

Digital Eye Strain: Time for a Break

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INTRODUCTION

Digital Eye Strain (DES) is an emerging public health problem with an estimated prevalence in the community reported between 22.3% and 39.8%.

COVID-19 pandemic created a host of issues with physical and mental well-being of people of all ages around the world. For those who had to work online, particularly in school going children and working adults, it created undue strain on the eyes. Myopic progression and accommodative dysfunction in children are also on the rise due to prolonged use of digital devices. Children often do not express ocular discomfort but may manifest certain mannerisms such as forced blinking or complain of transient episodic eye pain, rubbing or watering of eyes which may indicate eye strain.

Digital screen-time refers to time spent in front of screen of Video Display Units (VDU) including digital and electronic devices, such as watching television, working on a computer, laptop or tablet, using a smartphone, and playing video games.

Screen time increased many times in our daily routine while working on VDU. This led to a host of symptoms like eye strain, burning sensation, tired eyes, irritation, blurred vision along with various musculoskeletal symptoms like neck pain, back pain, shoulder and wrist pain. Also, symptoms comprising pain behind eyes and itching sensation in eyes increased in those who were on prolonged digital activity of more than 6 hours. A similar study on North Indian population showed those individuals on digital devices for more than 4 hours suffered from severe dry eyes.

Increased screen time also leads to circadian rhythm disturbances which happen due to the blue light emitted by VDU and the electromagnetic fields they produce. A study from Harvard showed that blue light suppresses release of melatonin (essential for proper sleep) twice as much as green light when the lux or luminance from both eyes was the same. A similar study showed Artificial Light at Night (ALAN) exposure imposes a direct challenge to circadian rhythms as it has been found to disrupt hypothalamic Suprachiasmatic Nucleus Activity (SCN) and various ensuing mechanisms particularly by suppressing and dysregulating melatonin release from the pineal gland. The

melanopsin containing photosensitive ganglion cells of the retina are sensitive to light in the wavelength of 482 nm, falling within the blue light spectrum.

DESCRIPTION

Due to circadian rhythm dysfunction there is a lack of sleep which results in increased tear osmolarity, reduced tear film break-up time, less tear secretions, each one of which independently triggered or exacerbated the ocular surface disease.

Symptoms of irritation, burning, tearing and dryness were noted to be closely related to dry eye while symptoms of eyestrain, pain behind eyes and headache were linked to accommodative and/or binocular vision stress. The constant near work leads to an increased state of accommodation, while the concomitant requirement of convergence associated with near work leads to eyestrain and headache due to strain on the extraocular muscles.

While working on computers there is decrease in blink rate and increase in palpebral aperture due to higher gaze angle which results in unstable tear film, which coupled with an inadequate lipid layer results in symptoms of dry eyes.

Smart phone use is more commonly associated with dry eye disease than other digital devices.

The eye focusing and ocular movements required for better visibility of digital screen place additional demand on an intricate balance between accommodation and convergence mechanisms, thus making people with uncorrected or under-corrected refractive errors even more susceptible.

Thus increased digital device use affects health of the individual leading to depression/anxiety, sedentary behaviour, obesity, headache, neck/shoulder pain, backache, poor quality/shorter sleep duration and dry eye.

One of the most significant ocular health complications of the COVID-19 pandemic has been new-onset myopia and the increased progression of existing myopia due to excessive near work. This influence on myopia progression has been maximum in the age group of 6 years-8 years. There are predictions of a worsening of refractive errors worldwide and it is estimated that

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over 50% of the world's population will have myopia by 2050. Eye health care providers need to promptly identify those children who are at a higher risk of DES and progression of myopia and manage them appropriately.

Some studies have shown more affection of DES in females as compared to males due to higher incidence of dry eyes in females. However in a study done by Mohan, et al. male sex appeared to be at higher risk probably due to male children being involved in multitasking on digital device.

Recommendations to alleviate DES include the correct ergonomic use of digital devices, limiting screen time to <4 hours, screen time tracking, using larger high-resolution displays, adjusting the lighting, and an inclination towards outdoor recreational activities. Forced gadget break at least 30 min-60 min before bedtime, frequent pauses during screen use or the 20-20-20 rule (to focus on a distance of 20 feet every 20 min for 20 sec), encouraging family time with non-gadget based learning and entertainment are some measures.

Forceful blinking during screen time should be encouraged, since this squeezes the meibomian glands, and the lipid layer of the tear film is well formed, which can help with evaporative dry

eye. Proper positioning of the desktop, so that it is 4 inches-5 inches below eye level, ensures that most of the globe is protected by the eyelids, and only a small inferior position is exposed to environmental drying forces.

CONCLUSION

Innovations with optical segment such as antireflective coating, blue-light blocking glasses, and polaroid lenses are other recommended measures to reduce eye strain. However American academy of ophthalmology website states that blue-blocking filters are an unnecessary expense. Similarly other studies have shown that there is relatively low level of blue light transmission from electronic devices hence blue blocking lenses did not alter signs or symptoms of eye strain with computer use. This advocates creation of optimal environment for screen viewing to minimize symptoms of DES.

Preventive strategies need to be incorporated in school and college curriculums, apart from teachers and parents sensitization, to promote physical, social and psychological well-being and quality of life.