

Knowledge, Attitude and Prevalence of Computer Vision Syndrome in Computer and Smartphone Using Population and Prevention by Ergonomics and Eye Exercises

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ABSTRACT

Introduction

The widespread usage of digital gadgets in close distance has resulted in complex of eye and vision problems collectively called as Computer Vision Syndrome (CVS). It is a major concern in adolescents because they rely on internet and digital platforms for academic purposes in the current pandemic situation. The study focus on the risk factors and ergonomic behaviour that contribute to the development of CVS in students, as well as raising awareness about how to avoid digital eye strain in the future.

Methodology

This cross sectional survey based study was conducted among 203 medical college students. A set of self-administered questionnaire was used to assess the prevalence of CVS symptoms and its associated risk factors. The survey consisted of questions on contact lens and digital screen usage, ergonomics, Computer Vision Syndrome Questionnaire.

Results

The most frequently reported severe CVS symptoms was head ache (11%) followed by tearing (6.9%) in the eyes of the subjects. In addition, 72% of them were had moderate excessive blinking symptoms. 50% of them were have mild headache, 37% of them were have tearing and burning symptoms. In regard to the physical symptoms, 27% of the have neck pain and 12% of them felt neck stiffness.

Conclusion

Finding of the present study revealed that majority of the students have CVS symptoms such as headache followed by dry eyes, tearing and burning sensation. In addition to that, students also reported extra ocular symptoms like neck pain and stiffness more frequently. As colleges continue to improve their educational strategies, it is important to promote student knowledge of the health risks associated with extended computer usage for studying and to explain how to avoid CVS symptoms.

Keywords: Computer Vision Syndrome, ergonomics, eye exercises

INTRODUCTION

In current era, electronic devices such as computers are universally used for both occupational and non-vocational activities. It includes e-mail usage, internet access, and entertainment (1). According to a recent estimate, Asia has huge internet users of about 2,762,187,516 (53.4% of the world's population) with a total estimated 5,168,780,607 users worldwide (<http://www.internetworldstats.com/stats.htm>).

In addition, computer use is not limited to adults. A recent study of over 2000 American children aged 8 to 18 found that on an average day, kids spend 7.5 hours on entertainment media, 4.5 hours watching television, 2.5

hours on a computer, and playing video games (2). These chronic usage of computer which has given rise to four major group of symptoms such as asthenopic, ocular surface related problem, visual and extra ocular defect. It is collectively known as computer vision syndrome or CVS (3).

The American optometric association defines CVS as “a group of eye- and vision-related problems that result from prolonged computer usage”(4). The visual defect of CVS includes reduction in blinking reflex which causes drying of eyes. Long-term exposure to digital electronic screens also leads to diminished power of accommodation, deviation in near point of convergence and phoria for near vision (5). In a study done by Thomson on prolonged computer usage reported eyestrain, headaches, ocular pain, dry eye, diplopia, and impaired vision (6). The two main reason for causing ocular issues related to CVS might be inappropriate oculomotor responses and dry eye. Non-ocular causes of CVS may include poor work or study station design in the organisation, which might potentially be a major cause of back, neck, and shoulder symptoms and wrist pain (7). In a study done by Wick and Morse blurred vision was reported after prolonged computer usage. It was due to defective accommodative response (AR) or a failure to properly relax the AR in response to the near-vision demands (8, 9). Tosha et al. investigated the link between visual discomfort and the AR in a recent work. They discovered a longer lag of accommodation in those who reported more discomfort after prolonged computer viewing(10). Blehm et al. also found that after a long period of computer use caused dryness in eye, burning, and grittiness. They speculated that one or more of the following variables could cause these ocular surface symptoms like environmental factors, reduced or incomplete blink rate, greater amount of corneal exposure or Wearing contact lenses for longer duration of time (3).

In the current situation, as the epidemic forces us to stay at home, the number of hours spent in front of a screen has substantially increased. Students have been utilizing more digital devices than usual since the COVID-19 lockdown was proclaimed. It has led to an increase in the prevalence of Computer Vision Syndrome, particularly among students who have been attending online courses. All outdoor activities were forbidden during that time, increasing the disease occurrence. The ocular manifestation is the most commonly reported abnormality. Nearly 60 million individuals worldwide are thought to be affected by CVS, with a million new cases reported each year. CVS is common among computer users, with prevalence ranging from 64% to 90% (11). CVS is the subject of the research because it creates inconvenience by interfering with academic efficiency and so lowering productivity in students. A big majority of students rely on the digital platform for e-books, online video lectures, computer programming, e-newsletters, mail, and other educational resources for academic purpose due to the conveniently available educational sources on the internet. Recreational activities such as watching movies, live sports, gaming, and social networking are also popular among students (12).

The purpose of this study is to analyze medical students' knowledge, attitudes, and prevalence of Computer Vision Syndrome and to create awareness about the methods to prevent CVS.

MATERIALS AND METHODS:

A cross sectional questionnaire study was conducted among the undergraduate medical students of host institution. The Institutional Ethical committee approval was obtained for conducting the survey. An informed consent was obtained from the participants before initiating the study. Sample size was calculated with studies reporting 60% symptom prevalence at the 0.05 level of significance and 80% power while assuming 10% difference among medical and business students; using the two proportion formula, a sample size of 200 was obtained. A total of 203 students were included in the study based on nonprobability convenience sampling.

INCLUSION CRITERIA

The students of age group 19 - 25 years, who used computers or electronic devices on a weekly basis (> 2 hours/ day) for duration of more than 3 months, were included for the study.

EXCLUSION CRITERIA

Those students who declined to take part in the survey were excluded. The subjects who were diabetic and frequently used contact lens were not included in the study. The students who were under medications such as

antidepressants, anti-histamines, beta blockers and reported with ocular diseases other than nearsightedness, farsightedness, and astigmatism were also excluded.

STUDY TOOL & DATA COLLECTION

Students were randomly selected and invited to complete a self-administered questionnaire. The survey consisted of following sections

PART 1 of the survey included questions regarding the demographic details, year of study, refractive error, usage of contact lens, usage of spectacle (with or without blue light filter coating), presence or absence of dry eye complaints.

PART 2 of the survey included questions like the frequent digital screen usage, hours spent on screen, ergonomics and work practices.

PART 3 of the survey was “The Computer Vision Syndrome Questionnaire” (CVS-Q). It evaluates the frequency and intensity of 16 symptoms of CVS using a single rating scale that fits the Rasch rating scale

model. Frequency was measured as never, occasionally and always with assigned values of 0,1,2 while the intensity was measured as moderate and intense with assigned values of 1 and 2. The total score was found and the students with score 6 or above were considered having the computer Vision syndrome.

Students were briefed about the proper ergonomic practices, tear drops and eye exercises to avoid eye strain. After the educational intervention, a small test was conducted to evaluate the participant’s knowledge about Computer Vision Syndrome (CVS).

STATISTICAL ANALYSIS

The data was analysed using the R statistical software. Frequencies and percentages were used to show descriptive data.

RESULT

A total of 203 students were invited to take part in the survey (table-1). The age varied from 19 to 25 years, with a mean of 22.56 years, while 61 percent (n=123) were females and 39 percent (n=80) were males. In regards to the course, 81 percentage (n=164) were from MBBS and 19% (n=39) from AHS. Majority of them from first (27%) and second year (n=45%).

From table 2, 50% (101) of them was known to have refractory errors, 7.9% (16) of students wear contact lens, 48% (97) were wearing spectacles and 64% of them does not have blue light filter coating. 4.9%

(10) of them were diagnosed with dry eye disease and 12 % (25) used lubricant for that.

Most of the students (table-3) exposed to mobile (48%) and computer (41%) screen, 22% exposed 3-4 hours and 32% exposed for 4-6 hours of digital screen. Most of them (83%) had break while using digital screening and 42% of them using 10-30% of brightness while using the digital screen. 53% of them maintained at least 20-30 inches distance while using and very few (14%) use antiglare filter.

The most frequently reported (table: 4) severe CVS symptoms were tearing (6.9%) and headache (11%). 72% of them were had moderate excessive blinking symptoms. 50% of them were have mild headache, 37% of them were have tearing and burning symptoms.

In regard to the physical symptoms (Table: 5) , 27% of the have neck pain and 12% of them felt neck stiffness.

Table 1: Basic characteristics of the study participants

Characteristic	N = 203
Age (Years)	
19	79 (39%)
20	71 (35%)
21	30 (15%)

22	14 (6.9%)
23	7 (3.4%)
25	2 (1.0%)
Gender	
Female	123 (61%)
Male	80 (39%)
Course	
AHS	39 (19%)
MBBS	164 (81%)
Participants level	
First year	55 (27%)
Second year	91 (45%)
Third year	39 (19%)
Final year	15 (7.4%)
CRRI	3 (1.5%)

Table 2: Details of eye related issues among the participants

Characteristic	N = 203
Refractive errors (Like near sightedness, farsightedness, astigmatism)	
Yes	101 (50%)
No	102(50%)
Are you wearing contact lenses?	
Yes	16 (7.9%)
No	187 (92.1%)
Are you wearing spectacles?	
Yes	97 (48%)
No	106(52%)
If using specs, does it have a blue light filter coating?	
Maybe	29 (14%)
No	129(64%)
Yes	45 (22%)
Do you have a previously diagnosed dry eye disease?	
Maybe	12 (5.9%)
No	181 (89%)
Yes	10 (4.9%)
Are you using any lubricant eye drops for dry eyes?	
No	178 (88%)
Yes	25 (12%)

Table 3: Details of the Screen exposure of the participants

Characteristic	N = 203
The frequent digital screen you use ?	
Computer	84 (41%)
Mobile	97 (48%)
Tablet	20 (9.9%)
TV	2 (1.0%)
The frequent digital screen you use ?	
1 - 2 hour	6 (3.0%)

2 - 3 hour	19 (9.4%)
3 - 4 hour	44 (22%)
4 - 6 hour	65 (32%)
How many hours do you spend on your screen?	
Continuous (no breaks)	34 (17%)
Interrupted (With 5-10 mins breaks for every one hour)	169 (83%)
To what level you illuminate your digital screen (brightness) in room light?	
<10%	43 (21%)
10 - 30 %	85 (42%)
30 - 50 %	53 (26%)
50 - 70 %	16 (7.9%)
> 70 %	6 (3.0%)
Your distance from the computer? (inches)	
Less than 20 inches	65 (32%)
20 - 30 inches	107 (53%)
more than 30 inches	31 (15%)
Do you use an antiglare filter on your screen?	
May be	48 (24%)
No	126 (62%)
Yes	29 (14%)
What type of work do you mostly perform on the computer or smartphone?	
Class via online	1 (0.5%)
Gaming	23 (11%)
online class	11 (5.4%)
Reading e-books	21 (10%)
Social networking	70 (34%)
Watching movie	77 (38%)

Table 4: Prevalence of self-reported computer vision syndrome (CVS)

CVC	Nil	Mild	Moderate	Severe
Burning	115 (57%)	75 (37%)	5 (2.5%)	8 (3.9%)
Itching	114 (56%)	72 (35%)	9 (4.4%)	8 (3.9%)
Feeling of foreign body	136 (67%)	56 (27.9%)	3 (1.5%)	8 (3.9%)
Tearing	111 (55%)	75(37%)	3 (1.5%)	14 (6.9%)
Excessive blinking	42(20.4%)	3 (1.5%)	146 (72%)	12 (5.9%)
Eye redness	129 (64%)	59 (28.9%)	6 (3.0%)	9 (4.4%)
Eye pain	112 (55%)	77 (38%)	8 (3.9%)	6 (3.0%)
Heavy eyelids	158 (78%)	39 (19%)	3 (1.5%)	3 (1.5%)
Dryness	138 (68%)	51 (25%)	2 (1.0%)	12 (5.9%)
Blurred vision	139 (68%)	51 (25%)	1 (0.5%)	12 (5.9%)
Double vision	175 (86%)	21 (10%)	4 (2.0%)	3 (1.5%)
Increased sensitivity to light	137 (67%)	52 (26%)	5 (2.5%)	9 (4.4%)
Feeling the sight is worsening	144 (71%)	47 (23%)	5 (2.5%)	7 (3.4%)
Headache	66 (33%)	102 (50%)	13 (6.4%)	22 (11%)

Table 5: Gender wise prevalence of Physical symptoms among the participants

Characteristics	Over all	Female, N = 123	Male, N = 80
None	89 (44%)	51 (41%)	38 (48%)
Neck pain	54 (27%)	34 (28%)	20 (25%)
Neck stiffness	24 (12%)	12 (9.8%)	12 (15%)
Numbness of arms and hands	16 (7.9%)	14 (11%)	2 (2.5%)
Shoulder pain	19 (9.4%)	11 (8.9%)	8 (10%)

DISCUSSION

The findings of the current study revealed that symptoms of a modern disease, CVS, experienced by medical college students. Most students in India are seeing a boom in education as a result of the current economic circumstances, leading in increased computer and cellphone use. This survey could be the first of its kind in the region to look into the impacts of long-term computer use among medical students, who are known to use a lot of electronic devices.

Headache was one of the most common symptoms mentioned by respondents, with 57.4 percent reporting it. Our finding was in line with previous studies done among indian students (5). According to these studies, one-sided headaches, vision-related or cluster headaches, or tension headaches are all prevalent symptoms of excessive computer use.

Another common CVS symptom observed in this study was eye pain, tearing and burning sensation, reported by 38% and 37% of the students. Presence of other CVS symptoms were not reported much by the students. In regard to incidence of this non-vision-related symptom, 27% reported neck pain and 12% reported neck stiffness which is similar to the previous studies (13).

The range is broad because musculoskeletal discomfort in the neck and shoulder area is dependent on numerous factors such as poor posture and hours of computer use. It should be emphasised, however, that this survey reveals the highest occurrence, highlighting the necessity to educate medical students on proper computer usage strategies. The majority of students (53%) watched computers and mobile at a distance of 20-30 inches length, resulting in considerably greater CVS symptoms. The majority of students (62%) did not use screen filters and it may be the main reason for the dry eyes, tearing and burning sensation of eyes. Looking at distant objects every now and then while using an electronic device was strongly related with less CVS symptoms, indicating that following the 20/20/20 rule can assist to reduce the incidence of CVS (14). Similarly, according to a study, taking five-minute breaks per hour reduces the pain associated with CVS (15). In previous studies, applying this guideline improved work efficiency and also prevents the CVS symptoms among the users (16, 17). The study's limitations include a single-center cross-sectional design and CVS diagnosis based on self-reported symptoms rather than ocular examination. There were no exclusion criteria in place, therefore people with prior medical or ocular issues were included, perhaps leading to an overestimation of CVS prevalence.

CONCLUSION

Excessive tearing, headache, and neck and shoulder pain are the most prevalent symptoms of computer vision syndrome (CVS) in undergraduate medical students. According to this study, the following risk factors are connected with the development of CVS: previous dry eye illness, prolonged computer use, short distance from the screen, and greater screen brightness.

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