

Factors Leading Computer Vision Syndrome in Medical Students: A Descriptive Analysis

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Abstract

Computer vision syndrome (CVS) is a condition caused by staring at digital devices for a prolonged period of time throughout the day. This screen overexposure can cause vision problems and discomfort. Whether using a phone, tablet, laptop, or computer monitor, there is a range of symptoms experienced by the user. The most common symptoms include headaches, eye strain, double vision, dry eyes, and eye fatigue, neck and back pain. A cross sectional study carried out at Oman Medical College (OMC). Data collection was carried out using a structured self-administered questionnaire, Statistical analysis was performed using SPSS (IBM SPSS Statistics 20.0). A total of 120 students were participated, 100 (83.3%) were female students. Sixty five percent of the participant use laptop and 22.5% use mobile phone daily. Nearly half of the participants reported that they keep top screen 10-15 degree below their eye level and keep level of the center of screen from eye 20"-24". Off total, 83.3% participants utilize anti-glare screen and 77.5% make use of brightness adjustment. Most frequent symptoms are eye strain, visual fatigue, headaches, neck and backaches, ocular discomfort. This study conclude that medical students experienced some of the health problems due to constant computer use like eye strain, visual fatigue, headaches, neck and backaches, ocular discomfort and musculo-skeletal disorders. Since, computer-related morbidity has now become an occupational health problem, the care should be taken while using computer for long time.

Keywords

Computer Vision Syndrome, Eye Strain, Medical Students

1. Introduction

Computer vision syndrome is an emerging problem due to increase usage of computer [1]. The American Optometric Association defines computer vision syndrome as a complex of eye and vision problems related to the activities which stress the near vision [2]. Three major mechanisms that lead to computer vision syndrome are extra ocular mechanism, accommodative mechanism and ocular surface mechanism. The visual effects of the computer such as brightness, resolution, glare and quality all are known factors that contribute to computer vision syndrome [3].

Extra ocular symptoms include neck stiffness and pain, shoulder pain, headache, backache. Accommodative mechanism includes blurring of vision, double vision,

presbyopia, myopia and slowness of focus change. Ocular surface mechanism includes tearing, gritty sensation, dryness, redness, burning eyestrain, tired eyes, irritation, redness, blurred vision, and double vision. As computers become part of our everyday life, people are experiencing a variety of ocular symptoms related to computer use [4]. Although many studies have reported the association between prolonged computer use, poor postures at workstations and various musculoskeletal discomforts, most of them were focused on western adult subjects [5-7].

Among the most important modifiable external environmental factors is lighting. Bright lights, windows and overhead fluorescent lights often contribute to discomfort glare. These bright light sources need to be controlled with proper blinds, filters or adjustment of the room arrangement so that an acceptable level of lighting is obtained to minimize visual

fatigue. Imbalanced of light between the computer screen and the surrounding is another important factor to be considered. For example, a dark background screens often require lower lights level so when other source of documents are also viewed at the same time additional reading lamp may be needed to prevent ocular strain [8]. Use of screen filters can reduce glare and reflection of the computer screen, but it should be used as a supplement and not a replacement for poor lighting of the room. Screen brightness and contrast should be adjusted to provide balance with room lighting and maximum visibility [8, 9].

Prevention is the most important strategy in managing computer vision syndrome. Studies have proven that a higher refresh rates is associated with less flickering thus decreases ocular symptoms [10]. Extremely low refresh rates (high flickering) is known to be associated with headache, fatigue, irritability and epileptic [11]. Modification in the ergonomics of the working environment, patient education and proper eye care are important strategies in preventing computer vision [12, 13].

It is recommended that the eyes should be about 35-40 inches from the screen and that the screen should be placed 10-20 degrees below or that the middle of the screen 5-6 inches below eye level. Improved physical ergonomics of the computer workstation has been proven to reduce ocular discomfort and improve performance [11, 14]. The main purpose of this study was to identify ocular complaints among the computer user medical students and to evaluate the factors that have an impact on ocular complaints among computer users.

2. Method

2.1. Data Collection

A cross sectional study carried out at Oman Medical College (OMC) where the students use computers as a part of their curriculum. Data collection was carried out using a structured self-administered questionnaire, especially designed for this study. Survey instrument was made after literature search reviewed by and agreed on via several brainstorming sessions and understanding, so the questionnaire would maximize the response rates. Validation of questionnaire on small group (pilot) was also done.

The questionnaire was prepared and approved with ethical review committee of Oman Medical College. All students in preclinical and clinical years were invited to participate. Participants were enrolled after taking written informed consent. The principal investigator ensured uniformity and two trained research assistants assisted principal investigator in data collection. A questionnaire was designed comprising of four sections. The first section consists of demographic details of the participants. Section two was containing questions about assessment of their refractive status, and finally third section was about symptoms or ocular complaints related computer vision syndrome.

2.2. Data Analysis

Statistical analysis was performed using SPSS (IBM SPSS

Statistics 20.0). Data was expressed in frequencies for questionnaire responses calculated for all variables in numbers and percentages. Cross tabulation was performed to determine if there is a relationship between subgroups.

3. Results

A total of 120 students were participated in the study, of which 18 (15%) were male and 100 (83.3%) were female students. Among all participants, 100 (83.3%) were aged between 20 to 30 years and 60 (50%) were pre-clinical student (Table 1). Nearly half of participants use appliances, daily for 2-6 hours (46.7%) and more than 6 hours 47.5%).

Table 1. Demographics of Study Population – n (%).

	Male	Female	Total
Age			
< 20	5 (27.8)	13 (12.7)	18 (15)
20-30	13 (72.2)	87 (85.3)	100 (83.3)
>30	0	2 (2)	2 (1.7)
Year of Study			
Pre-Clinical	9 (50)	51 (50)	60 (50)
Clinical	9 (50)	51 (50)	60 (50)
Daily Duration of use of Appliances			
< 2 hrs.	1 (5.6)	6 (5.9)	7 (5.8)
2-6 hrs.	9 (50)	47 (46.1)	56 (46.7)
>6 hrs.	8 (44.4)	49 (48)	57 (47.5)
Last visit to ophthalmologist			
< 1 year	5 (35)	35 (34.3)	40 (33.3)
1-2 years	3 (16.7)	20 (19.6)	23 (19.2)
> 2 years	5 (27.8)	22 (21.6)	27 (22.5)
None	5 (27.8)	25 (24.5)	30 (25)

Sixty five percent of the participant use laptop and 22.5% use mobile phone daily. Nearly half of the participants reported that they keep top screen 10-15 degree below their eye level and keep level of the centre of screen from eye 20"-24". Off total, 83.3% participants utilise anti-glare screen and 77.5 make use of brightness adjustment (Table 2). Nearly half of the study participants wear eye glasses due to reduced far vision and 40% had normal vision.

Table 2. Assessment of Study Participants.

	Frequency	Percentage
Type of monitor		
LCD	9	7.5
Laptop	78	65.0
Mobile	27	22.5
Tablet / iPad	6	5.0
Level of the centre of screen from eye		
<20"	50	41.7
20"-24"	57	47.5
>24"	13	10.8
Top screen is below your eye level		
<10 degree	41	34.2
10-15 degree	59	49.2
>15 degree	20	16.7
Break (min 20 Sec) during computer use		
<20 min without break	47	39.2
20 min without break	11	9.2
>20 min without break	49	40.8
Continuous use without break	13	10.8
Blinking during computer use		

	Frequency	Percentage
10/min	57	47.5
10-15/min	47	39.2
>15/min	16	13.3
Use of anti-glare screen		
Yes	20	16.7
No	100	83.3
Brightness adjustment		
Yes	93	77.5
No	27	22.5
Use of Eye glasses		
Myopic (Reduced far vision)	59	49.2
Hyperopia (Reduce near vision)	2	1.7
Presbyopia (Reduced near vision in old age)	1	.8
Astigmatism (Blurred vision to all distance)	10	8.3
None	48	40.0
Use of Contact lens		
Yes	27	22.5
No	93	77.5

Participants were enquired about any trouble in their vision and symptoms related to the eye (Table 3). More than two third of the participants reported about blurring of vision (34.2) and tired eyes (37.5%). Less than half of the participants come across headache (45.8) and neck and shoulder pain (46.7%). More than one fourth complained about dry eyes (27.5%) and difficulty in focusing objects (28.2%).

Table 3. Symptoms related Computer Vision syndrome – n (%).

	Yes	No
Redness	16 (13.3)	104 (86.7)
Blurring of vision	41 (34.2)	79 (65.8)
Burning sensation	22 (18.3)	98 (81.7)
Headache	55 (45.8)	65 (54.2)
Dry eye	33 (27.5)	87 (72.5)
Neck & Shoulder pain	56 (46.7)	64 (53.3)
Eye strain	21 (17.5)	99 (82.4)
Tired Eyes	45 (37.5)	75 (62.5)
Sore eyes/irritation	13 (10.8)	107 (89.2)
Watering from eyes	20 (16.7)	100 (83.3)
Difficulty in focusing	34 (28.2)	86 (71.7)

Ten percent of study population have reported previous history of eye disease, 4.2% informed about previous medical history and 1.7% of participants were on medications.

Participants were asked about their sitting posture during use of their laptop. More than half of the study participants elected option “C” for their sitting posture (Figure 1).

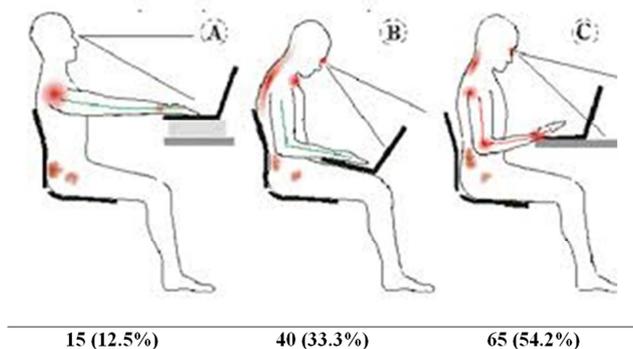


Figure 1. Sitting posture and Computer Vision syndrome.

Participant were asked multiple questions regarding environmental factors (Table 4). More than one fifth of the participants believe that poor lighting (20.8%) and imbalanced of light between the computer screen and the surrounding (22.5) causes computer vision syndrome.

Table 4. Environmental factor(s) associated with Computer Vision syndrome – n (%).

	Yes	No
Poor lighting	25 (20.8)	95 (79.2)
Imbalanced of light between the computer screen and the surrounding	27 (22.5)	93 (77.5)
Computer factor	7 (5.8)	113 (94.2)
Poor resolution	0 (0)	120 (100)
Poor contrast	4 (3.3)	116 (96.7)
Glare of the display	7 (5.8)	113 (94.2)
Slow refresh rate	3 (2.5)	117 (97.5)
Font size	17 (14.2)	103 (85.8)
Any other	1 (0.8)	119 (99.2)

4. Discussion

In this study, a total of 120 students participated, of which 18 (15%) were male and 100 (83.3%) were female students. Among all participants, 100 (83.3%) were aged between 20 to 30 years and 60 (50%) were pre-clinical student (Table 1). This is congruent with previous studies in which majority of participants were female and had similar age group as our study [15, 16].

Nearly half of the participants use appliances daily for 2-6 hours (46.7%), and more than 6 hours 47.5%). This finding is similar to a study conducted at a university in West Indies, where 52.6% of participants spent 2-6 h and 40.3% spent more than 6 h [17]. Interestingly, sixty five per cent of the participant use laptop and 22.5% use mobile phone daily. This is in agreement with two recent studies which indicated that most students preferred laptops over other appliances, for both work and recreation [15, 16].

Moreover, about half of the participants reported that they keep top screen 10-15 degree below their eye level. These significant findings were consistent with the results of recent studies conducted by Mashige et al and Agarwal et al [8, 18]. Off total, 83.3% participants utilise anti-glare screen and 77.5% make use of brightness adjustment (Table 2). In addition, half of the study participants wear eye glasses due to reduced far vision and 40% had normal vision. These observations are parallel to the findings of a recent study which evaluated factors contributing to ocular complaints among computer users [8].

Surprisingly, more than two third of the participants reported about blurring of vision (34.2) and tired eyes (37.5%). Less than half of the participants come across headache (45.8), neck and shoulder pain (46.7%). More than one fourth complained about dry eyes (27.5%) and difficulty in focusing objects (28.2%). These pattern of complaints were same as reported by the subjects in the previous studies which involved evaluation of computer vision syndrome [17-19].

In addition, ten percent of study population reported previous history of eye disease, 4.2% informed about previous

medical history and 1.7% of participants were on medications. A recent study also reported comparable fraction of participants with previous medical history [20-21].

Participants were asked about their sitting posture during use of their laptop. It was revealed that more than half of the study participants elected option "C" for their sitting posture (Figure 1). This observation is consistent with previous study in which an analogous position was adopted by majority of participants [15, 22-23].

This study indicated that more than one fifth of the participants believe that poor lighting (20.8%) and imbalanced of light between the computer screen and the surrounding (22.5) causes computer vision syndrome. Subjects of the previously held studies also had a similar opinion and it was also reported that light influences laptop use. Light adjustments had a positive influence and it reduced the computer vision syndrome [15, 18].

5. Conclusion

This study was conducted to identify ocular complaints among the computer user medical students and to evaluate the factors that have an impact on ocular complaints among computer users. Hence, it was revealed that the students experienced some of the health problems found among constant computer users like eye strain, visual fatigue, headaches, neck and backaches, ocular discomfort and musculo-skeletal disorders. Since, computer-related morbidity has now become an occupational health problem, therefore, awareness programs and strategies need to be adapted to educate the medical students, health professionals and other work forces for the prevention of computer vision syndrome and related health issues.

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