Risk Factors of Computer Vision Syndrome among College Students and Employees in Jeddah

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Abstract

Background: Computer Vision Syndrome (CVS) described by the American Optometric Association (AOA) as "The complex of eye and vision problems related to near work experience during computer use." The current study aims to evaluate the prevalence of CVS and the association between CVS symptoms with age and behavior's, among college students and employees in Jeddah, Saudi Arabia. **Subjects & Methods:** This was a cross-sectional analytic study conducted in Jeddah, Saudi Arabia from July to August 2020. The study targets college students and employees living in Jeddah, Saudi Arabia, from July 2020. The target sample size was a minimum of 377 that was calculated using raosoft. Data entry was performed by Microsoft Excel 2019, and analysis was done using Statistical Package for the Social Sciences (SPSS) software, version 25. Frequency, descriptive analysis, Chi-square, and One-way ANOVA was performed. P-value of <0.05 was considered statistically significant. **Results:** Overall, 786 responses were received, only 459 met the criteria of which 277 (60.3%) were college students and 182 (39.7%) were employees. Pain in and around the eyes 288 (66.5%) and sore eyes 247 (57%) were the most commonly reported ocular symptoms among participant and in terms of extra-ocular symptoms; headache 355 (82%) and neck and shoulder pain 237 (55%) recorded highest. The highest number of symptoms was reported by IbnSina National College (ISNC) students with approximately a mean number of symptoms 7 ± 3.443. **Conclusion:** Computer Vision Syndrome is a common syndrome among college students and employees.

Keywords: Computer vision syndrome; Prevalence; Risk factors; Jeddah; Saudi Arabia; Computer users; Ocular symptoms

Introduction

Computer Vision Syndrome symptoms are classified into ocular symptoms such as eye strain, blurry vision, and dry eyes, and extraocular symptoms which includes pain in the neck or shoulders or numbing in the hands or fingers. [1]

CVS is a growing public health problem that is not clearly understood. [2] The usage of computers and other digital devices for an extended period causes the rise of CVS symptoms later on in the future. [1,3]

AOA found that 14% of patients who visit the ophthalmology clinic for visual examinations have CVS. [4] On average more than 50% of the work environment now uses computers in their job; thus, nearly 60 million people experience ocular problems. [5]

The most frequently occurring health problem among computer users are CVS, [6–9] followed by wrist and shoulder pain and overuse syndrome to musculoskeletal injuries. [10,11]

Subjects and Methods

The study was approved by Dr. Soliman Fakeeh Hospital Scientific Research Review Committee (DSFH IRB). It was a cross-sectional analytic study conducted in the Jeddah region of Saudi Arabia from July to August 2020.

The study targets college students and employees in Jeddah, Saudi Arabia. Those diagnosed with underlying systemic diseases (diabetes, hypertension, hypothyroidism, hyperthyroidism), who had pre-existing eye diseases (such as Glaucoma, Sjogren syndrome, LASIK surgery done less than a year), they're not employees nor college students and those who wear contact lenses were excluded.

The target sample size was a minimum of 377 that was calculated using Raosoft software.

A validated electronic questionnaire was taken from a study conducted in Sri Lanka that was used for measuring the CVS symptoms. [12]

The used survey was translated into Arabic and subjected to a process of forward and backward translation.

All information in this study was confidential, and the

participants' privacy was protected with no access to data other than those authorized. The survey was legally permitted and socially accepted.

Data was collected through an online questionnaire constructed on Google Forums from the month of June to July 2020. A link to the questionnaire was provided through social media platforms such as Twitter and WhatsApp.

Data entry was performed by Microsoft Excel 2019, and analysis was done using Statistical Package for the Social Sciences (SPSS) software, version 25. Frequency, descriptive analysis, Chi-square and One-way Anova was performed. P value of <0.05 was considered statistically significant.

Results

Overall, 786 responses were received in this study, only 459 met the criteria of which 277 (60.3%) were college students and 182 (39.7%) were employees.

The majority of 261 (56.9%) of the study population belonged to the age category of 20 years-29 years, with a mean age of 2.30 years ± 0.8 years.

King Abdul-Aziz University (KAU) students represent the majority of the included students 99 (35.7%), followed by IbnSina National College (ISNC) for Medical Science 37 (13.4%).

Regarding the ocular symptoms of CVS, it was noted that pain in and around the eyes 288 (66.5%) and sore eyes 247 (57%) were the most commonly reported ocular symptoms among participant and in terms of extra-ocular symptoms; headache 355 (82%) and neck and shoulder pain 237 (55%) recorded highest. The frequency of reported behaviors were as follow: Spending 6-9 hours on a computer 207 (48%), using both postures; laying and sitting 270 (62.6%), using a light bulb 272 (63.1%), and adjusting computer brightness 325 (75.4%) [Tables 1 and 2].

Association between number of symptoms with age and college/ university

Participant aged 20 years-29 years old and those more than 40 years of age reported experiencing the most symptoms.

Of the study sample, 261 participants were between 20 years and 29 years old with a mean number of symptoms 6.24 ± 3.58.

Table 1: Frequency of variables.			
Variables		**No.**	**%**
Age	less than 20 years	54	11.80%
	20-29 years	261	56.90%
	30-39 years	97	21.10%
	more than 40 years	47	10.20%
Occupation	college student	277	60.30%
	employee	182	39.70%
	other	0	0.00%
College/university	KAU	99	35.70%
	Effat university	8	2.90%
	ISNC	37	13.40%
	FCMS	9	3.20%
	BMC	12	4.30%
	CBA	12	4.30%
	Dar Al-Hekma university	9	3.20%
	KSU	15	5.40%
	Jeddah university	34	12.30%
	others	42	15.20%
Using computer during work/study	yes	433	94.30%
LASIK surgery	yes	57	13.20%
Time during LASIK surgery	less than a year	0	0.00%
	more than a year	59	100.00%
Number of working hours you spend on the computer	less than 2 hours	50	11.60%
	2-5 hours	107	24.80%
	6-9 hours	207	48.00%
	more than 9 hours	67	15.50%
Breaks between work	every 30 minutes or less	162	37.60%
	every 30-60 minutes	154	35.70%
	every 60 minutes or more	115	26.70%
Posture while using the computer	sitting	155	36.00%
	laying	6	1.40%
	both	270	62.60%
Source of light	natural light	159	36.90%
	light bulb	272	63.10%
Adjust computer brightness	yes	325	75.40%
Contact lens	yes	0	0.00%

*KAU: King Abdul-Aziz University; *ISNC: IbnSina National College for Medical Science; *FCMS: Fakeeh College for Medical Science; *BMC: Batterjee Medical College; *CBA: College of Business and Administration; *KSU: King Saud University

While the mean number of symptoms affecting those more than 40 years of age was 6.255 ± 3.36. The difference was statistically insignificant (p=0.26, one-way anova) [Table 3].

Significant association was found with headache and age with (p=0.012, chi-square) and it was the most common associated symptom overall, especially with individuals more than 40 years old with 43 (95.6%). Pain in and around the eyes was common among individuals between 20 years-29 years with 165 (67.9%). Blurred near vision was more common in individuals above 40 years of age 26 (57.8%) with a significance of p=0.018. Back pain was reported highest among participant aged more than 40 years old 27 (60%) with a significant association of (p=0.002) [Table 4].

The mean number of symptoms affecting those college/university students; the highest number of symptoms was reported by ISNC students with approximately a mean of 7 ± 3.443 symptoms. The difference was statistically insignificant (p=0.293) [Tables 5 and 6].

Association between computer vision syndrome symptoms and behaviours/risk factors

Participants who spent more than 9 hours on the computer had a mean symptom number of 8, while those who spent less than 2 hours had a mean symptom number of 5.

The majority of college students and employees take a break every 30 minutes, or less 162 (37.6%) have a mean of 6

Table 2: Frequency of CVS Symptoms.

Symptoms		No.	%
Pain in and around the eyes	yes	288	66.50%
Headache	yes	355	82.00%
Blurred near vision	yes	158	36.50%
Blurred distant vision	yes	216	49.90%
Dry eyes	yes	223	51.50%
Sore eyes	yes	247	57.00%
Red eyes	yes	214	49.40%
Excessive tearing	yes	108	24.90%
Double vision	yes	90	20.80%
Twitching of eyelids	yes	130	30.00%
Changing in visualizing colour	yes	37	8.50%
Neck and shoulder pain	yes	237	55.00%
Back pain	yes	236	54.80%
Numbing in hands and fingers	yes	177	41.10%

Table 3: Number of symptoms associated with age.

	N	Mean	SD	P-value
Less than 20 years	54	4.8704	3.11446	
20 years-29 years	261	6.2452	3.58002	
30 years-39 years	97	5.4536	3.44607	0.26
More than 40 years	47	6.2553	3.36522	
Total	459	5.9172	3.50323	

These values were calculated using One-way ANOVA

Table 4: Number of symptoms associated with age.

	Age								
Symptoms	Less than 20 years		20 years-29 years		30 years-39 years		More than 40 years		P-value
	No.	%	No.	%	No.	%	No.	%	
Pain in and around eyes	33	62.30%	165	67.90%	61	66.30%	29	64.40%	0.867
Headache	42	79.20%	202	83.10%	68	73.90%	43	95.60%	0.012*
Blurred near vision	17	32.10%	85	35.00%	30	32.60%	26	57.80%	0.018*
Blurred distant vision	29	54.70%	134	55.10%	37	40.20%	16	35.60%	0.016*
Dry eyes	19	35.80%	135	55.60%	43	46.70%	26	57.80%	0.039*
Sore eyes	24	45.30%	149	61.30%	47	51.10%	27	60.00%	0.098
Red eyes	14	26.40%	133	54.70%	46	50.00%	21	46.70%	0.003**
Excessive tearing	13	24.50%	72	29.60%	14	15.20%	9	20.00%	0.044*
Double vision	6	11.30%	56	23.00%	18	19.60%	10	22.20%	0.287
Twitching of eyelids	10	18.90%	90	37.00%	22	23.90%	8	17.80%	0.003**
Changing in visualizing colour	3	5.70%	27	11.10%	3	3.30%	4	8.90%	0.108
Neck shoulder pain	23	43.40%	139	57.70%	48	52.20%	27	60.00%	0.228
Back pain	16	30.20%	142	58.90%	51	55.40%	27	60.00%	0.002**
Numbing in hands fingers	14	26.40%	101	41.90%	41	44.60%	21	46.70%	0.121

Table 5: Number of symptoms associated with college/university.

University/college	No.	Mean	SD	P-value
KAU	99	6.3333	3.60555	
Effat university	8	5.75	2.37547	
ISNC	37	7.4054	3.44367	
FCMS	9	4.8889	4.34294	
BMC	12	6	2.9542	
CBA	12	4.9167	2.35327	0.293
Dar Al-Hekma university	9	4.4444	3.2059	
KSU	15	6.7333	3.71227	
Jeddah university	34	6.1471	3.4914	
Others	42	5.8095	3.53545	
Total	277	6.1949	3.49403	

Table 6: Association between CVS behaviours and Symptoms.

Categories		Number of symptoms		
		Mean	SD	%
Number of working hours you spend on the computer	Less than 2 hours	4.54	2.4	11.60%
	2 hours-5 hours	5.62	3	24.80%
	6 hours-9 hours	6.57	3.35	48.00%
	More than 9 hours	7.67	3.39	15.50%
Breaks between work	Every 30 minutes or less	6	3.2	37.60%
	Every 30 minutes-60 minutes	6.06	3.2	35.70%
	Every 60 minutes or more	6.92	3.46	26.70%
Posture while using the computer	Sitting	5.89	3.05	36.00%
	Laying	6.33	3.44	1.40%
	Both	6.48	3.41	62.60%
Source of light	Natural light	5.65	3.34	36.90%
	Light bulb	6.62	3.21	63.10%
Adjust computer brightness	yes	6.32	3.25	75.40%
	no	6.09	3.42	24.60%
Contact Lens	yes	0	.	0.00%
	no	6.27	3.29	100.00%

Table 7: Association between CVS symptoms with occupation.

Symptoms		Occupation				
		College student		Employees		P-value
		No.	%	No.	%	
Pain in and around the eyes	yes	180	67.70%	108	64.70%	0.5899
headache	yes	224	84.20%	131	78.40%	0.164
Blurred near vision	yes	93	35.00%	65	38.90%	0.465
Blurred distant vision	yes	147	55.30%	69	41.30%	0.0064**
Dry eyes	yes	142	53.40%	81	48.50%	0.3732
Sore eyes	yes	156	58.60%	91	54.50%	0.4529
Red eyes	yes	134	50.40%	80	47.90%	0.6876
Excessive tearing	yes	79	29.70%	29	17.40%	0.0055**
Double vision	yes	54	20.30%	36	21.60%	0.8478
Twitching of eyelids	yes	89	33.50%	41	24.60%	0.0627
Changing in visualizing colour	yes	26	9.80%	11	6.60%	0.3278
Neck or shoulder pain	yes	147	55.70%	90	53.90%	0.7914
Back pain	yes	142	53.80%	94	56.30%	0.6828
Numbing in hands or fingers	yes	103	39.00%	74	44.30%	0.3229

symptoms, but on the other hand, those who had breaks every 60 minutes or more had mean symptoms number of 7.

Regarding the posture used during computer usage, those college students and employees who use both sitting and lying position while using the computer experience a mean symptom number of 7 compared to sitting alone with a mean number of 6.

Using a light bulb showed a higher mean number of 7, while those participants who adjust their computer brightness showed a mean number of 7. Participants who don't use contact lens experience a mean symptom number of 7.

Association between CVS Symptoms with Occupation.

College students reported having higher symptoms than

employees which is shown in [Table 7]. There was no significant association between CVS symptoms and occupation.

Discussion

The prevalence of CVS found to be (91.7%) without headaches since our definition of CVS consisted only of eye/visual symptoms apart from headache which was contrasted with a study had done by which had a prevalence of 67.4%. [12] The headache is a symptom that is felt in various situations regardless of whether it is due to CVS. Correspondingly, another study among medical and engineering students in Chennai has found a higher prevalence of CVS (80.3%). [13] Contrarily previous studies on CVS from Malaysia (68.1%) and Nigeria (74%) have demonstrated lower results. [1,14]

Those aged between 20 years-29 years and more than 40 years old found to have a high number of symptoms with a mean of 6.2 compared to those aged less than 20 years old. Similarly, Priyanka found a significantly higher prevalence of CVS among those aged over 40 years (72.7%) to those aged less than 20 years old (58%). [12] A possible explanation is due to those aged more than 40 years are exposed and dealt with computers more frequently than those less than 20 years of age.

In our study, the most common reported ocular symptoms are pain in and around the eyes (66.5%), followed by sore eyes (57%). While in extraocular symptoms, headache (82%) was the most common followed by neck and shoulder pain (55%). In a study carried out in Saudi Arabia, Jeddah, excessive tearing (20.6%), followed by a feeling of dryness (20.3%), was observed to be the highest in extraocular symptoms by Ghufran A. Abudawood. [15] In Iran, the most frequent ocular problems were a pain in and around the eyes (41%), then excessive watering (18%) followed by burning, then itching in eyes (15%). [16]

The most commonly reported symptom in computer users and several other similar studies is a headache. [4,14,17] If a computer user needs to view the computer screen while looking at a paper on the table from time to time, the eyes constantly adjust with focusing and refocusing. These constant changes take place thousands of times when a computer user stares at a computer screen for hours, which then stresses the eye muscles leading to eye fatigue and discomfort, causing headaches. [18]

This study, students who spend more than 9 hours working on the computer were significantly at higher risk of CVS than those who spend less than 2 hours. In contrast, Al Rashidi and Ghassemi-Broumand reported that students who spent more than four hours were significantly at higher risk of CVS than those who spent less than four hours. [13,19] A study conducted in Malaysia stated that the hours of computer usage per day were significantly associated with CVS. Working with a computer for more than 7 hours per day was predisposing a person to get CVS. [1] Another study conducted by Shrestha reported that visual symptoms aggravates with increasing hours spent on the computer. [20] Also Rahman and Sanip in their study documented that more than 7 hours of computer usage is significantly associated with symptoms of CVS. [1]

The frequency of taking breaks was not associated significantly with CVS which is supported by the same finding in previous studies. [4,12,19] In contrast, Hassan et al. found that taking short breaks every 30 minutes decreases visual discomfort every hour. [21,22]

However, a study carried out by Leon Straker found that musculoskeletal complaints get worse by sitting position. [22] A significant association was noted regarding the source of lighting and symptoms of CVS in this study. On the contrary, a study conducted on medical students in Saudi Arabia pointed out that there was no significant association. Adjusting the computer brightness was not significantly associated with CVS. This is consistent with a study conducted in Sri-Lanka, which illustrates that no association was found between adjusting the brightness of the screen and angle of gaze. [12]

There are several limitations to this study first this is a cross-sectional study, ophthalmic examination was not included, and the symptoms reported were self-reported. Secondly, this study was only conducted in Jeddah therefore we can't generalize the results. Thirdly those participants' ages 20 years-29 years were more than the rest of the age group. As well as participants from different colleges and universities were inconsistent.

It is recommended that screen brightness and room lighting should be balanced. As well as limiting the number of working hours while using a computer.

Conclusion

Computer vision syndrome is a common syndrome among college students and employees.

Acknowledgement

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