

Causes of ocular discomfort in patients of computer vision syndrome coming to a tertiary care centre

Erum Shahid¹, Uzma Fasih¹, Asad Raza Jaffery¹, Arshad Shaikh¹

¹Department of Ophthalmology, Karachi Medical and Dental College & Abbasi Shaheed Hospital, Karachi, Pakistan

Abstract

Aim: To document causes of ocular discomfort in patients with computer vision syndrome.

Materials and methods: This study included 150 patients with computer vision syndrome who presented in the Eye Out Patient Department of Abbasi Shaheed Hospital. It was a descriptive cross-sectional study with consecutive sampling technique starting from January 2016 until July 2016. All the patients were above 18 years and working at least three hours per day during the last year. Patients diagnosed with ocular diseases, neurological diseases, using topical or systemic medications, who had ocular surgery and systemic diseases causing dry eyes, who did not give consent, and contact lens users were excluded. Ocular examination was done including refractive errors, slit lamp examination, and tear film breakup time. Data was collected and analysed on Statistical Package for Social Sciences (SPSS) version 21.

Results: This study had 150 individuals, of which 115 (76.2%) were males and 35 (23.2%) were females. Mean age was 32.3 ± 8.8 SD. The most frequent complaint was eye strain in 123 (81.5 %) individuals, followed by blurred vision in 94 (62.3%) individuals; the least common was diplopia in 13 (8.6%) individuals. Mean computer daily use was 5.96 ± 2.819 SD hours and duration of computer use was 10.13 ± 6.371 SD years. Tear film breakup time was less than 10 seconds in 63 (42%) individuals. Statistically significant P value of 0.003 was seen between tear film breakup time and daily use in hours.

Conclusion: A frequent cause of ocular discomfort in patients with computer vision syndrome is decreased tear film break up time. Another important cause is uncorrected refractive error, the most common of which is myopia, which should be addressed without delay to reduce ocular discomfort.

Keywords: computer vision syndrome, dry eyes, ocular discomfort, refractive error

Correspondence: Dr. Erum Shahid, FCPS, Assistant Professor, Ophthalmology, KMDC & Abbasi Shaheed Hospital, C88, Block A, North Nazimabad, Karachi, Pakistan.
E-mail: Drerum007@yahoo.com

Introduction

In the current era, computers have become an essential part of life. People work in offices in front of the computer for extended periods. However, computer use is no longer restricted to the workplace, being used extensively in schools and homes. Other than desktops, additional digital devices like smart phones, tablets, notebooks and e-book readers have gained popularity. Individuals use digital display devices not only for office work but also for web surfing, social networking, and playing video games. Children as young as two years old are given touch screen devices like iPads to play and learn with.¹

The most frequently reported health problem in computer workers is eye and vision problems.² Eye and vision problems related to activities that stress near vision and experienced in relation to, or during use of computers is termed by the American Optometric Association as “computer vision syndrome” (CVS).³

The most common complaints associated with CVS are strained or tired eyes, redness, dry eyes, excessive tears or blinking, squinting, and contact lens discomfort resulting from dryness. It is also associated with musculoskeletal symptoms like tension or pain in the neck, shoulders, back, or arms.⁴

The prevalence of CVS varies from place to place. One study claimed CVS to be seen in 70% to 75% of computer users.² Similarly, other studies revealed a prevalence of CVS from 64% to 90% among computer users.⁵ Worldwide, nearly 60 million people suffer from CVS and a million new cases occur each year.⁶ Therefore, it has also been referred by some optometrists as a possible occupational epidemic of the 21st century.⁷

In our country, scarce research has been done on this subject and most of the work has been published in non-medical journals. This study will be an initiative to generate local data and understanding among doctors about the various causes of ocular discomfort in patients with CVS to help computer workers.

Materials and methods

This study was conducted in the Department of Ophthalmology, Karachi Medical and Dental College, Abbasi Shaheed Hospital, Karachi, Pakistan. It was a prospective cross-sectional descriptive study conducted from January to July 2016 after approval from the Ethics Research committee of the college. The sample size was 132, calculated⁸ with help of WHO software with 5% margin of error, 95% confidence interval. We recruited 150 to avoid type 2 error. Sampling technique was non-probability consecutive sampling.

We included computer users who work on computers for a minimum of three hours or more continuously per day, working on computers for the last year or more, ages from 18 years and above. We excluded those who did not provide consent, were diagnosed with neurological problems, contact lens users,

diagnosed with eye diseases such as infective lid, conjunctiva and corneal diseases, previous ocular surgeries (cataract surgery, refractive surgeries, glaucoma surgery, pterygium excision), known cases of glaucoma, and using any topical eye drops or any systemic medications, including oral contraceptives. Patients suffering any systemic autoimmune disorders like rheumatoid arthritis, thyroid eye disease, systemic lupus erythromatosis, Sjogren's syndrome, etc. were all excluded.

Data was collected on a pre-designed proforma in English with the subjects' consent. They were assured about the confidentiality and anonymity of the information consigned in the proforma. It included demographic details along with history of any visual problems related to prolonged computer use. Ocular examination was conducted, visual acuity was assessed, retinoscopy was performed, and refractive errors were corrected. The anterior segment was examined with slit lamp to identify conjunctival congestion, hyperaemia, corneal irregularities, and anterior chamber. Light reflexes were checked. Optic disc was examined with an ophthalmoscope in non-mydratic state to exclude any posterior segment pathology. Tear film breakup time was measured with fluorescein dye. A stopwatch was used to measure time for dry eyes by a single examiner. Intraocular pressure was checked with an applanation tonometer.

Data was collected and analysed on Statistical Package for Social Sciences (SPSS) version 21. Descriptive statistics was used to calculate mean and standard deviation. Frequencies were calculated for duration of work, various eye symptoms, and eye disorders along with the percentages. The independent t-test was used to compare means between tear film breakup time with duration of computer use in years and daily use in hours.

Results

The total number of patients in our study was 150, of which 115 (76.2%) were males and 35 (23.2%) were females. Mean age of the patients was 32.3 ± 8.8 SD with a minimum age of 18 years and a maximum of 58 years. Most frequent complaint of patients suffering with CVS was eye strain with 123 (81.5%) patients, followed by blurred vision with 94 (62.3%), while the least common was diplopia with 13 (8.6%) patients. Other demographic characteristics of the patients are shown in Table 1.

Refractive error was seen in 94 (62.7%) patients, in which myopia was most common in 46 (30.7%). Mean daily computer use in our patients was 5.96 ± 2.819 SD hours and mean duration of computer use for years is 10.13 ± 6.371 SD. Tear film breakup time was less than 10 seconds in 63 (42%) patients, as shown in Table 2. The independent t-test was used to compare mean tear film breakup time and daily use of computer with a p value of 0.038. A statistically significant p value of 0.003 was seen between tear film breakup time and daily use in hours.

Causes of ocular discomfort in CVS patients

Table 1. Demographics of patients enrolled in the study

Variables	Value	%
Mean age	32.37 ± 8.89 SD	
Min	18	
Max	58	
Male	115	76.2
Female	35	23.2
Student	25	16.6
Employed	125	82.8
Married	98	65.9
Unmarried	52	35.1
Headache	59	39.1
Blurred vision	94	62.3
Eye strain	123	81.5
Eye watering	64	42.4
Eye redness	30	20
Diplopia	13	8.6
Hypertension	22	14.6
Addiction	34	22.5
Exercise	30	20
Mean daily computer per hour	5.96 hours ± 2.819 SD	
Mean duration in years	10.13 years ± 6.371 SD	

Table 2. Frequencies of outcome variables

Refractive errors	Frequency (n)	Percentage
Myopia	46	30.7 %
Hypermetropia	30	20.0 %
Presbyopia	18	12.0 %
Total	94	62.7 %
Tear film breakup time		
Less > 10 seconds	63	42%
More > 10 seconds	87	58%
Total	150	100

Discussion

CVS symptoms can be classified broadly into three categories: eye-related symptoms such as dry, watery, and irritated eyes; vision-related symptoms such as eye strain, eye fatigue, headache, and blurred vision; and posture-related symptoms such as sore neck, shoulder pain, and sore back.⁷ In our study, vision-related symptoms were the most frequent, with eye strain seen in 81.5% of patients being at the top of the list, followed by blurred vision in 62.3% of patients. A study conducted in Nigeria also had eye strain as most frequent symptom with 30.94%.⁹ Other studies by Chiemeké *et al.* and Bali *et al.* also reported eye strain as being the most common visual symptom experienced by computer users.^{10,11} However, the incidence in Bali *et al.* is quite high at 97.8%.¹¹ These symptoms vary from place to place, depending on work place or stations provided as well as the nature of work, along with duration of sitting.

Eye-related symptoms such as watery eyes were seen in 42.4% of patients and eye redness in 20% of patients in our study. In the Nigerian study, watery eyes were seen in 10.7% and eye redness in 4.3% of patients.⁹ Symptoms of eye irritation were seen in 66% of patients in another study.⁷ Eye-related symptoms are associated with dry eyes. We measured tear film breakup time to check dry eyes, which was less than 10 seconds in 42% (n = 63) of cases. Various environment factors contribute towards dry eye, such as excessive heating or air conditioning, along with physical, biological or chemical contaminants in the air.¹² The process of eye blinking drops by 60% when seated in front of the computer for prolonged periods of time. Decreasing font size and contrast also diminishes the blink rate.¹³ This in turn causes poor tear production and temporarily stresses the cornea, thereby exacerbating eye dryness.¹⁴ A high-gaze angle while viewing desktop monitors also exposes the cornea.¹⁵ Females, older individuals, and contact lens users are also more commonly affected by dry eyes.^{7,16-18}

Mean daily computer use in our patients was 5.96 hours, since most of these people belong to the employed group rather than students. They were bankers, office workers, call centre workers, and receptionists. In our study, increasing daily computer use per hour decreases the tear film breakup time with the significant p value. Mean computer use duration our patients was 10.13 years. As the duration of computer use per year increases, tear film breakup time decreases with a highly significant p value (0.003). Longer periods of computer work are related to a high prevalence of dry eyes.¹⁵ Another study discovered that there is an increase in the prevalence of visual symptoms in individuals who spent more than four hours in front of video display terminals.¹⁹ Reducing the amount of time spent in front of the computer will have a significant impact on symptoms associated with CVS.²⁰

There were 115 (76.2%) males and 35 (23.2%) females in our study. Most South Asian countries still have male-dominated societies in which males are the bread

earners. Females are still prohibited to work for longer hours in our culture compared to the Western world.

The most common refractive error found in our study was myopia, which was seen in 46 (30.7%) patients, followed by hypermetropia seen in 30 (20%) patients. Luberto *et al.* has reported transient myopia in 20% of video display terminal users at the end of their work shift.²¹ Students and employees use these electronic gadgets for longer periods without breaks, which in turn strains near vision and accommodation. It has been suggested that myopia is highly associated with the use of electronic gadgets like smart phones and computers.²² One of the causes of ocular discomfort is an uncorrected refractive error that needs to be corrected.

One of the study's limitations is its limited sample size.

Conclusion

A frequent cause of ocular discomfort in patients consulting due to CVS is decreased tear film breakup time. Another important cause found in these patients is uncorrected refractive error, myopia being the most common among them, which should be addressed without delay to reduce ocular discomfort.

References

1. Barthakur R. Computer vision syndrome. *Internet Journal of Medical Update*. 2013;8(2):1-2.
2. American Optometric Association. The relationship of computer vision syndrome to musculoskeletal disorders. <http://www.aoanet.org/clinicare/environmental-relation.asp>.
3. American Optometric Association. The effects of video display terminal use on eye health and vision. <http://www.aoanet.org/clinicare/environmental-effects.asp>.
4. Kathy S. Tips for managing computer vision syndrome. *AAOHN J*. 2005;53:12.
5. Sen A, Richardson S. A study of computer related upper limb discomfort and computer vision syndrome. *J Hum Ergol (Tokyo)*. 2007;36:45-50.
6. Hayes JR, Sheedy JE, Stelmack JA, Heaney CA. Computer use, symptoms, and quality of life. *Optom Vis Sci*. 2007;84:738-744.
7. Blehm C, Vishnu S, Khattak A, Mitra S, Yee RW. Computer vision syndrome: a review. *Surv Ophthalmol*. 2005;50(3):253-262.
8. Ellahia A, Khalilb MS, Akram F. Computer users at risk: Health disorders associated with prolonged computer use. *J Bus Manage Econ*. 2011;2(4):171-182.
9. 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.
10. Chiemek SC, Akhahowa AE, Ajayi OB. Evaluation of vision-related problems amongst computer users: a case study of University of Benin, Nigeria. *Proceedings of the World Congress on Engineering*. Vol. 1. WCE 2007, July 2-4, 2007 London, U.K.
11. Bali J, Navin N, Thakur BR. Computer vision syndrome: a study of the knowledge, attitudes and practices in Indian ophthalmologists. *Indian J Ophthalmol*. 2017;55:289-293
12. Piccoli B. A critical appraisal of current knowledge and future directions of ergophthalmology: consensus document of the ICOH Committee on Work and Vision. *Ergonomics*. 2003;46:384Y406.
13. Shrivastava SR, Bobhate PS. Computer related health problems among software professionals in Mumbai: A cross sectional study. *Int J Health Sci*. 2012;1:74.
14. Anshel JR. Visual ergonomics in the workplace. *AAOHN J*. 2007;55:414-420.

15. Uchino M, Schaumberg DA, Dogru M, et al. Prevalence of dry eye disease among Japanese visual display terminal users. *Ophthalmology*. 2008;115(11):1982-1988.
16. Schaumberg DA, Sullivan DA, Dana MR. Epidemiology of dry eye syndrome. *Adv Exp Med Biol*. 2002;506:989-98.
17. Schaumberg DA, Sullivan DA, Buring JE, Dana MR. Prevalence of dry eye syndrome among US women. *Am J Ophthalmol*. 2003; 136:318-326.
18. Glasson MJ, Stapleton F, Keay L, Sweeney D, Willcox MD. Differences in clinical parameters and tear film of tolerant and intolerant contact lens wearers. *Invest Ophthalmol Vis Sci*. 2003; 44:5116-5124.
19. Rossignol AM, Morse EP, Summers VM, Pagnotto LD. Visual display terminal use and reported health symptoms among Massachusetts clerical workers. *J Occup Med*. 1987;29: 112-118.
20. Dinesh J Bhandari, Sushilkumar Choudhary, Vikas G Doshi, A community-based study of asthenopia in computer operators. *IJO*, 2008. 56;1:51-55.
21. Luberto F, Gobba F, Brogna A. Temporary myopia and subjective symptoms in video display terminal operators. *Med Lav* 1989; 80:155-163.
22. Parveen N, Hassan SH, Rehman J, Shoukat U. Prevalence of myopia and its associated risk factors in local medical students. *Cell*. 2015;334:3887822.