

Review Article

Computer Vision Syndrome

KM Arif¹, MJ Alam²

Abstract:

Computer Vision Syndrome (CVS) is a condition in which a person experience one or more of eye symptoms and/or headache and back pain as a result of prolonged working on a computer. Bankers, account section workers, professional computer workers, excessive near work by mobile, laptop or tab users are commonly affected. Headache, eye strain, dryness, burning, grittiness, heaviness or watering, stiff shoulders, low back pain and general fatigue are main symptoms. The duration of computer work is directly related to eye symptoms; and longer duration tends to result in long-lasting complaints even after the work is finished. Professional workers should practice preventive measure. Correction of refractive errors, modification of work station, using antiglare screen filter and hourly eye exercise are the chief preventive strategy. Neglected person may have less/decreased working capacity and reduced productivity.

Key words: Computer vision syndrome, headache, eye strain, blurred vision.

Introduction:

Technological advances have made an impact in almost every aspect of our lives e.g. office work, accounting, designing, medical facilities, database management, experimental work and daily tasks after the availability of computers. A personal computer is a common item now-a-days in office, colleges, university and home. Its use has increased efficiency in easy access to information, writing articles and communicating to others. Millions of people including children, college students are using computers for prolonged hours. Computer vision syndrome (CVS) describes a group of eye and vision-related problems which are experienced and result from prolonged computer use¹. Total 143 million American workers work on a computer, 90 % of them use computer for more than 3 hours every day, 88 % of them suffer from computer eyestrain. This problem affects productivity by 4 % to 19 %.

Causes:

Our eyes have little problem focusing on most printed material, which is characterized by dense black characters with well-defined edges. Healthy eyes can easily maintain focus on the printed page. Characters

1. Dr. Khan Mohammad Arif, MBBS, FCPS (Medicine), Assiatant Professor, Department of Medicine, Faridpur Medical College, Faridpur.

2. Dr. Md. Jahangir Alam, MBBS, MTM (Transfusion Medicine), Assiatant Professor, Department of Transfusion Medicine, Faridpur Medical College, Faridpur.

Address of correspondence :

Dr. Khan Mohammad Arif, MBBS, FCPS (Medicine), Assiatant Professor, Department of Medicine, Faridpur Medical College, Faridpur. Phone: +8801711986724, E-mail:dr.arif.ss23@gmail.com

on a computer screen, however, don't have this contrast or well-defined edges. These characters (pixels) are brightest at the center and diminish in intensity toward their edges. This makes it very difficult for our eyes to maintain focus and remain fixed onto these images². We normally blink about 20-22 times per minute. During computer use our blinking rate is decreased to 4-6 times per minute, causing evaporative dry eye. Prolonged viewing is another important factor which is not only unnatural for the human optical system causing strain but also contributes to dry eye. Dry eye causes people to arch their foreheads in an effort to see better and cause headache^{3,4}. At workplace many people assume an awkward or unnatural posture during using computer/tab/mobile which causes back-ache, stiff neck and hurting shoulder. Air conditioning of our office/computer section is another cause of evaporative dry eye.

In summary the factors responsible for computer vision syndrome are-

1. Uncorrected refractive error.
2. Inappropriate glasses for computer use.
3. Decreased blinking rate.
4. Prolonged viewing.
5. Dry eye and tear film dysfunction.
6. Glare and reflections from the monitor.
7. Strain of the ocular muscles.
8. Poor setup or improper use of workstation.
9. Job nature and stress.

Bankers, account section workers, professionals computer workers, excessive near work by mobile, laptop or tab users are commonly affected^{5,6}.

Symptoms:

Symptoms have been divided broadly into four categories:

- (i) Asthenopic- eye strain, tired eyes, sore eyes
- (ii) Ocular-surface related watering, irritation, dry eye
- (iii) Visual-blurred vision, slowness of focus change, double vision
- (iv) Extra ocular-neck pain, back ache, headache⁷.

Frequency of most common two symptoms reported in computer users

Author	Most common two symptoms	
	First	Second
Shrestha et al ⁸	Headache (13.3%)	Tired eyes (12.5%)
Edema and Akwukwuma ⁹	Tired eyes (62.5%)	Blurred vision (59.4%)
Megwasand Daguboshim ¹⁰	Headache (41.7%)	Pain in eyes (31.5%)
Bali et al ¹¹	Eye strain (97.8%)	Headache (82.1%)
Singh et al ¹²	Burning sensation (31%)	Tired eyes (25%)
Smith et al ¹³	Eye strain (91%)	Painful or stiff neck and shoulder (81%)

Diagnosis of Causes:

Diagnosis of computer vision syndrome is chiefly done by taking detail history and eye examination.

- (i) Is the patient suffering from any other disease that may cause headache?
- (ii) Computer use
 - a. How long have you been using computer? months/years.
 - b. Average duration of computer use in a day hours.
 - c. Are you aware that prolonged use of computer has had effects on the eyes?: yes/no.
- (iii) Ask about eye strain (irritation, heaviness)/ tiredness of eyes/watering of eyes/redness of eyes/blurring of vision/dry eye/discomfort/double vision/headache/backache/neck pain/shoulder pain/ no symptoms¹⁴.
- (iv) Use of Medications/Drugs responsible for headache.

Prevention:

Regular computer users should practice preventive measures. The following strategies have been reported

by the researchers to prevent/reduce the symptoms of CVS. (i) Using Anti Glare Screen Filters for Computer Monitor may help by blocking the glare from the computer screen. (ii) Anti-reflective (AR) coating is highly recommended on the glass of all computer users. Anti-reflective (AR) coating prevents glare and reflections on the front and the back of the lenses. Anti-reflective (AR) Coating in Eye-glass will eliminate the constant refocusing effort that our eyes go through when viewing the screen. If the office is brightly lit, a tint of light grey (B1) or light brown (SP9) may benefit by cutting the amount of light reaching our eyes. But they don't address the cause of computer eyestrain. (iii) Keeping the computer screen at a distance of 35-40 inches away may allow the eyes to relax and may reduce eye strain¹⁵. (iv) Adjusting the computer monitor to a viewing angle of 15° lower than horizontal level may reduce the musculoskeletal discomfort (neck pain and back pain) and visual discomfort¹⁶. (v) Taking regular small breaks may relax accommodation process of the eyes, thereby preventing eye strain. It will be easy to practice the small breaks in between the work by following the rule of 20/20/20. After 20 minutes of computer use, one should look at something 20 feet away for 20 seconds^{17,18}. (vi) Maintaining good sitting posture to avoid neck pain and back pain¹⁹. (vii) Correction of visual problems by wearing spectacles or contact lenses is important to avoid eye strain. (viii) The screen lighting, contrast and brightness should be adjusted to the optimum before starting the work on the computer. The luminance of the room should not exceed three times than the mean luminance of the screen²⁰. (ix) Blinking helps to rewet our eyes to avoid dryness and irritation. Patients may be advised to create a "Blinking Key" (like enter key or mouse click). Whenever he presses that key he will blink. (x) Hourly Exercise: Look far away at an object for 10-15 seconds and then near for 10-15 seconds; 10 times. Rocking and readjusting our focusing back and forth between near and far will help to prevent straining of near vision and stretch our focusing muscles. When using computer continuously for a long time, take break and give rest to your eyes.

Treatment:

Assurance and educating the patient is the mainstay of management. Encouraging the patient to practice preventive measures is important. If there is any refractive error, spectacles of appropriate power with anti-reflective coating is to be prescribed. Hourly exercise as mentioned before. Tear Substitutes keep our eyes moist and decrease irritation; Cellulose Derivatives for mild cases, Carbomers are longer lasting. Polyvinyl Alcohol may be used. Headache, back pain, shoulder pain are treated by NSAIDs. Anxiolytics may be prescribed if needed. In order to get relief from headache patients use to seek treatment from Medicine specialist, Neurologist, ENT specialist. For back pain and neck pain Orthopedic surgeon, Neuro-surgeon, Physical medicine specialist^{21,22}.

Discussion:

Computer Vision Syndrome (CVS) may have wide range of presentation. About 75% of computer users who worked for long hours at the computer had complaints of visual symptoms. Eye strain (asthenopia) is the most frequent symptom reported from different countries. The symptoms of headache, eye strain, dryness, burning, grittiness, heaviness or watering, stiff shoulders, low back pain and general fatigue were reported higher with increasing duration of daily use. The duration of computer work is directly related to eye symptoms and longer duration tends to result in long-lasting complaints even after the work is finished.

More than two hours continuous use of computer was significantly associated with occurrence of CVS symptoms. Prominent visual symptoms are seen in people spending 6-9 hours daily at a computer. Spending long time on the computer screen without pause also can lead to problem of shifting focus on screen documents and keyboard. The constant process of drifting and refocusing on fuzzy pixel of texts on the screen can leave eyes strained and fatigued. Computer work place illumination, screen contrast, duration of work on compute, viewing distances and angles, specific work related task, pressure and interest, screen reflection, image quality and work place ergonomics were found to have significant role in manifesting symptoms of computer users. The level of the computer screen can be at or above or below the eye level of computer user. A higher proportion of subjects who had their computer screen at or above the eye level reported asthenopia.

Preventive measures includes modification of the work station, maintaining good sitting posture to avoid neck pain and back pain, adjusting the computer monitor to a viewing angle of 15° lower than horizontal level, taking regular small breaks, Correction of visual problems by wearing spectacles or contact lenses. The screen lighting, contrast and brightness should be adjusted to the optimum before starting the work on the computer. The luminance of the room should not exceed three times than the mean luminance on the screen. Artificial tears, herbal eye drops-itone, polysorbate 0.5%-optizen and tetrahydrozoline 0.05% - visine, povidone 2% preservative-free eye drops have been prescribed to alleviate the symptoms related to CVS. Use of eye drops was significantly associated with less frequency of CVS symptoms. These eye drops rewet the ocular surface, contribute to tear volume and thus decrease symptoms of ocular tiredness, dryness and difficulty in focus, thus improve dynamic visual acuity.

Conclusion:

Poor visual function is the principal difficulty. It will increase mental stress level. These lead to reduced effective working hour and frequent absence from work. There is also increase risk of errors, less time for personal care and reversal. All these ultimately lead to Reduced Productivity. So, creating public awareness about healthy use of computer is essential to prevent this visual disorder.

References :

1. Cole BL, Maddocks JD, Sharpe K. Effect of VDUs on the eyes-report of a six-years epidemiological study. *Optom Vis Sci.* 1996;73:512-28.
2. Gerr F, Marcus M, Ensor C, Kleinbaum D, Cohen S, Edwards A, et al. A prospective study of computer users: I, Study design and incidence of musculoskeletal symptoms and disorders, *Am. J. Ind. med.* 2002;41(4):221-35.
3. Hales TR, Sauter SL, Peterson M, Fine LJ, Putz-Anderson V, Schleifer LR, et al. Musculoskeletal disorders among visual display terminal users in a telecommunications company. *Ergonomics* 1994;37(10):1603-21.
4. Iwakiri K, Mori I, Sotoyama M, Horiguchi K, Ochiai T, Jonai H, et al. Saito Survey on visual and musculoskeletal symptoms in VDT workers. *Sangyo EiseigakuZasshi* 2004;46(6):201-12.
5. Kanitkar K, Carison AN, Richard Y. Ocular problems associated with computer use. The ever-increasing hours spent in front of video display terminals have led to a corresponding increase in visual and physical ills. *Rev. Ophthalmol.* 2005;12:4.
6. Smita A, Goel D, Sharma A. Evaluation of the Factors which contribute to the ocular complaints in computer workers. *J. Clin. Diagn. Res.* 2013;7(2):331-335.
7. Blehm C, Vishnu S, Khattak A. Computer vision syndrome; A review. *SurvOphthalmol* 2005;50:253-62.
8. Shrestha GS, Mohamed FN, Shah DN. Visual Problems among video display terminal (VDT) users in Nepal. *J Optom.* 2011; 4(2):56-62.
9. Edema OT, Akwukwuma VVN. Asthenopia and use of glasses among visual display terminal (VDT) users. *Int J Trop Med.* 2010;5:16-19.
10. Megwas AU, Daguboshim RC. Visual symptoms among non-presbyopic video display terminal (VDT) operators in Öwerri, Nigeria, *JNOA* 2009;15:33-36.
11. Bali J, Navin N, Thakur BR. Computer vision syndrome: A study of the knowledge, attitude and practices in Indian Ophthalmologists, *Indian J Ophthalmol.* 2007;55:289-93.
12. Singh S, Batra N, Arora G. A study of the prevalence of computer vision syndrome among computer users. *Highlights of Ophthalmol (Indian section)* 2007;35(4): 24-28.
13. Smith MJ, Cohen BCF, Stammerjohn LW. An investigation of health complaints and job stress in video display operations. *Hum factors* 1981;23:387-400.
14. Costanza MA. Visual and ocular symptoms related to the use of video display terminals. *J BehavOptom.* 1994;5:13-36.
15. Jaschninski W, Heuer H, Kylian H. Preferred position of visual displays relative to the eyes: A field study of visual strain and individual differences, *Ergonomics* 1998;41:1034-49.
16. Psihogios JP, Sommerich CM, Mirka GA, Moon SD. A field evaluation of monitor placement effects in VDT users. *Applied Ergonomics* 2001;32:313-25.
17. Mc Lean L, Tingley M, Scott RN, Rickards J. Computer terminal work and the benefits of microbreaks. *Applied Ergonomics* 2001;32:225-37.
18. Anshel J. *Visual ergonomics hand book.* New York, Taylor and Francis. 2005.
19. Liao MH, Drury CG. Posture, discomfort and performance in a VDT task. *Ergonomics*2000;43:345-59.
20. Sheedy JE. Doctor Ergo and CVS doctors: Meeting the eye care needs of computer users. *J Behav Optom.* 2000;11:123-125, 139.
21. Gangamma MP, Poonam, Rajagopala M. A clinical study on "Computer Vision syndrome" and its management with Triphala eye drops and SaptamritaLauha. *Ayu* 2010;31(2):236-39.
22. Butzon SP, Eagles SR. Prescribing for the moderate and advanced ametropicpresbyopic VDT users: A comparison of the Technica Progressive and Datalite CRT Trifocal. *J. Am. Optom. Assoc.* 1997;68(8):495-502.