

The Relationship Between Dry Eye Syndrome And Digital Screen Use

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ABSTRACT

Using digital screens, also known as VDTs (visual display terminals) for extended periods of time each day has become a need in today's world, involving a variety of tasks in work, school and leisure contexts. Dry eyes are the most common problem occurring with extended use of digital screens. Dry eyes arise when there is insufficient production of tears in either quality or quantity to maintain the eyes moisturized and comfortable. In order to lessen the screen related vision impairment and issues, we examine the link between digital screen use and dry eyes and also increase the awareness of this issue. A combination of multiple factors led to a notable increase in the prevalence of dry eye illness during the COVID-19 pandemic.

Keywords: Digital Screen Use, Visual Display Terminals (VDTs), Dry Eye Syndrome, COVID-19 Pandemic, Prolonged Screen Exposure.

1. INTRODUCTION

Overview of dry eye syndrome: Dry eye syndrome is a multifaceted and intricate disorder that impacts both the ocular surface and the tear film. With an increasing number of people suffering its symptoms globally Dry Eye Syndrome is becoming more widely acknowledged as a serious public health concern. It is one of the most frequent causes of ocular care visits and has found to be a significant contributor to discomfort and a lower standard of living. Inflammation and damage to the eye's fragile tissues ensure the compromise of the tear film, which is essential for preserving the ocular surface's health. Insufficient tear production and excessive tear evaporation, which results in insufficient lubrication, are the causes of the dry eyes. Inflammation, irritation and damage to the ocular surface are caused by this imbalance between tear production and drainage. [1,2]

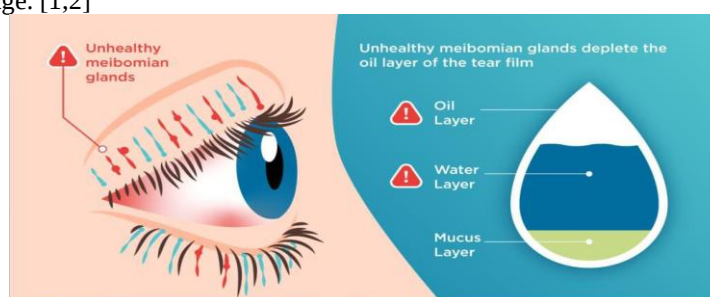


Fig.1.1-layers of tear film

- **Computer Vision Syndrome:** The term “digital eye strain”, commonly referred to as “computer vision syndrome” or “CVS”, describes a broad spectrum of muscle and ocular symptoms brought by extended, continuous usage of digital devices including computers, cellphones, televisions and tablets. Digital eye strains have become much more common in recent years due to the increased dependence on visual display terminals (VDT’s) for communication, business and enjoyment. [3,4] Up to 90% computer users may experience visual symptoms like blurred vision, eyestrain, headaches, ocular discomfort, dry eye and diplopia. Neck and shoulder pain may also be present. According to the American Optometric Association, which also defines computer vision syndrome as a collection of eye and vision-related issues brought on by extended computer vision use.[5]

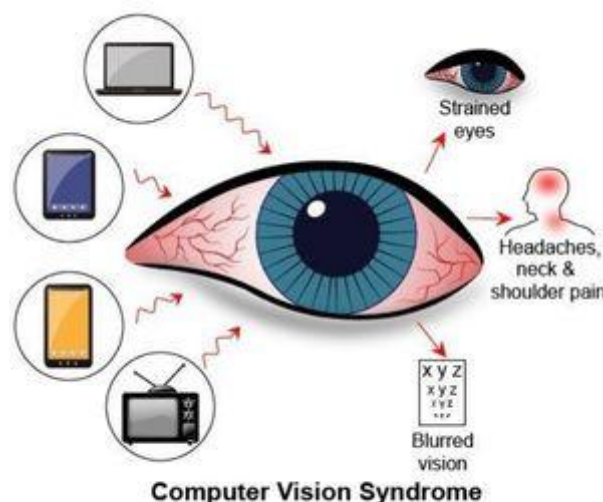


Fig.1.2-contributing factors associated with computer vision syndrome

2. LITERATURE REVIEW:

In 2000, Moss et al. Found that dry eye illness was very common, especially in elderly persons. Despite not focusing on screen time, it was often referenced in subsequent research that linked dry eye with digital screen use.

In 2004, Schaumberg et al. The study examined the potential link between prolonged screen usage and the rising prevalence of dry illness. It found extended screen time to be a risk factor for the development of dry eye symptoms, particularly because of factors like decreased blink rate and environmental circumstances even though it did not explicitly measure the relationship between screen use and dry eye.

In 2005, Torkildsen et al. An investigation into the connection between digital screen use and ocular discomfort- a prelude to symptoms of dry eye.

In 2006, Chia et al. Investigated how computer use affects the ocular surface, namely tear production and tear film stability. It sought to comprehend the effects of prolonged screen use on eye health.

In 2007, Schmidl, D. et al. studied how a group of screen users tears were affected by extended exposure to digital screens. This research aimed to examine the potential effects of screen time on tear production and tear film stability.

In 2009, Korb et al. (2009) This study surveyed computer users to determine how common dry eye symptoms were among people who spent a lot of time on computer every day. It aimed to determine how screen time impacts the production of tears and the incidence of symptoms associated with dry eyes.

In 2014, Kose et al. Office workers who utilize digital screens on a regular basis were the subject of this investigation. To determine the prevalence of dry eye complaints in this population, a survey is conducted.

In 2015, Chung et al. Investigated how a sample of screen users' ocular surface health, tear function, and tear film break-up time were affected by extended digital screen exposure.

In 2016, Lemp et al. This study looked at how using digital screens at home and at work directly affects dry eye condition. Surveys and clinical testing were done to assess the association.

In 2018, Choi et al. In a sizable sample population, this study investigated the connection between the computer use and symptoms of dry eye.

In 2019, Cakir et al. Examined the connection between the prevalence of dry eye symptoms and use of digital screens, such as computers, cellphones, and tablets with an emphasis on college students.

In 2021, Gehlsen et al. The precise impact of blue light from electronic device on symptoms of dry eyes was investigated in this more recent study.

3. REVIEW GAP

The main gap is understanding how the COVID-19 pandemic and the widespread shift toward prolonged digital screen use have intensified the burden of dry eye symptoms. With remote work, online learnings and increased reliance on visual display terminals now woven into our daily routines, the condition has quietly become more prevalent and persistent. Many individuals are unaware of the impact that screen habits-like reduced blinking and constant blue light exposure-can have on ocular surface health.

This not only raises much-needed awareness but also stresses the importance of updating clinical approaches and public education strategies. It encourages a shift in focus-from just treating symptoms to recognizing the environmental and behavioral triggers behind them.

Association Among Parameters:

In recent years, with the growing reliance on digital devices for work and communication, concerns about screen time and eye health have intensified. A common eye ailment known as dry eye disease (DED) is brought on by the eyes inability to produce a healthy tear film, which causes dryness, irritation and pain. The primary characteristic of DED is the loss of homeostasis in the tear film, a thin layer of fluid that covers the surface of the eye and is essential for maintaining its moisture, clarity and protection.[6] The issue is made worse when this tear film becomes unstable or insufficient, damaging the ocular surface and perhaps causing the inflammatory reaction. Symptoms of DED include impaired vision, burning, redness, a persistent feeling of dryness, and a gritty feeling.[7]

Many individuals spend hours every day staring at screens, whether they are on smartphones, tablets, laptops, or desktop computers, in the current digital era. LED (light emitting diodes) backlit screens are found in the majority of the gadgets we use on a daily basis, including laptops, televisions, tablets and smartphones. Even though these LED panels are bright and energy-efficient, they release a lot of blue light, namely 400-490 nanometers. What is referred to as “HEV (high energy visible)” light falls inside this range, particularly the 400-450 nm band, which emits that characteristic bluish glow. Growing research indicates that extended exposure to blue light may be contributing to the onset or exacerbation of dry eye symptoms, particularly in those who spend a lot of time in front of VDTs, even though we might not notice or feel anything out of the ordinary when using these devices. One of the primary worries is that blue light might eventually cause ocular poisoning. According to some scientists, excessive blue light exposure might cause oxidative stress in the eye’s cells, which could harm retina and ocular surface. One of the main causes of dry eye disease is inflammation, which can be exacerbated by this stress. Long term digital device users frequently experience burning, itching, or a grainy feeling in their eyes, which are typical signs of dry eye and may be related to exposure to blue light in addition to decreased blinking and screen focus.

There is a direct correlation between prolonged screen usage and the development of dry eye symptoms, according to numerous research studies.[8] Eye dryness, pain, and other related symptoms are far more common in those who spend a lot of time using computers or digital devices. This correlation is due to a number of established behavioral and physiological factors, not chance.

A decrease in natural blink rate is one of the main things that links screen time to dry eye disease.[9] Blinking is much less common when people are directly focus on screen, particularly when reading or working. This decreased blink rate causes the tear film to be less often renewed, accelerating the drying out of the eye’s surface. Additionally, blinking is frequently insufficient- that is the eyelids do not completely close- making it difficult for tears to spread evenly across the surface of the eye.[10] Parts of the eye may be left exposed by this partial blinking, making them susceptible to evaporation and discomfort.

The visual strain that comes with prolonged screen usage is another contributing cause, Eye muscles, particularly those involved in accommodation and convergence, can become fatigued by prolonged close-up attention on a bright screen [11]. Due to the eye’s inability to remain comfortable and clear throughout extended tasks, visual fatigue can eventually cause or worsen DED symptoms.

Dry eye syndrome can develop or worsen in computer users due to a combination of decreased blinking, increased tear evaporation, and visual strain. Comprehending these mechanisms is crucial for both patients and eye care providers because it allows for the development of focused preventative and treatment methods. In the context of everyday screen use, small adjustments like taking regular breaks, adopting artificial tears, actively blinking more frequently, and altering screen height can have a significant impact on managing dry eye.[12]

4. IMPACT OF COVID-19 IN DRY EYE SYMPTOMS:

A prevalent multifactorial ocular surface disorder caused by disruptions to the tear film’s homeostasis, dry eye can significantly impair one’s quality of life. Patients with dry eye are among the many groups of people spending more time at home during the ongoing coronavirus disease (COVID-19) .[13] As a result of spending more time home and less time outside, socializing, travelling, and commuting, people are spending more time reading or ‘screen time’-than they were prior to the pandemic. Low humidity and draft air are two further elements of the indoor environment that might be linked to exacerbating dry eye.

People rely more on digital devices for both personal and professional tasks as a result of the transition to remote employment, online learning, and virtual meetings, longer periods of continuous visual focus have coincided with this increase in screentime, which further lowers blink frequency and promotes tear evaporation. These behavioral and environmental alterations have resulted in decreased visual performance and increased discomfort for those who are already suffering dry eye problems. Commonly used air conditioning and heating systems frequently reduce the surrounding humidity, which aggravates the ocular surface even more. Eye chances have also decreased due to the absence of natural breaks they may often occur during in-person work or outdoor activities. Furthermore, the pandemic related psychological stress may have the indirect impact on eye health by upsetting hormonal balance and sleep patterns, both of which are known to impair tear formation. In general, the home environment during the pandemic has made it difficult for those with dry eye, which may exacerbate their disease and make managing their symptoms more difficult.[7]

5. PREVENTION OF DRY EYE FROM SCREEN USE:

The prevention of dry eye from screen use are in the following ways:

- **20-20-20 rule:** Try adhering to the 20-20-20 rule first. Look at something 20 feet far away for at least 20 seconds every 20 minutes. This relieves eye strain and provides the rest to the eyes. Overtime, this little practice has a significant impact. Eyes will automatically reset and rehydrate by giving them regular pauses like this. Additionally, it lessens the chance of headaches and blurred vision caused by extended concentration. [15,16]
- **Blinking more often:** Also, remember to blink-really. We blink much less frequently when we look at screens, which causes tears to evaporate more quickly. Maintaining eye moisture consciously remembering yourself to blink more frequently, particularly working on lengthy tasks. Blinking is how our eyes naturally distribute tears and maintain lubrication, which may sound almost too simple. To help remember, try placing minor reminders or even putting a little note to the screen. With time, this minor insight can help to avoid that unpleasant, grit-filled sensation at the end of the day.[14]
- **Environmental modifications:** It can also be beneficial to modify the surroundings. If working in a dry room, use a humidifier and watch out for fans or vents blowing air directly into the face. Additionally, the position of the screen is important; ideally it should be just below eye level. By doing this, the surface area of the eyelids that is exposed to air is decreased and they remain in a more natural position. Striking lighting, particularly from windows and overhead, can also strain the eyes, so use drapes or anti-glare screen to reduce glare. To lessen eye strain, think about adjusting to warmer screen tones in the evening if working late. In addition to increase productivity, maintaining a pleasant workstation is essential for long-term eye health. [16,17]

6. DIAGNOSIS CRITERIA

It's critical to diagnose dry eye in order to develop a customized and successful treatment strategy for individuals who report having dry eye symptoms and exhibit clinical indicators during examination. Using instruments like as DEQ-5, OSDI, or SPEED questionnaire, anyone deemed to be at risk for DED can be screened, regardless of environmental factors, screen time, age, or underlying medical issues. Even if they haven't received an official diagnosis, these easy, verified surveys can assist identify people who could be exhibiting dry eye symptoms. Regular application of these instruments in clinical contexts promotes a more patient-centered approach and aids in standardizing care.[18]

When a patient exhibits certain symptoms such as decreased tear production on the Schirmer test, delayed tear clearance, and positive staining results with fluorescein and rose Bengal dyes, Ohashi et al. proposed that dry eye illness can be clinically verified. This condition is depicted more clearly thanks to these combined findings. It is crucial to remember that there is no universally accepted criterion for diagnosing dry eye among researchers. Due to the disease's intricacy and multifaceted nature, different specialists have put forth distinct sets of criteria overtime. Standardizing treatment procedures or comparing studies may be difficult due to this lack of agreement.[19][20]

The tests to confirm the dry eye includes:

- The Schirmer's test is straightforward and widely used technique to measure the amount of tear production pf eyes. The test involves carefully placing a tiny strip of special filter paper beneath the lower eyelid. Close the eyes for around 5 minutes, allowing the tears to be absorbed by the paper. The strips moisture content is then measured in millimeters. If the eyes may not be producing enough tears, which is one of the symptoms of dry eye disease, if the strip remains largely dry.
- The Tear Break-Up Time (TBUT) test, on the other hand, examines the stability of the tear film, which is the thin coating of moisture that protects and comforts the eyes. Doctor will apply a little amount of fluorescein dye to the eyes and then use a special blue light to measure the amount of time it takes for dry spots to form on the surface after the blink. A shorter TBUT indicates that the tears are dissolving too rapidly, which can cause irritability, blurred vision, and that familiar dry, grainy sensation.

7. MANAGEMENT

The primary objective of treating dry eye disease is to restoring the equilibrium of the tear film in order to maintain long-term eye contact and health. As a result, the eyes will produce more tears, have less inflammation, and retain more moisture. Treatment also focuses on preventing flare-ups and halting the recurrence of symptoms after stability is regained. People with DED can frequently effectively control their illness and have a high quality of life with the correct care.[21]

Initial methods consist of:

- Instruction regarding the state.
- Alteration of the surroundings.
- Restrict the amount of time spent on screens.
- Every hour, blink more deliberately.
- Adhere to the 20-20-20 rule.
- Lid hygiene.
- Nutrition and supplements.
- Omega-3 fatty acids.
- Plenty of water.
- Artificial eyedrops.

ACTION	FREQUENCY
20-20-20 rule	every 20 minutes
Artificial tears	3-6x daily
Blink exercises	hourly
Break from screens	every one hour
Lid hygiene	daily
Omega-3s	daily

Table1.1- initial treatment of dry eye with specific time period.

The following course of treatment options consists of:

- Artificial lubricants (preservative free that reduces the risk of ocular surface toxicity).
- Anti-inflammatory agents (topical corticosteroids, tetracyclines, cyclosporine A).
- Application of serum drops.
- Ointments and night gels.
- Therapeutic contact lenses (bandage soft contact lenses taken into consideration as a corneal reepithelization assistant, corneal surface protection, or pain alleviation).
- Punctal plugs alleviate the symptoms of dry eyes.
- Surgical procedures for severe state (including lid or corneal procedures) [23][24][25]

8. CONCLUSION

Dry eye syndrome has subtly crept throughout society in the current screen-centric environment, strongly linked to our changing digital habits, and is no longer a problem that only affects a small percentage of people. This study examined how, particularly in the wake of COVID-19 epidemic, greater exposure to blue light, decreased blink rates, and extended screen time have all significantly enhanced the symptoms of dry eyes. We draw attention to the increasing prevalence of dry eye and the pressing need for early detection, prevention and awareness by analyzing the interrelated roles of behavior, environment and digital dependency. Combining clinical knowledge with useful behavioral therapies is the way of the future for managing dry eye, enabling people to make minor, long-lasting adjustments that can greatly enhance comfort and eye health.

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