

The prevalence of computer vision syndrome in students



Asieh Ehsaei^{1,2}, Hadi Ostadimoghaddam¹, Morad Amir Ahmad³,
Hassan Hashemi⁴, Abbasali Yekta², Abbas Forough Ameri²,
Nasrin Moghadas Sharif⁵, Bamdad Mahbod⁴, Mahdi Mahmoodi⁵,
Mehdi Khabazkhoob⁶, Mahshid Saffarpour⁷

¹ Refractive Errors Research Center, Mashhad University of Medical Sciences, Mashhad, Iran
Head: Hadi Ostadimoghaddam, PhD

² Department of Optometry, Mashhad University of Medical Sciences, Mashhad, Iran
Head: Hadi Ostadimoghaddam, PhD

³ Department of Optometry & Physiotherapy, Erbil Technical & Medical Health Collage, Erbil Polytechnic University, Erbil,
Kurdistan Region, Iraq
Head: prof. Edrees Mohammad Tahir

⁴ Noor Research Center for Ophthalmic Epidemiology, Noor Eye Hospital, Tehran, Iran
Head: Mehdi Khabazkhoob, PhD, assist. prof.

⁵ Noor Ophthalmology Research Center, Noor Eye Hospital, Tehran, Iran
Head: Mehdi Khabazkhoob, PhD, assist. prof.

⁶ Department of Medical Surgical Nursing, School of Nursing and Midwifery, Shahid Beheshti University of Medical
Sciences, Tehran, Iran Head: dr Reza Masoudi, assist. prof.

⁷ Department of Restorative Dentistry, School of Dentistry, Alborz University of Medical Sciences, Alborz, Iran
Head: dr Mahshid Saffarpour

HIGHLIGHTS

CVS affects 40% of optometry students in Iran. Higher prevalence observed in females and postgraduate students. Most common symptoms: headache, burning, eye redness, tearing, dryness. Ergonomic adjustments and proper eye care are essential to reduce CVS.

ABSTRACT

Purpose: To determine the prevalence of computer vision syndrome (CVS) in optometry students in Iran.

Methods: This descriptive cross-sectional study was conducted among a total of 279 optometry undergraduate and postgraduate students in all 4 optometry departments in Iran who used computers or other digital electronic devices for at least 2 h per day. A reliable questionnaire designed by Segui et al. was used to evaluate the prevalence of computer vision syndrome. It was included 16 symptoms that were scored using 2 rating scales: frequency and intensity. Response for each symptom was combined multiplicatively into one rating scale, resulting in a single symptom severity score and consequently, overall symptom severity. The total score of 6 points or more was considered as having a computer vision syndrome.

Results: Of a total of 279 optometry students who enrolled, 226 participants (100 males and 126 females) aged 22.63 (± 5.69) years completed the study. Prevalence of computer vision syndrome was 40.27% in optometry students (42.06% in female and 38.00% in males). Also, the prevalence of CVS was 36.41% in BSc,

62.50% in MSc and 71.43% in PhD students. The most common symptom reported in the present study was headache (42.03%), followed by burning (37.17%), eye redness (36.73%), tearing (36.28%) and dryness (35.40%).

Conclusion: Modification in the ergonomics of the environment during work, education and proper eye care are essential strategies in preventing or at least decreasing CVS symptoms.

Key words: computer vision syndrome, optometry, prevalence

INTRODUCTION

Computers and digital electronic devices are now an inseparable part of a daily life [1]. The viewing of electronic screens is no longer limited to desktop computers in workplace. Nowadays, visual requirement may include viewing laptop, tablet, electronic book, smartphones and other electronic devices in the workplace, at home or in any location [2]. Comprehensive use of these tools led to a set of ocular complaints included dryness, eyestrain, headache, irritation, redness, photophobia, blurred vision and diplopia which collectively known as a computer vision syndrome (CVS) [3, 4]. It is estimated that nearly 60 million people suffer from CVS globally and a million new cases of CVS occur each year [5].

CVS may be caused due to ocular etiologies such as ocular surface and tear film abnormalities or overload of accommodation and convergence and/or extraocular (ergonomic) etiology [6]. The probability of having a CVS will increase with increasing the length of exposure and not taking rest periods [7].

Proper environmental lighting, regular break from work, ergonomic position of displays and anti-glare filters may help improving visual comfort and overcome CVS to some extent [6].

Considering that optometric students have a higher level of knowledge about visual damage associated using digital electronic devices than ordinary people and even educated society, this study was aimed to determine the prevalence of CVS in optometry students in Iran with respect to their knowledge.

METHODS

This descriptive cross-sectional study was conducted among a total of 279 optometry students in all 4 optometry departments in Iran in 2017. The present study adhered to the tenets of the Declaration of Helsinki and was approved by the Research Ethics Committee of university. Written informed consent was obtained from each participant.

Inclusion criterion was all optometry students who used computers, smart phones, or other digital electronic devices for at least 2 h per day, and had been in this situation for at least 12 months, regardless to their age [1]. Exclusion crite-

ria were any history of ocular surgery, any ocular or systemic diseases which cause dry eye, use of contact lens or any use of ocular or systemic drugs that result in dry eye. Hence, 53 individuals were excluded from the study population, leaving 226 individuals who completed the study.

A reliable and valid questionnaire designed by Segui et al. was used to evaluate the prevalence of computer vision syndrome [8]. Since the optometry students were familiar with Latin terms of symptoms, we applied main English name of the main questionnaire to maintain its validity. The questionnaire was consisted of 2 parts: the first part was related to the background variables such as age, gender, educational grade as well as measurement of refraction and best corrected visual acuity in all participants. The unnamed questionnaire was used to avoid impacting on response. The second and main part of the questionnaire was included 16 symptoms that were scored using two rating scales: one for frequency and another for intensity. The symptoms are included: burning, itching, feeling of foreign body, tearing, excessive blinking, eye redness, eye pain, heavy eyelids, dryness, blurred vision, double vision, difficulty for focusing in near vision, increased sensitivity to light, colored halos around objects, feeling that sight is worsening and headache.

The response to the 2 rating scales for each symptom are combined multiplicatively into one rating scale for the analysis, resulting in a single symptom severity score and consequently, overall symptom severity (CVS score). With considering the frequency score (Never = 0, Occasionally = 1, Often or Always = 2) and the intensity score (Moderate = 1, Intense = 2), the result of frequency multiply by intensity should be recoded as: 0 = 0; 1 or 2 = 1; 4 = 2. Therefore, the total score could be varied between 0 to 32 which are comparable between different subjects or in the unique subject at various times or conditions. Finally, the total score of 6 points or more was considered as a CVS.

Data was analyzed using Statistical Package for Social Sciences (SPSS) software, version 11.5. Descriptive data was presented as percentages or as mean ($\pm$ standard deviations).

RESULTS

Of a total of 279 optometry students who participant in the current study, 53 individuals were excluded from the study

population based on inclusion and exclusion criteria. Therefore, 226 participants (100 males and 126 females) aged 22.63 (± 5.69) years (range: 18 to 50 years) completed the study.

Of a 226 students, 57 were studying in Mashhad University of Medical Sciences (MUMS), 46 in Iran University of Medical Sciences (IUMS), 64 in Shahid Beheshti University of Medical Sciences (SBUMS) and 59 in Zahedan University of Medical Sciences (ZUMS). Also, of total, 195 students were studying in Bachelor of Science (BSc), 24 in Master of Science (MSc) and 7 in Doctor of Philosophy (PhD) grade.

The assessment of results showed CVS prevalence in 40.27% (91 individuals) of optometry students in Iran that 42.06% (53 individuals) was found in females and 38.00% (38 individuals) in males. Table 1 showed the prevalence of CVS according to different universities.

TABLE 1

The frequency and prevalence of CVS according to different universities.

	Frequency	Prevalence
Total (n = 226)	91	40.27%
MUMS (n = 57)	16	28.07%
IUMS (n = 46)	22	47.83%
SBUMS (n = 64)	33	51.56%
ZUMS (n = 59)	20	33.90%

CVS – computer vision syndrome; IUMS – Iran University of Medical Sciences; MUMS – Mashhad University of Medical Sciences; SBUMS – Shahid Beheshti University of Medical Sciences; ZUMS – Zahedan University of Medical Sciences.

Also, the prevalence of CVS based on educational grades is summarized in table 2. Higher prevalence of CVS was found in higher educational grades.

TABLE 2

The frequency and prevalence of CVS based on educational grade.

	Frequency	Prevalence
Total (n = 226)	91	40.27%
BSc (n = 195)	71	36.41%
MSc (n = 24)	15	62.50%
PhD (n = 7)	5	71.43%

BSc – Bachelor of Science; MSc – Master of Science; PhD – Doctor of Philosophy.

Table 3 showed the prevalence and frequency of 16 ocular symptoms associated with CVS in optometry students. According to the results, the highest ocular symptoms were headache, burning, eye redness, tearing and dryness, respectively.

DISCUSSION

Following an increase demand of computer and other digital electronic devices both at home and at work in this century, associated ocular and visual symptoms has also emerged [9, 10]. Additionally, due to students' shift to internet studies, the different symptoms are frequently seen in university students [11, 12]. Considering that optometric students have a higher level of knowledge about associated visual damage with using digital electronic devices than ordinary people and even educated society, current study was aimed to determine the prevalence of CVS in both undergraduate and postgraduate optometry students in Iran with respect to their knowledge.

According to our study, the prevalence of CVS in optometry students was 40.27%. Our finding was significantly lower than previous studies. Logaraj et al. reported CVS prevalence of 80.3% among medical and engineering college students in Chennai. They found almost similar prevalence between the medical (78.6%) and engineering (81.9%) students [13]. The higher prevalence observed in this study may be due to the presence of neck and shoulder pain as a CVS, whereas in our study CVS involved only of ocular symptoms apart from headache.

Rahman and Sanip, reported 68.1% prevalence of CVS between university staff in Malaysia [14]. Another study revealed the prevalence of 74% among computer users in the workplace in Nigeria [15]. Lower prevalence of CVS among optometry students compared with other study populations may be explained by higher knowledge of optometry students about CVS and the managing ways compared to others.

We found greater prevalence of CVS in females compared to males. A similar pattern of results was obtained in previous studies [1, 14, 16, 17]. Toama et al. reported higher prevalence of CVS in females compared with males [16]. Ranasinghe et al. assessed CVS among computer office workers in Sri Lanka and indicated that female gender was significantly associated with developing CVS risk [1]. Rahman and Sanip also revealed a significant association between gender and prevalence of CVS [14]. Portello et al. investigated CVS in New York City office workers and reported greater symptoms in females [17].

From the results, it is clear that greater educational grades were associated with more prevalence of CVS. It may be explained by greater hours spent doing computer work by more educated individuals. Portello et al also reported significant positive correlation between the visual symptom and the number of hours spent working on a computer in a routine day [17].

The most common symptom reported in the present study was headache (42.03%), followed by burning (37.17%), eye redness (36.73%), tearing (36.28%) and dryness (35.40%). Similarly, headache was the most commonly reported

TABLE 3

The prevalence and frequency of 16 ocular symptoms associated with CVS in optometry students.

		Prevalence and frequency (n) of symptom severity score			
		Total	1	2	4
Burning	frequency	84	68	14	2
	prevalence	37.17%	30.09%	6.19%	8.88%
Itching	frequency	64	56	5	3
	prevalence	28.32%	24.78%	2.21%	1.33%
Feeling of foreign body	frequency	48	39	9	0
	prevalence	21.24%	17.26%	3.98%	0%
Tearing	frequency	82	65	10	7
	prevalence	36.28%	28.76%	4.42%	3.10%
Excessive blinking	frequency	44	38	5	1
	prevalence	19.47%	16.81%	2.21%	0.44%
Eye redness	frequency	83	74	8	1
	prevalence	36.73%	32.74%	3.54%	0.44%
Eye pain	frequency	63	53	8	2
	prevalence	27.88%	23.45%	3.54%	0.88%
Heavy eyelids	frequency	54	47	6	1
	prevalence	23.89%	20.80%	2.65%	0.44%
Dryness	frequency	80	61	12	7
	prevalence	35.40%	26.99%	5.31%	3.10%
Blurred vision	frequency	67	53	9	5
	prevalence	29.64%	23.45%	3.98%	2.21%
Double vision	frequency	30	26	1	3
	prevalence	13.27%	11.50%	0.44%	1.33%
Difficulty for focusing in near vision	frequency	43	35	3	5
	prevalence	19.03%	15.49%	1.33%	2.21%
Increased sensitivity to light	frequency	73	56	11	6
	prevalence	32.30%	24.78%	4.87%	2.65%
Colored halos around objects	frequency	22	17	3	2
	prevalence	9.73%	7.52%	1.33%	0.88%
Feeling that sight is worsening	frequency	69	59	5	5
	prevalence	30.53%	26.11%	2.21%	2.21%
Headache	frequency	95	74	16	5
	prevalence	42.03%	32.74%	7.08%	2.21%

symptom in computer users in previous studies [1, 10, 18]. Ranasinghe et al. who assessed CVS among computer office workers, reported headache as the most common symptom (45.7%), followed by eye dryness (31.1%) and pain in and around eyes (28.7%) [1]. Megwas and Aguboshim investigated visual symptoms in video display terminal operators. They reported headache (41.8%), pain (31.6%) and eye strain (26.7%) as the most frequent visual symptoms [18]. Also, according to Reddy et al. study, headache and eye strain were the most common symptoms which have been

reported more often in students who used computers more than 2 h in a day [10].

The main advantage of our study was the use of a valid questionnaire. Also, in the best of our knowledge, there was no previous study about CVS in optometry students. However, not including neck, shoulder and waist pains as CVS symptoms was considered as a limitation. Also, future studies with considering of objective measurement of tear quality, osmolality, blinking and binocular vision assessment is recommended.

CONCLUSION

Lower prevalence of CVS among optometry students compared with other study populations may highlight the effect of awareness of CVS and associated managing styles in reducing visual symptoms for whole society. Modification in the ergonomics of the environment during work,

education and proper eye care are essential strategies in preventing or at least decreasing CVS symptoms. Also, widespread use of computer in higher education institutions recommended that the topic of the prevention of associated CVS should be made part of the curriculum in higher institutions.

CORRESPONDENCE

Abbasali Yekta, PhD

Department of Optometry, Mashhad University of Medical Sciences, Mashhad, Iran
Mashhad, 91778 99191 Razavi Khorasan Province, Iran
Email: yektaa@mums.ac.ir

ORCID

Asieh Ehsaei – ID – <http://orcid.org/0000-0002-0471-4110>
Hadi Ostadimoghaddam – ID – <http://orcid.org/0000-0002-1210-2923>
Morad Amir Ahmad – ID – <http://orcid.org/0009-0003-3587-1164>
Hassan Hashemi – ID – <http://orcid.org/0000-0002-6086-1537>
Abbasali Yekta – ID – <http://orcid.org/0000-0003-4356-9064>
Abbas Forough Ameri – ID – <http://orcid.org/0000-0002-9226-8957>
Nasrin Moghadas Sharif – ID – <http://orcid.org/0000-0002-7492-4877>
Bamdad Mahbod – ID – <http://orcid.org/0009-0003-7520-3777>
Mahdi Mahmoodi – ID – <http://orcid.org/0000-0002-1355-8594>
Mehdi Khabazkhoob – ID – <http://orcid.org/0000-0003-0801-8793>
Mahshid Saffarpour – ID – <https://orcid.org/0000-0002-6928-1686>

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References

1. Ranasinghe P, Wathurapatha WS, Perera YS et al. Computer vision syndrome among computer office workers in a developing country: an evaluation of prevalence and risk factors. *BMC Res Notes*. 2016; 9: 150.
2. Rosenfield M. Computer vision syndrome: a review of ocular causes and potential treatments. *Ophthalmic Physiol Opt*. 2011; 31(5): 502-15.
3. Tauste A, Ronda E, Molina MJ et al. Effect of contact lens use on Computer Vision Syndrome. *Ophthalmic Physiol Opt*. 2016; 36(2): 112-9.
4. Al Rashidi SH, Alhumaidan H. Computer vision syndrome prevalence, knowledge and associated factors among Saudi Arabia University Students: Is it a serious problem? *Int J Health Sci (Qassim)*. 2017; 11(5): 17-19.
5. Sen A, Richardson S. A study of computer-related upper limb discomfort and computer vision syndrome. *J Hum Ergol (Tokyo)*. 2007; 36(2): 45-50.
6. Blehm C, Vishnu S, Khattak A et al. Computer vision syndrome: a review. *Surv Ophthalmol*. 2005; 50(3): 253-62.
7. Ye Z, Abe Y, Kusano Y et al. The influence of visual display terminal use on the physical and mental conditions of administrative staff in Japan. *J Physiol Anthropol*. 2007; 26(2): 69-73.
8. Seguí Mdel M, Cabrero-García J, Crespo A et al. A reliable and valid questionnaire was developed to measure computer vision syndrome at the workplace. *J Clin Epidemiol*. 2015; 68(6): 662-73.
9. Loh K, Redd S. Understanding and preventing computer vision syndrome. *Malays Fam Physician*. 2008; 3(3): 128-30.
10. Reddy SC, Low CK, Lim YP et al. Computer vision syndrome: a study of knowledge and practices in university students. *Nepal J Ophthalmol*. 2013; 5(2): 161-8.
11. Maducdoc MM, Haider A, Nalbandian A et al. Visual consequences of electronic reader use: a pilot study. *Int Ophthalmol*. 2017; 37(2): 433-9.
12. Shantakumari N, Eldeeb R, Sreedharan J et al. Computer use and vision-related problems among university students in ajman, United arab emirate. *Ann Med Health Sci Res*. 2014; 4(2): 258-63.
13. Logaraj M, Madhupriya V, Hegde S. Computer vision syndrome and associated factors among medical and engineering students in chennai. *Ann Med Health Sci Res*. 2014; 4(2): 179-85.

14. Rahman ZA, Sanip S. Computer User: Demographic and Computer Related Factors that Predispose User to Get Computer Vision Syndrome. *International Journal of Business, Humanities and Technology*. 2011; 1(2): 84-91.
15. Akinbinu TR, Mashalla YJ. Knowledge of computer vision syndrome among computer users in the workplace in Abuja, Nigeria. *J Physiol Pathophysiol*. 2013; 4(4): 58-63.
16. Toama MA, Mohamed A, Hussein A. Impact of a guideline application on the prevention of occupational overuse syndrome for computer users. *Journal of American Science*. 2012; 8(2): 265-282.
17. Portello JK, Rosenfield M, Bababekova Y et al. Computer-related visual symptoms in office workers. *Ophthalmic Physiol Opt*. 2012; 32(5): 375-82.
18. Megwas AU, Aguboshim RC. Visual Symptoms Among Non-presbyopic Video Display Terminal (VDT) Operators In Owerri, Nigeria. *Journal of the Nigerian Optometric Association*. 2009; 15: 33-6.

Authors' contributions:

Design and conduct of the study: Hassan Hashemi, Abbasali Yekta, Abbas Forough Ameri, Nasrin Moghadas Sharif.

Collection, management of the data: Asieh Ehsaei, Hadi Ostadimoghaddam, Hassan Hashemi, Abbasali Yekta, Mehdi Khabazkhoob.

Analysis, and interpretation of the data: Abbas Forough Ameri, Nasrin Moghadas Sharif.

Preparation, review, and approval of the manuscript: Asieh Ehsaei, Hadi Ostadimoghaddam, Hassan Hashemi, Abbasali Yekta, Abbas Forough Ameri, Nasrin Moghadas Sharif, Bamdad Mahbod, Mahdi Mahmoodi, Mehdi Khabazkhoob, Morad Amir Ahmad, Mahshid Saffarpour.

Conflict of interest:

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Ethics:

The content presented in the article complies with the principles of the Helsinki Declaration, EU directives and harmonized requirements for biomedical journals.