

Research Article

The Prevalence of Dry Eye in Young Individuals Exposed to Visual Display Terminal

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Abstract

Introduction: Dry eye is an emerging health hazard among the young individuals exposed to Visual Display Terminals (VDT). Globally personal computers are one of the commonest office tools. This study was conducted to observe the incidence with severity of dry eye and risk factors associated in young population.

Methodology: In this observational study, 1000 patients exposed to VDT were randomly selected from outpatient department or from different institute of medical and engineering colleges screened for dry eye. Candidates were further categorized into mild, moderate, severe grades according to Ocular Surface Disease Index (OSDI) questionnaire and underwent Schirmer's and Tear film breakup time test.

Result: Out of 1000, 29.2% were found to be dry eye patients with equal gender distribution. Incidence was more in office workers (42.16%) out of which 34.1% belonged to the engineering stream. Severity of dry eye was directly proportionate to the duration of exposure to VDT. Associated risk factors like smoking (62.12%) and summers (17.1%) were seen predominantly.

Conclusion: Diagnosis of dry eye is over looked as patient is unaware of the minor symptoms. Young population using computer continuously for more than 4 hours are at higher risk of developing dry eyes. Therefore, detecting disease is important to prevent progression by proper counselling and awareness program.

Keywords: Young population; Visual display terminal; Dry eye disease; Ocular surface disease index; Schirmer's test; TBUT test

Introduction

Dry-eye syndrome is a chronic disorder of the ocular surface that can substantially affect the quality of life of an individual. It is defined as a multi-factorial disease of the tears and ocular surface that results in symptoms of discomfort, Visual disturbance, and tear-film instability, with potential damage to the eye [1]. One of the etiology of dry eye is visual Display Terminal (VDT) use. Working on a computer monitor, laptops or digital displays for hours has become a part of the modern work day [2]. Many such individuals then experience decreased ability to perform certain activities such as reading, driving, and computer related works, which require visual attention affecting their quality of life [3]. However, their usage, even for 4 hours per day, has led to a health risk of developing dry eye [4]. Many times, symptoms are ignored by an individual and detected only on ophthalmic examination. Therefore this study was conducted in young population who were spending most of their time on VDT, to understand the prevalence, severity of dry eye and risk factors associated with it.

Materials and Methods

This observational study was conducted in the young age group of 19-35 years old who were randomly selected from different institute

of medical, engineering, information technology and attending ophthalmic clinics without any symptoms of dry eye. They were divided into three groups based on age: 19-24 years, 25-30 years, and 31-35 years. A detailed comprehensive history was obtained pertaining to symptoms of dry eye along with duration of exposure to Visual Display Terminals (VDT) like television, laptop, smart phones, and computers. The Ocular Surface Disease Index (OSDI) questionnaire was administered by a single examiner. The questions were explained to the patients in their local language. The OSDI questionnaire has 12 items, with each question given a score ranging from 0 (none of the time) to 4 (all of the time). The patients had to assign a score based on the duration of symptoms experienced over the preceding week. The final score was calculated by multiplying the sum of all the scores by 25 and then dividing the total by the number of questions answered. Scores range from 0 to 100, they represented as 0-12 normal, 13-22 mild, 23-32 moderate, and ≥ 33 severe DED (Figure 1).

All patients >13 OSDI score underwent Schirmer's and Tear film break up time test. Schirmer's test was performed with whatson filter paper 42 where wetting of more than 10 millimeters (mm) of tears on the paper was considered normal and less than 10 mm is abnormal which was again grouped into 2, >5 mm and <5 mm.

The production of tear film was checked by Tear Breakup Time (TBUT). To measure TBUT, ocular surface along with the tear film was stained with fluorescein and the patient was asked not to blink while the tear film is observed on slit lamp under a broad beam of cobalt blue illumination. The TBUT was recorded as the number of seconds that elapse between the last blink and the appearance of the first dry spot in the tear film. A TBUT value documented as >5 second and <5 second.

Results

A total of 1000 patients who were agreed to participate in the study were ordered the OSDI questionnaire, and their demographic

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profile was elaborated in Table 1. Mean age of the study population was 28 years. Maximum number of patients were in age group of 19 to 24 years.

Table 2 shows severity of dry eyes as per OSDI score 292 detected as dry eye patients and 1 grouped into 3 age groups in which incidence of dry eye was maximum in group A (19-24 years) whereas severity of dry eye was found to be more in Group B (25-30 years).

The incidence of dry eye in both the genders was almost equal as mentioned in the Table 3.

Table 4 shows the incidence and severity of dry eye who works in different field of professions. It was found to be more in office workers (32.06% out of 446 patients) who works more on VDT gadgets. Mild grade of dry eye was recorded almost in all profession whereas moderate grade was more in medical students and severe was in engineers.

Incidence of dry eye was detected which directly proportionate to exposure time to VDT out of which maximum cases 131 (4.6%) were recorded as mild form (Table 5).

Table 1: A total of 1000 patients who were agreed to participate in the study were ordered the OSDI questionnaire, and their demographic profile was elaborated.

Age	No. of Patients (%)	Mean OSDI Score
19-24	565 (56.5%)	20.09
25-30	321 (32.1%)	28.45
31-35	114 (11.4%)	23.02

Table 2: Severity of dry eyes as per OSDI score 292 detected as dry eye patients.

Age (Yrs of Age)	Dry Eye	Mild	Moderate	Severe
19-24 (Group A)	146	76 (5.2%)	22 (1.5%)	48 (3.2%)
25-30 (Group B)	92	33 (3.5%)	12 (1.3%)	47 (5.1%)
31-35 (Group C)	54	18 (3.3%)	31 (5.7%)	5 (0.9%)

Table 3: The incidence of dry eye in both the genders.

Sex	No Of Patients	Dry Eye
Male	676 (67.6%)	193 (28.5%)
Female	324 (32.4%)	99 (30.5%)

Table 4: Incidence and severity of dry eye who works in different field of professions.

Occupation	Total No of Patients	Dry Eye	Mild	Moderate	Severe
Office Workers	446	143 (32.06%)	38 (2.6%)	40 (2.7%)	65 (4.5%)
Engineers	341	97 (28.44%)	21 (2.1%)	21 (2.1%)	55 (5.6%)
Medical Students	213	52 (24.41%)	12 (2.3%)	16 (3.0%)	24 (4.6%)
		292 (29.2%)	71 (2.4%)	77 (2.6%)	144 (4.9%)

Table 5: Incidence of dry eye was detected which directly proportionate to exposure time to VDT out of which maximum cases 131 (4.6%) were recorded as mild form.

Duration of Exposure To VDT	No. of Patients	Dry Eye	Mild	Moderate	Severe
4-6 Hr of Exposure	276	48 (17.39%)	26 (5.4%)	8 (1.6%)	14 (2.9%)
6-8 Hr of Exposure	282	55 (19.5%)	29 (5.2%)	15 (2.7%)	11 (0.2%)
8-10 Hr of Exposure	323	123 (39.7%)	58 (4.7%)	32 (2.6%)	33 (2.6%)
10-12 Hr of Exposure	119	55 (46.21%)	18 (3.2%)	7 (1.2%)	30 (2.5%)
		281 (28.1%)	131 (4.6%)	62 (2.2%)	88 (3.1%)

Have you experienced any of the following during the last week?	All of the time	Most of the time	Half of the time	Some of the time	None of the time
1. Eyes that are sensitive to light? ..	4	3	2	1	0
2. Eyes that feel gritty?	4	3	2	1	0
3. Painful or sore eyes?	4	3	2	1	0
4. Blurred vision?	4	3	2	1	0
5. Poor vision?	4	3	2	1	0
Subtotal score for answers 1 to 5					(A)

Have problems with your eyes limited you in performing any of the following during the last week?	All of the time	Most of the time	Half of the time	Some of the time	None of the time	N/A
6. Reading?	4	3	2	1	0	N/A
7. Driving at night?	4	3	2	1	0	N/A
8. Working with a computer or bank machine (ATM)?	4	3	2	1	0	N/A
9. Watching TV?	4	3	2	1	0	N/A
Subtotal score for answers 6 to 9					(B)	

Figure 1: OSDI Questionnaire.

According to the results of OSDI questionnaires, candidates with positive OSDI score underwent Schirmer's 1 and 2 tests. The Schirmer's 1 was positive in 5% of eyes (10 mm of wetting in whatson filter paper 42 without topical anaesthesia) whereas Schirmer's 2 was positive in 3.6% (10 mm of wetting in whatson filter paper 42 with topical anaesthesia) (Table 6) (Figure 2 and 3).



Figure 2: Evaluation of dry eye by Schirmer's test.

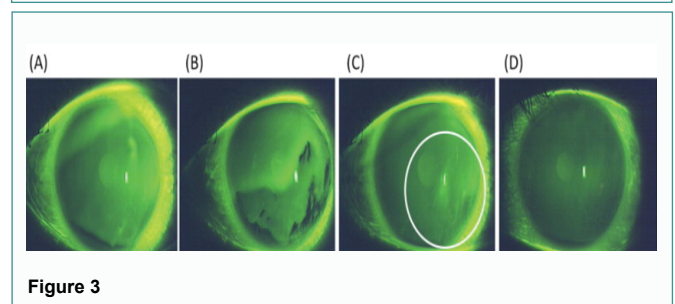


Figure 3

Table 7 shows the TBUT values positive in 165 patients (16.5%) out of 292, which were selected as per OSDI questionnaire.

On comparing relation between Schirmer's and TBUT tests, TBUT >5 sec and Schirmer's >5 mm was higher (14.2%) which makes the result significant as shown in Table 8.

The area of study was one of the key places for tobacco addiction and the study population thus comprises of tobacco addicts either in the form of chewing, snuffing or smoking. However out of all the addictions consumption of alcohol was higher but prevalence of dry eye was more in smokers (62.12% out of 132 smokers) (Table 9).

In Table 10 we compared the DED in summer, rainy, autumn season in which overall prevalence of dry eye was slightly more in summers whereas incidence and severity was found to be more during autumn.

Table 6: According to the results of OSDI questionnaires, candidates with positive OSDI score underwent Schirmer's 1 and 2 tests.

Schirmer's Test	>5mm	<5mm	Total
Schirmer's 1	52 (17.80%)	96 (32.87%)	148 (50.68%)
Schirmer's 2	70 (23.97%)	36 (12.32%)	106 (36.30%)
	122 (41.78%)	132 (45.20%)	254 (86.98%)

Table 7: The TBUT values positive in 165 patients (16.5%) out of 292, which were selected as per OSDI questionnaire.

Tbut	No. of Patients
<5SEC	76 (5.2%)
>5SEC	89 (5.3%)

Table 8: On comparing relation between Schirmer's and TBUT tests.

Tbut Value	Schirmer's Test	<5mm	>5mm
<5SEC		69 (6.1%)	57 (4%)
>5SEC		43 (3.8%)	85 (5.9%)
Total		112 (4.4%)	142 (5.5%)

Table 9: The area of study was one of the key places for tobacco addiction and the study population thus comprises of tobacco addicts either in the form of chewing, snuffing or smoking.

Addictions	No. of patients	Dry eye
Smoking	132	82 (62.12%)
Tobacco chewing	23	2 (0.08%)
Alcohol	178	32 (17.97%)

Table 10: The DED in summer, rainy, autumn season in which overall prevalence of dry eye was slightly more in summers whereas incidence and severity was found to be more during autumn.

Seasonal Variation	Total no. of patients	Mild dry eye	Moderate dry eye	Severe dry eye	Total
Summer	566	21 (3%)	11 (1%)	65 (1.1%)	97 (17.1%)
Rainy	321	46 (1.4%)	22 (6.8%)	12 (3%)	80 (2.4%)
Autumn	113	54 (4.7%)	23 (3%)	20 (2.3%)	97 (8.5%)
		121 (12.1%)	56 (5.6%)	97 (9.7%)	274 (27.4%)

Discussion

The use of computers and digital electronic devices for both vocational and non-vocational activities including e-mail, internet access and entertainment has become universal in modern society. The watching of digital electronic screens is no longer restricted to desktop computers located in the workplace. Today's visual requirements may include working on laptop, computers, electronic book readers, smart phones and other electronic devices either in the workplace, at home or in the case of portable equipment, in any location [5].

Moreover, blue light emission from VDTs can suppress the synthesis of melatonin, particularly in young population. Decrease in melatonin level might lead to disruption of sleep cycle which eventually will lead to affect their profession which needs proper visual attention [6]. The effect of long term use of devices on the ocular surface in the form of dry eye is well known. Many times clinical findings may be present but symptoms are minor or negligible [6].

To recognize the effect of exposure to VDTs, study was conducted in 19-35 years of age in absence of symptom of dry eye. They were subjected to OSDI questionnaire and 292 (29.2%) were diagnosed as dry eye in which age of 19-25 years of age group was more prevalent

for dry eye(14.6%).In best of our knowledge no other research study has been conducted in this specific age group. There are studies in all age group (21-75 years) and found more predominance in old age group [7].

On gender distribution, other studies found menopausal women responsible for hormonal changes and dry eye symptoms [8,9] whereas in our study no gender discrimination was seen, incidence was equal in both genders, may be due to inclusion of specific age group.

Candidates with OSDI >13, subjected to detailed history including duration of exposure of hours to VDT in a day in addition to complete ocular examination. They were divided into four groups as per duration of exposure and it was observed that severity of the dry eye was more in 10-12 hours of exposure (2.5%). The duration of exposure is a high predictor of the development of VDT induced dry eye, even if the exposure has been discontinued [10]. Other studies have found significance between time exposed to VDTs and development of dry eye due to VDT in a duration of 6 or 7 hours of exposure [11].

This dry eye prevalence in our study was more in office workers (32.6%) than engineers and medical students which are in accordance with [12,13]. On comparing the seasonal variation it is seen to be more in summers (20.21%).This can be correlated with effect of working in air conditioner in summers but in Miami study they have seen the prevalence of dry eye more in winters and spring [14].

Our study showed that Schirmer's 1 test after topical anaesthesia with 0.5% proparacaine hydrochloride eye drops was more objective and reliable than that without anaesthesia in reflecting the status of dry eye. In other studies, only few subjects (5%) had a Schirmer's test result of <10 mm [15]. Reported that Schirmer's test results changes according to reflex epiphora, therefore, there was no correlation with symptoms of dry eye in their study.

Overall in our 12 months of duration of study no gender predominance was seen however incidence was higher in 19-24yrs of age group whereas severity of dry eye was more in 31-35 years of age group who were office workers and exposed to VDT for more than 10-12 hours of duration daily. The total time of daily VDT work and the VDT employment duration were not specified in most studies. Only six studies [16-21] reported the daily duration of VDT use and only four of these reported the prevalence of dry eye related to duration of VDT work. The cut-off used for the daily VDT working time was 4 hour in three of these studies and 8 hour for another.

Out of all the addictions, smoking (62.2%) was found to be an important associated risk factor for dry eye. Other studies have also related an increased prevalence of dry eye among smokers [22]. The reason for this is not clearly known, but smoking is indeed a suggested risk factor which needs to be further verified and quantified.

In this duration of study we have found that asymptomatic individuals can have dry eye due to long duration of exposure to VDTs from mild to severe in grade for which we have even counseled and described the commonly used distances for the current electronic forms of written communication. Mobile phones at a distance of one foot (about 30 cm), two feet (about 60 cm) to two and a half feet for desktop devices and laptops, and, and 10 feet (about 3 meters) for the television screens. Use of the computer monitor in an ergonomic position - one arm distance or 40 inches away with a downward gaze

of 14° or more appears to help relieve the symptoms of computer related dry eye.

Conclusion

Dry eye disease prevails to a greater extent even in a healthy young population. In VDT users it has an important consequence for employees because it causes distress at work and may compromise workplace productivity. Therefore, regular screening, awareness about VDT induced dry eye, proper counselling is necessary in this class of population to minimize VDT induced dry eye and further complications.

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