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A CROSS-SECTIONAL ANALYTICAL STUDY TO FIND THE PREVALENCE OF DRY EYES IN MEDICAL STUDENTS AND ITS ASSOCIATION WITH DIGITAL SCREEN USE TIME

Ophthalomology

Dr. Ishan M. Shah* MBBS, Pramukhswami Medical College, Bhaikaka University, Karamsad, Gujarat. *Corresponding Author

Dr. Samir Bhavsar MBBS, M.S. Ophthalmology, Professor & Head Of Department Of Ophthalmology, Pramukhswami Medical college, Bhaikaka University, Karamsad, Gujarat.

Mrs. Jaishree Ganjiwale Department Of Community Medicine And Central Research Services, Pramukhswami Medical College, Bhaikaka University, Karamsad, Gujarat.

Dr. Rutva Shah MBBS, M.S. Ophthalmology, Assistant Professor, SBKS Medical College & Research Institute, Vadodara, Gujarat.

Dr. Ankita Bhavsar Associate Professor, Department Of Pharmaceutics & Pharm Technology, Indukaka Ipcowala College Of Pharmacy, Vallabh Vidhyanagar, Gujarat.

Dr. Zenisha Vekariya MBBS, Pramukhswami Medical College, Bhaikaka University, Karamsad, Gujarat.

ABSTRACT

Purpose : To Find Prevalence of Dry Eyes in Medical Students and its Associations with Digital Screen Use Time. **Materials And Methods :** All participants filled the google form for demographic details and Ocular Surface Disease Index (OSDI) questionnaire & were called for TBUT test after consent. Collected data from OSDI and TBUT was used to establish the prevalence of dry eye disease and association of dry eyes with screen time. **Results :** Out of 496 volunteers who filled up the OSDI questionnaire, 431 volunteered for TBUT test. Based on TBUT scores, only 9 did not have dry eye making the prevalence of dry eye to be 98%. Based on OSDI scores, 44.8% had dry eye of various degrees. The TBUT reading significantly reduced with increased screen time beyond 6 hours. For concordance between OSDI and TBUT, kappa = 0.026 which implies there is poor agreement between the two. **Discussion :** It was found that more hours of visual display terminal exposure is a major etiological factor for dry eye disease. This underscores the need for health education and interventions. Therefore, it is recommended to reduce exposure to visual display terminals and use lubricating eye drops to prevent it. Further research on the efficacy of different lubricating eye drops could definitely provide valuable insights into tailoring preventive strategies and managing the varying degrees of severity associated with dry eye disease and its scope for interventional study.

KEYWORDS

Dry Eye Disease, Ocular surface disease index score, visual display terminals, computer vision syndrome

INTRODUCTION

Tear Film and Ocular Surface Society International Dry Eye Workshop – TFOS DEWS II stated that Dry Eye is a multifactorial disease of the ocular surface characterised by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyper osmolality, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles. Dry eye disease is characterized by a combination of watering, redness, dryness, pain, foreign body sensation, poor or fluctuating vision in severe cases.[1-2] Studies for this disease due to increased digital screen time were limited in the pre-pandemic era due to a small group being constantly exposed to Visual Display Terminals.[3] Post-pandemic digital screen use has been standardized in educational, recreational and occupational settings which increases the prevalence of dry eye disease. It is found more or less in the majority of the population irrespective of the age group with university students being one of the most vulnerable groups.[4-5] Covid-19 Pandemic has forced people to work from home which primarily includes the usage of Visual Display Terminals. Constant exposure to visual display terminals has many adverse effects on health like dry eye disease, neck pain, back pain, carpal tunnel syndrome, obesity, near work induced myopia to name a few. All these effects are out of scope of this study except dry eye disease (DED) which will be tested by a standardized Ocular surface disease index (OSDI) questionnaire and also by a test- Tear Film Breakup Time (TBUT) test. OSDI questionnaire is a reliable and valid instrument for measuring severity of dry eyes.[6] Aim of the study is to establish prevalence of dry eyes in medical students and also to establish the relationship between dry eye disease and screen time. It also finds associations between Ocular Surface Disease Index and Tear Film Breakup Time test (TBUT).

MATERIALS AND METHODS

Study Setting

A Medical college in rural western India.

Study Population

All medical students enrolled in the university at the time of study.

Inclusion Criteria

All Medical students above the age of 18 years, volunteering for the study, after a brief description.

Exclusion Criteria

Students with any significant Ocular Surface Disease (OSD), like Sjogren's syndrome, trachoma, chemical burns, chronic blepharitis or meibomitis.

Sample Size

This being an estimation problem, we included all medical students in the college for the study. At any given time, there are about 700 medical students in the setting considered. Assuming the prevalence of dry eye to be 50%, considering the acceptable difference to be 5% at 95% Confidence level, the calculated sample size is 385 which is a minimum required number. However, the sample size of this study is 496, which is more than the minimum required number.

Study Design

Observational - Cross-sectional analytical study.

Study Intervention

None

Methodology

Before the study an informed consent of all participants was taken. The approval of Institutional Ethics Committee was taken before the commencement of the study. After the participants having consented, they were given google form for demographic details and Ocular Surface Disease Index (OSDI) questionnaire which is a 12 item questionnaire designed to provide a rapid assessment of the symptoms of ocular irritation consistent with dry eye disease and their impact on vision-related functioning. It is a free to use questionnaire. It also takes into account environmental triggers. The questionnaire was taken up by them following which, a consent form was given before taking up the Tear Film Breakup Time (TBUT) test. Tear film breakup time test (TBUT) determines the stability of the tear film and checks for evaporative dry eyes. The test was performed by residents in the department of ophthalmology of the institute. For the test, they were instilled fluorescein dye with a disposable fluorescein dye strip and then examined on the slit lamp for the break up time of tear film. This test was to establish the relationship between the screen time and prevalence of dry eyes in the participants.

OSDI questions had a scoring from 0-5, the score was calculated by a formula – sum of scores for all answered questions multiplied by 100 divided by total number of questions answered multiplied by 4. All the scores were calculated and tabulated to form 4 groups – scores of 0-12 were considered normal, 13-22 were grouped as mild dry eye disease, 23-32 were grouped as moderate dry eye disease and 33-100 were grouped as severe dry eye disease. The results were used to establish a concordance between OSDI and TBUT. Compiled results from the OSDI were compared across all the screen time groups to find out the most common group of symptoms suffered by the students.

Collected data from the OSDI and TBUT were used to establish the prevalence of dry eye disease and association of dry eyes with screen time. TBUT test results were taken with a stopwatch for right and left eye separately. TBUT more than 10 seconds were considered normal. TBUT less than 10 seconds were taken positive for dry eye disease. They were further grouped for severity of dry eye disease – TBUT less than 2 seconds suffered severe dry eye disease, 2 to less than 5 seconds were considered moderate for DED, 5 seconds to less than 10 seconds were grouped as mild type of DED.

RESULTS

All 700 on campus students were approached of which 496 (70.85%) volunteered. Out of the volunteers, the response rate for the ocular surface disease questionnaire was 100% while 86% (431/496) turned up for the tear film break up time test (TBUT). There were 254 girls and 242 boys in the respondents with mean (SD) age as 20(1.28) years and (minimum, maximum) age as (17,27) years. Gender Observed (N) Mean age (SD) and (Minimum, Maximum). MALE (242) 20.05 (1.284) and (17, 23) and FEMALE (254) 20.0 (1.286) and (17, 27).

1) Gender Wise Average Screen Time Distribution

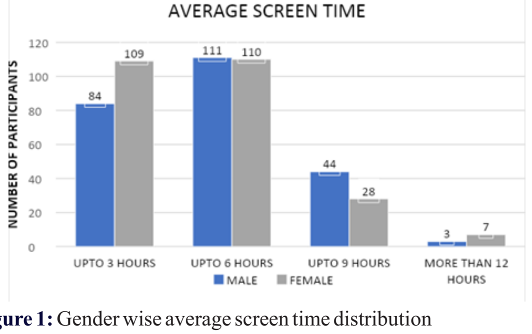

Figure 1: Gender wise average screen time distribution

The gender wise comparison of screen time from Figure[1] has a p value is 0.04 which signifies that females have significantly lesser hours of usage of screen time compared to males.

Table 1: Correlation between screen time and OSDI sub groups

Screen Time (N)	Ocular symptoms N (%)	Vision related functioning	Environmental triggers
Up to 3 hours (193)	133 (69)	116 (60)	108 (56)
Up to 6 hours (221)	172 (78)	147 (66)	165 (75)
Up to 9 hours (72)	61 (85)	44 (61)	55 (76)
More than 12 hours (10)	6	8	0
P value*	0.031^	0.316	<0.001^

*Chi square for trend analysis; ^significant association with increasing hours of screen time.

The 3 groups of symptoms were compared across the average screen time groups in Table[1]. It was found that ocular symptoms increased with more hours of screen time, vision related functioning remained comparable across different hours of screen time usage and more environmental triggers were seen with increased hours of screen time. The further analysis is done for 431 participants as the rest did not consent for the TBUT test.

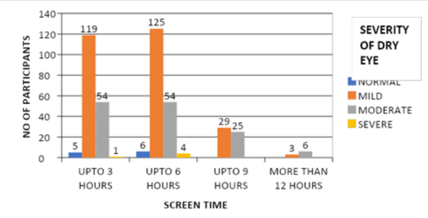

Figure 2: Severity of dry eye on the basis of right eye TBUT.

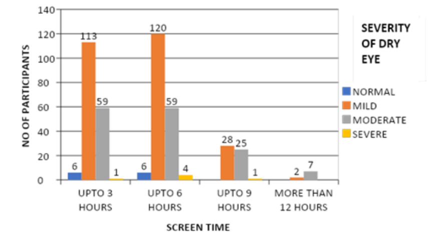

Figure 3: Severity of dry eye on the basis of left eye TBUT.

2) Association between screen time and tear film break up time (TBUT) as calculated using ANOVA

Table 2 : Association between screen time and TBUT

	Mean (SD) (seconds)	p value
Up to 3 hours	5.57 (2.08)	<0.0001
Up to 6 hours	5.63 (2.11)	
Up to 9 hours	4.78 (1.79)	
More than 12 hours	3.85 (1.92)	

TBUT test readings were tabulated for both eyes with the average screen time groups and p values in Table[2] and they were found to be less than 0.0001. It states that TBUT reading significantly reduced with increased screen time beyond 6 hours. Hence, those with longer hours of screen time have significantly lesser TBUT readings.

Table 3: Concordance between OSDI and TBUT

	OSDI calculated				
		Normal	Mild	Moderate	Severe
TBUT Calculated Both eyes	Normal	14	7	2	0
	Mild	317	145	45	32
	Moderate	145	75	43	26
	Severe	6	3	0	2

Calculated TBUT results for both eyes were compared with calculated OSDI scores to find concordance between OSDI and TBUT in Table[3]. It was found kappa = 0.026 which implies there is poor agreement between TBUT and OSDI. Here, the total comes out to be 862 with 431 participants. Left eye and right eye individual entries have been taken for TBUT and double entries of OSDI scores have been taken for their counterparts.

Based on TBUT scores, out of 431 participants, only 9 did not have dry eye (7 females and 2 males) – making the prevalence of dry eye to be 98% while based on OSDI scores, 55.2% participants had normal score while 44.8% had compromised score readings of various degrees.

DISCUSSION

The advent of computer screens and modern technology such as computers, tablets, smartphones and other electronic devices have revolutionised the world and benefited the society as these devices are easily accessible and available as an indispensable source of information. COVID-19 has disrupted campus life, lectures previously held face to face are now shifted to virtual screens. This has caused a significant rise in the screen time which is a major factor for dry eye disease. A study done on impact of COVID-19 and digital device related ocular health, it was found that out of 407 people, 93.6% reported an increase in screen time while 95.8% had at least one symptom related to digital device usage. Screen time post lockdown recorded was 8.65 $\pm$ 3.74 hours.[7] The central mechanism of dry eye disease is evaporative water loss leading to hyperosmolar tissue damage.[8] A greater increase in incomplete blinks was associated with worsening of the overall ocular surface symptoms leading to dry eye disease.[9] Hence, excessive use of these devices incurs substantial health hazards, which is very pronounced in students. This study enabled us to correlate common adverse effects like inflammation, abrasions of corneal surface and vision loss with long term continuous exposure to visual display terminals. Cessation of visual display terminals for 4 weeks in diseased group show improvement in both subjective symptoms and objective signs.[10] From the knowledge of participants, it was understood that not many are aware about the disease although they were suffering from it. About 20(4%) of the participants were aware and diagnosed dry eye disease and used lubricating eye drops or artificial tears. Many participants were suffering from superficial punctate keratitis – one of the early complications of severe dry eye disease if left untreated, were unaware until it was discovered on the slit lamp examination while doing the TBUT test.

In a study done in medical students in Peru during the COVID-19, prevalence was 70.9%.20 Prevalence from this study are 98% by TBUT scores and 44.8% by OSDI which is strikingly high as this is done post COVID-19 where learning was done in social confinement and there was migration from classroom teaching to digital remote learning. Hence, prolonged screen time, especially exceeding 6 hours a day, significantly escalated disease severity. A study done in 2021 for risk factors of Dry Eye Disease also found that screen time of more than 6 hours was a potential risk factor.[11] The study also highlights that the ocular group of symptoms and environmental triggers increased across groups whereas the vision related functioning was comparable among different screen time groups.

This study tries to establish an agreement between OSDI and TBUT, but kappa value of 0.026 signifies poor agreement. This study gives us prevalence, average screen time, severity of dry eyes based on TBUT as well as OSDI and concordance between OSDI and TBUT.

Notably, awareness of the disease was particularly low among the most vulnerable group. Hence, it was found that more hours of visual display terminal exposure is a major etiological factor for dry eye disease. This underscores the need for health education and interventions. Therefore, it is recommended to reduce exposure to visual display terminals and use lubricating eye drops to prevent this disease. Further research on the efficacy of different lubricating eye drops could definitely provide valuable insights into tailoring preventive strategies and managing the varying degrees of severity associated with dry eye disease and its scope for interventional study. Single centre study and shorter study period were some of the limitations of the study.

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