Research article

Computer vision syndrome; its prevalence, associated factors and practices among medical undergraduates of University of Colombo, Sri Lanka

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Abstract

Introduction and objectives: *Computer vision syndrome is a common condition among digital screen users and is increasing among undergraduates with the changeover to online learning brought on by the COVID-19 pandemic. Main aim of this study was to assess the impact of computer vision syndrome among medical undergraduates in University of Colombo, Sri Lanka. Specific objectives included assessing the prevalence, associated risk factors and identifying the practices used by medical undergraduates to overcome the difficulties caused by computer vision syndrome.*

Materials and methods: *A descriptive cross-sectional study was conducted among 231 medical undergraduates of University of Colombo. Data was collected using an online questionnaire. Descriptive statistics were generated and analyzed using binary logistic regression and other statistical tests.*

Results: *Mean age of the population was 22.69 (SD: 1.906) years. The prevalence of CVS was 63.6%. The most reported symptom was headache (78.35%) followed by burning eyes (63.63%). When present, headache was intense in 30.17%. Female gender (p=0.002, OR=2.513), daily total duration of VDT use (p=0.008, OR=1.002) and presence of refractive errors (p=0.002, OR=2.659) were associated significantly with the prevalence of CVS. Adjusting the brightness of the screen was the commonest method practiced to relieve the symptoms (92.64%), while taking frequent breaks (83.98%) was the next in line.*

Discussion and conclusions: *The prevalence of CVS is over 60% among the medical undergraduates and was significantly associated with female gender, daily total duration of VDT use, and presence of refractive errors. It is timely to raise awareness on CVS and associated factors to improve the effectiveness of online programmes and ocular health of the online users.*

Introduction

Computer vision syndrome (CVS), also known as digital eye strain is described by American Optometric Association (AOA) as "a group of eye- and vision-related problems that result from prolonged computer, tablet, e-reader and cell phone use"[1]. Around 60 million people suffer from it worldwide with one million people getting the syndrome anew each year[2].

Eye strain, headache, blurred vision and neck or shoulder pain are the common symptoms[3]. The distance from the screen and duration of daily computer usage are factors associated with the prevalence of CVS[3]. The severity of symptoms increase with the video display terminal (VDT) usage[1]. Awareness of CVS was found to have reduced the symptoms[4].

With the COVID-19 pandemic restrictions in most parts of the world, online working and teaching-learning has become an inevitable alternative. This has caused a huge spike in screen time of students and the work force of all categories[5,6,14]. In the case of medical students, the risk of developing CVS is high as most of the study materials were becoming digital and the use of computers was increasing in many procedures in the hospital even before the COVID-19 pandemic[4].

CVS is likely to be underdiagnosed as it presents with different eye-related symptoms and mimics other medical conditions[7]. By understanding the prevalence and associated factors in the local context, new knowledge can be obtained on early detection of CVS and improved practices in reducing the burden of it.

Little research has been carried out in Sri Lankan undergraduates to identify the effects of video display terminals on eye health. Hence, this research was planned to study the impact of CVS among medical undergraduates focusing on practices they utilize as well as factors that are associated in the local setting.

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Bridging the gaps in knowledge this study will help in improving the teaching learning methods. This will also create an awareness about CVS among the medical students so that they would take proactive measures to combat the health issues.

Methodology

A descriptive cross-sectional study was conducted among 231undergraduates enrolled in 6 batches in MBBS category, Faculty of Medicine, University of Colombo by August 2021. A large sample size was considered to generalize the findings of the study. The inclusion criterion was medical undergraduates who have used a visual display terminal for studying purposes for a minimum period of three months during the past year and the exclusion criteria were - 1) Medical undergraduates who do not use a visual display unit for studying purposes, 2) Medical undergraduates who do not consent to the study, 3) Medical undergraduates who are below 18 years.

The data collection tool was a self-administered questionnaire in the form of a google form. The questionnaire included questions on socio-demographic characteristics, associated factors and practices related to computer vision syndrome and a validated CVS-Q questionnaire[8] to measure the prevalence of CVS and its symptoms. Final Questionnaire was further reviewed by an independent expert in the field.

According to the CVS-Q questionnaire, each symptom was analyzed according to its presence and severity when present. When a symptom was not there '0' score was given. When a symptom was present occasionally '1' score was given, and often/ always, '2' score was given. If the symptom is moderate in intensity, '1' score given separately and if severe, '2' score was given. The scores of presence and severity were multiplied for each symptom (For example, Headache – Occasionally present, Intense - 1 x 2 = 2). The scores of all 16 symptoms were added and a total of '6' or more was suggestive of CVS.

Ethical clearance was obtained from the Ethics Review Committee (ERC) of the Faculty of Medicine, University of Colombo (Protocol EC-21-090).

The demographic data was used to describe the sociodemographic characteristics of the study sample. Analysis of quantitative data was done by using SPSS software version 25. The knowledge score was stratified according to the sociodemographic status. The association of computer vision syndrome with the sociodemographic data, risk factors and practices of medical undergraduates were analyzed.

There was no external funding obtained for the study.

Results

The descriptive cross-sectional study included 231 MBBS undergraduates of Faculty of Medicine, University of Colombo from all 6 academic years. 107 (46.3%) males and 124 (53.7%) females participated. The mean age was 22.69, ranging from 18 to 27. The study group included participants from all six academic years at the time of the study. The participants of the study group have been using VDT devices for about two years (24.81 months) on average for studying purposes. Smart phones were the most commonly used device (94.8%) while desktop computers were the least used ones (8.2%). More than 90% undergraduates use video display terminal devices for more than two hours, all seven days of the week.

On average, each person uses VDT devices 418 minutes (6 hours and 58 minutes) per day. The average duration of VDT devices without any break was found to be 104.25 minutes. The average length of breaks taken when using he VDT devices was found to be 73.17 minutes. Only 2.6% use the devices with brightness more than 75% while the most (45.9%) use the devices with a brightness equal or less than 25%.

63.6% of the students study the most using a VDT during the daytime and only 36.4% study the most at night. Ceiling light (61.9) was the most used light source when studying using a VDT at night while only 2.2% used the screen light in the dark room. When studying using a VDT 93.9% were in the seated position. When using a VDT in the seated position, 72.3% placed the VDT below the level of the eyes. The mean distance from the eyes to the devices was 40 cm. 59.7% of the study population did not have prediagnosed refractive errors while 30.3% had myopia. 41.1% were using spectacles at the time of the study.

After analyzing the results, according to CVS-Q questionnaire, the study revealed the prevalence of CVS was 63.6% among the study population. Headache (78.35%) was the most reported symptom followed by burning eyes (63.63%). Diplopia (14.71%) was the least reported symptom.

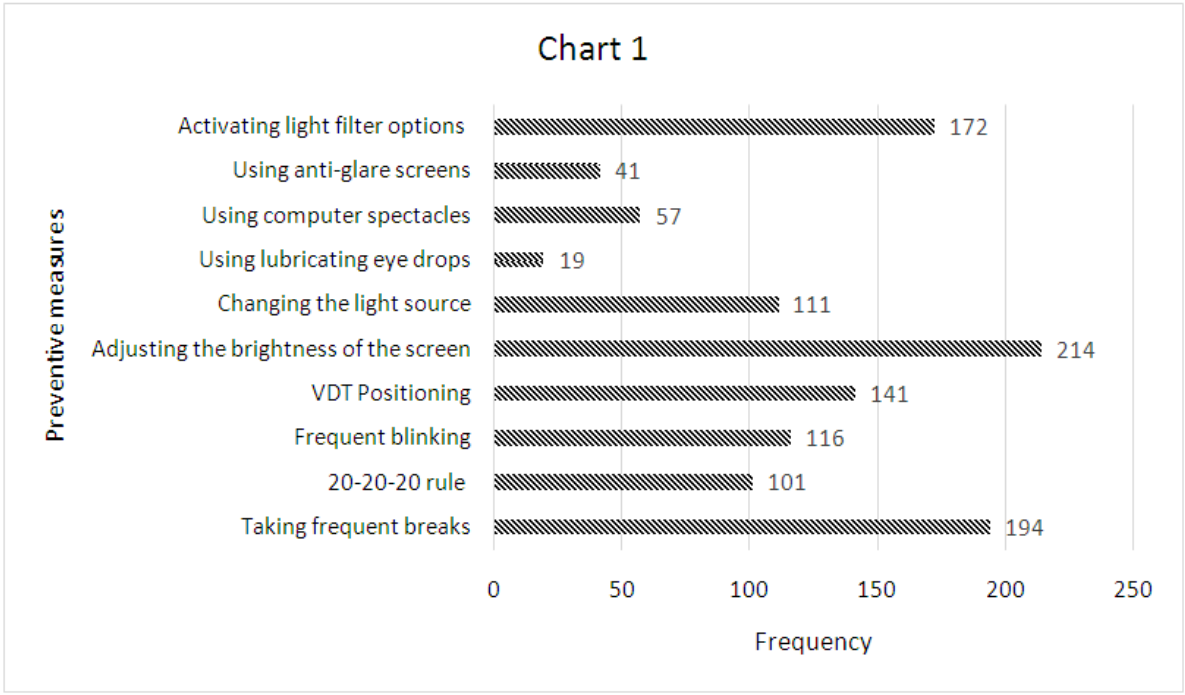
On average, it takes 81.73 minutes to relieve the symptoms of CVS, the longest time being 1440 minutes/ 24 hours.

Among the practices to alleviate the symptoms, adjusting the brightness of the screen (92.6%) was the most practiced measure followed by taking frequent breaks (84%). Using lubricating eye drops (8.2%) was the least practiced measure. 43.7% followed the 20-20-20 rule (every 20 minutes, focus the eyes on objects 20m/6 feet away for 20 seconds).

Table 1. Symptoms, their frequency and severity

Symptom	*Frequency*			*Severity*	
	Never	*Occasionally*	*Often/ always*	*Moderate*	*Intense*
Burning eyes	75	126	30	151	5
Itching eyes	87	135	9	133	11
Feeling of foreign body in the eyes	161	64	6	67	3
Tearing eyes	100	113	18	124	7
Excessive blinking	140	78	13	87	4
Eye redness	142	75	14	88	1
Eye pain	82	117	32	140	9
Heavy eyelids	136	79	16	91	4
Dryness in eyes	125	75	31	100	6
Blurred vision	131	86	14	90	10
Double vision	195	28	8	32	4
Difficulty focusing for near vision	157	63	11	66	8
Increased sensitivity to light	107	91	33	105	19
Coloured halos around objects	179	47	5	50	2
Feeling that sight is worsening	134	82	15	83	14
Headache	42	134	55	155	36

Chart 1. Preventive measure undertaken



When considering the risk factors for CVS, female Gender (p=0.002), daily total duration of VDT use (p=0.008), and presence of refractive errors (p=0.002) were significantly associated with the prevalence of CVS.

Discussion

The prevalence of CVS among medical undergraduates was found to be 63.6% according to this study which is considerably high. One previous study conducted in UCSC, UOC found the prevalence of eye symptoms as 70.5%[3]. Another recent study done in Pakistan among medical undergraduates showed frequency of CVS as high as 98.7%[9]. A study conducted on university students of UAE reported prevalence of CVS as 72%[10], a survey of students at Engineering university of India reported 80.3%[11]. Other studies showed prevalence of 97.3%[12] in Jeddah, Saudi Arabia and 89.9% in Malaysian students[13].

But the same diagnostic criteria were not used in most of the previous studies. Some studies considered that even the presence of one symptom is adequate for the diagnosis of CVS leading to remarkably high prevalence while some studies considered only the presence of symptoms for the diagnosis of CVS which does not effectively indicate the impact of CVS.

In this study, CVS-Q – a validated questionnaire was used and it took into consideration, the presence of symptoms as well as the severity of the symptoms which make the findings of this study more consistent and open for comparison with future studies.

The most reported symptom of this study was headache (78.35%) followed by burning eyes (63.63%), the former being compatible with Reddy SC et al., 2007[13] and Shantakumari N. et al., 2014[10].

Neck pain (75.1%), eye strain (67%), shoulder pain (65.5%) and eye burn (61.9%) were the most common CVS symptoms according to a study among students of Faculty of Medical Sciences in Jamaica[15].

A study on 500 university students in the United Arab Emirates, reported that "burning in the eyes" (54.8%), headaches (53.3%) and tired eyes (48%) as the most common complaints[10].

If the positioning of head, neck and trunk is not appropriate to allow comfortable screen viewing, it leads to extraocular symptoms and neck pain, shoulder pain and back pain become apparent[7].

When considering the risk factors for CVS, according to our study, female gender (p=0.002, OR=2.513), daily total duration of VDT use (p=0.008, OR=1.002) and presence of refractive errors (p=0.002, OR=2.659) were associated significantly with the prevalence of CVS.

This is compatible with a large study done in Saudi Arabia on Medical students where female gender, astigmatism, dry eyes, and longer duration of studying were significantly associated with CVS[12].

According to a Jamaican study on CVS, females were more likely to have mild (34.1%) and moderate (20.4%) headache compared with men (24.1% and 11.1%), respectively[15].

Significant correlation has been reported between increased duration of computer use and the symptoms redness, burning sensation, blurred vision, and dry eyes. A study conducted among medical and engineering students in Chennai found that students with computer use of 4-6 hours a day were at a higher risk of redness, burning in the eyes (OR 2.1, P < .01) compared to those with <4 hours[11].

According to a study in Saudi Arabia, students with dry eye disease revealed a significant association with CVS[17].

When considering the measures practiced to relieve the symptoms of CVS, the most practiced preventive strategy among the study population was found to be adjusting the brightness of the screen (92.64%) followed by taking frequent breaks (83.98%).

The American Optometrists Association recommends and maintaining an appropriate brightness of screen, taking a 20 seconds break to look at something 20 feet away every 20 minutes, maintaining a seating position using an ergonomically designed chair, the use of antiglare screen filter, keeping the digital screen 4-5 inches below eye level and distancing the digital screen at least 25 inches.

Holding the device/ placing the screen just below the eye level and improved ergonomic practices has been proven to be effective in reducing the symptoms of CVS[15].

Digital screens are recommended to be 10-20° below eye level, as higher than this position requires a head up posture with resulting muscular strain on the neck muscles[18].

Limitations

This study was conducted among the medical students of a single university, which might have lead to some bias in the findings. Further, the questionnaire collected details of self-reported symptoms and no examinations were done to confirm or refute the conditions.

Conclusion

The prevalence of CVS is high among the medical undergraduates. It is significantly associated with female gender, daily total duration of VDT use, and presence of refractive errors. It is timely to raise awareness on CVS and associated factors to improve the overall performance and ocular health of medical undergraduates. CVS is likely to be underdiagnosed as it presents with different eye-related symptoms and mimics other medical conditions[7]. By understanding the prevalence and associated factors in the local context, early detection and improved practices will help in reducing the burden of CVS. Increasing awareness and promoting healthy practices on CVS will increase the productivity of the workforce and effectiveness of teaching learning programmes among students.

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