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EFFECTS OF BLUE LIGHT ON HUMAN BODY

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ABSTRACT

Blue light (415-455nm) is among the shortest and highest energy wavelength in the spectrum of visible light. The blue light or the high energy visible wavelength flicker more, creating a glare, reducing the visual contrast and ultimately affecting the sharpness and clarity; this flickering and glaring is often accompanied by eyestrain, headaches, sleeplessness, physical and mental fatigue. Digital eye strain is one of the leading computer-associated complaint, also an emerging medical issue which affects the learning and hampers the productivity of a person. Digital eyestrain has affected individuals of all age group. With the growing use of digital devices, it is important to regulate or limit the screen time, especially in the trending times of social media. The symptoms of digital eye strain include hazy vision, difficulty in focusing, dry eyes, irritation in the eyes, headache, neck pain and back pain. There is growing medical evidence that suggests excessive exposure to blue light may cause permanent eye damage.

KEYWORDS: Blue Light, Electromagnetic Spectrum, Digital Eye Strain, Circadian Rhythm, Melatonin.

The electromagnetic spectrum is the gamut of frequencies of diverse electromagnetic radiations. It includes their respective wavelengths and photon energy. However, the human eye is sensitive to a narrow spectrum of radiations, referred to as the visible light. The wavelength and the photon energies emitted from this spectrum are perceived by us and interpreted as different colors ranging from red (lowest energy) to violet (highest energy). Blue light (415-455nm) is among the shortest and highest energy wavelength in the spectrum of visible light.

Over the generations, there has been a shift from natural light to carbon or early tungsten filament light bulb, and currently to energy efficient fluorescent bulbs, LED lights and OLED or AMOLED technology. Majority of the devices available in the market like LED lamp, television, smartphones, laptops, computers, etc. are major sources of blue light emission. With the wide spread use and vogue of these devices as well as the recent advancement in light sources, there has been a gradual exposure to a lot more sources that contribute in the emission of toxic blue light for a longer duration of time. This is a matter of concern for both the scientific and the general population.[1]

Digital eye strain is one of the leading computer-associated complaints, also an emerging medical issue which affects the learning and hampers the productivity of a person. The symptoms of digital eye strain include hazy vision, difficulty in focusing, dry eyes, irritation in the eyes, headache, neck pain and back pain. The blue light or the high energy visible wavelength flicker more, creating a glare, reducing the visual contrast and ultimately affecting the sharpness and clarity; this flickering and glaring is often accompanied by eyestrain, headaches, sleeplessness, physical and mental fatigue. Noell et al (1966) reported that the blue light has the potential to damage the rod cells.[2] There is growing medical evidence that suggests excessive exposure to blue light may cause permanent eye damage.[3-5] It is believed that prolonged exposure to high energy wavelength can cause retinal damage and further may lead to age related macular degeneration (AMD), ultimately affecting the vision. The blue rays of spectrum seem to accelerate AMD and retinal degenerative diseases more than any other ray of the spectrum.

Human body uses the blue light to regulate the circadian rhythm. It is also known for boosting alertness in an individual and heightening of the reaction time. With chronic exposure to blue light at night, the melatonin production is suppressed, disrupting the circadian rhythm. It is proven that increase in the irradiance of narrowband blue-appearing light can result in increasing plasma melatonin suppression in healthy individuals.[6] Blue light seems to be more disruptive at night. Sleep is an important pillar of health. Epidemiological studies

have shown that exposure to blue light and sleep deprivation have detrimental effects on the human body such as increased risk of depression, several types of cancer (breast, prostate), premature aging, cognitive and affective impairment, diabetes, heart diseases and obesity.[7] Individuals working night shifts and having increased exposure to blue light during working hours are more prone to these health problems as they are associated with lower levels of melatonin. It is suggested that the blue light hazards are increased with increase in the color temperature and decreased with increase in age.[8]

Blue light wavelength surrounds us. Whether working on a computer or playing in the sun, every individual is exposed to the blue light. The question is, is this a public health concern? A recent study assessed the number of sources, their exposure and their comparison with international exposure limits along with the exposure that is likely to be received from the blue sky and it was found that none of the sources assessed approached the exposure limit, even for extended viewing time.[9]

Even though the blue light exposure received from the screens is small than exposure from the sun, there are concerns related to long-term effects of screen exposure because of proximity of the screens and time spent in-front of them. There is a need to take precautions against the high energy visible blue light and it's effect. Digital eyestrain has affected individuals of all age group. With the growing use of digital devices, it is important to regulate or limit the screen time, especially in the trending times of social media. Invest in the blue light filter screens and amber or yellow tinted computer glasses to limit the blue light reaching the retina while using electronic devices. Blue-light blocking glasses may be useful as a countermeasure for alerting effects of light exposure through different devices and LED screens. They may be potentially useful to reduce harmful effects associated with modern lighting on the circadian physiology in the evening.[10] Blink frequently when working for long hours on computers or smartphones, or use lubricant eye drops to avoid dry eyes. Take frequent breaks from using these devices. Change the background of these devices to warmer colors to reduce the eye strain. It is recommended to reduce the exposure of blue light during night, especially before sleeping to have a regular circadian rhythm. Development of lighting systems that can preserve the melatonin rhythm could help in reducing the health risks. Use of dim red lights during the night is less likely to shift the circadian rhythm and suppression of melatonin. Exposure to bright light during the day not only increases the alertness during the day but also boosts the ability to sleep at night.

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