ORIGINAL ARTICLE

EVALUATION OF COMPUTER VISION SYNDROME AMONG STUDENTS AT THE COLLEGE OF MEDICINE, UNIVERSITY OF KERBALA: RESULTS OF ONLINE LEARNING DURING COVID-19 ISOLATION

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ABSTRACT

Objective: A complex of vision problems related to stress can occur during the use of computers or other digital devices. Many of the visual problems that users report are transient and resolve after they stop using computers or other digital devices. Even after stopping their computer job, some people may still have diminished visual abilities, such as blurry distance vision. This study aimed to evaluate computer vision syndrome among students at the College of Medicine, University of Kerbala

Materials and Method: This is a cross-sectional study conducted at the University of Kerbala College of Medicine, which was completed between November 2021 and January 2022, involving students of the College of Medicine who were given student questionnaires about the effects of long-term use of computers, laptops, and mobile phones.

Result: The cross-sectional studies, which included questionnaires administered to 460 students at the College of Medicine, University of Karbala, were examined. We drew lines to identify computer vision syndrome based on these associated ocular and extraocular symptoms and recorded a high prevalence of computer vision syndrome, reaching 91.6%.

Conclusion: The criteria in this study can be used to diagnose computer vision syndrome, assess the severity of the condition, and determine its relationship to prolonged use of computers or other devices.

Keywords: Computer vision syndrome, ocular, extraocular

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INTRODUCTION

The development of the 21st century has brought significant changes in how computers are used in the educational sector of universities. Additionally, computers are now utilized for watching movies, playing computer games, and engaging in online chatting. In early 2019, Iraq experienced a political crisis that prevented enrollment in colleges and schools, followed by the COVID-19 pandemic, which has lasted more than two years and is still ongoing. The mode of teaching shifted to online platforms in schools and universities through online teaching programs and social media. Due to prolonged use of mobile phones, iPads, and computers, students at the College of Medicine, University of Karbala, suffered harm beyond COVID-19 infection. [1-4] Over the past two years, dependence on mobile and computer devices has increased primarily due to the COVID-19 pandemic, prompting many universities and schools to utilize audiovisual equipment for online learning and research. This reliance led to complications in ocular and non-ocular signs and symptoms, similar to computer vision syndrome, which this research discusses in students. [1, 5, 9] Prolonged use of computers and other digital devices often results in a group of symptoms, with more patients complaining about ocular and non-ocular issues related to computer use. Symptoms such as eye strain, tired eyes, irritation, burning sensations, redness, dry eyes, blurred vision, and double vision reported by users of visual display units are collectively known as “Computer Vision Syndrome.” This study aimed to analyze the effects of mobile phones and computers on the quality of eyesight in students of the College of Medicine at the University of Karbala, who use gadgets for extended periods each day, and to examine the effects of these devices on the distribution of symptoms associated with computer vision syndrome. [6-8]

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MATERIALS AND METHOD

This is a cross-sectional study conducted at the University of Kerbala College of Medicine, completed between November 2021 and January 2022. The study involved students from the College of Medicine who completed questionnaires about the effects of long-term computer, laptop, and mobile phone use on the eyes and various parts of the body. The data collection period lasted three months. Data were gathered through both online and paper questionnaires. The questionnaire included questions about the type of electronic device used, daily duration of use, whether glasses were worn and their strength, symptoms related to electronic devices, and students' awareness of protection techniques.

MATERIALS AND METHODS

The study was conducted on 518 undergraduate students from the College of Medicine at the University of Karbala, with ages ranging from 19 to 24 years. Consent was obtained from them, excluding approximately 58 students who did not meet our search criteria, including the exclusion criteria, which are:

1. The person has an abnormality in vision and uses a high degree of eye class more than the power of eyeglasses

2. Disease related to the eye and causes severe headaches, such as Astigmatism, history of myopia & hyperopia

3. Consumption of drugs that cause affected vision and cause severe headaches

We developed a questionnaire for our subjects; a separate questionnaire was designed for data collection. The questionnaire has nine subsections covering participants' detailed medical history that has been collected for each subject, which includes:

1 Identity of the shared subject: name, gender (male or female), date of birth, and grade of the class.

2. What is used in studies, and how time is spent using the laptop and mobile

3. Distance more than 50 cm and using screen filters

4. Medical eyeglasses are used, and the Degrees of Medical eyeglasses are used

5. Any measures practiced to prevent eye problems

6. Headache

7. Burning sensation

8. Dry, tired, and sore eyes

9. Double vision and Blurred distance vision of the eyes

10. The subject has Neck pain, neck stiffness, shoulder pain, and Backache after a long time of use of this laptop and mobile

CRITERIA OF COMPUTER VISION SYNDROME

Three groups of criteria, each consisting of signs and symptoms, were established in this study to diagnose Computer Vision Syndrome. Three of these signs are consistently present and used for diagnosis, with two related to Ophthalmic disturbance that may require treatment. These groups are:

1. Group one// Ophthalmic symptoms

a. Visual symptoms

b. Internal Ocular Symptoms

2. External Ocular Symptoms

3. Group two// Musculoskeletal symptoms and headache

4. Groups three// Psychosocial symptoms

STATISTICAL ANALYSIS

was performed using Excel and Version 25 of the Statistical Package for the Social Sciences (SPSS). The differences between the groups were assessed using correlation and Crosstab to describe the relationship between the groups, and categorical data were presented as numbers and percentages. The study was conducted in accordance with the ethical standards established by the Medical Research Bioethics Committee of the University of Kerbala/College of Medicine. Before administering the questionnaires, informed consent was obtained from the student participants, and the study protocol was reviewed and approved by a local ethics committee (number 43) on 7/24/2020. The approval was renewed annually, with the final approval letter numbered 83, dated July 30, 2023.

RESULT

These cross-sectional studies were conducted using 33 questions (questionnaires) to 518 students of the College of Medicine/ University of Karbala; 460 were included in these studies, and 58 were excluded according to the criteria recorded in the method. A total of 460 medical students were included in the study with a mean age of (22 ± 1.27). The number of females in this study was 346 students equal to 75.2% and the number of males in this study114 students 24.8%), female with a male ratio of 3:1. Out of 460 students, 164 (35.7%) were using mobile, those were using IPad 158 (34.3%), were using laptops 138 (30%) explained in **figure 1.**

The majority of them used devices for more than 8 hours a day. Among students who used devices from a distance of more than 50cm, 228 (49.6%) used them at less than 50cm, while 232 (50.4%) used them at more than 50cm. Additionally, 148 (32.2%) students wore eyeglasses. The instruments students used to protect their eyes are detailed in Table **1.**

The majority of students used their laptops or mobile devices for more than 8 hours, which causes problems in vision. The prevalence of computer vision syndrome among student participants in this study was 89.6%, with

70% experiencing musculoskeletal symptoms. The most common vision issue was ocular problems, as reported by students **in table 2 and figure 3.** Other issues related to muscle spasms and device usage are detailed in **table 3 and figure 4**.

To apply the criteria that were created we found 412 of 460 students (89.6% of students) have Computer Vision Syndrome of which 98 students (21.3%) present with the symptoms of all types of criteria recorded with different in severity, well the headache with ocular and visual symptoms in 128 students (27.83%) and backache with ocular and visual symptoms in 140 students (30.43%) and these percentage of the symptoms overlap with each other in some of the cases of students with computer vision syndrome and with other musculoskeletal symptoms. The

Table 1: The method used for the protective eye from the instrument.

Preventive measures		Frequency	Percent
Using screen filters	Yes	156	33.9 %
	No	304	66.1 %
Taking break	Yes	278	60.4 %
	No	182	39.6 %
Illumination of the room	Normal	344	74.8 %
	Abnormal	116	25.2 %
Brightness of screen	Normal	230	50.0 %
	Abnormal	230	50.0 %

Table 2: Explains the percentage of symptoms related to vision

Type of ocular Symptoms		Number of students with Symptoms related to eye							
		Mild		Moderate		Severe		Total	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Blurred vision	460	105	22.83%	104	22.61%	29	6.3%	238	51.74%
burning sensation	460	150	32,61%	81	17.61%	39	8.48%	270	58.7%
Watery eyes and irritated eyes	460	178	38.7%	77	16.74%	23	5%	278	60.44%
Eye strain	460	104	22.61%	119	25.87%	47	10.22%	270	58.7%
Temporary Double vision	460	106	23.04%	37	8.04%	9	1. 96%	152	33.04%
Difficulty in accommodation	460	93	20.22%	62	13.48%	35	7.6%	190	41.3%

Table 3: explains the details of symptoms severity related to musculoskeletal and Extra-Ocular symptom

Type of Psychosocial Symptoms	Total	Number	Percent
Stress and Anxiety	460	122	26.52%
Fatigue,	460	101	21.96%
Dizziness and vertigo	460	71	15.43%
Reduced attention span	460	42	9.13%
Poor behavior	460	37	8.04%

Table 4: The Psychosocial symptoms distributed in students

Type of extraocular Symptoms		Number of students with Symptom							
		Mild		Moderate		Severe		Total	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
backache	460	132	28.69%	72	15.65%	34	7.39%	238	51.74%
Shoulder pain	460	101	21.96%	40	8.7%	38	8.26%	179	38.9%
Headache	460	107	23.26%	134	29.13%	85	18.48%	326	70.87%
Neck pain	460	62	13.48%	75	16.3%	47	10.22%	184	40%
Neck stiffness	460	50	10.87%	43	9.35%	11	2.391%	104	22.61%

Table 5: explained the cross-tabulation between the tool used by the students in studies and ocular symptoms

symptoms	Degree of severity	The tool used by the students			Total
		Computer and laptop	I Pad	Mobile	
Blurred vision	Severe	11	8	10	29
	Moderate	30	43	31	104
	Mild	32	30	43	105
	No blurred v	65	77	80	222
	Total	138	158	164	460
Eye strain	Severe	15	16	16	47
	Moderate	33	49	37	119
	Mild	26	28	50	104
	No eye strain	64	65	61	190
	Total	138	158	164	460
burning sensation	Severe	9	16	14	39
	Moderate	23	30	28	81
	Mild	50	47	53	150
	No burning	56	65	69	190
	Total	138	158	164	460

Table 6: explained the cross-tabulation between the tool used by the students in studies and extra-ocular symptoms

symptoms	Degree of severity	The tool used by the students			Total
		Computer and laptop	I Pad	Mobile	
Headache	Severe	22	34	29	85
	Moderate	42	40	52	134
	Mild	33	37	37	107
	No headache	41	47	46	134
	Total	138	158	164	460
Backache	Severe	11	12	11	34
	Moderate	24	20	28	72
	Mild	39	45	48	132
	No backache	64	81	77	222
	Total	138	158	164	460
Shoulder pain	Severe	11	17	10	38
	Moderate	11	19	10	40
	Mild	25	36	40	101
	No pain	91	86	104	281
	Total	138	158	164	460
Neck stiffness	Severe	1	6	4	11
	Moderate	7	20	16	43
	Mild	25	14	11	50
	No stiffness	105	118	133	356
	Total	138	158	164	460
Neck pain	Severe	13	17	17	47
	Moderate	23	24	28	75
	Mild	12	28	22	62
	No pain	90	89	97	276
	Total	138	158	164	460

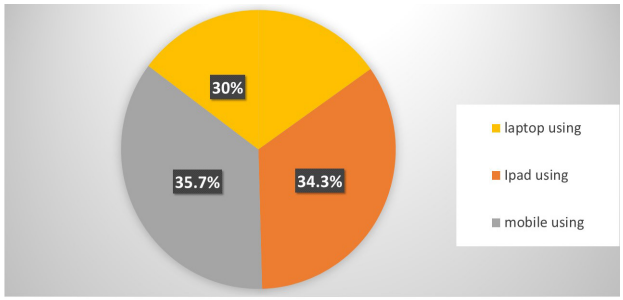

Fig 1: instrument used bv the student

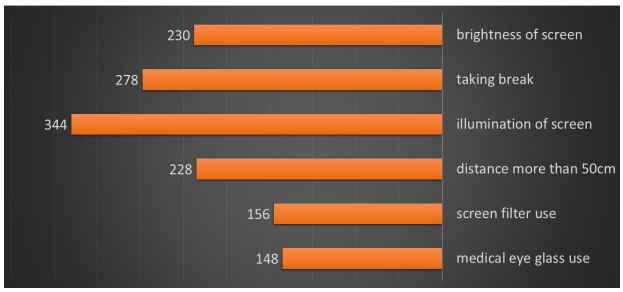

Fig 2: Protective eye methods sued by students

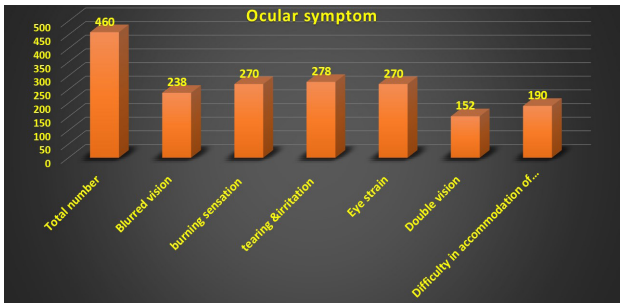

Fig 3: Explained the number of students with ocular and visual symptom

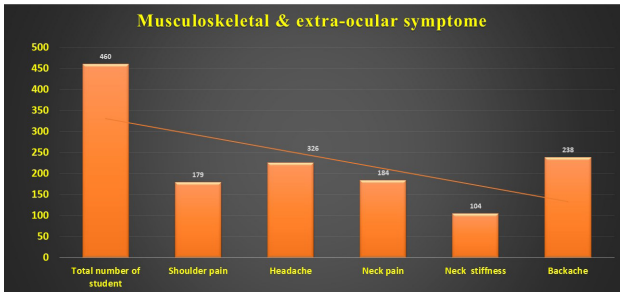

Fig 4: Explained the number of students with extraocular symptom

cross-tabulation between the tool used by the students in their studies and the symptoms of computer vision syndrome, as presented in **Tables 4 and 5,** indicates that there are no differences between using a mobile device or a computer in terms of the number of students with symptoms and the degree of severity of these symptoms.

DISCUSSION

In mid-October, Iraq faced a political crisis that led to restrictions on college and school enrollment. This was followed by over two years of COVID-19 isolation, during which online teaching through programs and social media became common, often involving extended use of mobile phones, iPads, and computers. This situation affected students at the College of Medicine, University of Kerbala, including those with health issues such as computer vision syndrome. The high prevalence of this syndrome among students explains the widespread impact, with a combined rate reaching 91.6%. This contrasts with studies from other countries conducted before COVID-19. [5, 22, 23, 24, 25, 26] During the isolation period, specific research also found similar percentages. [27, 28, 29]

Computer vision syndrome occurs from working long hours on a computer with poor sitting posture and not properly adjusting the screen brightness. Mild symptoms may last a few minutes to several hours during computer use. When severe eye issues develop, managing symptoms that persist while using the computer and improve after rest can become difficult, along with severe symptoms that may require medical treatment. Sometimes, severe eye lesions develop, leading to the need for corrective lenses, and extraocular vision problems might require medication.

In this study, we established criteria to identify computer vision syndrome based on associated ocular and extraocular symptoms. According to these criteria, students exhibit both ophthalmic symptoms and extraocular symptoms. Common ophthalmic symptoms related to CVS include visual and ocular issues such as eye strain, burning, blurred vision, and itchy eyes. The most typical visual problems noted in the study are eye strain, which affected almost 58.7% of students. A lower prevalence was reported among medical students in Chennai, at 32.3%, while university students in Ajman, United Arab Emirates (UAE), and Jordan reported rates of 54.8% and 48.3%, respectively [22, 28, 30]. Nearly 60.44% of our students complained of eye irritation. A lower prevalence was recorded among medical students in Chennai, with decreased rates of eye irritation (17.4% redness and 13.9%). In Ajman, over 48% of cases involved eye irritation (30). In our study, 33.04% of students reported temporary double vision, with lower rates reported in the UAE at 11.5% (30), and in Jordan at 18.3% [28]. About 51.71% of our students reported blurred distance vision, comparable to a study at Al-Aaliyah University in Jordan, which found a prevalence of 45.7% [28]. In contrast, a study among medical and engineering students in Chennai reported rates of 16.4% and 31.6%, respectively [22]. A study conducted in the UAE reported a prevalence of 24.8% (30), and the Indian study indicated a rate of 48% [32]. The percentage of difficulty in accommodation is 41.3%, which can be explained by the fact that accommodation is a dynamic process. Accommodation fatigue can result from maintaining the eyes in a stationary position. Changing the focal point can provide relief from constant eye strain and reduce glare [31, 42]. Visual fatigue occurs when the stress on the eye muscles caused by these movements exceeds the eye's ability to perform

visually [10].

Extraocular symptoms may be related to or result from musculoskeletal spasms and are often accompanied by other ocular symptoms. The most common musculoskeletal symptom reported by students with computer vision syndrome in this study was backache, at 51.73%. While 38.9% of students reported shoulder pain, 40% reported neck pain, and 22.61% experienced neck stiffness. In contrast, a study among medical and engineering students in Chennai found a prevalence of 60% [22], and in Albania, a high rate of shoulder pain and neck stiffness was reported at 81% [33]. A study in Jamaica showed that 75.1% of undergraduate students suffered from neck pain and 65.5% from shoulder pain [35]. The variation is wide because musculoskeletal pain, such as backache, neck pain, and shoulder pain, is influenced by several factors, including poor posture and prolonged computer use. Nonetheless, it is important to note that this survey indicates the highest prevalence, underscoring the need to educate students on proper computer use and promote the development of good habits.

Headache was the most common symptom reported, at 70.87%. In contrast to a study conducted among medical and engineering students in Chennai, approximately 43.3% of medical students and 45% of engineering students were reported to experience headaches. Another study was conducted among university students in Ajman, UAE, where 53.3% reported headaches [28]. A similar percentage was also observed among university students in Jordan, at 53% [30]. A comparable study in India found that 82.1% of the population reported suffering from headaches [33]. Another study in Egypt found that 26% of medical students complained of headaches [34]. Common causes of headaches in CVS patients include the constant contraction of ocular and ciliary muscles to adjust the eyes and keep the lens in the accommodating phase. To view objects at various distances from the screen to the keyboard and to work on documents, the eyes must continually focus and refocus. This causes eye muscle fatigue or eyestrain, which can result in headaches, in addition to other vision-related issues such as cluster headaches and tension headaches—common symptoms associated with frequent computer use.

In our study, students with psychosocial symptoms related to computer vision syndrome showed high levels of stress and anxiety at 26.52% and fatigue at 21.96%, compared to those with low levels of reduced attention span at 9.13% and poor behavior at 8.04%. These symptoms have been reported by other authors in similar percentages [36-43]. The stress from studying and a political crisis, along with new online learning, contribute to fatigue, which leads to repetitive feelings of anxiety and stress, as well as ongoing fatigue. According to our study, students who used iPads and smartphones were more frequently affected by extraocular symptoms of computer vision syndrome than students who used desktops and laptops, and had more severe symptoms recorded in backache and headache.

CONCLUSION

The criteria in this study can be used to diagnose computer vision syndrome, assess the severity of the condition, and determine its relationship to prolonged use of computers or other devices.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under

Authors	Conceived & designed the analysis	Collected the data	Contributed data or analysis tools	Performed the analysis	Wrote the paper	Other contribution
AbuRagheiff M	✓	×	✓	×	✓	×

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.