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Computer vision syndrome: A disease of the new age era

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ABSTRACT

Advancement in technology has revolutionized the modern era, making people turn a blind eye to its disastrous effects. One such harmful effect is the overuse of digital screens for various purposes leading to a new disease entity named "Computer vision syndrome". Although a major health problem, it is often ignored by the patients and practitioners, particularly in a developing country like India. The purpose of this narrative review article is to shed light on the various symptoms as well as provide a fruitful treatment based on evidence-based literature available.

Keywords: Computer vision syndrome, Dry eye disease, Asthenopia, Eyestrain, Visual fatigue

INTRODUCTION

Computer vision syndrome or visual fatigue or digitalized strain is a pathology of the modern era characterized by the presence of various ocular, musculoskeletal, and behavioral signs and symptoms due to prolonged use of digital screen.[1] It is characterized by range of eye and vision-related symptoms.

Often described as a 'complex of eye and vision problems related to near work experienced during constant use of computers,[2] the massive emergence of digital age has influenced people of all strata, regardless of age.[1] Emergence of digital gadgets has greatly benefited the society but also exposed us to many health-related issues. According to Anbesu and Lema, the use of devices even for three hours (h) per day can lead to development of computer vision syndrome.[2]

Although an emergency problem, computer vision syndrome is often ignored, particularly in developing countries. It has been seen that engagement with digital devices has increased dramatically in the recent years. A lot many of "recent internet users" (aged 60–70 years) have been added to the list of people relying on digital screen. Furthermore, the younger generation (20–29 years) uses digital gadgets for multitasking and for work purposes.[3]

PAPER SELECTION

We searched for PubMed database to study recent articles on Computer Vision Syndrome in the past five years using keywords Computer Vision Syndrome and digital eye strain. Focus was given to meta-analysis and review articles. Total searched articles were 71 while articles relevant to our scope of research were 14 [Figure 1].

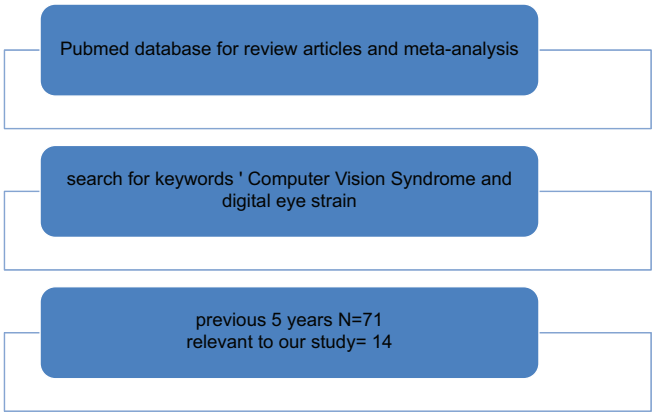

Figure 1: Selection of articles for overview

PREVALENCE

Anbesu and Lema conducted a meta-analysis including eight study designs from India which stated that nearly two in three participants have computer vision syndrome.[2] The pooled prevalence of computer vision syndrome in pre-COVID lockdown was 64.3% although it indicated that studies may have exaggerated the true prevalence of computer vision syndrome.[4-9] It is found to be more in females as compared to males.

SIGNS AND SYMPTOMS

According to the American Optometric Association, the most common symptoms associated with digital eye strain are headache, eyestrain, blurred vision, dry eyes and pain in the neck and shoulders.

A formal term "Asthenopia" was described word for eye strain by Sheedy *et al.*[10] It stated the external factors to be burning sensation, irritation, dryness, and tearing, whereas the internal factors comprise ache behind eyes, strain, and headache.

The main set of symptoms was identified into two categories: those associated with accommodation (blurred vision) and those linked with dry eye disease.[11]

Dry eye disease

Prevalence of dry eye disease in visual display terminal worker was found ranging from 9.5% to 87.5% as compared to general population, which has a prevalence of 5–33.3%.[12] According to Dry Eye Workshop II, the diagnostic methodology for dry eye, the disease includes ocular surface disease index, the TBUT (tear film break up time), osmolarity and ocular surface stain. This standardized criteria points toward higher prevalence of dry eye disease in patients with computer vision syndrome.[13] Also, reduced blinking rates with the use of computers is frequently associated with dry eye disease.[14]

Accomodative effects

Numerous studies have found that prolonged near work during the use of digital screen can lead to decrease in accommodation amplitude, acute acquired comitant esotropia leading to diplopia, high lag in accommodation. Dynamic retinoscopy with patient fixating a near target is used to assess lag of accommodation.[15,16] One hour working time can lead to decreased amplitude of accommodation and retraction of near convergence point.[1]

Change in intraocular pressure

Eun Ji Lee conducted a study on 158 subjects and reported significant elevation of intraocular pressure at 5 minutes (min) after starting the task and intraocular pressure kept increasing until 30 min viewing period.[17]

Environmental factors

They also play an important role. Light coming from a source over the device diminishes the contrast and leads to discomfort.[18] Use of digital screen for more than 4 h per day is a risk factor for dry eye disease and environment of humidity <40% can cause more eye discomfort.[13] Furthermore, the use of nicotine in a competitive work environment acts as a risk factor.[1]

Exposure to blue light

Exposure to 400–500 nanometer (blue light) for longer duration can induce photochemical damage to the macula. These can also cause alteration in physiological functions, alterations in circadian rhythm, and can cause insomnia.[19] This can also affect the sleep quality, thus causing daytime sleepiness and reduces subjective alertness.[20]

Extraocular symptoms

Headaches have been shown to be more common when gadgets are used for a prolonged time.[21] Furthermore, the use of computers causes a constant flexion of neck subsequently leading to back pain, shoulder pain, and neck pain. Wrist, arm, and hands are also affected leading to carpal tunnel syndrome.[22]

MANAGEMENT

Dry eye disease

For the management of dry eye disease, consistent use of lubricating eye drops has been shown to reduce symptoms of dryness.[23] Furthermore, the reduced blink rate, as noticed in patients with computer vision syndrome, can be increased by application of air stream to the face.[14] There is also a positive

impact on dry eye disease by closing of eyes for 2 seconds (sec) 2 times in between.[24] Dietary supplementation of omega-3 fatty acids on dry eye symptoms has shown improvement over a period of three months.[25] Meta-analysis has stated that overall berry extracts supplementation did not improve visual fatigue.[26]

Correction of refractive errors and presbyopia

Prolonged viewing of small fonts should be avoided and a minimum viewing distance of 500–635 mm and preferred screen angle of 120–125° horizontally or about 30° below the line of sight is recommended.[27]

Furthermore, the use of computer glasses has been effective in reduction of vision-related symptoms of computer users.[28] Supplementary breaks reliably minimize discomfort without impairing productivity.[29] According to the 20–20–20 rule, every 20 min, one should take the eyes off the screen for 20 sec and focus on an object 20 feet apart.[30]

Exposure to blue light

Van der Lely *et al.* suggested the role of blue blocker glasses in male adolescents.[20] While exposure to LED screen can attenuate melatonin suppression, use of glasses, thus have beneficial effects on sleep quality, daytime functioning, and mood.

CONCLUSION

In the modern era, the use of digital devices for work and recreation has become a common issue. As already cited in literature, a large proportion of the population are at risk for computer vision syndrome. However, persistent treatment options should be explored to address the issues present with computer vision syndrome.

To provide optimum patient care, every practitioner should be well aware of recent advances pertaining to the condition as it presents with a variety of vague complaints that dramatically affect the quality of life of individuals. To sum up, preventive techniques, patient education, and lifestyle modifications are the best tools to address the condition.

Ethical approval

Institutional Review Board approval is not required.

Declaration of patient consent

Patient's consent is not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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