Does digital screen exposure cause dry eye?

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Abstract

We get up in the mornings to the bright glow of our phones acting as alarm clock and probably bid good night to the phone screen by checking WhatsApp messages or facebook updates Demands of the modern society put us in front of the digital screens for long hours resulting in many of us having eye strain, fatigue, headache, blurred vision, watering, redness in eyes along with many musculoskeletal complaints like neck pain, back pain, stiffness or pain in wrist etc. These symptoms collectively constitute the computer vision syndrome.

Objective: The aim of the present study was to find the magnitude and severity of dry eye disease amongst young medical graduates who spend good amount of time on the digital screens.

Materials and Methods: This is a cross sectional analytic study which was conducted on 100 undergraduate medical students at the department of Physiology, Government Medical college, Srinagar, after approval from the institutional ethical committee. Informed oral consent was taken from the participants and then a pre validated questionnaire was distributed amongst them. Subsequently Schirmers test was performed on all the participants. Statistical analysis was done using Pearson chi square test.

Result: The prevalence rate of dry eye in the study population is 55.6%. Our results show that increased duration of usage of digital screens increases the risk of dry eye. Eye strain /fatigue was the most common symptom reported by 53 subjects (58.8%) followed by headache (23.3%) followed by blurring of vision. 37% of the students had never heard of dry eye whereas 53% had some knowledge about it. 62% of the students believed that digital screen exposure affects their lifestyle Majority of the students (75%) were willing to reduce their screen time as a preventive measure towards dry eye.

Conclusion: Wearing computer eyewear, looking away from the screen periodically, reducing the brightness of the device, increasing conscious blinking are some of the steps that help protect our eyes from the ill effects of technology.

Keywords: Digital screens, dry eye, Schirmers test.

Introduction

The present era of digitalization has revolutionized the way information is created, disseminated and displayed. Availability of the internet, smart phones, tablets and other such gadgets has indeed simplified life. Social networking sites like face book, WhatsApp, and twitter have removed the communication barrier and drastically changed the life style of people of all ages. Learning has become interactive and much easier. E-books allow one to carry an entire library with them. Smart phones provide an instant entertainment, round the clock access to banks and other facilities like ticket booking, online shopping, GPS system etc.

But our eyes were not created to stare at the digital screens all day, although the demands of the modern society do put us in front of the digital screens for long hours resulting in many of us having eye strain, fatigue, headache, blurred vision, watering, redness in eyes along with many musculoskeltal complaints like neck pain, back pain, stiffness or pain in wrist etc. These symptoms collectively constitute the computer vision syndrome (CVS).[1-6] CVS is also associated with dry eye.[7-9] The symptoms can be due to over exposure to the digital screens, poor lightening, glare, improper posture, close working distance, small font size, reduced blinking.[10,11]

Dry eye disease is a multifactorial problem with increasing prevalence throughout the world, affecting people of all age groups. The disease involves the eyelids, tear film, ocular surface, lacrimal apparatus and the autonomic nervous system. The prevalence increases with increasing age, history of smoking, ophthalmic surgeries, increase in the usage of contact lenses, low blink rate, vitamin A deficiency, diabetes, thyroid disorder, arthritis, sjogrens syndrome, use of certain drugs. Occupational and environmental factors like low humidity, high altitude, air pollution, indoor air conditioning, prolonged use of computers also play a role.[12-16]

Dry eye can be defined as a disorder of the tear film due to deficiency of tears or excessive evaporation that results in damage to the ocular surface hence causing ocular discomfort.[12] Reduced blink rate is one of the etiological factors for causation of dry eye which in turn could be due to many reasons like Parkinsonism, prolonged and continuous use of computers and smart phones, television viewing, reading etc. Prevalence of dry eye disease may be as high as 33% with moderate to severe form of the disease affecting 5 to 10% of the population.[16-18]

This study therefore aims to evaluate the influence of digital screens on ocular health of medical students and to see if there is an association between prolonged hours of usage of the digital screens and the occurrence of dry eye, in an attempt to create awareness about the disease and to detect the dry eye disease early so as to intervene and stop the progression of the disease. To our knowledge there are very limited such studies and none in our setup and most of

the studies that have been conducted have not included any subjective test.

Therefore we conducted the present study with an aim of finding the magnitude and severity of dry eye disease amongst young medical graduates who spend good amount of time on the digital screens.

Materials and Methods

This is a cross sectional analytic study which was conducted on 100 undergraduate medical students at the department of Physiology, Government Medical college, Srinagar, over a period of 3 months between June 2018 to august 2018 after approval from the institutional ethical committee. Informed oral consent was taken from the participants and then a pre validated questionnaire was distributed amongst them. The questionnaire was explained to the participants in detail and they were asked to tick mark the most appropriate option for each question.

Although there are various tests available for assessment of dry eye disease, like Schirmer test, tear film break up time, phenol red thread test, ocular surface dye staining etc, no single test is sufficient for the diagnosis and therefore a combination of the subjective symptoms and objective tests are used for diagnosis. We decided to do a Schirmer test considering that it is cheap, non invasive, easily to perform and less time consuming. Out of the 100 students who filled the questionnaire 10 students did not consent for the Schirmers test. So finally we had 90 participants in the study.

Taking all aseptic precautions, Schirmer test was performed on both the eyes of all the participants (without the use of topical anesthesia). The subjects were comfortably seated. Each strip was then bend, at the notch, to a 90 degree angle and subject was asked to look up, then with the help of the index finger, the lower lid was pulled down gently and Schirmer strip was placed into the lower temporal lid margin (each eye separately). The subjects were asked to keep the eyes closed for 5 minutes after which the strip was removed and the length of the moistened area was recorded. Values of less than 15 mm were taken as dry eye. Values greater than 15 mm are considered normal.[19]

Statistical Analysis

Data was analyzed using Pearson chi square test.

Results

Total of 90 subjects were examined using Schirmers test and their demographic details along with the type of digital screen used, the duration of usage and the prevalence of refractive error amongst the study population is shown in table 1. Out of the 27 subjects who had refractive error, 26 were using glasses and only 1 has undergone Lasik.

Table 1: Baseline parameters (N =90)

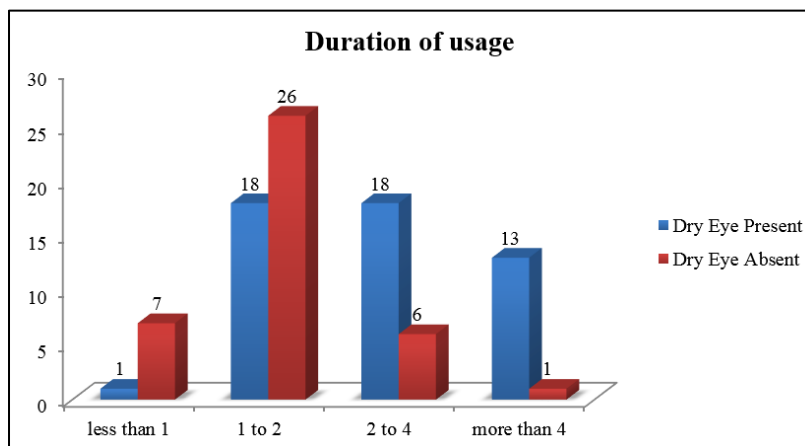| Mean Age of subjects		19 years
Male: Female ratio		64:26
Screen Type used	Smart Phones	89
	Kindle /Tabs	1
Duration of usage	< 1 hour	8
	1-2 hours	44
	2-4 hours	24
	> 4 hours	14
Refractive Error	Present	27
	Absent	63

Fig. 1: Relation between the duration of usage of digital screens and occurrence of dry eye
PEARSON CHI SQUARE = 18.793 with Df =3 and P value 0.003

Fig. 1 shows the relation between the time spent on the digital screen (duration of usage) with the occurrence of dry eye. Out of the 8 subjects, using the screen for less than 1 hour, 7 subjects did not have dry eye. Out of the 44 subjects using the screen for 1 to 2 hours, 18 (40.9%) had dry eye and 26 of them (59.1%) did not have dry eye. Amongst the 24 subjects using the screen for 2 to 4 hours, dry eye was found in 18 (75%). Only 14 subjects were using the screen for more than 4 hours, out of which 13 (92.9%) had dry eye. The results were statistically significant with p value 0.003. Our results show that 55.6% of the study population had dry eye whereas 44.4% did not have dry eye.
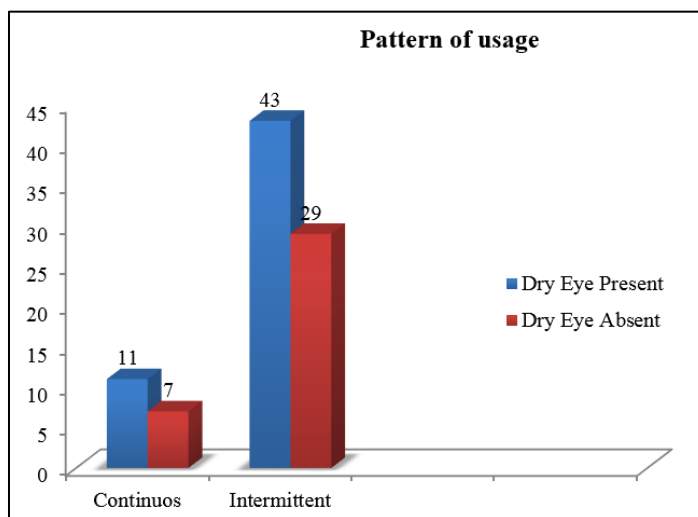

Fig. 2: Shows the relation between the patterns of usage (weather continuous or intermittent) with the occurrence of dry eye
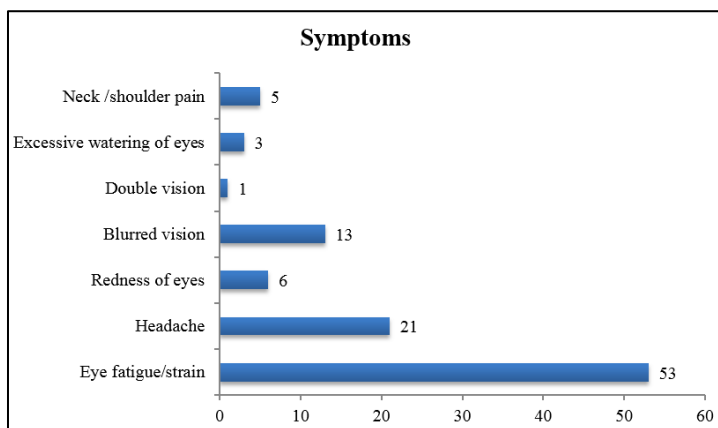PEARSON CHI SQUARE = 0.012 with Df =1 and P value 0.914

Fig. 3: Shows the percentage of the most prevalent symptoms amongst the study population

53 subjects (58.8%) complained of eye fatigue and the second most common symptom amongst the subjects was headache 23.3% followed by blurring of vision. The questionnaire that was administered to the students also had questions to access the knowledge, attitude and practice of these students towards dry eye. The results of which were expressed in percentage. 37% of the students had never heard of dry eye whereas 53% had some knowledge about it. 62% of the students believed that digital screen exposure affects their lifestyle and ocular health in particular and only 28% did not believe so. Majority of the students (75%) were willing to reduce their screen time as a preventive measure towards dry eye.

Discussion

The prevalence of dry eye in our study is 55.6%. Our results show that increased duration of usage of digital screens increases the risk of dry eye. The risk increases if the time spent is greater than 4 hours. This is in accordance to the previous studies.[1-3,5] Studies by Titiyal JS et al have found 4 or more hours of usage of video display terminals associated with 89.9% of dry eye cases.[17] Studies by Bali et al, Chakrabarti M have show that the usage of computer for even 3 hours daily is linked to increased risk of CVS.[20,21] Studies by Akinbinu and Mashalla show the prevalence of CVS symptoms amongst computer workers was 48.9% when the duration of usage was 6-8 hours as compared to 23.7% prevalence in workers who used the computers for 3

to 4 hours and only 0.72% prevalence in workers who spent 1 to 2 hours on the computers.[22]

The most common symptom in our study population was eye strain, followed by headache. Similar results were found by Sultan H et al, Hafiz M et al.[3,11] Some studies have found headache as the most common symptom.[1,8] When we tilt our head forward to look at the phone, a lot of pressure is added to the neck, resulting in neck pain, headache and backache and also due to the small font size of the text on our smart phones we tend to lean forwards putting extra strain on the back and the neck. Watching TV, computers etc in dim light also adds to the eye strain.

Also it has been found that increased incidence of symptoms of CVS is associated with reduced blink rate. [9]. Longer duration of eye opening and higher gaze angle while viewing a digital screen results in faster tear loss aggravating the dry eye disease.[17] Fenety and walker, Alexis and Gregory, Levy et al, Smita et al have shown that taking frequent breaks during continuous computer work is important to reduce the eye strain and the occurrence of headache as this helps to relax the accommodative system of the eye.[23-26]

From the present study we can also conclude that smart phones could be the main cause of the symptoms of CVS amongst medical students as 89 out of the 90 medical students of the study population used smart phones as the main gadget.

Conclusion

We must learn to use the gadgets and apps responsibly. Wearing computer eyewear, looking away from the screen periodically, reducing the brightness of the device, increasing conscious blinking are some of the steps that help protect our eyes from the ill effects of technology. Unplugging one's self from the digitally connected world at least temporarily is important. Follow the 20-20-20 rule to avoid dry eyes: every 20 minutes take a 20 second break and look at something 20 feet away.

Educating the masses regarding the health hazards of the digital screens and need for regular eye checkups is recommended by the authors as a preventive measure towards dry eye and other hazards of the digital screens.

Limitation

Though Schirmer test is frequently performed to evaluate the aqueous tear production but it can give variable results. Therefore further investigations with more sophisticated tests and a larger sample size are needed to confirm the diagnosis.

Conflict of Interest: None.

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