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ORIGINAL RESEARCH

A cross sectional observational study on incidence of dry eye disease and its association with computer exposure time among it professionals

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ABSTRACT

Aim: To study the incidence of dry eye disease (DED) and its association with computer exposure time (CET) among IT professionals. Material/Methods: A cross sectional study was performed on 138 IT professionals who met inclusion criteria. Details regarding type of VDT use and duration of exposure to VDT (hours per day) were noted. A standard computer vision symptom scale (CVSS17) questionnaire was applied to all subjects. DED evaluation was performed which included tear film breakup time (TBUT), Schirmer's test and ocular surface staining (OSS) with oxford grading scale. Results: Among 138 subjects (54.3% females) average age 28.7±7.8 years. Majority subjects used laptop (n=56, 40.6%), had CET ≥8 hours/day (n=92, 66.7%), Level 3 CVS (n=47, 34.1%) according to CVSS17 score. Cumulative CET showed statistically significant correlation with DED. Ocular surface damage and signs of DED was evaluated. Overall, in our study we found 71(51.4%) showed positive OSS, 89(64.5%) subjects had TBUT ≤10 seconds and 39(28.3%) subjects had Schirmer's value ≤ 10 mm. Conclusion: We found a higher incidence of DED and CVS among IT professionals with prolonged exposure time to VDT as major risk factor.

Keywords: DED, IT professionals, Computer vision syndrome.

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INTRODUCTION

Computer vision syndrome (CVS) is a combination of ocular and visual symptoms developed due to prolonged use of visual display terminal like desktop, laptop and ipad.

Globally with the increase in use of visual display terminal (VDT) there is large number of patients presenting with complaints of computer vision syndrome (CVS), low back ache, headache and psychological stress. This deteriorates the quality of work and one's own life. CVS is a combination of ocular and visual problems associated with the prolonged use of VDT like eye strain, burning sensation, redness of eyes, dry eyes and blurred vision. It may develop when a computer is used >3 hours per day or >30 hours per week. [1,2] CVS can be assessed and diagnosed using various standardized questionnaires like CVS-Q, CVSS17 etc. [5] The prevalence of CVS has been reported around 70% among office workers, but varies globally based on the type of work performed. [3,4] Dry eye disease is seen as common ocular surface disorder among subjects with prolonged screen time. Hence, prolonged computer exposure time (CET) being major risk factor, we studied the association between computer exposure time (CET) and DED among these subjects. DED is evaluated to look for ocular surface damage by doing ocular surface staining (OSS), amount of tear production (Schirmer's test) and tear film instability (Tear film breakup time-TBUT).[6]

MATERIALS AND METHODS

A cross sectional observational study was conducted at Department of ophthalmology at Tertiary eye care centre over a period of one year jan2021 to jan 2022,138 IT professionals aged between 18-45 years of either sex who had history of prolonged screen time and / or CVS symptom were included in our study. Patients with previous diagnosis of dry eye with or without treatment, prolonged use of topical eye medication, ocular comorbidities like pterygium, conjunctivitis, keratitis, blepharitis, facial nerve disorders, previous eye surgery, contact lens wearers, pregnancy, menopausal or hormonal replacement therapy, systemic diseases and systemic medication causing DED were excluded from our study. Patients exposed to mobile screen time more than 3hours were excluded from the study.

Informed consent was obtained from all eligible subjects.

Institutional Ethical committee approval was obtained for the study and we adhered to the tenets of Declaration of Helsinki.

Details regarding CET, spectacle use and type of VDT usage were noted. CET in hours per day, days per week and total years of exposure were noted. This data was used to calculate the total cumulative hours of exposure for each subject. Association between total cumulative hours of exposure and DED was determined statistically. A standard computer vision symptoms scale 17 (CVSS17) questionnaire was used to determine level of CVS in all subjects. A total score obtained is compared in an equivalence table to obtain the level of symptoms. (Range = level 1 to 6)[5]

Level of ocular surface damage was determined after ocular surface staining (OSS) in which corneal and conjunctival staining was done using fluorescein and lissamine green dye respectively. This OSS pattern was assessed and graded using oxford grading scale which ranges from 0 to V grades (absent dry eye to severe dry eye) depending on intensity of punctate staining displayed pictorially across a combination of cornea and conjunctiva is used. [6]

DED evaluation using tear film break up time (TBUT) and Schirmer's test was performed. Fluorescein-stained tear film of eye is examined using cobalt blue filter of slit lamp, to look

for the appearance of first dark spot over cornea after complete blink. An average of 3 reading was recorded. TBUT ≤10 seconds was considered diagnostic. Schirmer's test was performed using Whatmann No 41filter paper strip. This strip was inserted at the junction of lateral one third and medial two thirds of lower lid margin into the lower conjunctival sac of both eyes, after folding it at the marked site. Wettability of the strip of ≤ 10 mm at the end of 5 minutes was considered diagnostic.[6]

The Statistical software namely SPSS 22.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc**.** Fisher Exact Test and Pearson's correlation were used to find statistical significance and the correlation between two variables.

RESULTS

Among 138 IT professionals who met inclusion criteria, 63(46%) were males and 75(54%) were females (fig 1).

Majority of subjects belonged to the age group of 18-27 years (n=69, 50%). The Mean age was 28.7 years ± 7.8 years (SD) (range 18-45 years) (fig 2& table 1).

Out of VDT usage

Laptop (40.6 %) was predominately used type of VDT, 33.3% subjects who used desktop while 23.9% subjects used more than one VDT9(table 2).

Fifty-eight (42%) subjects used spectacles (fig 3 &table3).

VDT use for ≥8 hours/day was seen among 66.7% subjects. (fig 4) .

On evaluating for symptoms using CVSS17 questionnaire (table 4& fig 5), we found 126 subjects (93.3%) had different levels of CVS and majority (34.1%) had level 3 CVS (p<0.001).

Seventy-one subjects (51.4%) showed different levels of positive OSS of which, majority had mild grade (19.6%) of OSS (table 5 &fig 6). Eighty-nine (64.5%) subjects had TBUT ≤10 seconds (p <0.001) and 58(42%) subjects had Schirmer's ≤ 10mm. (p <0.001) (table 6 &fig 7).

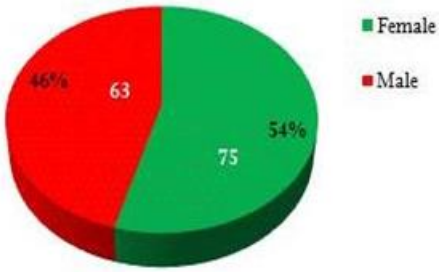

Figure 1: showing sex distribution

Table 1: showing age distribution frequency in study group

Age in Year	No. of IT Professionals	%
18-27	69	50.0
28-36	40	29.0
7-45	29	21.0
Total	138	100.0

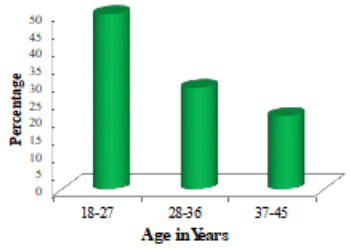

Figure 2: Showing age distribution of the patient

Table 2: showing Association of VDT according to computer Exposure time of IT professionals

VDT	Total
1	56(40.6%)
2	46(33.3%)
3	28(20.3)
4	8(5.8%)
1,4	18(13%)
2,4	15(10.9%)
Total	138(100%)

1→LAPTOP
2→DESKTOP
3→BOTH
4→IPAD

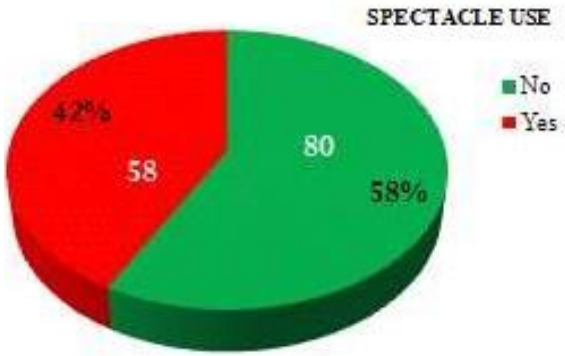

Figure 3: Association of spectacle use with Computer Exposure Time of IT professionals

Table 3: Association of spectacle use with Computer Exposure Time of IT professional

Variable	COMPUTER EXOPSURE TIME PER DAY			Total	P value
SPECTACLE USE	Less than 4 hrs	4-8hrs	>=8hrs		
No	4(100%)	22(52.4%)	54(58.7%)	80(58%)	0.199
Yes	0(0%)	20(47%.6)	38(41.3%)	58(42%)	
Total	4(100%)	42(100%)	92(100%)	138(100%)	

Chi-Square Test/ Fisher Extract Test

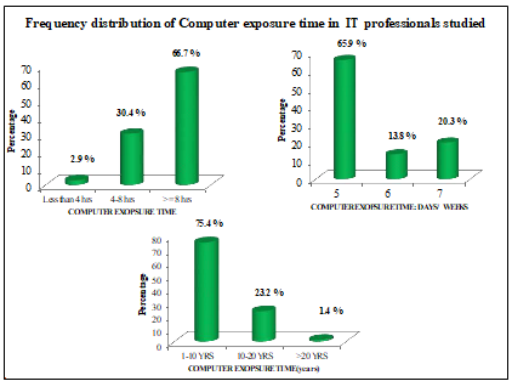

Figure 4

Table 4: Frequency distribution of CVSS17 level in IT professionals

CVSS17 LEVEL	CVSS17 SCORE	Total
0	<17	12(8.7%)
1	17-22	22(15.9%)
2	23-28	31(22.5%)
3	29-35	47(34.1%)
4	36-42	24(17.4%)
5	43-53	2(1.4%)
	Total	138(100%)

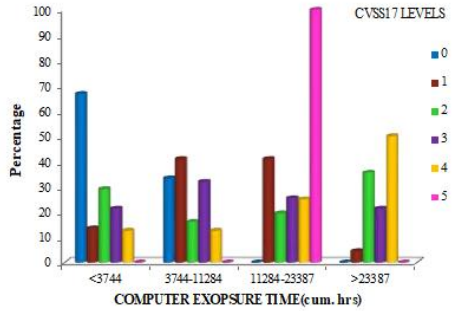

Figure 5: Frequency distribution of CVSS17 level in IT professionals

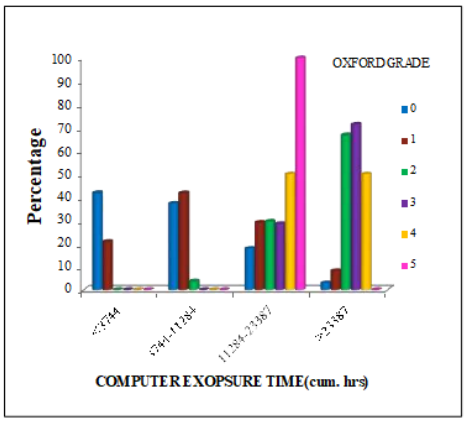

Figure 6: Frequency distribution of oxford grading of OSS in IT professionals

Table 5: Frequency distribution of oxford grading of OSS in IT professionals

OXFORD GRADE	Total
ABSENT DRY EYE/NORMAL	67(48.6%)

MINIMAL DRY EYE	24(17.4%)
MILD DRY EYE	27(19.6%)
MODERATE DRY EYE	14(10.1%)
MARKED DRY EYE	4(2.9%)
SEVERE DRY EYE	2(1.4%)
Total	138(100%)

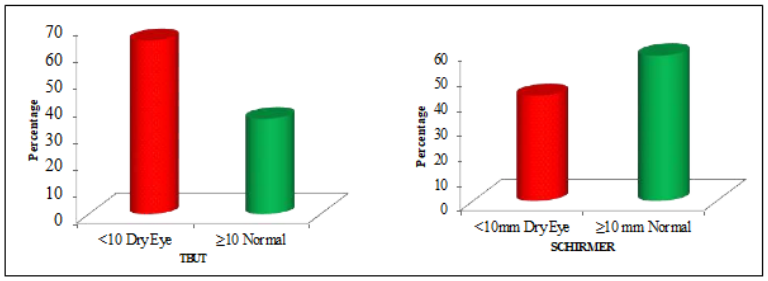

Figure 7: Showing results of TBUT & Schirmer test in study participants

Table 6: Showing results of TBUT & Schirmer test in study participants

	TBUT	**SCHIRMER**
<10 Dry Eye	89(64.5%)	58(42%)
≥10 Normal	49(35.5%)	80(58%)
Total	138(100%)	138(100%)

PERSON CORRELATION		
COMPUTER EXOPSURE TIME(cum.hrs)VS	**r Value**	**P value**
AGE IN YEAR'S	0.816	<0.001**
CVSS17 SCORE	0.362	<0.001**
TBUT	-0.564	<0.001**
SCHIMER	-0.628	<0.001**

DISCUSSION

In our study, among 138 IT professionals who met inclusion criteria, mean age ± SD was 28.70 years ± 7.78 years and predominantly were females (n=75, 54%). Most commonly used VDT was laptop (40.6 %). We found that the average CET was 8.00 hours ± 2.45 hours per day which was significant enough to cause some degree of DED in 71.74% subjects. CET of ≥8 hours/day was seen in 66.7% subjects. Majority (65.9%) subjects were exposed to VDT for 5 days a week and 75.4% subjects had prolonged screen time for less than 10 years. Rahman and Sanip et al, in their study reported that those respondents who used computer for more than 5 hours/day were at higher risk of developing CVS.[7]

We also found that, age, female sex, prolonged CET were important risk factors for developing some degree of CVS and DED. In a study done by Salinas-Toro D et al, in 2021 on 1797 respondents also found female gender (69.9%) and prolonged VDT hours as risk factors for increase in DED symptoms. ($P< 0.001$)[8]

In our study population 42% subjects used spectacles while working with VDT. However, we found no statistical significance between DED and spectacle use (P =0.199).

In a study done by Redondo B et al, in 2020 on 19 young adults were allowed to read on computer screen for 30 minutes with and without blue-blocking filter on two separate days.

They found that blue-blocking filters had no effect on either accommodation or visual symptoms related to DED. [9] Several other studies showed similar results. [10, 11, 12]

A majority of subjects (n=47, 34.1%) had CVS symptom Level 3 according to CVSS17 questionnaire in our study. Cumulative hours of computer exposure showed a statistically significant positive correlation with CVSS17 levels (P <0.001). Another study was done by Gammoh Y. Cureus in 2021 among 382 students, in which all subjects were assessed for CVS using computer vision syndrome questionnaire (CVS-Q). They found tearing of eyes as most common symptom and 94.5% as prevalence of CVS. [13] Similar results were seen in other studies.[14,15,16]

When we evaluated our study population for OSS grade using Oxford grading system, A total of 71 subjects (51.4%) showed different levels of positive OSS in which a majority of 27(19.6%) subjects showed mild grade of OSS.

In our study, mean TBUT was 9.80 seconds ± 4.88 seconds. TBUT ≤10 seconds was found in 64.5% subjects. Mean Schirmer's value was 11.68 ± 5.72 and 42% subjects had Schirmer's ≤ 10mm. On statistical analysis, we found TBUT and Schirmer's test had negative correlation with cumulative hours of CET, suggesting that more is the duration of exposure to VDT lower is the TBUT (r = -0.564) and Schirmer's value (r = -0.628). This was statistically significant with both TBUT and Schirmer's value. (P <0.001)

In a study by Nakamura mentions cumulative computer exposure time measured correlated with TBUT, but not with the Schirmer test.[17]

Sanchez-Valerio et al conducted a study on 119 subjects to assess the time of exposure to the computer and DED in subjects with CVS. They found that TBUT had significant negative correlation with CET in hours/day (P <0.001, rho -0.463). OSS showed positive correlation with CET (years) (P <0.001, rho -0.463). On assessing using accumulated CET, they found negative correlation with TBUT (P <0.001, rho -0.376), positive correlation with OSS (P <0.001, rho 0.433) and no correlation with Schirmer's test. [18]

CONCLUSION

During present time work from home is more common in IT professionals who presents with symptoms of pain, redness, irritation in eyes &change in lens power. So this study was done.

Our study highlights the higher incidence of DED among IT professionals affecting one's ocular health. The findings in our study population revealed that prolonged CET as important risk factor and the mean CET was 8.00 ± 2.45 hours per day, higher than those reported in other studies.[7]

Our findings highlight an important ocular health issue in this era and recommends to considerate about duration of exposure to VDT, type of VDT use and distance at which digital device is used to avoid developments of DED.

LIMITATION

In our study, we had a small study population and had no control group to compare the results.

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