Original Article

Computer Vision Syndrome and its Risk Factors among Medical Students of a Tertiary Care Centre in Odisha: A Cross-Sectional Study

Running Title: Computer Vision Syndrome among Medical Students

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Abstract

Background: Although the enormous use of digital devices such as personal computers, tablets and android mobiles makes our life much easier, but it welcomes terrible diseases such as Computer Vision Syndrome (CVS), and disrupts the direction of our life. The young generation is more addicted to this digital world, hence highly affected from CVS. *Objective*: To determine the prevalence of CVS, associated risk factors, and to assess the preventive measures taken by undergraduate medical students while using computers. Methodology: A cross-sectional descriptive study was conducted among 477 undergraduate medical students in IMS and SUM Hospital, Bhubaneswar, Odisha, India. The data were collected by Epicollect-5, and analysed using SPSS v21 software. Appropriate statistical tests were applied for observing the significant associations with p value <0.05. *Results*: The prevalence of CVS among the undergraduate students was found to be 83.22%. Final year students (49.87%) reported more symptoms of asthenopia as compare to second year (15.61%) and third year (34.50%) MBBS students. The most significant risk factors related to excessive computer use were – online classes, a high screen brightness, and sitting too close to computer screen. *Conclusion*: There is a need to create awareness regarding computer vision syndrome and its preventive measures among all healthcare personnel.

Key words: Digital eye syndrome, CVS, Vision, Medical students, Risk factors

Introduction

Today the entire world is going through a computer era [1]. The massive use of digital devices such as personal computers, tablets and android mobiles has increased substantially in recent years across the world [2]. Though it makes our lifestyle much easier, on the other hand it is a major driver in disrupting human life, and its excessive use may prove extremely dangerous. In each and every field, starting from the government to private sector, in trades and commerce, banks, factories, educational institutions, for research and development, and healthcare setup, the role of computer is indescribable [3].

The term Computer vision syndrome (CVS) came into notice when people were complaining of uncomfortable, painful, and irritable vision. It is one of the alarming public health issues related to digital technology that is – android cell phones, tablets and computers. Symptoms regarding our vision and visual disabilities are very common nowadays because of higher requirement of computer use in all fields [4]. Using computers has become a necessity of 21st century. However, this usage, even for 3 hour per day, leads to risk of developing computer vision syndrome (CVS), low back pain, tension headaches, and other forms of psychosocial stress [5].

Computer operators are reporting more vision problems as compared to those whose work is not computer dependent. The prevalence of CVS ranges from 64% to 90% among computer users. It is recorded around 60 million people suffer from CVS globally. A number of investigators have reported that in India, visual symptoms occur in 75% to 90% of computer workers. A survey released by the National Institute for Occupational Safety and Health (NIOSH) showed that nearly 22% of computer workers have been facing the problems of musculoskeletal disorders [6].

These days, university students especially medical students are spending more time on digital devices such as computers, laptops, and android cell-phones, from studying online to conducting web-based research. There have been several studies reporting an increased prevalence of CVS among computer users, specifically medical students [7].

Little research has been performed to document the effects of computer use on the physical health of Indian users especially college students and young generation employees. Hence, this study aims to assess the prevalence of CVS, associated risk factors and preventive measures taken by undergraduate medical students while using computers.

Materials and Methods

This was a cross-sectional study conducted among a total of 477 undergraduate MBBS students of a medical college of Bhubaneswar, Odisha, a state situated eastern part of India. The study was approved by institutional ethical committee. The study was carried out in January 2021, when the lockdown was over and students came to hostel for appearing university exam. The students of second, third and final year were interviewed in their hostel premises through one-to-one questionnaire method by using Epicollect5. Their participation was voluntary. All those students who used computer in last 1 month preceding the date of interview were included in the study. Those who were absent on the day of data collection and those who did not give consent to participate were excluded. The questionnaires developed by the investigators were internally validated by 2 ophthalmologists, 1 General Medicine, and 1 Community Medicine professor. The validate questionnaire was pretested on 15 students.

The pre-tested structured questionnaire tool included the demographic profile of participant, duration of computer use per

day, symptoms faced during past 1 month, type of refractive error present in each individual and frequency of breaks taken by participants while working on computers. The authors defined the outcome variable CVS as " the complex of eye and vision problems arise due to the close contact of computer for a longer time period." The eye symptoms were considered as redness, burning sensation, headache, blurring vision, dry eyes and musculoskeletal pain. The symptoms experienced by the participants were categorised into mild (transient symptoms remain for few minutes to hours), moderate (persist for few hours and subside after taking rest), and severe (needs ophthalmic consultation) visual problems as per the computer use.

The data were analysed using the standard statistical software package version 20(SPSS v21). All the descriptive data were presented as percentages. The categorical variables were analysed by applying chi-square test for observing the significant association between each variable and outcome.

Results

A total of 477 participants were interviewed, of which 57.2% were female, while rest 42.7% were males. The mean age was 23.5 years, ranging between 18 to 30 years. Almost all students reported use of computers daily for the purpose of studying. The mean duration of computer use per day was 5.5 hours. Around 83.22% (397) students reported at least one symptom of CVS. Final year students (49.87%) reported more symptoms of asthenopia as compare to 2nd year (15.61%) and 3rd year (34.50%) MBBS students. (see Figure 1)

Female participants 244 (61.4%) were observed to have higher risk of CVS as compare to male participants i.e., 153 (38.5%). Out of 397 students who had symptoms of CVS, 248 (62.4%) were myopic, 23 (5.7%) were hypermetropic, and 14 (3.5%) were astigmatic. A total of 112 (28.2%) students did not have any type of refractive error. The presence of refractive errors such as myopia and astigmatism showed significant association with CVS (p=0.003, and p=0.04 respectively). However, hyperopia was not associated with CVS.

The most frequently reported symptoms were headache 132 (33.24%), pain in neck and shoulder 117 (29.47%), blurring of vision 30 (7.55%), burning sensation 26 (6.54%), and redness of eyes 22 (5.54%). The rest 66 (16.62%) students suffered from more than one symptoms. (see Figure 2) Around 276 (69.52%) students suffered from mild CVS, while 102 (25.69%) faced moderate symptoms and the remaining 19 (4.78%) were having severe symptoms. Almost all participants used computer for daily online classes, as a complete shutdown of colleges was strictly followed by the university. The association between the presence of CVS and each risk factor was analysed [Table 1].

Discussion

The study reveals very high prevalence (83.22%) of computer vision syndrome among a total of 477 medical students. Such high prevalence of CVS among medical and engineering students were depicted by M. Logaraj et al, in Chennai [8]. Abdullah et al, mentioned of 95% prevalence of CVS among medical students in Saudi Arabia [9]. Another study carried out in Pakistan and Malaysia reported the prevalence rate as 90.5% and 89.9%, respectively [10,11]. Female students were observed to have more risk of CVS as compared to male students. This association between gender and CVS symptoms agrees with the findings by Straker et al and other studies conducted in Sri Lanka, Chennai and United Arab Emirates [8,12,13].

The above study reported a mean age of 23.5 years and no association of age with CVS. Similar findings were found by a

few studies [13,14]. However the study conducted by Ranasinghe et al, found a significantly higher prevalence of CVS among above 40 years population as compared with those aged less than 20 years [12].

Refractive errors such as myopia and astigmatism significantly aggravate the symptoms of computer vision syndrome. In contrast, a study conducted by Ghufran A. Abudawood showed no significant association between refractive errors such as myopia and hypermetropia with CVS, however there was an association between astigmatism and CVS symptoms (<0.001) [7]. Other experimental studies showed a significant increase in symptoms with uncorrected residual astigmatism [14,15]. If refractive errors are not corrected they contribute to the symptoms of CVS.

The most frequently reported ocular symptoms were headache in 33.24% followed by musculoskeletal pain in neck and shoulder (29.47%). Other symptoms included redness, burning sensation, blurring of vision, and dryness of eyes (5.54%, 6.54%, 7.55%, and 1%, respectively). Other studies report frequency of burning sensation in 33% of medical and dental students, 54.8% of university students, and 32.3% of medical students [8,10,14]. Headache in CVS is explained by the constant need to adjust the eyes by contracting the extraocular muscles and ciliary muscles to maintain the lens in the accommodating phase.

Focusing and refocusing are required throughout the time, repeatedly to see in different distances from the screen to the keyboard and to work documents, leading to eye muscle fatigue causing headache. Eye strain was experienced by 14% of students and blurred vision in 11.4%, both are associated significantly with dim room lightning [7]. Increased sensitivity to light was observed in 60.2%, specifically and significantly among students using higher screen brightness [16].

The result showed highly statistically significant risk factors – duration of studying, distance from the screen as well as brightness of the screen with p value <0.001. Duration of studying using computers was the most significant risk factor, in which the longer time exposure to computer more extent of symptoms [8,10]. Consistency with the similar results seen in another study conducted by Hassan et al and a report by the American Optometric Association. Furthermore, authors reported that among CVS-positive group, students who spent more than four hours were at significantly at higher risk of CVS than who spent less than four hours. The fact was strengthened by Reddy et al, who found a significantly higher CVS among students who used computers for more than two hours. Hence longer the duration, the longer the discomfort lasts even after work [11].

There is no association between frequency of taking breaks and symptoms of CVS, which is supported by the same finding in previous studies. However, visual discomfort can be reduced by taking short breaks every 30 minutes of using computer [17]. Not taking breaks at all during studying (8.8%) was found significantly associated with CVS [18]. In accordance to this finding, in previous studies also, visual symptoms were reported significantly among computer users who were not taking frequent breaks [19].

Most of the students (92.19%) viewed computers at a distance of less than 45 cm which resulted significantly in more CVS symptoms. Similarly, Hassan et al found that students who used computers at a distance of less than 50 cm were prone to higher risk of CVS [20]. According to American Optometric Association, the recommended viewing distance was suggested to be 20–28 inches [19].

There is are a few limitations in this single-centre study. There is a reporting bias as CVS is diagnosed based on self-

reported symptoms without ophthalmic examination. Pre-existing medical or ocular conditions were not mentioned separately hence overestimation of CVS prevalence may have contaminated the results.

Conclusion

The prevalence of computer vision syndrome (CVS) is alarming among undergraduate medical students, with excessive headache, musculoskeletal pain, blurring of vision, burning sensation, tearing, and dryness of eyes being the most common symptoms. The study shows higher prevalence of CVS is associated with female gender, refractive errors such as myopia and astigmatism, long duration of exposure to computers, using bright screen and close proximity to computer screen.

The students used to take preventive measures such as taking breaks for few minutes between sessions of using computer. The instigators thus recommend use of 20-20-20 rule should be followed by all students that means all students should take a break after 20 minutes of using the screen and they should look away at something that is 20 feet away from them for a total time of 20 seconds. There is severe risk of vision loss due to CVS if not treated in time or precautions are not followed timely. It has been proved that CVS-related symptoms lessen the productivity of work. There is a need to create awareness among students regarding health effects specially about the adverse effect of prolonged computer use and the preventive measures in order to reduce CVS symptoms.

Figure 1: Students of each MBBS batch suffering from CVS (n=397)

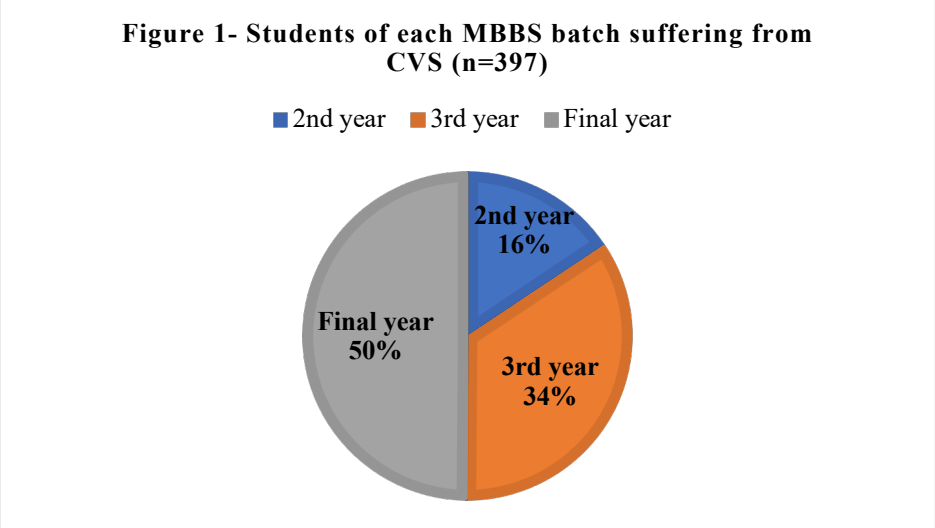

Figure 2: Symptoms of CVS faced by students(n=397)

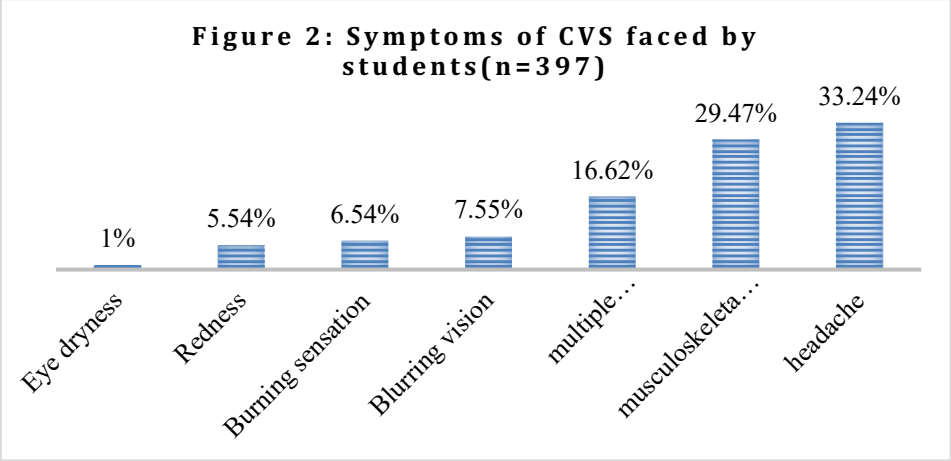

Table 1: Association between risk factors and computer vision syndrome

Variables	Groups	Computer vision syndrome			
		Positive	Negative	Total	*p* value
Duration of studying	3-5 hours/day	68(17.12%)	48(60%)	296(62.05%)	
	5-7 hours/day	81(20.40%)	22(27.5%)	103(21.59%)	0.00001*
	>7 hours/day	248(62.4%)	10(12.5%)	78(16.35%)	
Taking breaks	Yes	294(74.05%)	63(78.75%)	357(74.84%)	0.377
	No	103(25.94%)	17(21.25%)	120(25.15%)	
Frequency of taking breaks	Every 20 minutes or less	97(24.43%)	27(33.75%)	124(25.99%)	<0.08
	Every 20-40 minutes	219(55.16%)	38(47.5%)	257(53.87%)	
	>40 minutes	81(20.40%)	15(18.75%)	96(20.12%)	
Brightness of the screen	Dull	158(39.79%)	29(36.25%)	187(39.20%)	0.001*
	Bright	202(50.88%)	46(57.5%)	248(51.99%)	
	Very bright	37(9.31%)	5(6.25%)	42(8.80%)	
Distance from the screen	< 45cm	366(92.19%)	56(70%)	422(88.46%)	0.00001*
	>45cm	31(7.80%)	24(30%)	55(11.53%)	

*p value statistically significant

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