

Computer Vision Syndrome among undergraduate dentistry students

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Summary

Introduction:

The computer has become a common device and an indispensable tool not only in office but also in everyday life. As a consequence of working at the computer, Computer Vision Syndrome (CVS) may develop. The prevalence of CVS is estimated from 64% to 90% among computer users. Symptoms of the syndrome may be divided into ocular, visual and musculoskeletal.

Aim:

The aim of the study was to evaluate the prevalence of CVS symptoms among dentistry students and to determine the factors associated with the syndrome.

Material and methods:

The study involving 62 students from the dentistry of Medical University was conducted. Students were invited to complete a self-administered questionnaire regarding socio-demographic data and CVS-related questions.

Results:

Among dentistry students, most often CVS symptoms are headache, eye strain and neck pain. Headache, double vision and shoulder pain was significantly associated with gender.

Conclusion

Dentistry students suffer from CVS. Due to the increase of computer use in the last few years the syndrome is at risk of becoming a major public health issue. Treatment of the syndrome focuses primarily on prevention,

which is the modification of the computer environment and user education.

Keywords: computer vision syndrome, computer use, eye symptoms, musculoskeletal symptoms

Introduction

The use of digital devices in the modern world, usually for many hours each day for both professional and social purposes, is a common phenomenon among people in all age groups [1].

Nowadays, the computer has become a popular device and an essential tool in every office. Moreover, actions like shopping, learning or spending free time take place in front of the display of a computer or smartphone, which is inseparably linked to the reduction of physical activity. It causes stress to build-up and brings new, unknown threats to the health of a modern human. Almost every person working with a computer feels a definite lack of some stimuli and, at the same time, an excess of others which overwhelm them [2].

As the number of mobile device users is increasing constantly, it is estimated that by the end of 2018 almost 85% of the world's population will use telephones, laptops or computers [3].

Health consequences resulting from working with a computer are the consistencies of the incorrect position during use on the one hand and the electromagnetic field emitted by screens on the other hand.

As a consequence of working at the computer, Computer Vision Syndrome (CVS) may develop. It is defined by The American Optometric Association as a “complex of eye and vision problems related to near vision activities involving computer use” [4]. The syndrome is at risk of becoming a major public health issue. The prevalence of CVS is estimated from 64% to 90% among computer users (depending on the study), and around 60 million people worldwide suffer from this condition [5,6].

The main factors associated with CVS can be widely classified into the individual's visual ability and environmental factors. Agents comprising the first group include uncorrected refractive error, accommodative disorders, binocular vision anomalies and ocular surface or tear film disturbances. Lighting conditions in the work place, display position, display characteristics and image quality are representatives of the environmental factors [7,8]; being women is also a risk factor [9].

Symptoms may be divided into ocular, visual and musculoskeletal disorders. The first group consist of eyestrain, eye burning and dry eye. The second comprise blurred and double vision and the last is associated with neck and shoulder pain [10].

Aim

The aim of the study was to evaluate the prevalence of CVS symptoms among dentistry students and to determine the factors associated with the syndrome.

Methodology

The study involving 62 students from the dentistry of Medical University was conducted. Students were invited to complete a self-administered questionnaire.

The questionnaire comprise general socio-demographic questions: age, gender, use of glasses/contact lenses, duration and main reason for use (e.g. studying, social media, video games). Queries related to computer use, CVS symptoms and its severity (headache, itchy and burning eyes, blurred vision, eye strain), were also attached. Questions referring to CVS manifestations were rated on a scale ranging from “none” to “severe”. Confidentiality and anonymity were maintained. Data were analyzed using the Statistical Package of Statistica.

Results

Characteristics of the group

The study group consisted of students of the first year of dentistry. Most respondents were women (77,5%) and students in relation (42%). 3,2% of group studied more than one field of study.

Almost half (45,16%) declare, that their computer use do not exceed 2hr per day . Most use the computer in the range of: games/films, social media, study. Over 70% of respondents suffer from vision defect.

The vast majority of the students (75%) do not know 20/20/20 rule (every 20 minutes, look about 20 feet (6m) away from the computer for 20 seconds). Only half of the respondents (51,6%) keep the proper distance from the monitor (>50cm), [Table 1].

Table1. Group characteristic

Group characteristics	n (%)
Gender	
female	48 (77,5)
Mean age (years)	21,65 (SD=1,98)
Marital status	
single	36 (58)
In relation	26 (42)
Visual aid used for computer	
Glasses	(32,26)
Contact lens	0
Either None	(51,62)
Both	(16,12)
Duration of continuous computer use	
<2h	28 (45,16)
2-4h	16 (25,80)
4-6h	14 (22,58)
>6h	4 (6,46)
Reason for computer use (n)	
Study	6
Games/films, study	10
Games/films, Social media, study	28
Social media, study	18
Defect of Vision	
None	18 (29,03)
Farsightedness	4 (6,45)
Shortsightedness	38 (61,29)
Astigmatism	2 (3,23)
Awareness of 20- 20- 20 rule	
Yes	16 (25,8)
Distance from the monitor	
>50cm	32 (51,61)
<50cm	30 (48,39)

CVS symptoms

Headache (70,97%) was the most common CVS symptom reported by the students. 67.74% of the respondents complained about both eye strain and neck pain. Double vision was the least commonly experienced CVS manifestation [Table 2].

Table 2. Frequency and severity of computer vision syndrome (CVS) symptoms

Symptoms	Severity n (%)			
	None	Mild	Moderate	Severe
Headache	18 (29,03)	22 (35,48)	18 (29,04)	4 (6,45)
Eye burn	26(41,94)	22 (35,48)	14 (22,58)	-
Blurred vision	24 (38,71)	22 (35,49)	12 (19,35)	4 (6,45)
Double vision	48 (77,42)	14 (22,58)	-	-
Eye strain	20 (32,26)	24 (38,7)	16 (25,81)	2 (3,23)
Dry eyes	22 (35,48)	24 (38,71)	12 (19,36)	4 (6,45)
Neck pain	20 (32,26)	20 (32,26)	14 (22,58)	8 (12,9)
Shoulder pain	30 (48,39)	12 (19,35)	12 (19,35)	8 (12,91)

CVS and gender

Headaches at mild, moderate and severe levels, and mild double vision, in the studied group of dentistry students, concerned significantly more often women ($p < 0.05$). At a high level of statistical significance, it was found that mild shoulder pain was more often reported in men, while moderate and severe shoulder pain rather concerned women ($p < 0.001$), [Table 3].

Table 3. CVS symptoms and gender

	male	female	p value
CVS symptoms	%	%	
Headache			<0,05
None	9,68	29,03	
Mild	6,45	29,03	
Moderate	6,45	12,90	
Severe	0	6,45	
Eye burn	0	0	0,4
None	12,90	29,03	
Mild	6,45	29,03	
Moderate	3,23	19,35	
Blurred vision	0	0	0,38
None	9,68	29,03	
Mild	6,45	29,03	
Moderate	6,45	12,90	
Severe	0	6,45	
Double vision	0	0	<0,05
None	22,58	54,84	
Mild	0	22,58	
Eye strain	0	0	0,26
None	3,23	29,03	
Mild	12,90	25,81	
Moderate	6,45	19,35	
Severe	0	3,23	
Dry eyes	0	0	0,5
None	6,45	29,03	
Mild	9,68	29,03	
Moderate	6,45	12,90	
Severe	0	6,45	
Neck pain	0	0	0,051
None	6,45	25,81	
Mild	12,90	19,35	
Moderate	3,23	19,35	
Severe	0	12,90	
Shoulder pain	0	0	<0,001
None	9,68	38,71	
Mild	12,90	6,45	
Moderate	0	19,35	
Severe	0	12,90	

Discussion

As the computer use has increased in the last few years the new computer-related health problems has appeared. It affects not only the eye but also musculoskeletal system; these symptoms consist of CVS. The syndrome is at risk of becoming a major public health issue.

Headache was the most common symptom of CVS reported by students (70,97%). Confirming outcomes were also presented by study conducted in India (82,1%) [11], Saudi Arabia (66,5%) [12], Tokyo (61%) [5] and Jamaica (55%) [6]. On the other hand, others presented that the headache does not concern such a big part of study group as the incidence was: 26% in Egypt [13] and 19,7% in Malaysia [14]. These results suggest that headache is common symptom related to computer use. The possible explanation of headache being such a common symptom may derive from uncorrected or poorly corrected eye defect as in our study over 70% had the drawback.

Another common symptoms observed are musculoskeletal disorders. In our study 67,74% and 51,61% suffer from neck and shoulder pain, respectively. A study in Jamaica found that it was 75.1% for the first and 65.5% for the latter [6]. It was even reported that musculoskeletal pain concern 82,2% of people [12]. Others estimated the incidence in the range of 15% to 32% [13,15,16]. In this study these symptoms were the most often described as severe (12,9%, 12,91%) as the next were dry eye and blurred vision (6,45% each). High prevalence of these symptoms in our group may derive from the fact that dentistry students has a lot of manual classes in the university.

Others vision-related problems were also often reported except of double vision, as only 22,58% pointed this in mild severity. This is consistent with another studies as other showed the incidence as 28,9% [6] and 2,6% [17].

Not only in our study dry eye was one of the most common sign (64,52%) but also in Layan et al. (51,5%) [12] and Iqbal et al. (28%) [13] researches. On the other hand, in the study under the leadership of Mowatt it was one of the least (26,2%) manifestation of the syndrome [6]. Eye burning was stated by 58,06% in our study and by 58,3% [12] and 61,9% [6] in others.

Layan et al. [12] and Reddy et al. [14] showed lower incidence of blurred vision comparing to our study, 44,6%, 2,9% and 61,29 % respectively.

These reports point out that a big part of students suffer from CVS signs as 52.7% of students reported suffering from at least three CVS symptoms [12]. In other works at least one sign was reported by 89.9% [14] and 86% [13] of the students, in Malaysia and Egypt respectively.

In our study headaches in all range, and mild double vision, in the studied group of dentistry students, concerned significantly more often women. This is partially consistent with Mowatt et al. [6] as he found that relation in mild and moderate headache. We also found that mild shoulder pain was more often reported in men while moderate and severe shoulder pain rather concerned women, which is confirmed in another study [6]. This might be associated with shorter arms, wrists and consequently reach, which may affect the reading distance from the monitor or the height of the display requiring them to have a chin up position and increased musculoskeletal symptoms [18].

Conclusion

Among dentistry students, most often CVS symptoms are headache, eye strain and neck pain. Headache, double vision and shoulder pain was significantly associated with gender. Due to the increase of computer use in the last few years the syndrome is at risk of becoming a major

public health issue. Treatment of the syndrome focuses primarily on prevention, which is the modification of the computer environment and user education.

Bibliography

1. Sheppard AL, Wolffsohn JS. Digital eye strain: prevalence, measurement and amelioration. *BMJ Open Ophthalmol* [Internet]. 2018;3(1):e000146. Available from: <http://bmjophth.bmj.com/lookup/doi/10.1136/bmjophth-2018-000146>
2. Garwol K. Wpływ digitalizacji życia na pogorszenie stanu zdrowia młodego człowieka. *Eduk – Tech – Inform* [Internet]. 2017;20(2):278–83. Available from: <http://repozytorium.ur.edu.pl/handle/item/3096>
3. Parihar JKS, Jain VK, Chaturvedi P, Kaushik J, Jain G, Parihar AKS. Computer and visual display terminals (VDT) vision syndrome (CVDTS). *Med journal, Armed Forces India* [Internet]. 2016 Jul [cited 2019 Feb 28];72(3):270–6. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/27546968>
4. Computer Vision Syndrome [Internet]. [cited 2019 May 29]. Available from: <https://www.aoa.org/patients-and-public/caring-for-your-vision/protecting-your-vision/computer-vision-syndrome?sso=y>
5. Sen A, Richardson S. A study of computer-related upper limb discomfort and computer vision syndrome. *J Hum Ergol (Tokyo)*. 2007;
6. Mowatt L, Gordon C, Santosh ABR, Jones T. Computer vision syndrome and ergonomic practices among undergraduate university students. *Int J Clin Pract*. 2018;72(1).
7. Sheedy JE, Hayes JN, Engle J. Is all asthenopia the same? *Optom Vis Sci* [Internet]. 2003 Nov [cited 2019 May 30];80(11):732–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/14627938>
8. GOWRISANKARAN S, SHEEDY JE, HAYES JR. Eyelid Squint Response to Asthenopia-Inducing Conditions. *Optom Vis Sci* [Internet]. 2007 Jul [cited 2019 May 30];84(7):611–9. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17632310>
9. Siwak M. Charakterystyka Syndromu Widzenia Komputerowego (CVS). 2017;(September).
10. Gowrisankaran S, Sheedy JE. Computer vision syndrome: A review. *Work*. 2015;52(2):303–14.
11. Bali J, Navin N, Bali ;, Thakur R. Computer vision syndrome: A study of the knowledge, attitudes and practices in Indian Ophthalmologists [Internet]. [cited 2019 May 30]. Available from: <http://www.ijo.in>
12. Al Tawil L, Aldokhayel S, Zeitouni L, Qadoumi T, Hussein S, Ahamed SS. Prevalence of self-reported computer vision syndrome symptoms and its associated factors among university students. *Eur J Ophthalmol*. 2018;
13. Iqbal M, El-Massry A, Elagouz M, Elzembely H. Computer Vision Syndrome Survey among the Medical Students in Sohag University Hospital, Egypt. *Ophthalmol Res An Int J* [Internet]. 2018;8(1):1–8. Available from: <http://www.sciencedomain.org/abstract/22611>
14. Reddy SC, Low C, Lim Y, Low L, Mardina F, Nursaleha M. Computer vision syndrome: a study of knowledge and practices in university students. *Nepal J Ophthalmol* [Internet]. 2013 Sep 23 [cited 2019 May 30];5(2):161–8. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24172549>
15. Palm P, Risberg EH, Mortimer M, Pamerud G, Toomingas A, Tornqvist EW. Computer use, neck and upper-extremity symptoms, eyestrain and headache among female and male upper secondary school students. *Scand J Work Environ Heal Suppl*.

- 2007;33(3):33–41.
16. Zhang Y, Deng G, Zhang Z, Zhou Q, Gao X, Di L, et al. UK DRAFFT - A randomised controlled trial of percutaneous fixation with kirschner wires versus volar locking-plate fixation in the treatment of adult patients with a dorsally displaced fracture of the distal radius. 2011 [cited 2019 May 30]; Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4546215/pdf/12891_2015_Article_625.pdf
 17. Assefa NL, Weldemichael D, Alemu H woretaw, Anbesse DH. Prevalence and associated factors of computer vision syndrome among bank workers in Gondar City, northwest Ethiopia, 2015. *Clin Optom.* 2017;Volume 9:67–76.
 18. Bingefors K, Isacson D. Epidemiology, co-morbidity, and impact on health-related quality of life of self-reported headache and musculoskeletal pain - A gender perspective. *Eur J Pain.* 2004;8(5):435–50.