined as a complex group of eye and vision-related problems resulting from prolonged use of digital devices such as computers, tablets, e-readers and cell phones [3]. Its aetiology is multifactorial, involving sustained accommodation and convergence, reduced blink rate, glare, poor ergonomics, and prolonged exposure to digital screens [4].

Globally, the prevalence of CVS among digital device users has been reported to range from 12.1% to 97.3%, particularly among individuals with extended screen exposure, such as university students and women [5]. The academic environment has increasingly shifted toward digital learning platforms, resulting in prolonged screen time for both instructional and recreational purposes [6]. This trend has intensified following the COVID-19 pandemic, which normalised online learning and virtual interactions. While digital devices enhance educational opportunities, they also pose risks for ocular health when proper ergonomic and hygienic visual practices are not observed [7].

The consequences of CVS extend beyond transient visual discomfort. If unaddressed, CVS may reduce academic productivity, increase fatigue, and negatively impact quality of life [8–10]. Moreover, its symptoms often mimic or overlap with other neurological and systemic conditions, leading to misdiagnosis and unnecessary medical interventions [4]. Despite its high prevalence, knowledge and awareness about CVS remains a concern among university students, a population that spends considerable time on screens for study, communication, and leisure [11]. Inadequate knowledge and awareness can delay symptom recognition and adoption of preventive measures, exacerbating ocular strain and related health complications.

While several studies have explored CVS in various global contexts [4, 5, 9, 11, 12], there is limited evidence from low to middle-income countries (LMICs), including Zimbabwe. Context-specific data is critical, given that differences in digital device access, usage habits, and healthcare resources influence experiences. Understanding the prevalence and knowledge of CVS among university students in Zimbabwe is essential for developing targeted health education programs, informing institutional policies, and guiding preventive interventions in academic settings. Such evidence is particularly relevant in Sub-Saharan Africa, where the digitalisation of education is rapidly expanding [13], but ocular health awareness remains inadequate.

This study, therefore, aimed to determine the prevalence of Computer Vision Syndrome and assess the level of knowledge and awareness among students at Bindura University of Science Education (BUSE). By identifying common symptoms, risk factors such as screen time and device type, and gaps in knowledge, this research sought to provide actionable insights for eye health promotion in institutions. Findings will not only inform targeted local interventions but also contribute valuable evidence to the global understanding of the burden of Computer Vision Syndrome in the digital era.

2 Methods and materials

2.1 Study design and setting

A descriptive cross-sectional design was used in this survey, which was conducted between 1st March 2025 and 20th June 2025. Bindura University of Science Education, established in 1996 and formally recognized as a university in 2000, is a public institution located in Bindura, Zimbabwe, with a total registered student population of about 8000 [14]. BUSE offers a diverse range of academic programs across faculties such as Science, Commerce, Social Sciences, and Education, with notable developments including the establishment of a School of Optometry and a National Sports Academy [14]. The survey included all undergraduate students who agreed to take part. The university plays a pivotal role in advancing Science, Technology, Engineering and Mathematics (STEM) education and research in Zimbabwe, contributing significantly to national development through its academic and professional training initiatives [14].

2.2 Study population and sample

Participants were recruited using a convenience sampling approach. The online survey link was disseminated via course representatives and official student social media platforms (WhatsApp group) to ensure a broad reach. This method was selected because it provided a convenient, cost-effective and suitable approach for reaching and getting responses from our target population, made up of students in an online environment. The minimum sample size that was needed in this survey was calculated using the sample size formula proposed by Yamane [15]:

$$\mathrm{n} = \mathrm{N} / \left(1 + \mathrm{Ne}^2\right)$$

N = Estimated number of students at Bindura University during the study period = 5000.

e= margin of error = 0.05.

n = 370.

2.2.1 Selection criteria

All undergraduate students enrolled at Bindura University of Science Education during the study period were eligible to participate. Participants completed a consent form before they were allowed to proceed with providing their responses to the questions.

2.3 Data collection process

Data was obtained using two validated, self-reporting online Google Questionnaire forms with 3 sections; namely socio-demographic data (includes faculty of study, year of study, age, gender, and academic year), prevalence of CVS, and knowledge and awareness of CVS. The CVS Questionnaire, developed by Segui et al. [15, 16], was utilized to collect data for the section on the prevalence of computer vision syndrome [15, 16]. The form consisted of 16 questions asking about the intensity and frequency of 16 symptoms of CVS. The form uses Rasch analysis, which is a reliable approach for psychometric analysis. To answer questions about the frequency of symptoms or how often symptoms occur when using electronic gadgets, 3 options were available for participants to choose from: Never, Occasionally, and Often/Always. A "Never" response signifies that the symptom is completely absent, an "occasionally" response means the participant experiences sporadic episodes of CVS symptoms once a week, and an "often or always" response indicates that the symptom occurs daily, twice or three times a week. To measure intensity, participants had two response options available to them: “moderate” and “intense”. Respondents were instructed and reminded to select “not applicable” as their response to the intensity question if they selected the “never” option for the frequency question. Symptom severity scores were calculated as the product of the frequency of symptom occurrence and the intensity/severity of the symptom.

2.4 Ethics consideration

Ethical clearance was obtained from the ethics committee of Bindura University of Science Education. Informed written (electronic) consent was sought from all participants before data collection. Participants were first provided with a research participation information sheet and a consent form with a detailed explanation of the survey to seek their consent. Confidentiality was assured throughout the procedure as information obtained was shared with only authorized personnel; moreover, names and email addresses were not part of the patient information collected in the questionnaire. Participation of respondents was completely voluntary, and participants were permitted to withdraw from the survey at any moment without penalty. The study followed the guidelines of the Declaration of Helsinki, which stipulates how human participants should be treated in any research study.

2.5 Data coding and analysis

Frequency was coded as follows: Never = 0, Occasionally = 1, and Often/Always = 2. Symptom severity was coded as follows: Moderate = 1 and Intense = 2. The total score was derived as the sum of the products across all symptom items. Knowledge of computer vision syndrome was assessed using 22 structured questions. Participant scores were categorized according to Bloom’s cut-off criteria, which provides a standardized framework for classifying the cognitive performance of participants in surveys [17]. According to this criterion, total knowledge scores can be split into three main categories: Good knowledge: 80–100%, Moderate knowledge: 60–79%, Poor knowledge: Below 60%. This approach was adopted not only because it facilitates easy and clear interpretation of knowledge levels but also to facilitate a consistent comparison with prior studies that have assessed awareness and knowledge of health-related conditions.

Data collected from the online survey were analyzed using the Statistical Package for Social Sciences (SPSS) version 29. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated and presented using tables, charts, and graphs to summarize participant demographics, prevalence of CVS, and levels of knowledge and awareness. Associations between categorical variables, such as gender, faculty, device type, screen time, and the presence of CVS were evaluated using the Chi-square (χ^2) test of independence, with Fisher’s exact test applied where expected cell counts were small (< 5). Statistical significance was set at $p < 0.05$, and all analyses were conducted following standard assumptions for categorical data to ensure reliability and validity of results. A binary logistic regression was performed with knowledge as the dependent variable, coded as “Yes” or “No” based on whether participants had ever heard of Computer Vision Syndrome.

3 Results

A total of 374 students participated in this study, comprising 212 (56.7%) females and 162 (43.3%) males, with a mean age of 25.16 ± 4.64 years (range: 19 to 45 years). Most participants were enrolled in the Faculties of Science & Engineering (30.7%) and Commerce (30.6%), with ~39% of participants from other faculties (Agriculture and Social Sciences & Humanities). The highest representation by year of study was from second-year students (32.1%). The most used single device was a smartphone (25.7%), but most participants used multiple devices (60.9%), Table 1.

3.1 Prevalence of computer vision syndrome among the participants

Out of 374 participants assessed with the CVS-Q, 133 (35.6%) met the criteria to be classified as experiencing Computer Vision Syndrome (CVS). CVS prevalence was slightly higher among females (38.7%) compared to males (31.5%), though the difference was not statistically significant ($p = 0.158$). Across faculties, CVS prevalence among participants ranged from 30.7% among students enrolled in the faculty of Commerce to 39.0% among those enrolled in Social Sciences & Humanities, with no significant differences observed between them ($p = 0.608$). In terms of year of study, CVS prevalence was 25.7% among students in year one but increased slightly among students in years two (34.2%) and year 4 (37.4%), and more sharply among the third years (45.2%), although the differences were not statistically significant ($p = 0.095$), Table 2.

3.2 Common symptoms of CVS

Figure 1 shows the frequency and intensity/severity of commonly reported symptoms of CVS by participants. While most participants reported never experiencing many CVS symptoms frequently, a considerable proportion experienced them occasionally, and a few experienced them often. Typical symptoms include headache, blurred vision, eye pain, redness, and tearing. Blurred vision was the most "occasionally" reported symptom (42.5%) while headaches is most "often" reported symptom (22.5%). Among those affected, the majority rated their symptoms as moderate rather than intense. Blurred vision was mostly moderate (44.4%), and tearing was mostly intense (36%).

Table 1 Distribution of Socio-demographic characteristics

Demographics	Sub-group	Frequency (%)
Sex	Female	212 (56.7)
	Male	162 (43.3)
Faculty	Agriculture	45 (12.0)
	Commerce	114 (30.6)
	Science & Engineering	115 (30.7)
	Social Sciences & Humanities	100 (26.7)
Year of study	One	74 (19.8)
	Two	120 (32.1)
	Three	73 (19.5)
	Four	107 (28.6)
Devices used	Smartphone	96 (25.7)
	Laptop	24 (6.4)
	Desktop	10 (2.7)
	Tablet	16 (4.3)
	Multiple devices	228(60.9)

Table 2 Prevalence of computer vision syndrome among the participants

Variables	Sub-group	Computer vision syndrome		Total	*p*-value
		No (*n*, %)	Yes (*n*, %)		
Sex	Female	130 (61.3)	82 (38.7)	212	0.158
	Male	111 (68.5)	51 (31.5)	162	
	Subtotal	241 (64.4)	133 (35.6)	374	
Faculty	Agriculture	28 (62.2)	17 (37.8)	45	0.608
	Commerce	79 (69.3)	35 (30.7)	114	
	Science and Engineering	73 (63.5)	42 (36.5)	115	
	Social Sciences and Humanities	61 (61.0)	39 (39)	100	
	Subtotal	241 (64.4)	133 (35.6)	374	
Year of study	One	55 (74.3)	19 (25.7)	74	0.095
	Two	79 (65.8)	41 (34.2)	120	
	Three	40 (54.8)	33 (45.2)	73	
	Four	67 (62.6)	40 (37.4)	107	
	Subtotal	241 (64.5)	133 (35.6)	374	

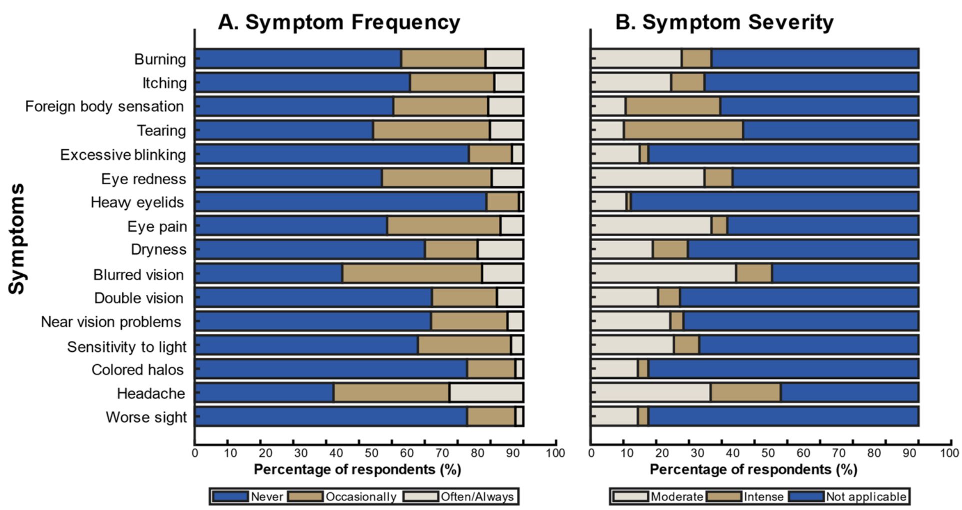

Fig. 1 Stacked bar graph showing (**A**) the frequency and (**B**) the severity of the observed CVS symptoms among participants. In the left panel (**A**), bars represent symptoms that never occur (Blue), occur occasionally in sporadic episodes, such as once per week (Yellow), or occur often, such as 2 or 3 times a week or almost every day (Grey). In the right panel (**B**), participants were asked to indicate "not applicable" if they selected "never" for frequency. This is represented by the blue bars. The yellow and grey bars represent "intense" and "moderate" severity of CVS symptoms, respectively. Overall, most participants occasionally experience CVS symptoms, but the most often reported symptom was headache, and the severity of symptoms was generally moderate.

3.3 Knowledge and awareness of Computer Vision Syndrome among participants

Awareness of CVS was moderate, with 48.4% of participants reporting prior knowledge of the condition. Most participants reported daily screen exposure exceeding four hours, both during daytime (88.5%) and nighttime (85.6%) use, and 72.7% had engaged in screen use for five years or longer. Screen use was often interrupted (53.2%), and the most common device type was small screens (48.7%), typically set at a brightness of 50–70% in dark environments. A large proportion (75.4%) experienced screen-related symptoms, though only 13.9% had a prior diagnosis of dry eye, and 30.5% reported having a refractive error. Most participants (80.2%) believed digital screens affected their health and lifestyle, with 76.7% enrolled in schools with mandated computer system literacy and use programs. Study methods were primarily a mix of books and screens (70.1%), while entertainment (69.5%) was the main purpose of screen use. Multiple device use (60.9%)

was common, and knowledge of CVS was most often acquired from multiple sources (28.3%) or the internet (11.8%), Table 3.

3.4 Association between participants' knowledge of CVS, behavioural attributes and the presence of CVS symptoms

The chi-square test revealed that CVS symptoms were significantly associated with prior knowledge of CVS, longer duration of screen use (≥ 5 years), continuous rather than interrupted screen use, use of medium-sized screens, the presence of refractive error, perception of screen-related health effects, and attendance at schools with mandated computer programs (all $p < 0.001$) (Table 4). Participants who had heard of CVS were significantly more likely to report CVS symptoms compared to those who had not ($\chi^2 = 17.5$, $p < 0.001$). In contrast, participants' knowledge about daily screen hours (day or night), screen brightness settings, study method, and primary purpose of screen use were not significantly associated with CVS symptoms.

3.5 Predictors of knowledge of computer vision syndrome among participants

To further explore potential independent predictors of CVS knowledge, a binary logistic regression analysis was conducted, controlling for other factors to identify these independent predictors of participants' knowledge of CVS (Table 5). After adjusting for sex, age, screen time, refractive error, and other potential covariates, two factors remained statistically significant. Participants with a history of refractive error or spectacle wear were significantly less likely (47%) to know about CVS (AOR = 0.53.95% CI 0.32–0.86, $p = 0.010$), whereas those who frequently used digital devices were almost twice as likely (~ 90%) to have some knowledge about CVS (AOR = 1.87, 95% CI 1.17–2.99, $p = 0.009$). No significant associations were observed for age, sex, screen size, screen brightness or previous diagnosis of dry eye disease (all $p > 0.005$).

4 Discussion

This study provides insight into the prevalence, symptom burden, and awareness of Computer Vision Syndrome (CVS) among undergraduate students in a low-middle-income context. Overall, more than one-third of participants (35.6%) reported clinically significant CVS symptoms, with headaches and blurred vision being the most common complaints. Despite nearly half of students (48.4%) having prior awareness of CVS, detailed knowledge regarding risk factors and preventive strategies was limited. Perhaps, this proportion of participants with prior awareness of CVS may not be representative of the general population and is likely overestimated because participants were recruited online from frequent VDU users who are more likely to have encountered the term in the past. Never-the-less CVS symptoms were significantly associated with prior awareness, prolonged and continuous screen use, refractive error, and perceived screen-related health effects. Even after adjusting for relevant covariates, awareness of CVS was significantly associated with a history of refractive error and the use of digital devices. These findings highlight the behavioural and optical contributors to symptom experience.

The predominance of female participants in this sample (56.7%) likely reflects several interrelated factors. First, the gender distribution in Bindura and Zimbabwe generally skews slightly towards females, as documented in national census statistics [18].

Table 3 Responses of participants to questions on their knowledge of CVS

Questions	Responses	Frequency (%)
Have you ever heard about computer vision syndrome?	Yes	181(48.4)
	No	193(51.6)
How many of your total screen hours do you spend on your digital screen during the night?	≤ 4 h	54(14.4)
	> 4 h	320(85.6)
How many of your total screen-hours do you spend on your digital screen during the daytime?	≤ 4 h	43(11.5)
	> 4 h	331(88.5%)
How many years have you spent using screens in this manner?	≥ 5 years	272(72.7)
	< 5 years	102(27.3)
How are the hours on your digital screen spent?	Continuous	175(46.8)
	Interrupted	199(53.2)
What is the screen-size of the most common individual/single screen you use?	Large	53(14.2)
	Medium	139(37.2)
	Small	182(48.7)
To what average level do you illuminate your primary screen percentage (i.e., screen brightness) in the dark?	10–30	96(25.7)
	30–50	81(21.7)
	50–70	126(33.7)
	70–100	71(19.0)
Are your symptoms associated with screen use?	Yes	282(75.4)
	No	35(9.4)
	Not sure	57(15.2)
Do you have previous diagnoses of dry eye disease or use eye drops to treat it?	Yes	52(13.9)
	No	322(86.1)
Do you have any refractive error or wearing glasses?	Yes	114(30.5)
	No	260(69.5)
Do you feel that digital screens affect your lifestyle and health?	Yes	300(80.2)
	No	74(19.8)
Is your school involved in mandated computer system use program?	Yes	287(76.7)
	No	87(23.3)
How do you usually study?	Books	14(3.7)
	Screens	98(26.2)
	Both	262(70.1)
What is your main purpose for screen use?	Academic	110(29.4)
	Entertainment	260(69.5)
	Both actually	1(0.3)
	Others	3(0.8)
What are the digital screens you commonly use?	Desktop	10(2.7)
	Laptops	24(6.4)
	Smartphones	96(25.7)
	Tablets	16(4.3)
	Multiple devices	228(60.9)
Where did you hear about computer vision syndrome?	Mass media	17(4.5)
	Newspapers	3(0.8)
	Health institutions	9(2.4)
	Internet	44(11.8)
	Friends or relatives	26(7)
	Multiple sources	106(28.3)
	Not applicable	169(45.2)

Additionally, women may be more inclined to participate in online surveys, possibly due to greater engagement with health and community issues or higher responsiveness to online recruitment efforts [19]. This trend of female predominance is consistent with findings from similar online studies conducted in Saudi Arabia [20], Columbia [21],

Table 4 Association between participants' knowledge of CVS, behavioural attributes and the presence of CVS symptoms

Questions	Responses	CVS diagnosis (counts)		Chi square test (χ^2)	*P*-value
		Absent	Present		
Have you ever heard about CVS?	Yes	105	88	17.5	< 0.001***
	No	136	45		
How many of your total screen hours do you spend on your digital screen during the night?	≤ 4 h	42	12	4.9	0.270
	> 4 h	199	121		
How many of your total screen-hours do you spend on your digital screen during the daytime?	≤ 4 h	33	10	3.2	0.073
	> 4 h	208	123		
How many years have you spent using screens in this manner?	≥ 5 years	153	119	29.2	< 0.001***
	< 5 years	88	14		
How are the hours on your digital screen spent?	Continuous	90	85	24.2	< 0.001***
	Interrupted	151	48		
What is the screen-size of the most common individual/single screen you use?	Large	33	20	18.2	< 0.001***
	Medium	72	67		
	Small	136	46		
To what average level do you illuminate your primary screen percentage (i.e., screen brightness) in the dark?	10–30	70	26	6.3	0.960
	30–50	54	27		
	50–70	78	48		
	70–100	39	32		
Are your symptoms associated with screen use?	Yes	163	119	23.1	< 0.001***
	No	32	3		
	Not sure	46	11		
Do you have previous diagnoses of dry eye disease or use eye drops to treat it?	Yes	16	36		
	No	225	97		
Do you have any refractive error or wearing glasses?	Yes	45	69	44.6	< 0.001***
	No	196	64		
Do you feel that digital screens affect your lifestyle and eye health?	Yes	174	126	27.4	< 0.001***
	No	67	7		
Is your school involved in mandated computer system use program?	Yes	171	116	12.7	< 0.001***
	No	70	17		
How do you usually study?	Books	9	5	4.1	0.130
	Screens	55	43		
	Both	177	85		
What is your main purpose for screen use?	Academic	73	37	4.0	0.410
	Entertainment	167	93		
	Both actually	0	1		
	others	1	2		

Table 5 Binary logistic regression controlling for multiple predictors of participants' knowledge of CVS

Variables	B	S.E	Wald	df	*p*-value	Exp(B) OR	95% CI of OR	
							Lower	Upper
Sex	0.1	0.2	0.3	1	0.559	1.1	0.7	1.8
Age	0.01	0.03	0.3	1	0.614	1.01	1.0	1.1
Duration of use (Night)	-0.6	0.3	2.8	1	0.095	0.6	0.3	1.1
Duration of use (Day)	-0.03	0.4	0.008	1	0.929	1.0	0.5	2.0
History of refractive error	-0.6	0.3	6.6	1	0.010**	0.5	0.3	0.9
Year of study	-	-	1.9	3	0.601	-	-	-
Pattern of use	0.6	0.2	6.8	1	0.009**	1.9	1.2	3.0
Length of use	-0.2	0.3	0.6	1	0.440	0.9	0.5	1.4
Screen size	-	-	3.4	2	0.187	-	-	-
Screen brightness	-	-	5.7	3	0.127	-	-	-
Diagnosis of dry eye disease	-0.3	0.3	0.7	1	0.410	0.8	0.4	1.5

Thailand [22], Peru [23], Ghana [24], Bangladesh [25] and Paraguay [26], although other studies, such as those in South Africa [27], and Ethiopia [28] have reported male predominance. These differences may be attributable to regional variations in internet access, digital literacy, cultural norms, or recruitment strategies that impact gender representation in online research.

The observed prevalence of 35.6% falls within the lower range of global estimates (12.1–97.3%) [5]. Notably, higher prevalence rates have been documented among university populations worldwide, with estimates ranging from 41.7 to 96% [5], which is higher than those reported in this study. However, prevalence figures can vary significantly depending on the measurement tools and criteria used. For instance, previous reports show that the CVS-Q used in this study tends to report lower prevalence rates [5]. These elevated rates in university settings are likely attributable to several factors, including increased academic demands, greater exposure to screens, and heightened stress levels commonly experienced by students. Additionally, methodological differences across studies (most studies were conducted during the COVID-19 pandemic) may contribute to the discrepancies in reported prevalence rates.

Headaches, dryness, and blurred vision emerged as the most frequently reported symptoms in this study, a finding consistent with results from global research [5, 29]. Variation in the ranking and prevalence of specific symptoms across different studies may be explained by several factors, including differences in screen ergonomics, the types of devices used, and cultural tendencies in symptom recognition and reporting. These factors can influence both the experience and the reporting of symptoms, contributing to the variability observed in the literature.

In terms of the distribution of CVS according to sex, our findings indicate that females exhibited a higher prevalence compared to males; however, there was no significant association between sex and CVS. The higher proportion in our study is consistent with the majority of previous studies on CVS [5, 30, 31]. Several factors may account for the higher prevalence of CVS observed among females. Women in some populations tend to spend more time using visual display terminals (VDTs) for both professional and personal activities [5, 30, 31]. Physiological and hormonal differences, such as greater susceptibility to ocular surface disorders like dry eye disease and hormonal fluctuations affecting tear film stability, may increase the risk of CVS symptoms among female students [32]. Ergonomic challenges are also relevant in the university context, as female students tend to spend more time on digital devices while adopting awkward postures [33]. This may have increased their risk of developing symptoms of CVS. Additionally, women are generally more likely to report symptoms and participate in health-related surveys, which can influence prevalence estimates [34].

Although awareness of CVS among university students was relatively moderate in this study (48.4%), detailed knowledge was generally poor, a trend that is consistent in various student populations worldwide [29, 35, 36]. This discrepancy may be explained by several factors. Most students are exposed to the term "CVS" through general awareness campaigns or informal discussions, but lack access to comprehensive education on its causes, symptoms, and prevention [29, 35]. University curricula rarely cover eye health or CVS unless students are in health-related programs, limiting their detailed understanding [29]. Additionally, many students perceive CVS symptoms as temporary or non-serious, reducing motivation to seek further information [37, 38]. The normalisation of digital device use for studying and socialisation may also lead students to dismiss CVS symptoms or view them as an inevitable part of university life [35]. Finally, reliance on online sources and peer discussions often results in incomplete or inaccurate knowledge about CVS [29, 35]. These factors collectively contribute to the observed gap between awareness and detailed understanding, underscoring the need for targeted educational efforts among university students, in support of the UN's Sustainable Development Goal (SDG)-3, which promotes good health and well-being of all people [39].

The analysis revealed significant associations between CVS symptoms and prior knowledge of CVS, continuous screen use, prolonged screen exposure (≥ 5 years), medium screen size, refractive error, and perceived health impacts. However, a binary logistic regression controlling for other confounders shows that a previous history of refractive error and digital device use are the main predictors of knowledge of CVS among the participants. A previous study among undergraduate students in Malaysia found that individuals with refractive errors or those wearing glasses had nearly twice the odds of developing CVS compared to those without refractive errors [29]. Similarly, research among medical students in Saudi Arabia indicated that using electronic devices for more than five hours daily was associated with a higher likelihood of experiencing CVS symptoms [40]. Additionally, a study in Mozambique identified that the absence of anti-glare treatment on monitors significantly increased the risk of CVS [41]. Although we found similar predictors, the relationship was different among participants who had a previous history of refractive error. For instance, our results taken together show that although refractive error was significantly associated with CVS symptoms, individuals with refractive error were less likely to report knowledge of CVS. This suggests that experiencing symptoms does not necessarily translate into knowledge of the condition and highlights a potential gap in patient education. One way this can happen is that potentially patients who complain of CVS symptoms end up getting diagnosed only with refractive error, hence missing out on vital education on CVS. This potential misattribution of CVS symptoms to refractive errors, because of their similarities, limits patient exposure to preventive health education specifically for CVS, which makes them less likely to know about it. Conversely, like the previous studies, we found that frequent users of digital devices were more knowledgeable about CVS, ostensibly due to firsthand experience of symptoms or exposure to related online information. These studies collectively highlight the multifactorial nature of CVS, emphasising the importance of addressing both individual behaviours, optical and environmental factors to mitigate its prevalence among at-risk groups like university students.

4.1 Study strengths and limitations

A major strength of this study is the use of a validated screening tool (CVS-Q) and a relatively large sample size, which enhances the reliability of the findings. However, as a cross-sectional study, the validity of any causal inferences is limited. The sample size was estimated using Yamane's formula [15], which assumes a simple random sampling and a uniform population distribution; this method does not account for population variability, statistical or multivariable effects and may therefore limit precision and generalizability [42]. In addition, data were self-reported, thus may be subject to recall bias, and the absence of ophthalmic examinations precludes differentiation of CVS from other ocular disorders. Further, conducting the study at a single institution and the use of convenience sampling via online platforms may also have introduced selection bias, potentially over-representing digitally active students and inflating prevalence estimates. Future research using probability sampling and objective ophthalmic measures across multiple institutions is recommended to improve generalizability.

5 Conclusion

Computer Vision Syndrome is a concern among university students, with headaches, dryness, and blurred vision emerging as the predominant symptoms. Despite high levels of screen exposure, detailed knowledge of CVS remains limited. Refractive error and digital device use remain major factors influencing the knowledge of CVS among university students. These findings underscore the need for targeted educational interventions on improved ergonomic practices during the use of digital devices in addition to regular vision screening to reduce the burden of CVS in higher education settings. Such measures could help promote ocular health, improve academic performance, and overall well-being among university students.

Authors' contributions

Conceptualisation: MAK; Data Curation: MAK, VCC, REC; Formal Analysis: MAK, ST; Methodology: MAK, VCC, REC, LEM; Supervision: MAK, Visualisation: MAK, ST; Writing: Original draft-MAK, Writing: review and editing: MAK, ST, VCC, REC, LEM; All authors read and approved the final version of the manuscript.

Funding

The authors did not receive support from any organisation for the submitted work.

Data availability

The datasets generated and analysed during the current study are available upon reasonable request from the corresponding author.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Bindura University of Science Education Health Research Ethics Committee. This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki: Ethical principles for medical research involving human subjects.

Written informed consent was obtained from all participants before data collection. Participation was voluntary, and all individuals were informed of the study's purpose, their rights, and their ability to withdraw at any point during data collection and before data analysis commenced without any consequences.

Consent for publication

Informed consent was obtained from all individual participants included in the study, and this included consent to publication of results.

The results of this study have not been previously published and are not under consideration for publication elsewhere.

Competing interests

The authors declare no competing interests.

Received: 20 October 2025 / Accepted: 25 June 2026
Published online: 09 July 2026

References

1. Kaur K, Gurnani B, Nayak S, Deori N, Kaur S, Jethani J, et al. Digital Eye Strain- A Comprehensive Review. Ophthalmol Ther. 2022;11(5):1655–80.
2. Rosenfield M. Computer vision syndrome: A review of ocular causes and potential treatments. Ophthalmic and Physiological Optics. . 2011 Sept 1;31(5):502–15. Available from: https://doi.org/10.1111/j.1475-1313.2011.00834.x. Cited 2025 Aug 24.
3. American Optometric Association: Computer Vision Syndrome American Optometry Association. 1997;1–5. Available from: https://www.aoa.org/healthy-eyes/eye-and-vision-conditions/computer-vision-syndrome. Cited 2026 Jan 8.
4. Dhar-Munshi S, Amed S, Munshi S. Computer Vision Syndrome: an Update. 2019 Apr 22. https://doi.org/10.12968/bjnn201915Sup2S10. Cited 2025 Aug 24;15(Sup2):S10–1. Available from: /doi/pdf/10.12968/bjnn.2019.15.Sup2.S10?download=true.
5. Ccami-Bernal F, Soriano-Moreno DR, Romero-Robles MA, Barriga-Chambi F, Tuco KG, Castro-Diaz SD et al. Prevalence of computer vision syndrome: A systematic review and meta-analysis. J Optom. 2024 Jan 1;17(1):100482. Available from: https://www.sciencedirect.com/science/article/pii/S1888429623000304. Cited 2025 Aug 25.
6. Zou Y, Kuek F, Feng W, Cheng X. Digital learning in the 21st century: trends, challenges, and innovations in technology integration. Front Educ (Lausanne). 2025;10:1562391.
7. Pardhan S, Parkin J, Trott M, Driscoll R. Risks of Digital Screen Time and Recommendations for Mitigating Adverse Outcomes in Children and Adolescents. Journal of School Health . 2022 Aug 1;92(8):765–73. Available from: https://pubmed.ncbi.nlm.nih.gov/35253225/. Cited 2025 Aug 24.
8. Akinbinu TR, Mashalla YJ. Impact of computer technology on health: Computer Vision Syndrome (CVS). Medical Practice and Reviews . 2014 Nov 30;5(3):20–30. Available from: https://academicjournals.org/journal/MPR/article-abstract/0905F9948599. Cited 2025 Aug 24.
9. Alemayehu AM. Pathophysiologic Mechanisms of Computer Vision Syndrome and its Prevention: Review. World J Ophthalmol Vis Res. 2019;2(5).
10. Ranasinghe P, Wathurapatha WS, Perera YS, Lamabadusuriya DA, Kulatunga S, Jayawardana N et al. Computer vision syndrome among computer office workers in a developing country: An evaluation of prevalence and risk factors. BMC Res Notes . 2016 Mar 9;9(1). Available from: https://pubmed.ncbi.nlm.nih.gov/26956624/. Cited 2025 Aug 24.
11. Kahal F, Al Darra A, Torbey A. Computer vision syndrome: a comprehensive literature review. Future Sci OA . 2025 Mar 8;11(1):2476923. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC11901492/. Cited 2025 Aug 24.
12. Anbesu EW, Lema AK. Prevalence of computer vision syndrome: a systematic review and meta-analysis. Sci Rep . 2023 Dec 1;13(1). Available from: https://pubmed.ncbi.nlm.nih.gov/36720986/. Cited 2025 Aug 24.
13. Mateko FM. Digital Technologies and Economic Development in Zimbabwe. Development. 2024;67(1–2):85–90.
14. Bindura University of Science Education, Section A. Profile of the Bindura University of Science Education. Bindura; 2024 Nov. https://www.buse.ac.zw/.
15. Yamane T. Statistics: an introductory analysis. 2nd ed. New York: Harper and Row; 1967.
16. Seguí MDM, Cabrero-García J, Crespo A, Verdú J, Ronda E. A reliable and valid questionnaire was developed to measure computer vision syndrome at the workplace. J Clin Epidemiol . 2015 Jun 1;68(6):662–73. Available from: https://pubmed.ncbi.nlm.nih.gov/25744132/. Cited 2025 Aug 24.
17. Bloom BS. Taxonomy of educational objectives: The classification of educational goals. Vol. 1, The cognitive domain. New York: David McKay; 1956.
18. Zimbabwe National Statistics Agency (ZIMSTAT). Zimbabwe 2022 Population and Housing Census Report Volume 1 — Zimbabwe Geoportal . 2022 Sept 1; Available from: https://zimgeoportal.org.zw/documents/84. Cited 2025 Apr 25.
19. Aerny-Perreten N, Domínguez-Berjón MF, Esteban-Vasallo MD, García-Riolobos C. Participation and factors associated with late or non-response to an online survey in primary care. J Eval Clin Pract. 2015;21(4):688–93. https://doi.org/10.1111/jep.12367 . Epub 2015 Apr 30. PMID: 25929295.
20. Almousa AN, Aldofyan MZ, Kokandi BA, Alsubki HE, Alqahtani RS, Gikandi P, et al. The impact of the COVID-19 pandemic on the prevalence of computer vision syndrome among medical students in Riyadh, Saudi Arabia. Int Ophthalmol. 2022;43(4):1275–83.
21. Vargas RodríguezLJ, Espitia Lozano N, de la Peña Triana HM, Vargas Vargas JL, Mogollón Botía DM, Pobre Vinasco AM et al. Computer visual syndrome in university students in times of pandemic. Archivos de la Sociedad Española de Oftalmología (English Edition) . 2023 Feb;98(2):72–7. Available from: https://pubmed.ncbi.nlm.nih.gov/36368629/. Cited 2025 Sep 12.
22. Wangsan K, Upaphong P, Assavanopakun P, Sapbamrer R, Sirikul W, Kitro A et al. Self-Reported Computer Vision Syndrome among Thai University Students in Virtual Classrooms during the COVID-19 Pandemic: Prevalence and Associated Factors. Int J Environ Res Public Health . 2022 Apr 1;19(7). Available from: https://pubmed.ncbi.nlm.nih.gov/35409679/. Cited 2025 Sep 12.
23. Lindo-Cano EF, García-Monge VA, Castillo-Cadillo KJ, Sánchez-Tirado EA, Távara IM, Morales J. Computer-digital Vision Syndrome Among University Students of Lima City. Open Public Health J. 2022;15(1).
24. Akowuah P, Nti A, Ankamah-Lomotey S, Frimpong A, Fummy J, Boadi P et al. Digital Device Use, Computer Vision Syndrome, and Sleep Quality among an African Undergraduate Population. Advances in Public Health. 2021;(2021):1–7. https://onlinelibrary.wiley.com/doi/10.1155/2021/6611348.
25. Roy S, Sharif AB, Chowdhury S, Iktidar MA. Unavoidable online education due to COVID-19 and its association to computer vision syndrome: a cross-sectional survey. BMJ Open Ophthalmol. 2022;7(1):e001118. https://doi.org/10.1136/bmjophth-2022-001118.
26. Coronel-Ocampos J, Gómez J, Gómez A, Quiroga-Castañeda PP, Valladares-Garrido MJ. Computer Visual Syndrome in Medical Students From a Private University in Paraguay: A Survey Study. Front Public Health . 2022 Jul 14;10. Available from: https://pubmed.ncbi.nlm.nih.gov/35910871/. Cited 2025 Sep 13.

27. Munsamy AJ, Naidoo S, Akoo T, Jumna S, Nair P, Zuma S et al. A case study of digital eye strain in a university student population during the 2020 COVID-19 lockdown in South Africa: evidence of an emerging public health issue. J Public Health Afr . 2022 Sep 7;13(3). Available from: https://pubmed.ncbi.nlm.nih.gov/36313920/. Cited 2025 Sep 13.
28. Gebresellassie MG, Sisay H, Getahun B, Abera E, Birhanu H, Ashenafi T. Prevalence of Computer Vision Syndrome and Predisposing Factors Among Engineering Students in Hawass University Institution of Technology Campus, Hawassa, Ethiopia, 2019. Open Ophthalmol J. 2022;16(1).
29. Yee NL, Binti Muhammad Riduan Wong LFW, Stewart MA, Nor Haty Binti H, Singh GKJ. Bin Mohamad Anuar MF. Prevalence, Knowledge and Associated Factors Related to Computer Vision Syndrome among Undergraduate Students. Florence Nightingale J Nurs. 2024;32(2):118–25. https://doi.org/10.5152/FNJN.2024.23037.
30. Courtin R, Pereira B, Naughton G, Chamoux A, Chiambaretta F, Lanhers C, Dutheil F. Prevalence of dry eye disease in visual display terminal workers: a systematic review and meta-analysis. BMJ Open. 2016;6(1):e009675. https://doi.org/10.1136/bmjopen-2015-009675.
31. Blehm C, Vishnu S, Khattak A, Mitra S, Yee RW. Computer vision syndrome: a review. Surv Ophthalmol. 2005 May-Jun;50(3):253 – 62. https://doi.org/10.1016/j.survophthal.2005.02.008. PMID: 15850814.
32. Gorimanipalli B, Khamar P, Sethu S, Shetty R. Hormones and dry eye disease. Indian J Ophthalmol . 2023 Apr 1;71(4):1276–84. Available from: https://pubmed.ncbi.nlm.nih.gov/37026259/. Cited 2025 Sep 13.
33. Pattath P. Gender differences in musculoskeletal discomfort due to computer use among university students in the United States. J Res Pract Musculoskelet Syst. 2024;08(01):1–6.
34. Hallyburton A, Evarts LA. Gender and Online Health Information Seeking: A Five Survey Meta-Analysis. J Consum Health Internet. 2014;18(2):128–42.
35. Kharel SR, Khatri A, Knowledge. Attitude and practice of Computer Vision Syndrome among medical students and its impact on ocular morbidity. J Nepal Health Res Counc. 2018;16(3):291–6.
36. Patil A, Bhavya, Chaudhury S, Srivastava S. Eyeing computer vision syndrome: Awareness, knowledge, and its impact on sleep quality among medical students. Ind Psychiatry J 2019 Jan- Jun;28(1):68–74. https://doi.org/10.4103/ipj.ipj_93_18.
37. Garg S, Mallik D, Kumar A, Chunder R, Bhagoliwal A. Awareness and prevalence on computer vision syndrome among medical students: A cross-sectional study. Asian J Med Sci . 2021 Sep 1;12(9):44–8. Available from: https://www.nepjol.info/index.php/AJMS/article/view/37247. Cited 2025 Sep 13.
38. Reddy SC, Low CK, Lim YP, Low LL, Mardina F, Nursaleha MP. Computer vision syndrome: a study of knowledge and practices in university students. Nepalese Journal of Ophthalmology . 2013 Sep 23;5(2):161–8. Available from: https://www.nepjol.info/index.php/NEPJOPH/article/view/8707. Cited 2025 Sep 13.
39. United Nations. Health - United Nations Sustainable Development . Available from: https://www.un.org/sustainabledevelopment/health/. Cited 2025 May 15.
40. 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. Eur J Ophthalmol . 2020 Jan 1 ;30(1):189–95. Available from: https://pubmed.ncbi.nlm.nih.gov/30474390/. Cited 2025 Sep 13.
41. Sengo DB, da Deolinda Bernardo Pica A, Dos Santos IIDB, Mate LM, Mazuze AN, Caballero P, López-Izquierdo I. Computer vision syndrome and associated factors in university students and teachers in Nampula, Mozambique. BMC Ophthalmol. 2023;23(1):508. https://doi.org/10.1186/s12886-023-03253-0.
42. Tejda JJ, Punzalan JRB. On the Misuse of Slovin's Formula. Philippine Stat. 2012;61:129–36. https://www.scirp.org/reference/referencespapers?referenceid=2979973. cited 2026 Jan 12. Available from:.

Publisher's note