

Evaluation of Tear Film Status During Covid-19 Pandemic

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Abstract

Introduction: COVID-19 creates severe health hazards including many damaging effects in the eye. From last one year due to work / school from home through different video display terminals (VDT) have increased the display exposure time considerably. Which resulted in ocular surface diseases, namely Computer Vision Syndrome (CVS). This study aims to evaluate the tear film status of VDT users.

Methods: This cross sectional observational study was conducted in Combined Military Hospital, Jashore Cantonment from February 2021 to August 2021. 200 individuals were included in the study according to inclusion criteria and grouped into two according to daily VDT exposure time. The symptoms were evaluated; Schirmer test 1 was done and compared.

Results: The mean age of the participants was 27.5 +/- 4.61 years. Symptomatic participants were 142 (71%). The main symptoms reported were dry eye feeling 59 (41.54%), burning sensation 26 (18.31%), eye tiredness 22 (15.49%) and gritty feeling 35 (24.64%), while asymptomatic were 58 (29%). The value of Schirmer-1 test <10 mm was found in 114 (57%) and the rest 86 (43%) were >10 mm. Among the 114 participants of <10mm valued Schirmer-1 test 89/100 (89%) were prolonged VDT users and other 25/100 (25%) were non-prolonged VDT users. By the Schirmer-1 test among the symptomatic 71% (142) participants, the prevalence of tear film insufficiency was found 80.28% (114).

Conclusion: Prolonged VDT use (>4 hours a day) results in tear film instability. On the contrary non-prolonged VDT users remain relatively free from such risks. Study regarding Tear biochemistry can be undertaken taking a larger sample size.

Key Words: Prolonged VDT use, Schirmer-1 test, Tear film insufficiency.

Introduction

"Computer Vision Syndrome" (CVS), is defined by the American Optometric Association as a complex of eye and vision problems related to the activities which stress the near vision and which are experienced in relation to or during the use of computers.¹ It encompasses a group of visual symptoms which crop up from the extended viewing of the video display terminals (VDT), when the demands of the task exceeded the abilities of the viewer. Symptoms of CVS

includes; dry and irritated eyes, eye strain/fatigue, blurred vision, redness, burning sensation, excessive tearing, diplopia, headache, photophobia, glare and haloes, accommodative insufficiency and color desaturation.² It is estimated that nearly 60 million people suffer from CVS globally, and that a million new cases occur each year.³ From January 2020 the use of digital screen increased tremendously to meet the demand of official, educational, social works & many other business related works due to COVID-19 pandemic where lockdown was imposed in

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every country.

Dry eye syndrome (DES) is one of the most common problems affecting the general population and can cause problems that range in severity from mild irritation to debilitating condition, it describes the state of the ocular surface in response to a breakdown in the natural layer of tears that coats the front of the eye, called the tear film. Normally, this layer of tears is a stable, homogenous layer that not only provides the cornea and conjunctiva a healthy buffer from damage were it constantly exposed to the air, but this interface between the tear film and the air is also responsible for a significant amount of refraction. When the tear film becomes unhealthy, it breaks down in different places on the cornea and conjunctiva, leading not only to symptoms of irritation, but also to unstable and intermittently changing vision.

Estimation of the prevalence of eye problems associated with VDTs vary enormously, depending on the sample tested, research methods employed and study instrument used.⁴ In a review on CVS, studies estimate that the prevalence of CVS ranges from 75 to 90 % among VDT users.⁵

Many studies have shown that the prevalence of visual symptoms was higher among individuals who spend more than four hours working on VDT. CVS symptoms were reported more among the employees who spent six to eight hours on the computer daily (48.9%) as compared to 23.7% and 0.72% among those who spend three to five hours and one to two hours, respectively.⁶

Considering dry eye disease (DED) specifically in VDT users, a recent meta-analysis including data from 11,365 individuals estimated an overall prevalence of 49.5%, ranging from 9.5% to 87.5%.⁷ While these values appear higher than the 5%–33% DED prevalence observed in the general population.⁸ The recent Tear Film and Ocular Surface Society Dry Eye Workshop II report included detailed recommendations for diagnostic methodology.⁹ Key proposals were symptom screening with either the Ocular Surface Disease Index (OSDI) or Dry Eye Questionnaire (DEQ) instruments, followed by objective clinical tests in DED suspects, including tear breakup time, osmolarity, Schirmer test and ocular surface

staining with fluorescein and lissamine green.⁹

Schirmer-1 test measures both basal and reflex tear production. A strip of filter paper is placed on the lower eyelid margin without anesthesia, after 5 minutes, the strip is removed and the amount of wetting is measured in millimeters. Although this test is used frequently in the office, it has been found to lack accuracy and reproducibility; the same person's test results taken at the same time each day for several days can fluctuate widely and the mean Schirmer's test-1 results for normal individuals have been reported to range from 8.1 mm to 33.1 mm. In general, any value below 10 mm is considered abnormal. Many other ophthalmologists consider this test as a reasonable diagnostic tool only for severe dry eyes, where there is moderate reproducibility, with many practitioners only considering values of less than 5 mm to be significant.¹⁰

Materials and Methods

This cross sectional observational study was performed by purposive sampling technique from 07 February 2021 to 07 August 2021 in the Department of Ophthalmology, Combined Military Hospital, Jashore, Bangladesh. Total 200 Bangladesh Armed Forces personnel using VDTs e.g. computer, smart phone, tablets, laptops for >4 hours/day and 2 hours/day or less (they grouped as non-users) fulfilling the inclusion criteria's- both male and female, between 20 to 35 years of age, willing to give prior consent for evaluation and exclusion criteria's- having any associated ocular pathology, taking any systemic medication which causes dry eyes, contact lens wearers, history of previous ocular surgery, unwilling to participate in the study were taken for the study. Basic and reflex tear secretion test was done by Schirmer's test-1 and measured in mm per 5 minutes value below 10mm was considered as pathognomonic. As demographic variables age, gender, occupation and symptoms of dry eye were taken in consideration.

Results

Out of 200, 70% were male. Mean age was 27.5±4.61 (20-35 years). 62.5% were office clerks out of which 40% were prolonged VDT users. Shown in table 1, 2 &3.

Table 1: Age distribution of the participants:

Age Group (Years)	No of patients	Percentage (%)
20-27	104	52.0
28-35	96	48.0
Total	200	100.0
Mean (+/-SD)	27.5 (+/- 4.61)	

Table 2: Gender distribution of participants:

Gender	No of participants	Percentage (%)
Male	140	70.0
Female	60	30.0

Table 3: Distribution of participants according to VDT users and non-users:

Occupation	Frequency	Percentage	VDT Users	VDT non-users
Office Clerk	125	62.5	80 (40%)	45 (22.5%)
Other officials	75	37.5	20 (10%)	55 (27.5%)
Total	200	100.0	100 (50%)	100 (50%)

41.54% reported dryness followed by gritty sensation 24.64%. Eye tiredness and burning sensation were also reported. Shown in Figure 1.

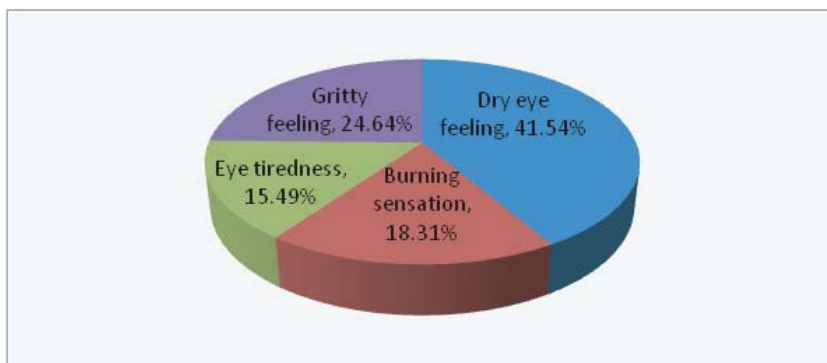


Figure 1: Pie chart showing Distribution of participants by presence of symptoms

Out of the 200 patients, 57% had a reading of less than 10 mm and the rest more than 10 mm. Shown in Figure 2.

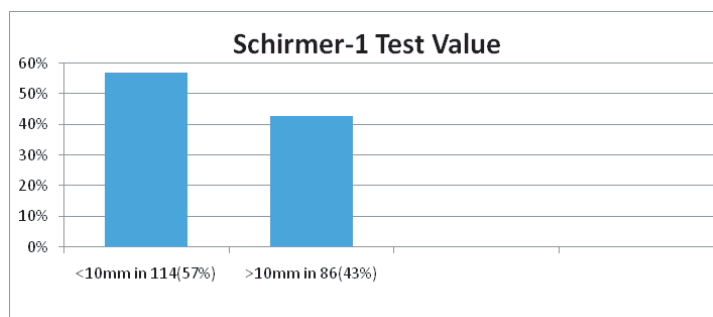


Figure 2: Distribution of participants in Column diagram according to Schirmer-1 test result value

In the prolonged VDT user group, Schirmer 1 value below 10 mm was found in 89%, where as it was only 25% in the non user group. Shown in Figure 3.

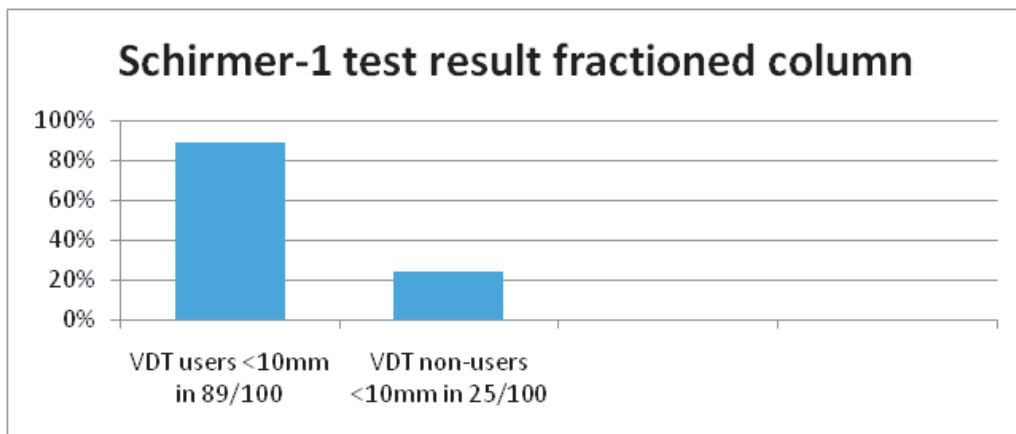


Figure 3: Fractioned column of Schirmer-1 test value in VDT users and non-users

Among the 142 patients with symptoms, almost 80% had a Schirmer 1 result of <10 mm, shown in table 4.

Table 4: Prevalence of tear film insufficiency among the participants with symptoms:

Symptoms	symptoms present	Tear film insufficiency (Schirmer-1 test <10mm)	
		N	%
Dry eye Feeling	59	48	81.35
Burning sensation	26	21	80.77
Gritty feeling	35	28	80.00
Eye tiredness	22	17	77.27
Total	142	114	80.28

Males (60.72%) were found to suffer from dry eye more than females (48.34%) shown in table 5.

Table 5: Distribution of tear film insufficiency among different Genders:

Age group (years)	Presence of dry eye					
	Dry eye		Normal		Total	
	N	%	N	%	N	%
Male	85	60.72	55	39.28	140	100
Female	29	48.34	31	51.66	60	100
Significance	X ² = 2.6267, p= 0.105078					

Tear film insufficiency was noted significantly in the 28-35 years age group, as shown in table 6.

Table 6: Distribution of tear film insufficiency among different age groups:

Age group	N	Mean (+/- SD) of Schirmer-1 test value	p value
20-27	104	11.06 (+/- 3.08)	0.0001
28-35	96	9.01 (+/- 2.48)	

Discussion

Every electronic device including computer, laptop, smart phone and tablets produce a form of electromagnetic field (EMF). This EMF is actually a non ionizing radiation which release energy from these electronic devices that is not enough to ionize the atoms, hence instead of removing electrons it only excites the electrons. This energy brings negative effects to human health. By using computers, laptops or even sitting in computerized workplaces an individual is exposed to the dangerous waves.⁶

The popularity of personal VDT has increased in recent years with the greater involvement of internet in our daily lives. In 1994, it was estimated that 75% of all jobs would involve VDT usage by the year 2000.¹¹ Many people have begun to spend more time in front of VDT devices at work arena and at home also. Thus prolonged VDT exposure results in many ocular hazards.¹²

Abida Ellahi, M. Shahid Khalil, Fouzia Akram¹³ showed in their study that, there is an association between frequency of VDT use and computer vision syndrome among computer users. They also reported that users who use VDT daily for more than 4 hours are more likely be subjected to the risks of health disorders. Gauri Shankar Shrestha, Fatema Nestha Mohamed, Dev Narayan Shah¹⁴ stated the use of VDT more than 6 hours/day causes computer related health problems. In our study we have taken VDT use for more than 4 hours on daily basis in office work arena and compared with less than 4 hours use.

In this study, the age groups of the participants were ranging from 20 to 35 years with the mean age of 27.5 (+/- 4.61) years. Among the participants, 52.0% was within 20 to 27 years of age group and 48.0% was within the ranges between 28 to 35 years of age group. Persons over 35 years of age, there is a chance of many ocular problems; like early presbyopia and other aging changes which may affect the final outcome, so they were not included in our study.

Among the symptomatic patients, most common symptom was dry eye feeling in 59(41.54%)

followed by burning sensation in 26(18.31%), eye tiredness in 22(15.49%) and gritty feeling were in 35(24.64%). In Cihan Unlu et al study¹⁵ VDT use was found to be one of the most common causes of dry eyes and the rate of dry eye sensation (37.44%) is similar to our findings. Gauri Shankar Shrestha, Fatema Nestha Mohamed, Dev Narayan Shah¹⁴ reported that most common symptoms among VDT users were eye tiredness. Alireza Deghani et al¹⁶ reported that burning sensation was the most common symptom. Besides dry eye feeling and burning sensation, another important complaint we found that was 22(15.49%) of the participants suffered from asthenopic symptoms like eye tiredness. It is probably related to the pseudo-myopic condition resulting from prolonged near accommodation with VDT use. This results in the asthenopia. Some investigators reported temporary myopia among the digital screen users.¹⁶

We found tear film insufficiency (according to Schirmer-1 test less than 10mm) present in 57% cases. Cihan Unlu et al¹⁵ found prevalence of tear film insufficiency in 42%, which is higher than normal population.¹⁶ Nakaishi H and Yamada Y¹⁷ reported dry eye in more than 30% of VDT users. This problem was explained as a cause of close distance work with monitors that made users concentrate on VDT and eyes exposure to fresh air increases. Moreover, the VDT usually renders prolonged opening of palpebral fissure resulting in exposure of ocular surface causing increased evaporation of tear film.¹⁶ Another important factor was described by Gauri Shankar Shrestha et al¹⁴ that CVS is caused by decreased blinking reflex while working long hours focusing on VDT screens. The normal blink rate in human being is 16-20 per minute, but this decreases to as less as 6-8 blinks/minute for persons working on the VDT screens. This leads to dryness of eyes.

There is significant variation of tear film insufficiency among symptomatic persons. Among the symptomatic patients Schirmer-1 test value <10mm in 48/59 (81.35%) dry eye feeling, burning sensation in 21/26 (80.77%), eye tiredness in 17/22 (77.27%) and gritty feeling in 28/35

(80.00%). Schaumberg DA et al¹⁶ found tear film insufficiency to be more common among the participants complaining of dry eye feeling. But Bartlett JD et al¹⁸ reported poor relationship between the symptoms and results of diagnostic tests in patients with dry eye syndrome. They found out some patients being symptoms free although Schirmer-1 value was below 5mm. On the other hand Schirmer-1 test alone does not seem to be a good test for diagnosis of dry eye syndrome because it might result in misdiagnosis of dry eye patients as being normal.¹⁵ It is challenging to diagnose and grade dry eye syndrome and clinicians should evaluate ocular history, symptoms, signs and test results together.

In this study, the value of Schirmer-1 test was <10mm in 114(57%) participants, while >10mm in 86(43%) participants. Among prolonged VDT users the value was <10mm in 89/100(89%) and in non-users <10mm was in 25/100(25%). Thus tear film insufficiency clearly varies among VDT users and non-users. Among the 140 male participants, 85(60.72%) had tear film insufficiency and 55(39.28%) were in normal range. Among 60 female participants, 29(48.34%) had tear film insufficiency and 31(51.66%) were normal. Although the prevalence of dry eye was higher among the male compared to female, this difference was not statistically significant ($p>0.05$). Schaumberg DA et al¹⁶ found no significant difference among different genders. But in another study Khurana AK¹⁹ found dry eye to be more common in females. Abida Ellahi¹³ found males are more experiencing digital screen related disorders than females. It was also found that tear film insufficiency was significantly ($p<0.05$) more in the 28-35 years age group. Among many different causes of dry eyes, aging process is one of the most common reasons¹⁹ which is similar to our findings.

Conclusion

Prolonged VDT use (>4 hours a day) results in tear film instability. On the contrary non-prolonged VDT users remain relatively free from such risks. Schirmer 1 test can be an effective and fast aid to detect tear film insufficiency. Our study

was limited by small sample size, limited duration of six months and using a single diagnostic tool. Study regarding Tear biochemistry can be undertaken taking a larger sample size.

Conflict Of Interest

No financial interest or any conflict of interest to declare.

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